



**Question #1: Social Studies – US History**

*15 points*

In 1834, the house of Lewis Tappan in this city was the target of anti-abolitionist rioting. In 1863, immigrants in this city rioted against the black population after President Lincoln announced a draft. George Washington’s first presidential inauguration took place in this city. It was the site of the Triangle Shirtwaist Factory fire. Until 1667, part of it was called New Amsterdam. Name this major city, where on September 11, 2001 two World Trade Center towers fell.

**New York** City, New York  
(accept **NYC**)

**Question #2: Literature – British Literature**

*15 points*

He complained of not having that which makes the hours short. Claiming to have a “soul of **lead [led]**” that “stakes him to the ground,” he offered to bear a torch instead of dance. He was warned that talking of “mortal drugs” would result in death. With “fire-eyed fury,” he slew the man who killed Mercutio. He bought poison from an apothecary, which he consumed after seeing his beloved in a tomb. Name this Shakespearean title character who fell in love with Juliet.

**Romeo** Montague (prompt on  
“Montague”)



**Question #3: Science – Biology**

15 points

This organ contains the **pectinate** [PEK-tuh-nate] muscles. Like the thigh, it contains a depression called the **fossa ovalis** [FAW-sa oh-VAH-les], which is what remains from the **foramen ovale** [FOR-uh-men oh-VAH-lee] in embryos. This also contains **papillary** [PA-pih-la-ree] muscles, which can be damaged by **ischemia** [ih-SKEE-mee-uh]. This is also the location of **Purkinje** [pur-KIN-jee] fibers or Bundle of His, which are generally less important than its **sinoatrial** [sigh-no-AI-tree-ul] node. Its function is aided by the **mitral** [MIGH-trul], tricuspid, and aortic valves. Name this organ with two **atria** [AI-tree-uh] and two ventricles that pumps blood to the rest of the body.

heart

**Question #4: Miscellaneous – Pop Culture**

15 points

He played an art thief set up by an insurance agent in *Entrapment*. This actor starred as Alan Quatermain in the movie adaptation of *The League of Extraordinary Gentlemen*, shortly after turning down the role of Gandalf in *The Lord of the Rings*. In one role, this actor had a gunshot wound healed with water poured from the Holy Grail. In that role, he was captured by Nazis and served as a lure for his son, Indiana Jones. Name this Scottish actor who starred in *Thunderball* and *Goldfinger* as secret agent James Bond.

Sir Thomas Sean Connery



**Question #5: Science – Astronomy**

15 points

Though this planet has no magnetic field, readings from its global surveyor determined that its crust in the southern hemisphere is magnetized. The 5261, which trails it, is a trojan asteroid. The subject of NASA's [NA-suhs] Viking missions, it was visited more recently by Spirit and Opportunity. This contains large canyons called Valles Marineris [VAL-us mar-ih-NAR-is] and the largest volcanic mountain in the solar system, Olympus Mons. Phobos and Deimos [DEE-mose] are its two moons. Name this red planet visited in 2012 by the rover Curiosity.

Mars

**Question #6: Literature – Mythology**

15 points

This man was the progeny [PRAH-juh-nee] of an incubus and a nun according to Geoffrey of Monmouth. He traveled with Aurelius Ambrosius [aw-REE-lee-us am-BROE-shus] to obtain the Giants' Ring. At the Round Table, he accounted for 28 of the 150 seats. In *Le Morte d'Arthur*, he teaches Nimue [NEE-moo-ay], who later imprisoned him in a cave. He created the test of the Sword in the Stone. He disguised Uther [OO-ther] Pendragon as Gorlois [gor-LOIS] to engineer the birth of King Arthur. Name this magician of the Round Table.

Merlin (accept Merlinus or Myrddin)



### Question #7: Science – Physics

10 points per part

Let's find out what you know about wavelengths.		
1	A common way to calculate wavelength is to divide wave speed by this quantity equal to waves per time. Name the quantity, not the common unit.	<u>frequency</u>
2	The wavelength of light is commonly measured in these units. The visible spectrum is between about 400 and 700 of these.	<u>nanometer</u> s (prompt on "10 <sup>-9</sup> meter")
3	Matter waves, which are used because of the wave-particle duality of matter, have a wavelength that varies inversely with momentum and are named after this scientist.	Louis <u>de Broglie</u>

### Question #8: Science – Physics

10 points per part

These particles are named after the Indian scientist who worked with Albert Einstein on their statistical models.		
1	Name these particles with integer spin values.	<u>bosons</u>
2	Because two bosons can occupy the same quantum state, they do not follow this principle that applies to fermions.	<u>Pauli exclusion</u> principle (prompt half answer)
3	These bosons carry the fundamental forces. Give the collective name rather than naming the carrier for each force.	<u>gauge</u> bosons



### Question #9: Social Studies – Psychology

10 points per part

Fergus Craik and Endel <b>Tuving</b> [TOO-veeng] found semantic encoding worked best for improving this.		
1	Name this process of storing and retrieving information. Emotionally charged moments can create the “flashbulb” type.	<u>memory</u>
2	Princeton psychologist George Miller developed a short-term memory law that found, on average, humans can hold this many items in working short-term memory.	<u>Seven</u>
3	This form of memory loss can be described as retrograde, where one loses stored memories, or <b>anterograde</b> [an-TER-oh-grade], where one cannot form new memories. It can be caused by head trauma.	<u>amnesia</u>

### Question #10: Social Studies – Psychology

10 points per part

He wrote about his search for <b>physiological</b> [FIS-ee-oh-LAH-ji-cul] and materialist evidence to back his psychological theories in <i>Project for a Scientific Psychology</i> .		
1	Name this Austrian psychologist, the founder of psychoanalysis. In <i>The Psychopathology of Everyday Life</i> , he wrote about slips of the tongue which were later named for him.	Sigmund <u>Freud</u>
2	In <b>Freud’s</b> [froyds] theories on psychoanalysis, this part of one’s personality is said to be the source of primitive drives.	<u>id</u>
3	In this seminal work, Freud claimed that the manifest content of the title events has a latent meaning, as the events themselves defy logical entailment and narrative coherence. In it, he coined the term “ <b>libido</b> [luh-BEE-doe]” to describe the mind’s energy.	<i>The <u>Interpretation of Dreams</u></i> (accept <i>Die <u>Traumdeutung</u></i> )



### Question #11: Literature – World Literature

10 points per part

In one of his stories, <b>Heracles</b> [HERE-uh-clees] told a wagon driver to stop praying to him so much.		
1	Name this ancient Greek slave who wrote a large number of fables.	<u>Aesop</u>
2	In one of Aesop's fables, an ant told this creature that his leisure-taking and singing in the summer led to his starvation in the winter.	<u>grasshopper</u>
3	Aesop also wrote about this slave, who was thrown to a lion. Much to the king's amazement, the lion licked this man's paw, as he had earlier pulled a thorn from the lion's paw.	<u>Androcles</u>

### Question #12: Literature – World Literature

10 points per part

When the reader first encounters this character, his path is blocked by a leopard, wolf, and a lion.		
1	Name this figure, who is led through Inferno and Purgatory by Virgil in the <i>Divine Comedy</i> . He is the author of the work.	<u>Dante Alighieri</u> (accept either half of answer)
2	All or nothing: in the ninth circle of hell, <b>Dante</b> [DAHNTAY] depicted Satan consuming the bodies of these three betrayers.	<u>Judas</u> Iscariot, <u>Cassius</u> , Marcus <u>Brutus</u> (answers may be in any order, all three must be given or it is incorrect)
3	After Virgil led <b>Dante</b> [DAHNTAY] to the Garden of Eden, this handmaid of Mary takes over as Dante's guide. Representing efficient grace, she guides him through Paradise.	<u>Beatrice</u>



### Question #13: Math – Probability

10 points per part

Two standard dice are rolled. Express your answers as simplified fractions when appropriate.		
1	Find the probability that the sum of the numbers on the dice is exactly 6.	<u>5/36</u>
2	Find the probability that the product of the numbers on the dice is exactly 5.	<u>1/18</u>
3	Because knowing the number that comes up on one die does not help in any way to predict the number that comes up on the other die, this term describes the relationship between the two rolls.	<u>independent</u> events (accept <u>independence</u> , do not accept “dependent” or “dependence”)

### Question #14: Math – Probability

10 points per part

An example is the probability that it is hot and the probability that it is snowing.		
1	Give the two-word phrase to describe events that cannot both happen. Such events can also be described as disjoint.	<u>mutually exclusive</u>
2	If S and T are mutually exclusive, the probability of S is 1/4, and the probability of T is 1/8, find the probability of S or T.	<u>3/8</u> (accept <u>.375</u> )
3	This set is the intersection of two disjoint sets.	<u>empty</u> set (accept <u>null</u> set)



**Question #15: Social Studies – World History**

15 points

<p>He gave the speech later titled <i>I Am Prepared to Die</i> as part of his defense during the <b>Rivonia [ri-VOH-nee-uh]</b> Trial. He helped found the militant wing <b>Umkhonto We Sizwe [oom-KONE-toh way SEEZ-way]</b> following the <b>Sharpeville SHARP-vill</b> massacre. He was imprisoned on Robben Island for twenty-seven years before his release was granted by Frederik Willem de Klerk. Name this African who became the first freely elected President of South Africa.</p>	<p>Nelson <u><b>Mandela</b></u> (prompt on “Madiba”)</p>
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**Question #16: Fine Arts – Art History**

15 points

<p>This architect designed additions to the Caroline <b>Wiess [WISE]</b> Law Building which are part of the Museum of Fine Arts in Houston, and his only other museum work is the New National Gallery in Berlin. He worked on Royal Trust Tower as part of his design of the Toronto-Dominion Centre, and his design in <b>Plano [PLAY-noe]</b>, Illinois is known as the Farnsworth House. Name this German-American architect associated with the saying, “Less is more.”</p>	<p>Ludwig <u><b>Mies van der Rohe</b></u> (prompt if part of the underlined information is given)</p>
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**Question #17: Math – Conceptual Math**

15 points

In a system based on these numbers, any non-empty set bounded above has a least upper bound. These can be constructed by taking **Dedekind [DEH-duh-kund]** cuts of a smaller set. These numbers form the only complete totally ordered field, and, as it did with the irrational numbers, Cantor **diagonalization [die-AG-null-i-ZAY-shun]** demonstrated that this set is uncountable. The set of imaginary numbers can be generated by multiplying the members of this set by the square root of negative one. Name this set equal to the union of rational and irrational numbers, often represented by the letter R.

**real** numbers (accept **reals** or **continuum**, prompt on “R”)

**Question #18: Science – Chemistry**

15 points

This element was combined with **chlorine [KLOR-een]** using light by Max **Bodenstein [BOH-den-stayn]** in the first explanation of a chain reaction. In 2011, two German scientists claimed to create the metallic form of this element, which normally exists around the cores of large planets. It is the only neutral atom that can be solved exactly with the Schrodinger equation, and an earlier attempt to explain it was the Bohr model. Name this element whose **diatomic [die-uh-TOM-ic]** gas is the lightest molecule, the first element in the Periodic Table.

**Hydrogen** (prompt on “H”)



**Question #19: Literature – US Literature**

15 points

<p>The protagonist of this novel compared himself to a squirrel in a forest; both followed their instinct and ran from danger. When a “tall soldier” who later became “spectral” died, the “red sun” was compared to a wafer. Its action centers on a farm boy from New York who encounters Wilson and Jim Conklin while fighting in the Civil War. Name this novel about the maturation of Henry Fielding, written by Stephen Crane.</p>	<p><i>The <u>Red Badge of Courage</u></i></p>
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**Question #20: Social Studies – Economics**

15 points

<p>A one-to-one relationship exists between the change in this and the change in the money growth rate, according to the quantity theory of money. Unemployment is plotted against this value on the Phillips curve. Increased production expenses can lead to its cost-push form, while a lack of supply can lead to the demand-pull form. The rate of this phenomenon over a period of time is calculated utilizing the Consumer Price Index. Name this increase in the relative cost of goods and services over time.</p>	<p><u>inflation</u></p>
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### Question #21: Math – Algebra

10 points per part

The adjoint of a matrix is divided by this number to find its inverse.		
1	Give this value used to determine the impact of a linear transformation on the area or volume of a shape.	<u>determinant</u>
2	Determinants are divided in this rule used to solve systems of equations.	<u>Cramer's</u> Rule
3	Find the value of the determinants you would use in the denominator of Cramer's Rule for the system $2x+3y=5$ and $x-y=7$ .	<u>-5</u>

### Question #22: Math – Algebra

10 points per part

For systems, this term applies when there is at least one solution.		
1	Give this term that can be applied to dependent or independent systems.	<u>consistent</u>
2	Give both solutions to the system $y=x$ and $y=x^2$ . Give those solutions as ordered pairs.	<u>(0,0) &amp; (1,1)</u> (accept <u>(1,1) &amp; (0,0)</u> )
3	Give the solution to the system $x+y=10$ and $x-y=14$ .	<u>(12,-2)</u> (order matters)



**Question #23: Social Studies – World History**

*10 points per part*

He altered the text of a telegraph to provoke what would become the <b>Franco-Prussian [FRAYN-koh PRUSH-un]</b> War.		
<b>1</b>	Name this statesman who declared that the great questions of the day would be decided by “blood and iron.”	Otto von <b><u>Bismarck</u></b> (prompt on “Iron Chancellor”)
<b>2</b>	Otto von Bismarck resigned as Prime Minister after falling out with this successor to Frederick III. He would abandon his post at the conclusion of World War One.	Kaiser <b><u>Wilhelm II</u></b> (accept Frederick <b><u>William</u></b> Victor <b><u>Albert of Prussia</u></b> )
<b>3</b>	Despite the Prussian government’s attempts to undermine this organization via the May Laws, the people reacted by backing the Zentrum at the ballot box.	Roman <b><u>Catholic</u></b> Church (prompt on “Church”, do not accept “Vatican”)

**Question #24: Social Studies – World History**

*10 points per part*

He came to power after ousting his sister Sophia and her lover Prince <b>Golitsin [GOH-lit-sin]</b> .		
<b>1</b>	Name this tsar who abolished the <b>Streltsy [STREHLT-see]</b> and founded a new Russian capital on the delta of the Neva River in 1703.	<b><u>Peter the Great</u></b> (accept <b><u>Peter I</u></b> )
<b>2</b>	In the Great Northern War, Peter the Great attempted to take back territory lost to this kingdom. It won an early victory at the Battle of Narva, but the tide turned following the death of Charles XII.	<b><u>Sweden</u></b>
<b>3</b>	Following the Treaty of <b>Nystadt [NIGH-stat]</b> which ended the Great Northern War, Sweden lost all of its possessions on the eastern border of this body of water. St. Petersburg is connected to it through the Gulf of Finland.	<b><u>Baltic</u></b> Sea



### Question #25: Literature – British Literature

10 points per part

In one of these stories, Absalom kissed Nicholas' buttocks before branding it with a red-hot iron.		
1	Name this collection of stories, told by such characters as the Knight and the Nun's Priest.	<i>The <u>Canterbury Tales</u></i>
2	The <i>Canterbury Tales</i> were penned by this English author, who is the narrator. He also wrote <i>The Parliament of Fowls</i> .	Geoffrey <u>Chaucer</u>
3	In this tale, a knight raped a woman in King Arthur's court. Instead of death, he is tasked to find out what women desire most, which is power. He then agreed to marry the old woman who provided the answer.	" <u>Wife of Bath</u> 's Tale" (prompt on partial answer)

### Question #26: Literature – British Literature

10 points per part

Colonel [KER-nel] Sebastian Moran was an agent of this villain.		
1	Name this "Napoleon of Crime" who died after falling over Reichenbach [RIKE-en-bawk] Falls in Switzerland.	Professor James <u>Moriarty</u>
2	Professor Moriarty vowed to end this man, who was determined to take down Moriarty's network of organized crime. His first appearance was in <i>A Study in Scarlet</i> , and his adventures are narrated by Dr. John Watson.	<u>Sherlock Holmes</u> (accept either)
3	Sherlock Holmes was created by this English writer, who wrote about the detective in such stories as "The Adventure of the Speckled Band" and "The Red-Headed League."	Sir Arthur Conan <u>Doyle</u>



### Question #27: Fine Arts – Classical/Opera Music

10 points per part

The only opera he wrote is about <b>Leonore</b> [lay-uh-NOR-ay], who disguises herself as a prison guard named Fidelio.		
<b>1</b>	Name this composer whose ninth and final symphony is nicknamed Choral and uses words from Schiller's "Ode to Joy."	Ludwig van <b><u>Beethoven</u></b>
<b>2</b>	This nickname is commonly given to Beethoven's Third Symphony, which he originally planned on dedicating to Napoleon.	<b><u>Eroica</u></b>
<b>3</b>	The last part of this Beethoven ballet shares a theme with his Eroica Symphony. It is Beethoven's only full length ballet, and its title refers to the human race.	<i>The <b><u>Creatures of Prometheus</u></b></i> (accept <i>Die <b><u>Geschöpfe des Prometheus</u></b></i> )

### Question #28: Fine Arts – Classical/Opera Music

10 points per part

This opera includes " <b>Votre</b> [VOH-tray] Toast", which is known as the Toreador Song.		
<b>1</b>	Name this opera whose title character is a gypsy who works in a cigarette factory in Seville.	<b><u>Carmen</u></b>
<b>2</b>	Carmen was composed by this Frenchman.	Georges <b><u>Bizet</u></b>
<b>3</b>	This soldier falls in love with Carmen, but she falls in love with the toreador <b>Escamillo</b> [es-ka-MEEL-oh].	Don <b><u>Jose</u></b>



**Question #29: Literature – World Literature**

15 points

In one work, this author compared a woman to a jar that housed infinite tenderness, shattered by infinite oblivion, as well as a fruit that countered thirst and hunger. In another poem, this author asked someone to “give me the struggle, the iron, the volcanoes.” This author of “A Song of Despair” wrote a poem in which the speaker asked “arise to birth with me, my brother;” “The Heights of **Macchu Picchu** [**MAH-chew PEE-chew**].” Name this author who wrote the poetry collection *Canto General* [**HEN-uh-rah**l], a **Chilean** [**chee-LAY-un**] poet.

Pablo **Neruda** (accept Neftalí Ricardo **Reyes** Basoalto)

**Question #30: Math – Conceptual Math**

15 points

Distances measured on this class of shapes are often in ratios given by one of the **Feigenbaum** [**FIE-gen-baum**] constants, and these can often be defined by **affine** [**ah-FINE**] transformations, as is done for a Barnsley’s fern. One common method of generation involves applying random numbers to an iterated function system, while another involves quadratic recurrence equations in the complex plane such as  $z^2 + c$ . Examples include the dragon curve, Koch snowflake, and several shapes named after **Waclaw** [**VAHTS-wahf**] **Sierpinski** [**sir-PINS-kee**]. Their dimension generally is not an integer, and these shapes exhibit self-similarity. Name these shapes that visualize a Julia set or Mandelbrot set.

**fractal**



**Question #31: Social Studies – US History**

15 points

<p>During his first presidential campaign, his closest rival for the nomination was Mo Udall. He signed the law that created the Department of Energy, and, with General Omar <b>Torrijos [tor-REE-hoes]</b>, he signed treaties ensuring the end of US control of the Panama Canal. This president helped negotiate a peace treaty between Anwar <b>Sadat [sah-DAHT]</b> and <b>Menachem Begin [meh-NAHK-em BAY-gin]</b>, the Camp David Accords. Name this successor to Gerald Ford, a former peanut farmer and governor of Georgia.</p>	<p>James Earl “Jimmy” <b><u>Carter</u></b></p>
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**Question #32: Science – Physics**

15 points

<p>An effort to reconcile this phenomenon with quantum mechanics led to the idea shared by string theory that the information inside a volume can be contained on its surface, the holographic principle. Its ability to deflect light was confirmed in 1919 by Arthur Eddington, giving strength to the theory of general relativity. General relativity improved on the theory put forth in the <i>Principia</i> [prin-SIP-ee-uh] that this has an inverse square relation with distance and requires two objects with mass. Name this force that keeps planets in orbit and keeps us near the ground.</p>	<p><b><u>gravity</u></b> (accept <b><u>gravitation</u></b>, prompt on “relativity” or “general relativity”)</p>
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**Extra Question #1: Social Studies – World History**

15 points

After this was signed, Pope Innocent III excommunicated Richard of Clare, who was tasked with ensuring it was followed. Article 39 of it mandated that only a lawful judgment could be used to justify imprisonment or exile. It called for a body of twenty-five barons to ensure that all parties, including the crown, followed its provisions. Name this document that curbed the power of the King of England, signed by King John in 1215.

**Magna Carta** (accept **Great Charter**, prompt on “Articles of the Barons”)

**Extra Question #2: Fine Arts – Classical/Opera Music**

15 points

This composer’s works, ending with an *Ode to France* that was edited after his death by his friends, were organized by **Francois Lesure [fran-SWAW lay-SZUR]**. One collection of six pieces, dedicated to his young daughter nicknamed **Chouchou [CHOO-choo]**, ends with “Golliwogg’s Cakewalk” and is titled *Children’s Corner*. Another work was based on a poem by **Stephane Mallarme [ste-FAHN mal-ar-MAY]** and turned into a ballet choreographed by Vaslav **Nijinsky [nih-JIN-skee]**. A three-movement work by this composer ends with his “Dialogue between wind and waves.” Name this composer of *Prelude to the Afternoon of a Faun* and *La Mer* who also wrote *Clair de lune [loon]*.

Claude **Debussy**



**Extra Question #3: Math – Conceptual Math**

15 points

One type of this shape in four dimensions is named for William Clifford, and the type in three dimensions that intercepts itself is the spindle type. One way to form this shape is to connect both pairs of opposite ends of a rectangle without twists, and the calculation of their surface area and volume is a straightforward application of Pappus' theorem. Other than the spindle type, these can be of the horn or ring type, and these are generated by moving a circle in three-space through a circular path. Name these shapes that look like doughnuts.

torus (accept toroid)

**Extra Question #4: Science – Biology**

15 points

This phase of mitosis is triggered by **cyclosome** [SIGH-kloh-some], which eliminates securin, leading to the release of separin. The end of this phase is characterized by the disintegration of the **kinetochore** [ki-NEE-tuh-kor] microtubules and the first stages of a cell membrane. This phase is characterized by movement along the polar microtubules pulling the sister **chromatids** [KROH-muh-tids] apart, leading to an elongation of the cell. Name this phase of mitosis occurring between metaphase and telophase.

anaphase



**Extra Question #5: Literature – US Literature**

*15 points*

His father was killed by Kerchak, who with Tublat tortured him as he was raised by Kala. Among the people rescued by him were Lieutenant Paul d'Arnot, who later taught him French. In Wisconsin, he saved his future wife from a fire before being rejected, along with financier Robert Canler. The son of Alice Clayton and Lord Greystroke, his name translates as "white ape." Name this fictional jungle resident who fell in love with Jane Porter, created by Edgar Rice Burroughs.

**Tarzan** of the Apes



**Extra Question #6: Science – Chemistry**

*10 points per part*

This element has the highest electrical and thermal conductivity.		
<b>1</b>	Name this metal once known as argentum.	<b>Silver</b> (prompt on “Ag”)
<b>2</b>	Silver is used as a catalyst to break down methanol into hydrogen gas and this embalming agent.	<b>Formaldehyde</b> (accept <b>Methanal</b> , prompt on “Aldehyde”)
<b>3</b>	Silver is combined with this element to seed clouds.	<b>Iodine</b> (prompt on “Silver Iodide”)

**Extra Question #7: Science – Chemistry**

*10 points per part*

This is commonly used in tandem with gas or liquid chromatography.		
<b>1</b>	Give a two-word answer to name this method of measuring the mass-to-charge ratio of particles.	<b>Mass Spectrometry</b> (accept <b>Mass Spectroscopy</b> or other word forms)
<b>2</b>	This scientist worked with Harvey Fletcher on his oil drop experiment to measure the charge of an electron. Because the mass-to-charge ratio was already known, this also gave the mass.	Robert <b>Millikan</b>
<b>3</b>	This is one of the people credited with developing mass spectrometry. His work was improved by J.J. Thomson, and he also developed an equation to describe the short wavelength spectrum of blackbodies.	Wilhelm <b>Wien</b>



**Extra Question #8: Social Studies – US History**

*10 points per part*

Packaged with 150 guns and 25,000 bales of cotton, the capture of this city was called a “Christmas present” in 1864.		
<b>1</b>	Name this city, the terminus of the “March to the Sea.”	<u>Savannah</u> , Georgia
<b>2</b>	Savannah was offered to President Lincoln by this general, who refused to run for President, saying “if nominated I will not run; if elected I will not serve.”	William Tecumseh <u>Sherman</u>
<b>3</b>	Sherman’s “March to the Sea” began in this city. Having been tapped to replace Joseph Johnston, John Hood fled this city after the railroads that supplied his troops were cut.	<u>Atlanta</u> , Georgia

**Extra Question #9: Social Studies – US History**

*10 points per part*

Sir Eric Drummond was chosen as the first leader of this organization.		
<b>1</b>	Name this badly-run international organization, whose constitution was adopted at the Paris Peace Conference in 1919.	<u>League of Nations</u>
<b>2</b>	The formation of the League of Nations was one of this President’s Fourteen Points.	Thomas Woodrow <u>Wilson</u>
<b>3</b>	This head of the Foreign Relations Committee headed the campaign against US ratification of the Treaty of Versailles. He attempted to add an amendment mandating Congressional approval of League decisions.	Henry Cabot <u>Lodge</u> , Sr.



**Question #1: Science – Chemistry**

*15 points*

Particle physicists use devices with this name to measure particles in detectors, often using **lead [led]** to stop particles and then measuring the amount of energy released. The isothermal **titration [tie-TRAY-shun]** type of this device uses a reference and sample cell, each of which is a good thermal conductor. A common type of this device uses stainless steel inside a constant volume container that is a good thermal insulator; that is the bomb type. Name this device used to measure heat capacity and the heat of chemical reactions.

(bomb) calorimeter

**Question #2: Social Studies – World History**

*15 points*

In the aftermath of this battle, the victorious side was ambushed at **Malfosse [MAHL-foss]** Wood. After an order to fire higher, and a subsequent cavalry charge, **Gyrth [gurth]** and **Leofwine [lee-uh-FWINE]** were killed. The losing side took a defensive position with housecarls providing a shield wall and the **fyrd [furd]** behind them at Senlac Hill. An arrow to the eye at this battle killed King Harold II. Name this 1066 battle that secured the conquest of England by William of Normandy.

Battle of Hastings



**Question #3: Fine Arts – Classical/Opera Music**

15 points

In one opera by this composer, Anna worries that her fiancée Roberto will not return to her. In addition to that first work, *Le Villi*, this composer wrote an opera in which the Prince of Persia is beheaded because he fails to answer three riddles. Another opera by this composer includes the aria “*Che gelida manina* [chay guh-LEE-duh muh-NEE-nuh]”, which is sung after candles go out belonging to the main characters, a poet named Rodolfo and a seamstress named Mimi. Another opera involves a love affair between Lieutenant Pinkerton and *Cio-Cio-San* [cho-cho-sahn]. Name this composer of *Turandot* [tur-ahn-DOE], *La bohème* [bo-HEM], and *Madame Butterfly*.

Giacomo Puccini

**Question #4: Math – Conceptual Math**

15 points

One classification of graphs depends on whether or not their edges cross when they are drawn on this surface. A twisted sphere can also be referred to as the projective type of this shape, which includes a line at infinity. These can be determined by a point and a normal vector, and they can also be determined by three points that are not *collinear* [koe-LIN-ee-ur]. Unless two of these are parallel, their intersection is a line. Name this shape, able to define a two-dimensional space, which is flat and infinite.

plane (accept planar)



**Question #5: Literature – US Literature**

15 points

<p>In one novel, this author wrote about the star of <i>Daddy's Girl</i>, Rosemary Hoyt. One of this author's protagonists was a star quarterback and newspaper editor at St. Regis's before entering Princeton at seventeen. This author of <i>Tender is the Night</i> and <i>This Side of Paradise</i> also wrote about the cheating golfer Jordan Baker in a novel which saw Myrtle Wilson get run over by Daisy Buchanan. Name this author of <i>The Great Gatsby</i>.</p>	<p>Francis Scott <u>Fitzgerald</u></p>
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**Question #6: Social Studies – Geography**

15 points

<p>This river's Central Commission was established at the Mainz Convention of 1831. One of the terms of the 1919 Treaty of <b>Versailles [vehr-SIGH]</b> allowed France use of water from this river to create hydroelectric power. Julius Caesar made this river the eastern border of Roman Gaul. Lake Toma is a major tributary of this river, whose <b>Untersee [OON-ter-see]</b> arm begins at Lake Constance. Major cities found on its banks include <b>Basel [BAHS-el]</b>, Bonn, and <b>Cologne [kuh-LONE]</b>. Name this major river that flows through western Germany.</p>	<p><u>Rhine</u> River</p>
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### Question #7: Math – Statistics

10 points per part

One of these values is the median of the higher half of a list of numbers, and the other value is the median of the lower half.		
1	Give the common name for these numbers often denoted Q sub 1 and Q sub 3.	<u>quartiles</u> (accept first <u>quartile</u> and third <u>quartile</u> )
2	These numbers, sometimes defined as being greater than Q sub 3 plus three-halves the interquartile range or less than Q sub 1 minus three-halves the interquartile range, are data entries that are unusually high or low.	<u>outliers</u>
3	Rounded to the nearest percent, this is how many items in a list are within one standard deviation of the mean in a normal distribution.	<u>68%</u>

### Question #8: Math – Statistics

10 points per part

This drawing is used to represent the extremes and quartiles in a distribution.		
1	Name this diagram which shows the five-number summary.	<u>Box</u> and Whisker Plot (accept <u>Box</u> and Whisker Diagram)
2	Find the median for the following list of numbers: 4, 6, 7, 9, 10, 14.	<u>8</u>
3	Give the interquartile range for the same list of numbers. Once again, those numbers are 4, 6, 7, 9, 10, 14.	<u>4</u>



**Question #9: Literature – US Literature**

10 points per part

After returning home from work, he found his wife Mildred after she had overdosed on sleeping pills.		
1	Name this fireman who stayed in contact with Faber via a pair of earphone-transmitters.	<b><u>Guy Montag</u></b> (accept either half)
2	Guy Montag is the protagonist of this novel, whose title comes from the temperature necessary to burn books.	<b><u>Fahrenheit 451</u></b>
3	<i>Fahrenheit 451</i> was written by this author of <i>The Martian Chronicles</i> .	Ray Douglas <b><u>Bradbury</u></b>

**Question #10: Literature – US Literature**

10 points per part

The title character of this novel is sold to Simon Legree, who orders him to flog a sick woman.		
1	Name this novel in which Mr. Shelby ended up freeing all of his slaves in honor of the central character.	<b><u>Uncle Tom's Cabin</u></b>
2	<i>Uncle Tom's Cabin</i> was written by this author, who wrote about her research in <i>A Key to "Uncle Tom's Cabin."</i>	Harriet Elizabeth <b><u>Beecher Stowe</u></b> (accept either underlined part)
3	In <i>Uncle Tom's Cabin</i> , Eliza escaped from Haley by utilizing pieces of floating ice on this major waterway.	<b><u>Ohio</u></b> River



**Question #11: Science – Biology**

*10 points per part*

These organs are made up largely of osseous tissue.		
<b>1</b>	Name these structures, of which there are 206 in an adult human.	<u>bones</u>
<b>2</b>	Bones also include this tissue where red blood cells are produced.	bone <u>marrow</u>
<b>3</b>	Virtually all bones in mature adults are of this type, often contrasted with woven bones, in which the collagen is layered.	<u>lamellar</u> bones (accept <u>lamellae</u> )

**Question #12: Science – Biology**

*10 points per part*

Blood has many components.		
<b>1</b>	This is the liquid component of blood. It is mostly water.	blood <u>plasma</u>
<b>2</b>	This protein containing iron helps the blood transfer oxygen.	<u>hemoglobin</u>
<b>3</b>	This is the most abundant protein in blood plasma. This protein is also a major component in egg whites.	<u>albumin</u>



**Question #13: Social Studies – Religion**

*10 points per part*

This holy book is often called “ <b>al-karim [ahl-kah-REEM]</b> ” or “ <b>al-majid [ahl-mah-JEED]</b> ,” meaning “Noble” or “Glorious.”		
<b>1</b>	Name this holy text that according to tradition was revealed to the Prophet Muhammad by Gabriel.	<b><u>Koran</u></b> (accept <b><u>Quran</u></b> )
<b>2</b>	Since translating it involves human interpretation, some scholars hold that for a text to be a true Koran, it must be written in this language, since it was communicated to Muhammad in this language.	<b><u>Arabic</u></b>
<b>3</b>	When reciting Koranic verses in prayer in a mosque, Muslims often face a <b>kiblah [KEE-blah]</b> , which points in the direction of this sacred shrine. Those who go on the hajj circle this Meccan shrine seven times.	<b><u>Kaaba</u></b> (accept <b><u>Ka’bah</u></b> )

**Question #14: Social Studies – Religion**

*10 points per part*

Name these women from the Old Testament.		
<b>1</b>	This daughter-in-law of Naomi ended up taking Boaz as her husband. During <b>Shavuot [shah-voo-OTE]</b> , her eponymous book is read in its entirety.	<b><u>Ruth</u></b>
<b>2</b>	This woman once tied her husband up with seven wet ropes. Through her trickery, Samson was captured by the <b>Philistines [FIL-uh-steens]</b> .	<b><u>Delilah</u></b>
<b>3</b>	A judge, this woman and Barak took on the <b>Canaanite [KAY-nuh-nite]</b> army led by <b>Sisera [si-SEHR-uh]</b> under the rule of <b>Jabin [jah-BEAN]</b> .	<b><u>Deborah</u></b>



**Question #15: Literature – British Literature**

*15 points*

<p>In one poem, he described God as “one far-off divine event to which the whole creation moves.” This author wrote, “We are not now that strength which in old days moved heaven and earth... made weak by time and fate, but strong in will to strive, to seek, to find, and not to yield.” This author of the poem “Ulysses” also wrote about a group of six hundred soldiers who rode “into the valley of death.” Name this poet of “In Memoriam A H H” and “The Charge of the Light Brigade.”</p>	<p>Alfred, Lord <u>Tennyson</u></p>
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**Question #16: Science – Earth Science**

*15 points*

<p>Attempts to understand this weather phenomenon in North America have been called SWAMP and NAME, taking place in part in Sonora and Chihuahua [chi-WAH-wah] and caused in part by the Gulf of California and Mexican Plateau. Defined as a change in air circulation based on the seasons, it affects the trade winds in Africa and brings rain to Sudan. The change in altitude between both the Arabian Sea and Bay of Bengal on the one hand and the Himalayas on the other results in the strongest example of this phenomenon. Name this weather system exemplified by a very rainy season in India.</p>	<p><u>monsoons</u></p>
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**Question #17: Miscellaneous – Consumer Ed**

*15 points*

<p>After distributing leaflets entitled “What’s Wrong With” this company, Helen Steel and David Morris were sued for libel in the longest legal case in English history. Stella <b>Liebeck [LEE-beck]</b> successfully sued this company after suffering third-degree burns from its coffee. Its signs indicate that it has served over 99 billion customers. Currently using the slogan “I’m lovin it”, this franchise offers the Filet-O-Fish and Happy Meals. Name this fast food chain, symbolized by a pair of golden arches.</p>	<p><b><u>McDonald’s</u></b> Corporation</p>
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**Question #18: Social Studies – US History**

*15 points*

<p>The investigation that revealed this scandal’s details was led by Montana Senator Thomas Walsh. M.T. Everhart’s testimony was key in the trial of Edward Doheny, who was acquitted of bribery charges. In another trial stemming from it, Harry Sinclair was convicted of jury tampering. It surrounded the leasing of oil fields in California and Wyoming. Name this scandal leading to a bribery conviction for Albert Fall, the Interior Secretary under Warren Harding.</p>	<p><b><u>Teapot Dome</u></b> Scandal</p>
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**Question #19: Science – Biology**

15 points

The genus named after this person is a bacteria that includes the species **multocida** [mahl-toe-SIGH-duh], which he discovered caused **cholera** [KAHL-uh-ruh] in birds. The point named after him is used to explain the explosion of species during the Cambrian period, and the effect named after this person deals with the decreased rate of **glycolysis** [gligh-KOL-uh-sis] in the presence of oxygen. He developed the first anthrax vaccine in 1881. Name this French scientist whose name is associated with a process of heating and then cooling drinks to slow down the impact of pathogens.

Louis Pasteur

**Question #20: Literature – World Literature**

15 points

One member of this group gave up the name **Chevalier** [she-VAHL-yay] d'Herblay but would later become the bishop of **Vannes** [van]. One of them employed **Mousqueton** [MOO-skuh-ton] as a servant and had an affair with Madame **Coquenard** [COKE-nahr] in order to access her husband's money. One used to hold the title **Comte** [comt] de la **Fere** [fehr]; while a nobleman he married Charlotte Backson, who later became Milady de Winter. Name this group of fighters who took **D'Artagnan** [dar-tuh-nyan] under their wing, created by Alexander Dumas.

the Three Musketeers (accept Les Trois Mousquetaires, prompt on "Musketeers" or "Mousquetaires")



**Question #21: Math – Geometry**

*10 points per part*

This is non-orientable and has only one side.		
<b>1</b>	Name this object formed by joining the ends of a paper strip with a half-twist.	<b><u>Mobius</u></b> strip (accept <b><u>Mobius</u></b> band)
<b>2</b>	This non-orientable surface with no boundary appears to go through itself in three dimensions. It is named for the German who described it in 1882.	<b><u>Klein</u></b> bottle
<b>3</b>	A rectangular strip of paper with dimensions ten by two is used to make a Mobius strip by connecting the ends with a half twist. Find the surface area of the Mobius strip.	<b><u>40</u></b>

**Question #22: Math – Geometry**

*10 points per part*

This type of triangle has exactly two congruent sides.		
<b>1</b>	Name this triangle that also has exactly two congruent angles, the base angles.	<b><u>isosceles</u></b>
<b>2</b>	If each of the base angles in a triangle is 35 degrees, this is the measure of the vertex angle in degrees.	<b><u>110</u></b> degrees
<b>3</b>	If a right isosceles triangle has a hypotenuse of length 10, this is the area of the triangle.	<b><u>25</u></b>



**Question #23: Fine Arts – Art History**

10 points per part

The left side of this work shows Epicurus reading a book.		
<b>1</b>	Name this 16th century work believed to show Plato and Aristotle in its center surrounded by many leading ancient scholars.	<i>The <u>School of Athens</u></i> (accept <u><i>Scuola di Atene</i></u> )
<b>2</b>	The School of Athens was painted by this artist who also created <i>Madonna of the Goldfinch</i> .	<u>Raphael</u> (accept <u>Raffaello</u> or <u>Sanzio</u> )
<b>3</b>	Raphael painted this fresco in the same room. It depicts several people around an altar below Christ in heaven surrounded by several Biblical figures.	<i>La <u>Disputa</u> del sacramento</i> (accept <u><i>Disputation of the Sacrament</i></u> )

**Question #24: Fine Arts – Art History**

10 points per part

One of his works is <i>Dream Caused by the Flight of a Bee Around a Pomegranate a Second Before Awakening</i> .		
<b>1</b>	Name this Spanish surrealist.	Salvador <u>Dali</u>
<b>2</b>	This Dali work shows a red watch case covered with ants and a melting timepiece hanging on a tree.	<i>The <u>Persistence of Memory</u></i> (accept <i>La <u>persistencia de la memoria</u></i> )
<b>3</b>	One work by Dali shows this woman's head attached to the body of a red lioness with white claws. It sometimes is called Barcelona Sphinx.	Shirley <u>Temple</u> (accept Shirley Temple <u>Black</u> )



**Question #25: Science – Chemistry**

*10 points per part*

This group has high ionization energies and low melting and boiling points.		
<b>1</b>	Give the nickname of this column at the right end of the Periodic Table in group 18.	<u>Noble</u> gases
<b>2</b>	Though the Noble gases are generally not reactive, there are a few compounds combining them with this element that is the most electronegative element outside the Noble gases.	<u>Fluorine</u> (prompt on “F”)
<b>3</b>	One form of radiometric dating compares the amount of the Noble gas Argon to the amount of this element that is not a Noble gas.	<u>Potassium</u> (prompt on “K”)

**Question #26: Science – Chemistry**

*10 points per part*

Many of these are crystals.		
<b>1</b>	Name this state of matter characterized by a shape resistant to change.	<u>solids</u>
<b>2</b>	The most common example of this type of non-crystalline [KRIS-tul-eeen] solid is glass.	<u>amorphous</u> (accept <u>amorphic</u> )
<b>3</b>	One amorphous mineral is this volcanic glass formed by the rapid solidification of lava. It generally is black.	<u>Obsidian</u>



**Question #27: Social Studies – US History**

*10 points per part*

Its speaker describes a contest in which “brother has been arrayed against brother, and father against son.”		
<b>1</b>	Name this oration which decries a crown of thorns being pressed down upon the brow of labor, and mankind being crucified on a certain object.	“ <u>Cross of Gold</u> ” speech
<b>2</b>	The “Cross of Gold” speech was given by this former Nebraska congressman who prosecuted John Scopes for teaching evolution. He served as Woodrow Wilson’s Secretary of State.	Willian Jennings <u>Bryan</u>
<b>3</b>	Bryan gave the “Cross of Gold” speech at the 1896 iteration of this event in Chicago. The 1968 iteration, also held in Chicago, saw protests that led to the trial of the Chicago Seven.	<u>Democratic National Convention</u> (must give both underlined parts, prompt partial answers)

**Question #28: Social Studies – US History**

*10 points per part*

He initially claimed to have a list of 205 State Department employees who were registered Communists.		
<b>1</b>	During testimony, Special Council Joseph Welch asked this Senator, “Have you no sense of decency?” He was censured shortly after the incident.	Joseph Raymond <u>McCarthy</u>
<b>2</b>	McCarthy gained his Senate seat by defeating this Progressive and 1924 presidential candidate known as “Fightin’ Bob.”	Robert Marion <u>LaFollette</u>
<b>3</b>	McCarthy hails from this state, which is the only state LaFollette carried in the 1924 presidential election.	<u>Wisconsin</u>



**Question #29: Math – Conceptual Math**

15 points

The adjectival form of this word is applied to curves or lines on ruled surfaces where there is no curvature. That form can also be used for big **O** [oh] notation, since it classifies algorithms by the type of this created by its limiting behavior. Though graphs of rational functions are limited to only one horizontal example of this structure, there are two of them for some functions such as arctangent. The vertical type exists for rational functions with non-removable discontinuities, and the only non-degenerate conic section to be associated with these is the hyperbola. Name these lines that graphs approach as they go towards infinity.

asymptotes (accept asymptotic)

**Question #30: Literature – Mythology**

15 points

He was given the epithet *Agraeus* after slaying the lion of **Cithaeron** [SITH-er-on]. He competed with **Zephyrus** [ZEHF-ir-us] for the love of **Hyacinthus** [high-uh-SINTH-us], and he spent time as a shepherd for **Admetus** [ad-MEE-tus]. This god murdered the cyclops responsible for killing his son **Asclepius** [uh-SKLEE-pee-us] and pursued a mortal that was turned into a laurel tree. He killed the sons of **Niobe** [NIGH-oh-bee] in revenge for boasts denigrating his mother **Leto** [LEE-toe]. As a babe, **Hermes** [HER-meess] kidnapped this god's cattle, and then gave this god a lyre. Name this twin brother of **Artemis** [AHR-teh-mis], the Greek god of music and light.

Phoebus Apollo (accept Apollon)



**Question #31: Science – Physics**

*15 points*

<p>This person is the namesake of a version of helium also known as harmonium whose Schrodinger equation can be solved. The square root of the constant associated with him is divided by two pi and the square root of mass to find the frequency of a simple harmonic oscillator. In the equation named for him, the opposite of that constant is multiplied by displacement to calculate force. Name this physicist who discovered the law of elasticity and whose equation is used to find the restoring force of a spring.</p>	<p>Robert <u>Hooke</u></p>
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**Question #32: Social Studies – World History**

*15 points*

<p>The murder of Sebastian <b>Gomes</b> [GOH-mes] by this country's military led to the Santa Cruz Massacre. The first president of this country oversaw a period of "Guided Democracy" before being the target of a PKI insurrection. That leader was removed by a "New Order" coalition, which saw a power transfer from <b>Sukarno</b> [soo-KAR-noe] to <b>Suharto</b> [soo-HAR-toe]. Name this large Asian archipelago which used to control East <b>Timor</b> [TEE-mohr] and is where Java Man was found.</p>	<p>Republic of <u>Indonesia</u></p>
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**Extra Question #1: Fine Arts – Art History**

15 points

<p>This artist worked with <b>Jan Brueghel [yon BRAY-gel]</b> the Elder on works such as <i>Allegory of Sight</i>. This artist made several works for the Cathedral of Our Lady in Antwerp, including two <b>trptychs [trip-tiks]</b> that were taken by Napoleon. One of those works has a left panel showing the visitation between Mary and Elizabeth, and the other shows the presentation of Jesus at the Temple. Name this 17th century <b>Flemish [FLEH-mish]</b> painter who in addition to <i>Hippopotamus Hunt</i> and <i>The Union of Earth and Water</i> painted <i>The Elevation of the Cross</i> and <i>The Descent from the Cross</i>.</p>	<p>Peter Paul <b><u>Rubens</u></b></p>
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**Extra Question #2: Math – Conceptual Math**

15 points

<p>The line named after this person is found by extending pairs of opposite sides of a hexagon to find their intersection points. Inspired by the <b>Chevalier de Mere [SHEH-vahl-yay de MARE]</b>, a series of letters between this person and Pierre de <b>Fermat [FEHR-mah]</b> discussing the distribution of money in an unfinished gambling contest led to the development of probability theory. This person also used probability in a wager to argue for the existence of God. Name this Frenchman who arranged the binomial coefficients into his namesake triangle.</p>	<p>Blaise <b><u>Pascal</u></b></p>
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**Extra Question #3: Literature – British Literature**

15 points

<p>In one play by this author, one character claims that “a nod is as good as a wink;” that character later suggests the protagonist “leave well alone, or your goose may be cooked and eaten to the bone.” That threat came from the first of four tempters that tempted an archbishop who was slain by four knights. This author, who wrote about the murder of Thomas a Becket in <i>Murder in the Cathedral</i>, wrote a poem in which April was declared the cruelest month. Name this author of “The Waste Land.”</p>	<p>Thomas Stearns “T.S.” <u>Eliot</u></p>
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**Extra Question #4: Science – Astronomy**

15 points

<p>Very bright examples of these are known as <b>superbolides</b> [soo-per-BOE-lides], including the one associated with the island of <b>Sulawesi</b> seen in 2009. Many of these are classified as <b>chondrites</b> [KON-drites] or <b>pallasites</b> [PAL-uh-sites] depending on their composition and whether little round pieces are found within them. These can cause shatter cones, and the Alvarez hypothesis claims that one of these caused the <b>Cretaceous-Paleogene</b> [kreh-TAY-shus PAY-lee-oh-jeen] extinction event that killed all the dinosaurs. These are the objects in the <b>Perseid</b> [PER-see-id] and Leonid showers. Name these objects that can appear as shooting stars when they enter Earth’s atmosphere.</p>	<p><u>meteor</u> (accept <u>meteorite</u> or <u>asteroid</u>)</p>
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**Extra Question #5: Social Studies – US History**

*15 points*

This territory was formally annexed via the Newlands Resolution. Due to the forces under Lorrin Thurston threatening violence, its royalty were stripped of executive powers via the “Bayonet Constitution.” After forces from the *Boston* led a coup here, a republic was established by Sanford Dole. Prior to becoming a republic, it was led by Queen **Liliuokalani** [li-lee-OH-kah-lah-nee]. Name this state, the 50th state admitted to the United States.

**Hawaii**



**Extra Question #6: Literature – British Literature**

10 points per part

In this novel, birthmarks on the protagonist’s ear and opposing cheek represent geographical features.		
<b>1</b>	Name this novel featuring Parvati-the-witch, the mistress of the evil <b>Shiva [SHI-vah]</b> and the wife of narrator Saleem Sinai.	<u><b>Midnight’s Children</b></u>
<b>2</b>	<i>Midnight’s Children</i> was penned by this author, the target of a <i>fatwa</i> after writing the controversial novel <i>The Satanic Verses</i> .	Salman <u><b>Rushdie</b></u>
<b>3</b>	This body part of Saleem Sinai initially gave him the ability to intercept thoughts, but after surgery it gave him the ability to sense good and evil.	<u><b>nose</b></u>

**Extra Question #7: Literature – British Literature**

10 points per part

This author wrote of a man-about-town who would leave London claiming to have to attend to his cousin Bunbury.		
<b>1</b>	Name this playwright, the author of <i>The Importance of Being Earnest</i> .	Oscar <u><b>Wilde</b></u>
<b>2</b>	Oscar Wilde penned a novel about this handsome Londoner, whose evil tendencies were encapsulated in a painting. After he stabbed the portrait, his servants found him with a knife in his breast.	<u><b>Dorian Grey</b></u> (accept either)
<b>3</b>	While in jail for this crime, Wilde took the time to write <i>The Ballad of Reading <b>Gaol</b> [jail]</i> .	<u><b>homosexuality</b></u> (accept equivalents)



**Extra Question #8: Math – Algebra**

*10 points per part*

The decimal system uses 10 for this purpose, while the binary system uses 2 for this purpose.		
<b>1</b>	Give this term, a synonym of radix, that tells how many digits are used in a system and whose powers determine place value.	<u>bases</u>
<b>2</b>	This is the name of a base 16 system.	<u>hexadecimal</u> (prompt on “hex”)
<b>3</b>	Give the decimal equivalent of the hexadecimal number 2B.	<u>43</u>

**Extra Question #9: Math – Algebra**

*10 points per part*

This is contrasted with simple interest.		
<b>1</b>	Name this process in which the investor receives interest on one’s interest.	<u>compound</u> interest (accept <u>compounding</u> )
<b>2</b>	If \$1000 is invested at 10% annual simple interest for three years, how much money will end up in the account?	<u>\$1300</u>
<b>3</b>	If \$1000 is invested at 10% annual compound interest for three years, how much money will end up in the account?	<u>\$1331</u>



**Question #1: Social Studies – US History**

*15 points*

In this case, the Supreme Court ruled that it did not have the authority to issue a writ of **mandamus [MAN-duh-mus]**, even though the writ was legally justified. One party in this case was a lame duck appointment as a justice of the peace for the District of Columbia, but President John Adams ordered that the commission not be sent by the sitting Secretary of State. Name this Supreme Court case that established the exercise of judicial review.

Marbury v Madison (accept either underlined portion)

**Question #2: Science – Health**

*15 points*

One test to measure for a lack of this vitamin is **parathyroid [PAIR-uh-thigh-roid]** hormone level. Symptoms can include numbness around the mouth, arms, and legs and a walking gait that looks like a waddle. It technically is classified as a **secosteroid [seh-COS-tuh-roid]** and is not a real vitamin because the body can generate it without ingesting it. It regulates phosphate and calcium blood levels, preventing the occurrence of **osteomalacia [os-tee-oh-muh-LAY-shuh]**, which in children is known as rickets. Name this substance found in cod liver oil and fortified milk that can be generated by humans exposed to the sun.

Vitamin D (accept cholecalciferol or ergocalciferol)



**Question #3: Literature – World Literature**

15 points

He wrote of an immigrant who was banished by his Uncle Jacob for spending time with a business associate. That character later travelled with tramps towards Butterford. In another novel, a bank employee turns over his underwear to guards detaining him, who answer to The Whipper. At the end, the guards end up stabbing the protagonist in the heart. This author of *Amerika* wrote about Joseph K in *The Trial*, and he also wrote about a man who turned into a cockroach, Gregor Samsa. Name this author of *The Metamorphosis*, a Czech novelist.

Franz Kafka

**Question #4: Fine Arts – Composers of the Modern Era**

15 points

This composer's first ballet, about a sorcerer who brings the dead back to life, was *Grohg*, and his Clarinet **Concerto** [con-CHAIR-toe] was turned into a ballet about the Pied Piper. One of his works begins and ends with "The Open Prairie," and another uses the Shaker song "Simple Gifts," and another ends with his "Hoe-down." Another piece by him, which became a hit for Emerson, Lake, & Palmer, was *Fanfare for the Common Man*. Name this composer of *Billy the Kid*, *Appalachian Spring*, and *Rodeo* [roh-DAY-oh].

Aaron Copland



**Question #5: Literature – Mythology**

15 points

The chief maternal deity in this **mythos [MITH-ose]** died while giving birth to a fire god, after which she swore to kill one thousand people daily. One deity in this religion produced five goddesses by chewing up jewels and spitting them out. The sun deity in this mythos ascended to heaven by the Celestial Ladder. Divine symbols of this religion include a star-mirror and a “grass-cutting sword,” **Kusanagi [KOO-sah-nah-gee]**. Deities in this religion include the god of storms, **Susanowa [SOO-sahn-oe-wah]**, and the sun goddess **Amaterasu [ah-MAH-teh-rah-soo]**. Name this state religion of Japan.

**Shintoism** (accept **kami**-no-michi, do not accept “Japanese”)

**Question #6: Science – Physics**

15 points

A thought experiment named after this person involves a microscope designed to measure electrons. The group named after this physicist is a set of **matrices [MAY-truh-sees]** helpful in demonstrating **commutativity [kuh-MYOO-tuh-tiv-uh-tee]** in quantum mechanics and consisting of upper triangular matrices with ones on the main diagonal. The idea he is best known for can pair different components of angular momentum or can pair energy with time as conjugate variables. Name this scientist whose namesake principle states that it is not possible to measure both position and momentum arbitrarily closely at the same time, his uncertainty principle.

Werner **Heisenberg**



### Question #7: Social Studies – World History

10 points per part

Claiming certain clauses to be a danger to the state, Cardinal Richelieu [RISH-uh-loo] would annul them through the Peace of Alès [ah-LAY].		
1	Name this law, which also created <b>places de sûreté</b> [plah-say de soor-eh-tay], strongholds held by Protestants.	<b><u>Edict of Nantes</u></b>
2	The Edict of Nantes was promulgated by this king from <b>Navarre</b> [nah-VAHR], whose wedding was overshadowed by the St. Bartholomew’s Day Massacre.	<b><u>Henry IV</u></b> (accept <b><u>Henry</u></b> of <b><u>Bourbon</u></b> )
3	This king officially repealed the Edict of <b>Nantes</b> [nahnt] via the Edict of Fontainebleau, which suggested that Reformists who refused to convert to Catholicism should leave France.	<b><u>Louis XIV</u></b> (accept <b><u>Louis</u></b> the <b><u>Great</u></b> , prompt on “Sun King”)

### Question #8: Social Studies – World History

10 points per part

This group stood in opposition to moderates who supported <b>Deng Xiaoping</b> [dayng zhaw-peeng] and <b>Liu Shaoqi</b> [lyoo shaw-kee].		
1	Name this collection of elite radicals who put into effect the changes that were part of the Cultural Revolution.	<b><u>Gang of Four</u></b> (accept <b><u>Sirenbang</u></b> or <b><u>Ssu-jen-pang</u></b> )
2	The Gang of Four included <b>Jiang Qing</b> [zhaing king], the wife of this Chairman of the Chinese Communist Party who led his forces on the Long March to evade attacks by <b>Chiang Kai-Shek</b> [chaing kye shek].	<b><u>Mao</u></b> Zedong (accept <b><u>Mao</u></b> Tse-tung, prompt other part of name)
3	The Gang of Four attempted to discredit this Chinese Premier, who put forth the policy of “four modernizations.” He also welcomed Richard Nixon during the President’s visit to China.	<b><u>Zhou</u></b> Enlai (accept <b><u>Chou</u></b> Enlai, prompt other part of name)



**Question #9: Literature – US Literature**

10 points per part

He served in World War Two as a chaplain’s assistant.		
1	Name this soldier who was kept in a zoo on <b>Trafamadore [trahl-FAM-uh-dor]</b> . He was working in a factory in Dresden when it was firebombed.	<b><u>Billy Pilgrim</u></b> (accept either half)
2	Billy Pilgrim is the protagonist of this novel, subtitled <i>The Children’s Crusade</i> .	<b><u>Slaughterhouse-Five</u></b>
3	<i>Slaughterhouse-Five</i> was written by this author, who wrote about the Handicapper General Diana Moon Glampers in “Harrison Bergeron.”	Kurt <b><u>Vonnegut</u></b> , Jr.

**Question #10: Literature – US Literature**

10 points per part

In one novel by this author, the title character falls out of love with Amy Lawrence upon seeing a blue-eyed girl with lacy <b>pantalettes [PANT-uh-lets]</b> .		
1	Name this satirist who created such characters as Hank Morgan and the slave Jim.	Mark <b><u>Twain</u></b> (accept Samuel Langhorne <b><u>Clemens</u></b> )
2	Mark Twain also wrote about this troublesome youth who moved in with his Aunt Polly following his mother’s death. He would later join Huck Finn and Joe Harper in playing pirates on Jackson’s Island.	<b><u>Tom Sawyer</u></b> (accept either half)
3	Tom Sawyer revealed the truth about the slaying of Doctor Robinson by Injun Joe when this fellow robber is put on trial for the murder.	<b><u>Muff Potter</u></b> (accept either half)



**Question #11: Science – Biology**

10 points per part

Their name comes from the Greek word for change. Let's see what you know about ameba.		
1	This name for an extension from an ameba means false foot.	<u>pseudopod</u> s (accept <u>pseudopodia</u> or <u>pseudopodium</u> )
2	Ameba get nourishment through this process that involves surrounding food with their pseudopods.	<u>phagocytosis</u>
3	This species nicknamed the brain eating ameba enters through the nose and is deadly.	Naegleria <u>fowleri</u>

**Question #12: Science – Biology**

10 points per part

Identify these plants.		
1	This is the common name for species in the <b>bryophyta</b> phylum [brigh-oh-FIGH-tuh FIGH-lum], which are nonvascular land plants similar to liverworts and hornworts.	<u>mosses</u>
2	This is the common name for species in the <b>pteridophyta</b> [tear-id-oh-FIGH-tuh] division, which have leaves called fronds.	<u>ferns</u>
3	This division of <b>gymnosperms</b> [JIM-noh-sperms] includes <b>ephedra</b> [eh-FED-rah] and <b>welwitschia</b> [wel-WITCH-ee-uh]. Some undergo double fertilization, which makes them unlike other gymnosperms.	<u>gnetophyta</u> (accept <u>gnetophytes</u> )



### Question #13: Fine Arts – Art History

10 points per part

I.M. Pei [pay] designed a glass pyramid to stand over its entrance.		
1	Name this art museum in Paris.	Musee du <u>Louvre</u>
2	The Louvre [loov] houses this marble statue from approximately 100 BC that is missing its arms.	<u>Venus de Milo</u> (accept <u>Aphrodite of Milos</u> )
3	The Louvre also includes <i>Venus and Cupid with a Satyr</i> [SA-tur] and <i>The Mystic Marriage of Saint Catherine</i> , two paintings by this 16th century Italian.	<u>Correggio</u> (accept Antonio <u>Allegri</u> )

### Question #14: Fine Arts – Art History

10 points per part

He completed several series, including London Parliament, Rouen Cathedral, and haystacks.		
1	Name this painter who often depicted water lilies near his garden in Giverny [guh-VAIR-nee].	Claude <u>Monet</u>
2	Monet [moh-NAY] was part of this art movement which took its name from his painting subtitled Sunrise.	<u>Impressionism</u> (accept <u>Impressionist</u> or other word forms)
3	Many Monet works, including <i>Three Trees in Grey Weather</i> , show these tall thin trees.	<u>poplars</u>



**Question #15: Math – Conceptual Math**

15 points

In the **Frenet-Serret** [freh-nay sair-ay] formulas, a matrix containing curvature and torsion is multiplied by a matrix containing three of these, the last of which is the **binormal** [bye-NOR-mul]. The binormal type is found by using the tangent and normal types. The spaces named after these are defined by a basis consisting of a set of them. These can be normalized by dividing them by their length, resulting in one of these that has a magnitude of one. These are used to represent several basic physical quantities such as force, velocity, and displacement. Name these structures that have a magnitude and direction, often contrasted with scalars.

vectors

**Question #16: Social Studies – Religion**

15 points

He argued that scribes that love “long robes, and salutations in the marketplaces” devour widows’ houses. He once claimed that “a city set upon a hill cannot be hid,” and later described a lamp that “shineth unto all that are in the house.” He described a house of prayer as “a den of thieves” after attacking the dove-sellers and moneychangers. Barabbas was released instead of this man, who was sentenced to death for claiming to be King of the Jews. Crucified between two robbers, name this man often referred to as the Son of God.

Jesus Christ (accept either, accept early buzz of Son of God, accept Son of David, Jesus Son of Joseph, Jesus of Galilee or Jesus of Nazareth)



**Question #17: Language Arts – Grammar**

*15 points*

“Round-trip” ones are used to evaluate examples of it done by machines. Those that are “idiomatic” conform to a specific grammar and syntax. The dynamic principle of it focuses on basic thoughts, while the formal version is aimed at the exact wording. Name this act of converting text in one language into another language.

**translation** (accept other word forms)

**Question #18: Science – Chemistry**

*15 points*

This element clusters with iron in **Roussin’s [ROO-sins]** red and black salts and several proteins such as **nitrogenase [nye-TRAH-jen-ase]**. In **mercaptans [mer-CAP-tans]**, it plays the same role that oxygen plays in alcohols. Mercaptans, which are also known as **thiols [THEE-ols]** and found in **cysteine [SIS-teen]**, often have strong odors. This also is the central element in an acid produced in the lead-chamber or contact processes that was formerly called oil of **vitriol [VIT-ree-ol]**. Manmade production of its **dioxide [dye-OKS-ide]** is a major cause of acid rain. Name this element located under oxygen in the Periodic Table which has chemical symbol S.

**Sulfur** (prompt on “S”)



**Question #19: Social Studies – US History**

15 points

<p>The actions of Captain William Turner were said to be negligent in the build-up to this event, which occurred just south of Queenstown, Ireland. The orders to perform it were given by Captain-Lieutenant Walter Schweiger [SCHWAY-gur]. Its target was a vessel bound for Liverpool that was a legitimate target, as it was carrying war contraband. Name this 1915 maritime tragedy where a German U-Boat sunk a passenger ship.</p>	<p><u>sinking</u> of the <i>RMS Lusitania</i> (accept words in place of for “sinking,” i.e. “attacking” or “torpedoing”, prompt on “<i>Lusitania</i>”)</p>
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**Question #20: Miscellaneous – Journalism**

15 points

<p>This broadcasting company was the target of protests after a presenter described Mexicans as “lazy and feckless.” Its offices were raided in the <i>Zircon</i> affair, brought on after it published details in documentaries concerning classified government projects. Its digital broadcast features enhanced content via the Red Button. Operating under a royal charter, its responsibilities include broadcasting to the Isle of Man and the Channel Islands. Name this public service broadcaster headquartered in London.</p>	<p><u>BBC</u> (accept <u>British Broadcasting Corporation</u>)</p>
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**Question #21: Math – Algebra**

*10 points per part*

An example of this type of series is $1+2+4+8$ , etcetera.		
<b>1</b>	Name this type of series in which each number that gets added in is a fixed multiple of the number before it.	<b><u>geometric</u></b>
<b>2</b>	This term applies to infinite geometric series with $r$ between $-1$ and $1$ whose sum has a finite limit.	<b><u>converging</u></b> (accept word forms such as <b><u>convergent</u></b> , do not accept “diverging”)
<b>3</b>	This is the sum of the infinite series that begins $1 + 1/4 + 1/16 + 1/64$ , etcetera.	<b><u>4/3</u></b> (accept <b><u>1 1/3</u></b> or <b><u>1.3</u></b> <b><u>repeating</u></b> , do not accept “1.3”)

**Question #22: Math – Algebra**

*10 points per part*

This can be the high point or low point of a parabola depending on whether the parabola opens up or down.		
<b>1</b>	Name this point that lies on the axis of symmetry.	<b><u>vertex</u></b>
<b>2</b>	Find the x-coordinate of the vertex of the parabola $y=x^2+4x-1$ .	<b><u>-2</u></b>
<b>3</b>	Find the y-coordinate of the vertex of the same parabola, $y=x^2+4x-1$ .	<b><u>-5</u></b>



**Question #23: Social Studies – US Government**

*10 points per part*

Answer the following about Cabinet positions that were changed or no longer exist.		
1	Henry Knox held this post in George Washington’s first Cabinet. Due to its military implications, Ulysses Grant authorized William <b>Belknap [BEL-nap]</b> , who held this position, to create the National Weather Service.	<b><u>Secretary of War</u></b> (accept <b><u>War Secretary</u></b> , prompt on “War”)
2	Now serving under the Secretary of Defense, both Theodore and Franklin Roosevelt served as assistants to holders of this Cabinet position. Ray <b>Mabus [MAY-bus]</b> currently holds this title.	<b><u>Secretary of the Navy</u></b> (accept <b><u>SECNAV</u></b> or <b><u>Navy Secretary</u></b> , prompt on “Navy”)
3	Name either of the two Departments initially created as a single Department during Theodore Roosevelt’s administration. One department was later headed by Herbert Hoover during the Coolidge administration, and Francis Perkins headed the other during FDR’s time in office.	Departments of <b><u>Commerce</u></b> or <b><u>Labor</u></b>

**Question #24: Social Studies – US Government**

*10 points per part*

This body is run by the National Archives and Records Administration.		
1	Name this body, which directly votes for the President of the United States.	<b><u>Electoral College</u></b>
2	The Twenty-third Amendment created more electors, as residents of this territory were given the right to vote in presidential elections.	Washington, <b><u>D.C.</u></b> (accept <b><u>District of Columbia</u></b> )
3	This Amendment stipulates that if a majority is not reached in the Electoral College, that a vote in the House of Representatives would determine the winner of a Presidential election.	<b><u>Twelfth</u></b> Amendment to the United States Constitution (accept <b><u>12</u></b> )



### Question #25: Science – Physics

10 points per part

This is often classified as kinetic or static and is comparable to damping.		
1	Name this force that goes against motion. It is not a fundamental force.	<b>friction</b> (accept other word forms)
2	The force of friction is often calculated by multiplying the coefficient of friction times this force perpendicular to a surface.	<b>normal</b> force
3	This Frenchman rediscovered the laws of friction first stated by Leonardo da Vinci. His work was supported by Charles-Augustin de <b>Coulomb</b> [koo-lom].	Guillaume <b>Amontons</b>

### Question #26: Science – Physics

10 points per part

The common formula for the period of this object assumes that it swings through a small angle.		
1	Name this device that consists of a bob swinging on a string.	<b>pendulum</b>
2	This Frenchman hung a pendulum in a church in Paris to demonstrate the rotation of the Earth.	Jean Bernard Leon <b>Foucault</b>
3	This adjective is used for two pendulums connected by a spring, either at the top or bottom. The connected pendulums sometimes are used to model chaos.	<b>coupled</b> (accept other word forms)



**Question #27: Literature – Mythology**

*10 points per part*

Daedalus built the Labyrinth in order to trap this monster.		
<b>1</b>	Name this monster of Greek myth with the head of a bull and the body of a human.	<b><u>Minotaur</u></b>
<b>2</b>	The Minotaur was killed when this future husband of <b>Hippolyta [hip-poh-LIGH-tuh]</b> was among the youths sent to be sacrificed. He utilized a ball of thread given him by <b>Ariadne [ahr-ee-AD-nee]</b> to escape after slaying the Minotaur.	<b><u>Theseus</u></b>
<b>3</b>	The Minotaur was birthed from this Cretan, the wife of King Minos. Poseidon tricked her into falling in love with a snow-white bull, and she had Daedalus build a cow for her to hide inside.	<b><u>Pasiphae</u></b>

**Question #28: Literature – Mythology**

*10 points per part*

After he left the mortal realm, this hero gave his bow and poisoned arrows to <b>Philoctetes [fi-LOC-tuh-tees]</b> .		
<b>1</b>	Name this son of <b>Amphitryon [am-fi-TRY-on]</b> who slew the <b>Nemean [NEE-mee-un]</b> Lion, then wore its pelt.	<b><u>Heracles</u></b> (accept <b><u>Hercules</u></b> )
<b>2</b>	<b>Heracles [HERE-uh-klees]</b> was targeted frequently by this goddess. As goddess of childbirth, she delayed his birth so <b>Eurystheus [yur-IS-thee-us]</b> could be king. She also sent two snakes to his crib, but Heracles strangled them.	<b><u>Hera</u></b> (accept <b><u>Juno</u></b> )
<b>3</b>	As a youth, Heracles also caused a stir when he used this stringed instrument to kill his music teacher, Linus.	<b><u>lyre</u></b>



**Question #29: Math – Conceptual Math**

15 points

The sum of the degrees of the **vertices** [VER-tuh-sees] of a simple graph always are this type of number. A proof of the irrationality of the square root of two is based on the fact that the numerator and denominator of a rational value would both have to be this type of number, which contradicts the assumption that the fraction is irreducible. Goldbach's conjecture states that all of these except the least positive one can be represented as the sum of two prime numbers. These numbers are equivalent to zero mod two. Name these numbers, each of which is equal to twice an integer, contrasted with odd numbers.

**even** numbers (accept **evens**, prompt on “numbers divisible by two” or equivalents)

**Question #30: Science – Biology**

15 points

This organ contains the **caudate** [CAW-date] nucleus, internal capsule, and **putamen** [PYOO-tuh-men]. The region that contains those sections includes cells classified as medium spiny, which impact movement. This also includes the **entorhinal** [en-toh-RYE-nul] cortex, which is connected to a component containing Ammon's horn and the dentate **gyrus** [JYE-rus]. That region, which is shaped like a seahorse, is the hippocampus. This organ also contains the **amygdala** [uh-MIG-duh-luh] and cerebral cortex. Name this organ that regulates the nervous system and is located in your head.

**brain**



**Question #31: Literature – US Literature**

15 points

<p>In one work by this author, the narrator asks if something “stinks like rotten meat or crusts and sugars over like a syrupy sweet.” In another poem, he described singing that coincided with Abe Lincoln’s journey down to New Orleans. That poem also describes the title bodies “ancient as the world and older than the flow of human blood,” as well as the Congo lulling the speaker to sleep. Name this author of “The Negro Speaks of Rivers,” and “A Dream Deferred,” a prominent poet of the Harlem Renaissance.</p>	<p>Langston <u>Hughes</u></p>
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**Question #32: Social Studies – World History**

15 points

<p>As president of this nation, <b>Belisario Betancur</b> [beh-lee-SHR-ee-oh BAY-tahn-kur] offered a cease-fire to rebel groups that was rejected by the ELN, but accepted by M-19. Another rebel group pulled out of the ceasefire after thousands of Union Patriótica members were killed. One civil war in this nation was the War of a Thousand Days, while the assassination of <b>Jorge Eliecer Gaitan</b> [HOR-gay eh-lee-EH-sehr GAY-than] sparked <i>La Violencia</i> [vee-oh-LEN-see-ah]. Violence also spiked after the assassination of Pablo Escobar, who headed the <b>Medellin</b> [meh-DAY-leen] drug cartel. Name this country whose armed forces have long been targets of <b>FARC</b> [fark] rebels.</p>	<p>Republic of <u>Colombia</u> (accept <u>Republica de Colombia</u>)</p>
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### Extra Question #1: Literature – Mythology

15 points

<p><b>Leucothea</b> [loo-COE-thee-uh] felt compassion for this “persecuted wanderer,” and lent him her scarf. <b>Achilles</b> [uh-KILL-ees] told him that he’d rather be a lowly farmhand than king of the hollow dead. <b>Hermes</b> [HER-mees] provided this man with moly to prevent him from being transformed. <b>Palamedes</b> [pal-uh-MEE-dees] threw his son in front of a plow to prove he was feigning madness. Calypso kept him captive for seven years. Name this king of Ithaca, whose journey home from the Trojan War was the subject of an epic by Homer.</p>	<p><u>Odysseus</u> (accept <u>Ulysses</u>)</p>
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### Extra Question #2: Science – Chemistry

15 points

<p>The study of these types of substances led Thomas Graham, who wrote that they do not follow ordinary chemical relations and do not have crystallinity, to develop <b>dialysis</b> [dye-AL-uh-sis] using <b>semipermeable</b> [sem-i-PER-mee-uh-bul] membranes. Examples include <b>pumice</b> [PYOO-mis] and opal, and their color is often near the blue end of the spectrum because of the way they scatter light, known as the <b>Tyndall</b> [TIN-dahl] effect. These substances include gels, foams, sols, aerosols, and emulsions. Name these substances in which particles of one substance are dispersed throughout another substance.</p>	<p><u>colloids</u> (accept <u>sols</u> before pumice is mentioned)</p>
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**Extra Question #3: Social Studies – World History**

15 points

<p>After ascending to the throne, this ruler banished Sir John Conroy from the court. On top of questioning the lack of effort to save General Gordon at <b>Khartoum [kar-TOOM]</b>, this monarch backed the efforts of the Marquess of Salisbury as Prime Minister. Early in her reign, she was mocked as “Mrs. Melbourne,” but her refusal to dismiss Whig ladies from her bedchamber sparked the resignation of Sir Robert Peel. Name this longest-ruling English queen.</p>	<p>Queen <b>Victoria</b> (accept Alexandrina <b>Victoria</b>)</p>
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**Extra Question #4: Fine Arts – Classical/Opera Music**

15 points

<p>Heinrich von <b>Herzogenberg [her-ZOH-gen-berg]</b> wrote variations on a theme of this composer’s <i>Die Trauernde [dee trou-EHRN-day]</i>, and this composer’s <i>Saint Anthony Variations</i> were based on a theme by <b>Haydn [HIGH-den]</b>. He collaborated with Robert Schumann and Albert Dietrich on the F-A-E Sonata. During the 1860s, he used text from a Martin Luther Bible to compose his <i>German Requiem</i>, and at a time when many composers were writing symphonic poems, he wrote more classical pieces such as his <i>Tragic Overture</i> and <i>Academic Festival Overture</i>. Name this composer whose “Good Evening, Good Night” is popularly known as his lullaby.</p>	<p>Johannes <b>Brahms</b></p>
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**Extra Question #5: Math – Conceptual Math**

*15 points*

One form of this is used to find derivatives of functions that depend on dependent variables, and this is generalized by Faa di Bruno's formula. This is also used to justify the standard method of implicit differentiation, which involves multiplying terms by  $y$  prime when they are generated by taking a derivative with respect to  $y$ . Like the power rule, this can be combined with the product rule to prove the quotient rule, and it is used to find derivatives of composite functions. Name this rule which instructs mathematicians to multiply by the derivative of the inside function when taking a derivative.

**chain** rule (accept **implicit differentiation** or **implicit derivative** before it is mentioned, prompt "derivative")



### Extra Question #6: Science – Chemistry

10 points per part

This equals the opposite of the base ten logarithm of hydrogen ion activity.		
1	Name this quantity represented by two letters that measures how acidic a solution is.	<b>pH</b>
2	These substances, such as methyl red or litmus, help determine the pH [pee aitch] level of a solution by changing colors.	pH <b>indicators</b>
3	This equation uses dissociation constants and logs of concentrations to calculate pH levels.	<b>Henderson-Hasselbalch</b> equation

### Extra Question #7: Science – Chemistry

10 points per part

Many scientists from 1667 to 1777 believed that this substance exists.		
1	Name this substance that supposedly was released during combustion.	<b>Phlogiston</b>
2	This Frenchman wrote “On Combustion in General” in 1777. He named oxygen and is nicknamed the father of modern chemistry.	Antoine <b>Lavoisier</b>
3	Unfortunately, <b>Lavoisier</b> [luh-VWOY-see-ay] included this fluid substance of heat in his list of elements.	<b>Caloric</b> (accept <b>Calorique</b> )



### Extra Question #8: Literature – World Literature

10 points per part

In this novel, the “Little Princess” <b>Lise [LEES-uh]</b> dies during childbirth.		
<b>1</b>	Name this novel, in which Sonya fell in love with Nikolay <b>Rostova [ros-TOVE-uh]</b> , the brother of Natasha.	<b><u>War and Peace</u></b> (accept <b><u>Voyna i mir</u></b> )
<b>2</b>	<i>War and Peace</i> was written by this Russian, who wrote about his experiences in the Crimean War in <i>Sevastapol Sketches</i> .	Count Leo <b><u>Tolstoy</u></b>
<b>3</b>	This illegitimate son of Count Cyril was cuckolded by Helene <b>Kuragina [kur-uh-GEE-nuh]</b> , “the most fascinating woman in Petersburg.” In the end, he ended up marrying Natasha Rostova.	<b><u>Pierre Bezukhov</u></b> (accept either, accept Pierre <b><u>Bezuhov</u></b> )

### Extra Question #9: Literature – World Literature

10 points per part

In this play, wood is laid around the Acropolis, then lit on fire.		
<b>1</b>	Name this satirical drama, in which Athenian and Spartan women withhold sex in order to bring an end to the Peloponnesian War.	<b><u>Lysistrata</u></b>
<b>2</b>	This author, who created the Thinkery in <i>The Clouds</i> , wrote <b><i>Lysistrata</i> [LYE-suh-STRAH-tuh]</b> .	<b><u>Aristophanes</u></b>
<b>3</b>	The play ends with an ode to this “all-conquering,” “bronze-house” goddess.	<b><u>Athena</u></b> (do not accept “Minerva”)



**Question #1: Social Studies – World History**

15 points

<p>This empire conquered the Chancas and <b>Chimu</b> [CHEE-moo] people while under the rule of <b>Pachacuti Yupanqui</b> [PAH-chah-KOO-tee yoo-PAHN-kee]. Its northern boundary was pushed to the <b>Ancasmayo</b> [ahn-kahs-MY-oh] River during the reign of <b>Huayna Capac</b> [WYE-nah kah-PAHK]. After Huayna’s death, <b>Huascar</b> [WAHS-car] lost a civil war to his half-brother. That emperor was held for the ransom of a room filled with gold and two filled with silver. That hostage was <b>Atahualpa</b> [ah-tah-WAHL-pah]. Name this South American empire conquered by Francisco Pizarro.</p>	<p><u>Incan</u> Empire</p>
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**Question #2: Science – Astronomy**

15 points

<p>The leading 20th century research into these objects was carried out by Walter <b>Baade</b> [bahd], Fritz Zwicky, and Rudolph Minkowski, a group who designed their classification schemes based on spectral lines and proposed using these as standard candles. <b>Cassiopeia</b> [ka-see-oh-PEE-uh] A has provided important evidence of these, as has 1987A in the Large <b>Magellanic</b> [MAA-juh-LAHN-ik] Cloud. These sometimes start with a white dwarf in a binary system, though they often occur at the creation of a neutron star or black hole at the end of a star’s lifetime. Name these energetic explosions.</p>	<p><u>supernova</u> (prompt on “nova”)</p>
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**Question #3: Miscellaneous – Agriculture**

*15 points*

<p>This organization established an international presence with the creation of the International Farm Youth Exchange program. This organization nationalized following the passage of the Smith-Lever Act, which created the Cooperative Extension System. Younger members join “Cloverbuds” before becoming full members of this organization. Devotion to one’s “club, community, country, and world” is part of the pledge its members take. Name this organization, whose symbol stands for Head, Heart, Hands, and Health.</p>	<p><b><u>4-H</u></b></p>
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**Question #4: Literature – Mythology**

*15 points*

<p>She was the mother of the maiden that <b>Orestes</b> [or-EHS-tees] and <b>Neoptolemus</b> [nee-op-TOL-uh-mus] duelled over. King <b>Tyndareus</b> [tin-DAHR-ee-us] solicited oaths of fealty from every suitor pursuing this woman. She was sent to <b>Aphidnae</b> [ah-FID-nay] and left in the care of <b>Aethra</b> [AY-thrah] after <b>Pirithous</b> [PAIR-ih-thouse] and <b>Theseus</b> [THEE-see-us] captured her. To win a contest for a golden apple, <b>Aphrodite</b> [af-roe-DIGH-tee] promised the judge the love of this woman. Name this “most beautiful woman in the world,” whose pursuit by Paris kickstarted the Trojan War.</p>	<p><b><u>Helen</u></b> of Troy</p>
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**Question #5: Social Studies – US Government**

*15 points*

While holding this position, Thomas Reed engineered the end of the “disappearing quorum” tactic. The person in this position determines what bills come to the floor as the head of the Rules Committee. After helping gain a Republican majority through the “Contract with America,” Newt Gingrich was elected to this post. The holder of this position is second in the presidential line of succession, ahead of the President pro tem of the Senate. Name this Congressional post, the presiding officer over the chamber containing Representatives.

Speaker of the United States House of Representatives (prompt on “US Representative from Maine”, “Representative”, or “Congressman” until “Rules”)

**Question #6: Science – Chemistry**

*15 points*

Too much of this compound in the body is called **hypercapnia** [high-per-CAP-nee-uh] and can be caused by **SARS** [sahrs]. Its supercritical fluid is being used to replace **tetrachloroethylene** [teh-trah-klor-oh-ETH-uh-leen] for dry cleaning and to soak coffee beans to remove their caffeine. This is a byproduct of the production of ethanol by yeast, and ocean **acidification** [uh-SID-uh-fi-KAY-shun] is being caused by its rising levels. This is combined with water to form carbohydrates during photosynthesis. Name this compound found in dry ice and carbonated soft drinks.

carbon dioxide (prompt on “CO<sub>2</sub>”)



**Question #7: Math – Geometry**

*10 points per part*

When computing the area of a triangle, this segment can be used as the height.		
<b>1</b>	Name this segment connecting a vertex to its opposite side such that it makes a right angle with that side.	<b><u>altitude</u></b>
<b>2</b>	This is the name of the point where the three altitudes of a triangle intersect.	<b><u>orthocenter</u></b>
<b>3</b>	Find the length of the altitude of a triangle if the triangle has an area of 100, and the altitude goes to a side of length 10.	<b><u>20</u></b>

**Question #8: Math – Geometry**

*10 points per part*

This shape has two pairs of adjacent supplementary angles.		
<b>1</b>	Name this quadrilateral with at least one pair of parallel sides.	<b><u>trapezoid</u></b> (accept <b><u>trapezium</u></b> )
<b>2</b>	Find the area of a trapezoid that has base lengths of 6 and 10 and a height of 7.	<b><u>56</u></b>
<b>3</b>	An isosceles trapezoid has congruent sides each with length 10 and a base of length 22 adjacent to two 60 degree angles. Find the length of the other side.	<b><u>12</u></b>



### Question #9: Science – Biology

10 points per part

What used to be called the dark reactions of photosynthesis are now his namesake cycle.		
1	Name this scientist who studied those reactions with James <b>Bassham [BASH-um]</b> and Andrew Benson.	Melvin <u>Calvin</u>
2	The Calvin Cycle is also known as the fixation of this element, which is taken from inorganic compounds and placed into organic compounds.	<u>carbon</u>
3	The three main carbon fixation pathways are C3, C4, and this one used by <b>cacti [KAK-tie]</b> .	<u>CAM</u> (accept <u>Crassulacean acid metabolism</u> )

### Question #10: Science – Biology

10 points per part

Without lungs, where would you be now?		
1	These tiny air sacs are the location of gas exchange in the lungs.	<u>alveoli</u> (accept <u>alveolus</u> )
2	This muscle across the bottom of the lungs helps with breathing.	thoracic <u>diaphragm</u>
3	This membrane lines the thorax and lungs. The visceral one is attached to the lungs, while the <b>parietal [puh-RYE-uh-tul]</b> one is attached to the <b>thoracic [thuh-RAS-ik]</b> cavity.	<u>pleura</u>



**Question #11: Fine Arts – Musical Theatre**

10 points per part

This musical is the best known work of Robert Meredith Willson.		
<b>1</b>	Name this work about Harold Hill, who goes to Iowa and pretends to be a bandleader.	<i>The <u>Music Man</u></i>
<b>2</b>	<i>The Music Man</i> is set in this town based on Willson's boyhood home of Mason City.	<u>River City</u> , Iowa
<b>3</b>	In the musical, this is the last name of Marian the Librarian and her shy brother Winthrop.	<u>Paroo</u>

**Question #12: Fine Arts – Musical Theatre**

10 points per part

The musical <i>Annie</i> was inspired by the comic strip Little Orphan Annie.		
<b>1</b>	Name the optimistic song that Annie sings with President Roosevelt and his Cabinet.	<u>"Tomorrow"</u>
<b>2</b>	This is the billionaire who accepts Annie into his home.	Oliver "Daddy" <u>Warbucks</u>
<b>3</b>	This radio announcer allows Annie on his show while she is trying to find her real parents.	<u>Bert Healy</u> (accept either half)



### Question #13: Literature – Mythology

10 points per part

According to one creation myth, this god created humans from his own tears.		
1	Name this Egyptian god that represented the midday sun.	Amun <b>Re</b> (accept Amun <b>Ra</b> , prompt on “Aten”, do not accept “Amun”)
2	At night, as Ra travelled through the underworld, he was accompanied by <b>Mehen</b> [MAY-hen] and this god. This husband of <b>Nephthys</b> [NEF-this] killed <b>Osiris</b> [oh-SIGH-rus] before being defeated by Horus.	<b>Set</b> (accept <b>Seth</b> )
3	Seth and Mehen fought nightly against this sea-serpent. On the occasions that this creature won, a solar eclipse would occur.	<b>Apep</b> (accept <b>Apepi</b> or <b>Apophis</b> )

### Question #14: Literature – Mythology

10 points per part

This god’s wife, <b>Sigyn</b> [sig-un], held a cup that caught most of the deadly poison meant for this god’s forehead.		
1	Name this trickster god of Norse myth.	<b>Loki</b> (accept <b>Lopttr</b> )
2	Though he was male, <b>Loki</b> [LOH-kee] gave birth to a horse in order to prevent this goddess of beauty from being given away as payment for building Asgard.	<b>Freya</b> (accept <b>Freyja</b> , do not accept “Frey” or “Freyr”)
3	This giantess gave birth to Loki’s offspring Hel, <b>Jormungandr</b> [jor-mun-GAN-dur], and Fenrir.	<b>Angrboda</b>



**Question #15: Fine Arts – Art History**

15 points

Near the end of his life, this artist painted a series of pictures showing his city's first bishop, ending with *The Last Miracle and Death of Saint Zenobius* [zeh-NOH-bee-us]. The right side of one of his paintings shows Zephyr kidnapping Chloris [KLOR-us] away from Flora, while the left side shows Mercury looking upward near the three Graces. In another work, Zephyr carries Aura on the left side while Horae [HOR-ay] tries to put a robe on a new goddess who is standing on a shell. Name this painter of *Primavera* [pree-muh-VEHR-uh] and *The Birth of Venus*.

Sandro Botticelli

**Question #16: Literature – British Literature**

15 points

He wrote about an airplane bomb hitting a dynamite cache [cash], killing Mangan and Billy Dunn, in *Heartbreak House*. Despite not believing that Frank was her half-brother, Vivie [VIV-ee] left her mother behind in *Mrs. Warren's Profession*. In one of his plays, the trash collector Alfred was unable to recognize his daughter, who called her teacher a "selfish brute." That play saw a flower girl become the subject of a wager between Colonel Pickering and Henry Higgins. Name this playwright who wrote *Pygmalion*.

George Bernard Shaw



**Question #17: Math – Conceptual Math**

*15 points*

<p>When this word is preceded by the word fundamental, it names the union of conjugates of a subset. This term preceded by the word integral is used to name a <b>commutative</b> [kah-MYOO-tuh-tiv] ring with no zero divisors. The natural type of this set exists for a function that does not have any additional restrictions placed on it. This set does not include any values that correspond to discontinuities on a graph such as a hole or vertical <b>asymptote</b> [AS-im-tote]. This includes the possible values of the independent value for a function. Name this set of inputs to a function, often contrasted with the range.</p>	<p><u><b>domain</b></u></p>
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**Question #18: Social Studies – US History**

*15 points*

<p>This event's target was headed towards the local Trade Mart, and he sat alongside John Connally, who was seriously wounded. It is depicted on the Zapruder film. The perpetrator of this event was killed by Jack Ruby. Investigated by the Warren Commission, it took place in Dallas, Texas on November 22, 1963. Name this event in which Lee Harvey Oswald shot the President.</p>	<p><u><b>assassination</b></u> of <b>J</b>ohn Fitzgerald <u><b>Kennedy</b></u> (accept synonyms for "assassination" such as murder, killing, etc., prompt if first initial or name not given, accept <u><b>JFK</b></u> in place of full name, prompt on half answers)</p>
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**Question #19: Literature – World Literature**

*15 points*

He wrote of a poor child whose shoes made her dance until the executioner amputated her feet. He also wrote of a soldier who beheaded a witch who asked him to retrieve the title object, which he used to summon three dogs with eyes as big as saucers, millstones, and the Round Tower. This author of “The Red Shoes” and “The Tinder Box” wrote of a creature that spent a winter in a marsh before learning its true identity. He also wrote of a ruler who ended up parading naked until a boy revealed the truth. Name this Danish author of “The Emperor’s New Clothes” and “The Ugly Duckling.”

Hans Christian Andersen

**Question #20: Science – Physics**

*15 points*

One unit scale named after this scientist sets values such as the **gravitational** [gra-vuh-TAY-shu-nul] constant and speed of light equal to one, which ends up giving a length unit that is ten to the negative thirty-fifth meters. A postulate that he considered to be a mathematical trick was used by Einstein to explain the photoelectric effect. That postulate was used to justify why the ultraviolet catastrophe did not happen and describe blackbody radiation. Name this German scientist whose constant, which gives the ratio of energy to frequency, is often represented by a lower case h.

Max Planck



**Question #21: Social Studies – US History**

*10 points per part*

He and his wife were accused of being behind the suicide of Vincent Foster.		
<b>1</b>	Name this former President who was impeached after it was revealed that he had an affair with Monica Lewinsky.	William Jefferson (Bill) <b><u>Clinton</u></b>
<b>2</b>	Before becoming President, Clinton held this post for eleven years. During his first term, he revamped public school funding. He also received flak for housing Cuban refugees at Fort Chaffee.	<b><u>Governor</u></b> of <b><u>Arkansas</u></b> (prompt on “Governor”)
<b>3</b>	Eisenhower sent federal troops to allow nine students to enter Central High School in Little Rock to counter this Arkansas governor, who ordered the National Guard to block the students’ entrance.	Orval Eugene <b><u>Faubus</u></b>

**Question #22: Social Studies – US History**

*10 points per part*

The losing commander at this battle had just seized <b>Gloucester [GLOU-ster]</b> , and had planned for reinforcements under the command of Major General Clinton.		
<b>1</b>	Name this 1781 battle, the last major engagement of the American Revolution.	Battle of <b><u>Yorktown</u></b>
<b>2</b>	This losing commander at Yorktown had previously captured Charleston and Richmond. Citing illness, he sent Brigadier General Charles O’Hara to lead his defeated forces.	Charles <b><u>Cornwallis</u></b> , 1st Marquess Cornwallis
<b>3</b>	The French naval siege at Yorktown was set up by Admiral de Grasse’s victory over Thomas Graves in the Battle of the Virginia Capes, which led to a naval blockade of this body of water.	<b><u>Chesapeake</u></b> Bay



**Question #23: Science – Chemistry**

10 points per part

Two molecules of water can dissociate into a hydroxide ion and this ion.		
<b>1</b>	Name this ion with formula $\text{H}_3\text{O}^+$ .	<u>Hydronium</u>
<b>2</b>	Because water can supply hydroxide or hydronium, it can act as an acid or a base, making it this type of substance in addition to, similarly, being amphiprotic.	<u>amphoteric</u> (accept <u>amphoterous</u> )
<b>3</b>	This is a neutral molecule having positive and negative parts. Also called a dipolar ion, it is different than a dipole and characterized by amino acids. They are highly soluble in water.	<u>zwitterions</u>

**Question #24: Science – Chemistry**

10 points per part

It is the base SI unit for amount of chemical substance.		
<b>1</b>	Give this unit based on Avogadro's number very similar to a gram-molecule.	<u>mole</u>
<b>2</b>	This isotope is used to standardize the mole. Oxygen sixteen has been used in the past.	<u>Carbon Twelve</u> (accept <u>C 12</u> , do not accept partial answers)
<b>3</b>	Though the concept of a mole existed long before, this man is credited for naming the mole. He won a Nobel Prize for work on <b>catalysis</b> [kuh-TAL-uh-sis] and is the namesake of a process that converts ammonia to <b>nitric</b> [NIGH-trik] acid.	Wilhelm <u>Ostwald</u>



**Question #25: Literature – British Literature**

10 points per part

The victim in this story had been acquitted of the kidnapping and murder of Daisy Armstrong.		
1	Name this story in which twelve people, including Greta Ohlsson and Colonel Arbuthnot, killed Casseti, who was hiding under the pseudonym Mr. Ratchett.	<u><i>Murder on the Orient Express</i></u>
2	<i>Murder on the Orient Express</i> was written by this author of <i>And Then There Were None</i> and <i>The Murder of Roger Ackroyd</i> . She also penned a number of stories featuring Miss Jane Marple.	Agatha <u>Christie</u> (accept Mary <u>Westmacott</u> )
3	The title murder was solved by this Belgian detective, who was trying to rest his “little gray cells.”	Hercule <u>Poirot</u>

**Question #26: Literature – British Literature**

10 points per part

Reynaldo was sent to Paris to spy on this student.		
1	Name this young fencer who utilized a poison-tipped blade in a match refereed by Osric.	<u>Laertes</u>
2	Laertes is the son of this lord, Claudius’ right-hand man. While hiding behind a curtain to spy on the queen and the prince, he was stabbed to death.	<u>Polonius</u>
3	Polonius was killed by this prince of Denmark and title character of the longest Shakespearean drama.	<u>Hamlet</u>



**Question #27: Math – Pre-calculus**

*10 points per part*

This system of interpreting functions is useful to graph cardioids or lemniscates.		
<b>1</b>	Name this system in which location is expressed using the distance from the origin and the counterclockwise angle from the positive x-axis.	<u>polar</u>
<b>2</b>	This is the slope of the line with equation $r$ equals 10 divided by the quantity 4 cosine theta plus 2 sine theta.	<u>-2</u> (do not accept "2")
<b>3</b>	This is the area enclosed in the shape generated by the equation $r$ equals 5.	<u>25 Pi</u>

**Question #28: Math – Pre-calculus**

*10 points per part*

These functions are defined differently over different subsets of the domain.		
<b>1</b>	Name this type of function which, as an example, may be defined one way when $x$ is less than a particular value but defined a different way when $x$ is greater than or equal to that same value.	<u>piecewise</u> -defined
<b>2</b>	At the ends of subdomains, it is common to check for this property of functions requiring them to have a value equal to their limit.	<u>continuity</u> (accept <u>continuous</u> )
<b>3</b>	Find the value of $k$ if the following function is continuous at $x=3$ : the function equals $x^2$ if $x$ is less than 3, and $x+k$ if $x$ greater than or equal to 3.	<u>6</u>



**Question #29: Literature – US Literature**

15 points

<p>This author wrote of “colonials [kuh-LOE-nee-uls], possessing what we still were unpossessed by.” That poem also described a group that was “withholding from our land of living, and forthwith found salvation in surrender.” This author of “The Gift Outright” wrote of two entities, one “was grassier and wanted wear.” He wrote that “good fences make good neighbors” in “Mending Wall.” Name the author of “The Road Not Taken” and “Stopping By Woods on a Snowy Evening.”</p>	<p>Robert <u>Frost</u></p>
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**Question #30: Science – Biology**

15 points

<p>In 1993, the remains of a large extinct example of this class of animals was found on Madagascar and named <b>beelzebufo</b> [bee-EHL-zeh-boo-foe]. One of its orders, many of whose examples have tentacles between their nostrils and very small eyes, are <b>gymnophonia</b> [jim-noe-FONE-ee-uh]. These animals have <b>parotoid</b> [PAIR-ah-toid] glands to produce neurotoxins to fight predators, and their skin is generally <b>permeable</b> [PER-mee-ah-bul]. Its other living orders are <b>caudata</b> [caw-DAA-tuh] and anura. The caudate order is composed mainly of salamanders and newts. Name these animals often able to live on land and in water that includes frogs.</p>	<p><u>Amphibians</u> (or <u>Amphibia</u>)</p>
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**Question #31: Math – Conceptual Math**

15 points

A proof of this is nicknamed **Dulcarnon** [dul-KAHR-non], meaning the owner of two horns, and its diagram is nicknamed the bride’s chair or peacock tail. Another proof involves the dot product of the quantity  $x$  plus  $y$  with itself. This is used to prove the British flag theorem, which addresses the distances from a randomly chosen point in a rectangle to the vertices [VER-tih-sees]. Dependent on the parallel postulate, this is equivalent to the most basic relationship between sine and cosine, and this is a special case of the law of cosines. Name this theorem that allows a person to find the length of the third side of a right triangle if they know the other two, often expressed as  $a^2+b^2=c^2$ .

**Pythagorean** Theorem (accept **Pythagoras’ Theorem**, prompt on “Law of Cosines” or “ $a^2+b^2=c^2$ ”)

**Question #32: Social Studies – World History**

15 points

One of his daughters put down a revolt led by Thomas Wyatt. During his reign, Parliament targeted the lands of the Marcher Lords with Acts of Union that created a united Wales. He betrayed Robert Aske, who had led the Pilgrimage of Grace to protest his closing of England’s monasteries. He was the father of Bloody Mary and Queen Elizabeth the First through his first two marriages. Name this English king who counted Catherine of Aragon and Anne Boleyn among his six wives.

**Henry VIII**



**Extra Question #1: Literature – World Literature**

15 points

<p>In this play, a paper knife is used to attempt to stop someone watching, before poisons and ropes are also declared useless. This play takes place in a place that caters for Chinamen and Indians; according to the <b>Valet [vaa-LAY]</b>, they have no use for a Second Empire chair. Discounting tales of torture chambers, fire and brimstone, one character proclaims, “Hell is other people.” Name this play in which Estelle, Inez, and <b>Garcin [gahr-SEEN]</b> are trapped in a room, written by Jean-Paul <b>Sartre [sahrt]</b>.</p>	<p><b><u>No Exit</u></b> (accept <b><u>Huis Clos</u></b>)</p>
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**Extra Question #2: Math – Conceptual Math**

15 points

<p>This function is applied along with addition and subtraction to prime numbers in Wilson’s Theorem. When this function is applied after doubling a number, it has a simple relationship with products of triangular numbers, and this is shifted one unit over from the gamma function. This function appears in the denominators of both the terms in a Taylor Series and in solutions to problems on the rearrangements of letters. Name this function used to calculate permutations and combinations, the product of all of the natural numbers up to a given number.</p>	<p><b><u>factorial</u></b></p>
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**Extra Question #3: Fine Arts – Composers of the Modern Era**

15 points

This composer worked with Gunild Keetman on a method of music education known as his Schulwerk. His fairy tale opera, which is often paired with his work *The Moon*, is *The Wise Girl*, which is known in German as *Die Kluge* [dee-KLOOG-eh]. His best-known work is part of a *Trionfi* [tree-OWN-fee] that ends with “Trionfo di Afrodite.” The piece begins and ends with a medieval Latin poem. Name this composer who uses “O *Fortuna* [for-TOON-uh]” to begin and end his *Carmina Burana* [kahr-MEEN-uh bur-AHN-ah].

Carl Orff

**Extra Question #4: Science – Health**

15 points

A newly found form of this disease uses the *knowlesi* [no-LEHS-ee] species as a parasite, and the most deadly type is based on the *falciparum* [fal-SI-pahr-um] species. The parasites mature in a person’s liver and then enter red blood cells, which they cause to break open, causing anemia, blackwater fever, and other symptoms. It is often treated with *chloroquine* [KLOR-uh-queen], and the traditional medicine for it, which unfortunately destroys blood platelets, is *quinine* [KWI-neen]. Name this disease caused by *plasmodium* [plas-MOH-dee-um] that is often carried by mosquitos.

malaria



**Extra Question #5: Social Studies – US History**

*15 points*

In the aftermath of World War I, President Wilson tapped this person to head the European Relief and Rehabilitation Administration, as he had successfully led the US Food Administration during the conflict. His campaign of prosperity promised “a chicken in every pot, and two cars in every garage;” it helped him handily defeat Al Smith. Prior to entering the Oval Office, he was Calvin Coolidge’s Secretary of Commerce. Name this immediate predecessor to Franklin Delano Roosevelt.

Herbert Hoover



**Extra Question #6: Social Studies – World History**

*10 points per part*

A dangerous political vacuum was created in this country after the death of President Juvenal <b>Habyarimana</b> [hahb-yahr-ee-MAH-nah] and Prime Minister <b>Agathe Uwilingiyimana</b> [ah-GAH-thay oo-wil-eeng-ee-yee-MAH-nah].		
1	Name this country, whose forces, along with Uganda, helped overthrow Mobutu <b>Sese Seko</b> [say-say SAY-koh] and establish Laurent <b>Kabila</b> [kah-BEE-lah] as President of the Democratic Republic of the Congo.	<b><u>Rwanda</u></b>
2	After Rwanda’s President and Prime Minister were killed in April 1994, this ethnic minority was the target of a genocide that saw over 800,000 people killed. Rwanda’s president, Paul <b>Kagame</b> [kah-GAH-may], is a member of this group.	<b><u>Tutsi</u></b> (accept <b><u>Batusi</u></b> , <b><u>Tussi</u></b> , <b><u>Watusi</u></b> , or <b><u>Watutsi</u></b> )
3	The genocide was perpetrated by this majority ethnic group through the <b>Interahamwe</b> [in-ter-ah-HAHM-way] and <b>Impuzamugambi</b> [im-poo-zah-moo-GAHM-bee] militia groups.	<b><u>Hutu</u></b> (accept <b><u>Bahutu</u></b> or <b><u>Wahutu</u></b> )

**Extra Question #7: Social Studies – World History**

*10 points per part*

A sale of land to the colonial government prompted the First <b>Taranaki</b> [tahr-uh-NAH-kee] War, fought in this country.		
1	Name this country, where natives agreed to trade “ <b>kawānātanga</b> [kah-wahn-uh-THAN-gah]” to the crown in exchange for protection and guaranteed possession of lands in the Treaty of <b>Waitangi</b> [wye-TAHN-gee].	<b><u>New Zealand</u></b> (accept <b><u>Aotearoa</u></b> )
2	The Treaty of Waitangi was negotiated between Great Britain and members of this ethnic group. Clashes between these people and the colonists would lead to two wars in Taranaki and another in the <b>Waikato</b> [wye-KAH-toe] region.	<b><u>Maori</u></b>
3	This Dutch explorer was the first European to land in what is now New Zealand. His namesake sea separates New Zealand from Australia.	Abel Janszoon <b><u>Tasman</u></b>



**Extra Question #8: Math – Trigonometry**

*10 points per part*

This fraction of a degree is now less common as the use of decimals increases for angle measures.		
<b>1</b>	Give this name for a sixtieth of a degree.	<b><u>minute</u></b>
<b>2</b>	A measure of 0.25 degrees equals this many minutes.	<b><u>15</u></b>
<b>3</b>	How many seconds are in 1/300 degrees?	<b><u>12</u></b>

**Extra Question #9: Math – Trigonometry**

*10 points per part*

This measure is found by dividing the area of a circle on a sphere by the radius squared of the sphere.		
<b>1</b>	Name this SI unit of solid angles.	<b><u>steradians</u></b> (do not accept radians)
<b>2</b>	This steradian measure is the solid angle that covers an entire sphere.	<b><u>4 Pi</u></b>
<b>3</b>	The steradian measure of four pi is comparable to this radian measure of a complete circle equivalent to 360 degrees.	<b><u>2 Pi</u></b>



**Question #1: Miscellaneous – Industrial Arts**

15 points

The foundations of the Blackpool Tower and Empire State Building are made from these, manufactured in **Accrington** [**aak-KRING-ton**]. Aluminum oxide and silica dioxide are the primary ingredients of refractory ones. Frank Lloyd Wright's Robie House utilized the Roman variety of this building material. The most common ones are created through **vitrification** [**vi-tri-fi-KAY-shun**] of clay and shale in a kiln. Name this building material utilized along with mortar in masonry.

**bricks**

**Question #2: Math – Conceptual Math**

15 points

If an edge length of this figure is given as  $s$ , its volume increases at a rate of  $3s^2 ds/dt$  [**three s squared d s d t**], and its surface increases at a rate of  $12s ds/dt$  [**twelve s d s d t**]. Its **vertices** [**VER-tih-sees**] can be placed on a three-dimensional grid so they are located at all the points where all three coordinates each have an absolute value equal to a given constant. This shape is the basis for an optical illusion designed by Louis Necker. The only Platonic solid which has faces with an even number of sides, it contains eight vertices and six faces. All of its angles are right angles. Name this three-dimensional figure whose sides are all squares.

**cube** (accept **regular hexahedron**, prompt on "hexahedron" or "square prism")



**Question #3: Science – Biology**

*15 points*

The cartilage under this bone is the most common site of **chondromalacia** [kon-droe-mah-LAY-shuh], a disease characterized by the cartilage softening or **degenerating** [dee-JEN-uh-ray-ting]. This is the largest **sesamoid** [SEHS-ah-moid] bone in the human body, and its shifting out of place is known as tracking disorder. The rectus **femoris** [feh-MOHR-is] arises from the pelvis and inserts into this bone, while three vastus muscles arise from the femur and insert into this. Located in front of a joint, name this bone commonly called the kneecap.

**patella** (accept **kneecap** before it is mentioned, do not accept “knee”)

**Question #4: Literature – British Literature**

*15 points*

He wrote of “two Chinamen, behind them a third... carrying a musical instrument” in one poem dedicated to Harry Clifton. This poet described fifty-nine creatures “upon the brimming water among the stones” in “The Wild Swans at Coole.” In one poem, he compared an aged man to “a tattered coat upon a stick.” When “the falcon cannot hear the falconer; things fall apart, the center cannot hold” in his poem “The Second Coming.” Name this Irish poet of “Sailing to **Byzantium** [bih-ZANT-ee-um].”

William Butler **Yeats**



**Question #5: Social Studies – World History**

15 points

With his elder brother, this man negotiated a peace treaty with the Romans at **Margus [MAHR-gus]**. He led the sackings of **Singidunum [SING-ih-doo-num]** and **Serdica [SEHR-dih-kah]** during a raid on the **Danubian [dah-NOO-bee-un]** frontier. After reaching Constantinople, he led an attack on the **Gallipoli [gal-LIP-oh-lee]** peninsula. After **Honorius [on-o-REE-uh]** sent him a ring, he demanded a dowry of half of the Western Roman Empire. This led to the Battle of the **Catalaunian [ka-tah-LAU-nee-un]** Plains, where the forces of **Aetius [AY-tee-us]** and **Theodoric I [THEE-oh-dor-ik the first]** defeated this “Scourge of God.” Name this former king of the Huns.

**Attila** the Hun (prompt on “Flagellum Dei” or “Scourge of God”)

**Question #6: Science – Earth Science**

15 points

These can create sand volcanos, which look like volcanos but are very small. Those are often a secondary effect from the loss of shear strength in the ground, which is soil **liquefaction [li-kwuh-FAK-shun]**. These sometimes occur one after the other in close proximity, which is a swarm, and an attempt to predict them is the Coulomb stress transfer theory. Examples include the Great Kanto in 1923 and the Great Tangshan in 1976. These result in Love and Rayleigh waves on the surface and S- and P-waves through the ground. Name these events often explained by plate margins, or fault lines, which are studied by **seismologists [size-MOL-uh-jists]** and measured on the **Richter [RIK-ter]** Scale.

**earthquakes** (accept **tremor** or **temblor**, prompt on “seism”)



### Question #7: Math – Trigonometry

10 points per part

This function of an acute angle gives the ratio of the lengths of the hypotenuse over the leg adjacent to the angle in a right triangle.		
1	Name this reciprocal of the cosine function.	<b>secant</b> (do not accept “cosecant”)
2	In the graph of $y = \sec x$ , where $x$ is in radians, this is the $x$ -coordinate of the first <b>asymptote</b> [AS-im-tote] to the right of the $y$ -axis.	<b><math>\pi/2</math></b> (accept <b>one-half pi</b> )
3	This is the value of the secant of the quantity seven pi over four.	square <b>root</b> of <b>2</b> (accept <b>radical 2</b> , do not accept “2”)

### Question #8: Math – Trigonometry

10 points per part

These angles are always acute and are helpful when using a trig table that only goes up to 90 degrees.		
1	Name these angles that measure how many degrees any given angle of any measure is from the $x$ -axis.	<b>reference</b> angles (do not accept “polar” angles)
2	Find the reference angle for an angle of 220 degrees.	<b>40</b> degrees
3	This term refers to angles that differ by a multiple of 360 degrees. Their name is based on their matching location on the unit circle.	<b>coterminal</b> angle



**Question #9: Literature – World Literature**

10 points per part

This archdeacon was the subject of rumors involving sorcery.		
1	Name this priest, who attempted to use <b>Grignoire’s [gree-nyors]</b> sham marriage to procure a gypsy woman. After engineering the gypsy’s hanging, he was thrown from a tower.	<b><u>Claude Frollo</u></b> (accept either)
2	Claude Frollo was chucked to his death by this bellringer, who was chosen to be the Prince of Fools. After his death, his body was found in the vault of <b>Montfaucon [mont-fau-kon]</b> hugging the corpse of Esmerelda.	<b><u>Quasimodo</u></b> (prompt on “Hunchback of Notre Dame”)
3	Quasimodo was the title hunchback of Notre Dame in a novel by this author who also wrote about the thief <b>Jean Valjean [zhahn val-zhahn]</b> in <i>Les Miserables [lay miz-uh-rab]</i> .	Victor <b><u>Hugo</u></b>

**Question #10: Literature – World Literature**

10 points per part

During a <b>Particicution [par-TIH-sih-kyoo-shun]</b> in this novel, <b>Ofglen [of-glen]</b> is executed after knocking out a man about to be quartered.		
1	Name this novel in which Offred is forced to serve the Commander and his wife, Serena Joy.	<i>The <b><u>Handmaid’s Tale</u></b></i>
2	<i>The Handmaid’s Tale</i> was written by this author of <i>The Robber Bride</i> and <i>The Blind Assassin</i> .	Margaret <b><u>Atwood</u></b>
3	Offred was captured by forces within the Republic of Gilead when attempting to escape to this country, the home of Margaret Atwood.	<b><u>Canada</u></b>



**Question #11: Social Studies – Current Events**

*10 points per part*

Answer the following about political fallout from the 2012 Summer Olympics.		
<b>1</b>	UK’s Border Agency refused a visa to General <b>Mowaffak Joumaa [MOU-uhf-fahk joo-mah]</b> , the head of this country’s Olympic Committee, on account of his close ties to Bashar al-Assad.	<u><b>Syria</b></u>
<b>2</b>	During a speech, Mitt Romney questioned the host city’s readiness for the 2012 Summer Olympics, drawing on his experience when he helped Salt Lake City put on the Winter Olympics in this year.	<u><b>2002</b></u>
<b>3</b>	Romney’s criticism was the object of scorn when Boris Johnson, the holder of this political post, answered Romney by saying “Are we ready? Yes we are!”	<u><b>mayor</b></u> of <u><b>London</b></u> (prompt on “mayor”)

**Question #12: Social Studies – Current Events**

*10 points per part*

At a rally in Ashland, Virginia, he was mistakenly introduced as “the next President of the United States.”		
<b>1</b>	Name this VP nominee.	Paul <u><b>Ryan</b></u>
<b>2</b>	Paul Ryan has served in the House of Representatives on behalf of this state. It saw massive strikes and protests when Governor Scott Walker attempted to curb public unions’ collective bargaining rights.	<u><b>Wisconsin</b></u>
<b>3</b>	Ryan drew much ire in response to his 2012 Republican budget proposal. Among its most polarizing features was the end of this system starting in 2022 for those born after 1956, and replacing it with a voucher system.	<u><b>Medicare</b></u>



### Question #13: Science – Physics

10 points per part

A common type of this device uses helium and neon and emits red light.		
1	Name these devices that produce light through stimulated emission.	<u>lasers</u>
2	Because the light emitted by a laser is very consistent in frequency and phase, it possesses this property.	<u>coherence</u> (accept other word forms)
3	One step lasers use involves this property in which there are more atoms in an excited state than in the ground state. Give a two word answer.	<u>population inversion</u>

### Question #14: Science – Physics

10 points per part

This can causes clothes to cling or electric sparks.		
1	Name this form of electricity that is often contrasted with current electricity.	<u>static</u> electricity
2	This device, which uses a moving belt to charge a hollow metal sphere, is often used to demonstrate static electricity.	<u>Van de Graaff</u> generator
3	The belt must be this type of material, an insulator that is also used in capacitors that can maintain an electric field.	<u>dielectric</u>



**Question #15: Literature – World Literature**

15 points

<p>In one of his novels, Angela Vicario’s premarital sex led to her brothers Pablo and Pedro stabbing Santiago Nasar. In another novel, a cannibalistic fugitive took his own life; the doctor who discovered it later fell to his death attempting to retrieve a parrot. This author of <i>Chronicle of a Death Foretold</i> used the town of <b>Aracataca [ahr-ah-KAH-tah-kah]</b> as a model for the fictional city of Macondo, where the <b>Buendia [bwen-DEE-uh]</b> family resided. Name this author of <i>One Hundred Years of Solitude</i>, a Colombian novelist.</p>	<p>Gabriel <b><u>Garcia Marquez</u></b> (prompt on partial answer)</p>
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**Question #16: Social Studies – Geography**

15 points

<p>The city of <b>Soldotna [sol-DOT-nah]</b> is found on this state’s Kenai peninsula. Norton Sound separates this state’s St. Lawrence Island from the mainland. The Copper River Basin is found between the <b>Chugach [CHOO-gach]</b> and Wrangell mountains in this state. Home to Tongass National Park, its Misty Fjords National Monument is found near Ketchikan. Its major sea ports include Barrow, Kodiak, and Anchorage. Name this largest US State, with its capital at Juneau.</p>	<p><b><u>Alaska</u></b></p>
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**Question #17: Science – Chemistry**

15 points

This element is in **anorthite** [AA-nor-thite] but not **albite** [AL-bite]; those forms of **plagioclase** [PLAY-jee-oh-klase] differ based on how much of this element they contain as compared to sodium. Its hydrous sulfate is alabaster, also known as **gypsum** [JIP-sum], which is used to make plaster. Its carbonate is often used as an antacid or in chalk, and its oxide is called quicklime. Name this element, used by the body for muscle contraction and the prevention of **osteoporosis** [os-tee-oh-po-ROH-sis], which is in dairy products.

**Calcium** (prompt on “Ca”)

**Question #18: Fine Arts – Classical/Opera Music**

15 points

This composer completed Carl Maria von **Weber’s** [VAY-burs] opera **Die drei Pintos** [dee dray PIN-toes]. Several of his symphonies were based on songs with lyrics taken from a collection of German poems called **Des Knaben Wunderhorn** [des NAH-bin VOON-dur-horn]. His first two symphonies are nicknamed “Titan” and “Resurrection”. One of his song cycles is based on the deaths of children, and another, which includes songs such as “The lonely one in Autumn” is *The Song of the Earth*. Name this German composer whose Eighth Symphony requires so many performers that it is nicknamed “Symphony of a Thousand.”

Gustav **Mahler**



**Question #19: Literature – Mythology**

15 points

King **Heidrik** [**HIGH-drik**] was incensed at this god taking the form of **Gestumblindi** [**geh-STOOM-blin-dee**] and defeating Heidrik in a contest of riddles. In that contest, this god won by using the same riddle he used to defeat **Vafthrudnir** [**vaf-THROOD-nir**]. That riddle asked what this god whispered into the ear of his deceased son. This god sits on the throne **Hlidskjalf** [**LID-skyalf**], from which he can see everything in the nine worlds. He gave up an eye to drink from the Well of **Mimir** [**MEE-mir**], and procured eighteen runes by hanging himself from a tree for nine days. Name this leader of Asgard, the chief deity of Norse myth.

**Odin** (accept **Woden**, **Wotan**, or **Wotan**, prompt on “All-Father”)

**Question #20: Social Studies – US History**

15 points

In this conflict, the battery at Kalaklan point was destroyed in the Battle of **Olongapo** [**oh-lohn-GAH-poh**] by the winning side's Asiatic squadron, led by the *Olympia*. That victory was followed by a land invasion led by General Wesley Merritt. General William Shafter led the victorious land forces in its Caribbean theater, which included Leonard Wood's Rough Riders. Name this conflict fought in the Philippines and Cuba between the United States and a European colonial power in 1898.

**Spanish-American** War



### Question #21: Math – Algebra

10 points per part

These functions are also known as injective.		
<b>1</b>	Give this hyphenated term describing functions which do not use elements in their range more than once.	<b><u>one-to-one</u></b>
<b>2</b>	One-to-one functions that are also onto have one of these associated functions which undo the given function.	<b><u>inverse</u></b>
<b>3</b>	If the graph of a line has a slope of 5, this is the slope of the inverse function.	<b><u>1/5</u></b> (accept <b><u>.2</u></b> , do not accept a negative answer)

### Question #22: Math – Algebra

10 points per part

This is where a perpendicular bisector goes through a segment.		
<b>1</b>	Name this point that divides a segment into two congruent segments.	<b><u>midpoint</u></b> (prompt on “middle”)
<b>2</b>	If one endpoint of a segment is at the point (3,1), and the midpoint is at (6,-3), what are the coordinates of the other endpoint?	<b><u>(9,-7)</u></b>
<b>3</b>	If a segment’s length is the square root of 40, this is the distance from an endpoint to a midpoint.	square <b><u>root</u></b> of <b><u>10</u></b> (accept <b><u>radical 10</u></b> )



**Question #23: Social Studies – US History**

*10 points per part*

Millard Fillmore appointed him as Secretary of State, as did William Henry Harrison.		
<b>1</b>	Name this statesman who, with Baron Ashburton, negotiated the treaty that set the eastern US/Canada border, and participated in two debates with Senator Robert Hayne.	Daniel <u>Webster</u>
<b>2</b>	Webster defended this New Hampshire college in a case that went to the Supreme Court. The majority in this case ruled that the state does not have the right to impair a contract.	<u>Dartmouth</u> College v. Woodward
<b>3</b>	Webster’s statement "Liberty and Union, now and forever, one and inseparable!" put him at odds with this Vice President, who resigned over the issue of states’ rights.	John Caldwell <u>Calhoun</u>

**Question #24: Social Studies – US History**

*10 points per part*

It has been referred to as “The Bloody Massacre in King Street” and the “State Street Massacre.”		
<b>1</b>	Name this engagement between a crowd of civilians and a number of British soldiers. Confusion reigned as the crowd chanted “fire and be damned,” while the senior officer gave no such order.	<u>Boston Massacre</u>
<b>2</b>	At the subsequent trials, this future president led the defense team, along with Robert Auchmuty [auch-MOO-tee]. Ultimately, all the soldiers involved were acquitted.	<u>John Adams</u> (prompt on “Adams”, do not accept answers including “Quincy”)
<b>3</b>	Using Henry Pelham’s engravings, this silversmith generated a print of the Massacre full of inaccuracies. Beneath it, he wrote a poem comparing the soldiers to fierce barbarians.	Paul <u>Revere</u>



**Question #25: Literature – British Literature**

10 points per part

On the Island of Sorcerers, he was introduced to Alexander the Great and Julius Caesar.		
<b>1</b>	Name this fictional surgeon, who visited such lands as <b>Brobdingnag [brob-DEENG-nag]</b> and Lilliput.	<b><u>Lemuel Gulliver</u></b> (accept either)
<b>2</b>	The travels of Lemuel Gulliver were detailed in a novel by this Irish author. In <i>A Modest Proposal</i> , he suggested that Irish babies be slaughtered for consumption to combat famine.	Jonathan <b><u>Swift</u></b>
<b>3</b>	While visiting <b>Houyhnhnmland [HWIN-um-land]</b> , Dr. Gulliver encounters these human-like slaves. Gulliver’s memories of them scarred him after he was picked up by a Portuguese vessel.	<b><u>Yahoos</u></b>

**Question #26: Literature – British Literature**

10 points per part

A wedding guest tells the tale of the title character of this poem.		
<b>1</b>	Name this nautical poem, which features a boat “as idle as a painted ship upon a painted ocean.” At that time, there was “water, water everywhere, nor any drop to drink.”	“The <b><u>Rime of the Ancient Mariner</u></b> ”
<b>2</b>	“The Rime of the Ancient Mariner” was written by this English Romantic poet who teamed up with William Wordsworth on <i>Lyrical Ballads</i> .	Samuel Taylor <b><u>Coleridge</u></b>
<b>3</b>	The ship idled shortly after the Ancient Mariner shot one of these animals with a crossbow.	<b><u>albatross</u></b> (prompt on “bird”)



### Question #27: Fine Arts – Art History

10 points per part

He organized a series of events called the <i>Exploding Plastic Inevitable</i> .		
1	Name this pop artist known for his depictions of Campbell's Soup cans.	Andy <b>Warhol</b> (a)
2	Warhol made several works showing this actress whose birth name was Norma <b>Jeane [jeen]</b> Mortensen.	Marilyn <b>Monroe</b>
3	Warhol started making paintings and prints of these objects in 1963, using one from Sing Sing Penitentiary as his first model.	<b>electric chair</b> (prompt on "chair")

### Question #28: Fine Arts – Art History

10 points per part

This work has four people in it, and the only woman is wearing red.		
1	Name this 1942 painting looking into a Manhattan diner that includes a server wearing a white outfit with a white hat.	<b><i>Nighthawks</i></b>
2	<i>Nighthawks</i> was created by this artist who also painted <i>Chop Suey</i> .	Edward <b>Hopper</b>
3	Hopper's American realist works are often compared to works by this painter of <i>Men of the Docks</i> , <i>Cliff Dwellers</i> , and <i>Dempsey and Firpo</i> .	George <b>Bellows</b>



**Question #29: Science – Physics**

15 points

One form of this was used by Enrico Fermi to explain how a magnetic mirror creates cosmic rays and was named for him. Two spaceships perform this action while connected by a string in a thought experiment explained by length contraction, and this action explains the differences between the two people in the twin paradox. This quantity equals angular velocity squared times radius in circular motion, which means it also equals speed squared divided by radius. Give this quantity equal to the time derivative of velocity which also equals net force over mass.

(centripetal) acceleration

**Question #30: Literature – US Literature**

15 points

In this work, after covering a light bulb with a Chinese lantern, two characters dance to radio music. Jazz from a neighboring bar coincides with a man attacking his sister-in-law near the end of this play. One character is said to have “an animal’s habits...bearing the raw meat home from the kill in the jungle.” After the two central women in this play flee up the stairs after the radio incident, one character yells out Stella’s name. Name this work featuring the Kowalskis and Blanche DuBois [doo-bwah], written by Tennessee Williams.

A Streetcar Named Desire



**Question #31: Math – Conceptual Math**

15 points

To apply this function to a complex number  $p+qi$ , set  $a^2-b^2$  equal to  $p$  and  $2ab$  equal to  $q$ . An algorithm to calculate this function for decimal numbers pairs up digits in the input number, and evaluating this function for a complex number represented as a vector involves dividing the angle of that vector by two. Applying the squaring function to a real number and then this function has the net effect of finding the absolute value. Its graph is half of a rightward opening parabola. Name this function which takes an input of two and gives an output equal to approximately 1.414.

**square root** (accept **raise to the  $\frac{1}{2}$  power** or equivalent, prompt on “root” or “radical”, do not accept “square”)

**Question #32: Social Studies – World History**

15 points

Newly elected Prime Minister Herbert Asquith tapped this Liberal to head the Board of Trade. As a Constitutionalist, Stanley Baldwin appointed him as Chancellor of the Exchequer. In one speech, he warned of a structure stretching “from Stettin in the Baltic to **Trieste [TREE-est]** in the Adriatic,” that structure being the Iron Curtain. This successor to Neville Chamberlain who said he had “nothing to offer but blood, toil, tears, and sweat.” Name the British Prime Minister during World War II.

Winston **Churchill**



**Extra Question #1: Fine Arts – Art History**

15 points

On a few occasions, this artist portrayed **Aristide [AIR-uh-steed]** Bruant wearing a black cape and red-orange scarf, including the work *Ambassadeurs*. He also portrayed the dancer Jane Avril, and one of his early works shows a woman riding a horse at the Circus Fernando. One of his works shows him sitting at a table in a crowd and also shows several women with white faces, including one facing the canvas on the right side of the picture. Name this artist whose posters celebrated Parisian night life, the painter of *At the Moulin Rouge*.

Henri de Toulouse-Lautrec

**Extra Question #2: Social Studies – US History**

15 points

Georgia Senator Richard Russell led the Democratic filibustering of this bill, citing a failure to protect people from a bureaucracy, organizing invasion after invasion. One section within it included provisions specifically for federally funded programs, while Title VII of it created of the Equal Employment Opportunity Commission. Name this act that prohibits discrimination on the basis of race, religion, color, sex, or national origin.

Civil Rights Act of 1964



**Extra Question #3: Math – Conceptual Math**

15 points

This mathematician is the namesake of relations that are both symmetric and transitive, and he wrote that if a prime number evenly divides a product, then it evenly divides one of the factors. The standard dot product is sometimes named for him, and the algorithm named after him is used to find the greatest common divisor. He wrote one of the first proofs showing that there are infinitely many prime numbers, and the geometry named after him follows his parallel postulate. Name this ancient Greek mathematician whose book *Elements* develops geometry.

**Euclid** of Alexandria

**Extra Question #4: Literature – US Literature**

15 points

She was widowed while pregnant with Wade Hampton. She stole **Suellen's** [soo-ell-ens] fiancé, with whom she had Ella. During almost every crisis, her response is, "I'll think of it all tomorrow." She bought a sawmill from money she borrowed from her third husband. Despite loving Ashley Wilkes, she later married Charles Hamilton, Frank Kennedy, and finally Rhett Butler. Name this Georgian woman, created by Margaret Mitchell in *Gone With the Wind*.

**Scarlett** O'Hara (prompt on "O'Hara")



**Extra Question #5: Science – Physics**

*15 points*

<p>This person connected two pistons to a single beam in a system used in automobile suspensions known as his linkage. He also added a separate condensation chamber to a <b>Newcomen [new-koh-men]</b> engine in order to improve efficiency. He devised the horsepower unit, which now equals about 750 times the unit named after him. Name this improver of the steam engine whose namesake unit of power equals a Joule per second.</p>	<p>James <u>Watt</u></p>
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**Extra Question #6: Literature – Mythology**

*10 points per part*

This god and his traveling party were outsmarted by Utgard-Loki.		
1	Name this owner of <b>Mjollnir [MYOLE-nir]</b> , the Norse god of thunder.	<b><u>Thor</u></b>
2	<b>Thialfi [thee-AHL-fee]</b> lost several of these to <b>Hugi [HOO-gee]</b> , the embodiment of thought. Atalanta refused to marry a suitor who could not best her in one.	foot <b><u>race</u></b>
3	Being told it was a cat's paw, Thor ended up lifting up the tail of this beast, which could circle the earth and swallow its own tail.	<b><u>Jormungandr</u></b> (accept <b><u>Jormungandr</u></b> or <b><u>Midgard Serpent</u></b> )

**Extra Question #7: Literature – Mythology**

*10 points per part*

This god was born from Zeus' thigh after Hera engineered the death of his mother <b>Semele [SEH-meh-lee]</b> .		
1	Name this god of wine and drama.	<b><u>Dionysus</u></b> (accept <b><u>Bacchus</u></b> )
2	A group of pirates kidnapped <b>Dionysus [DYE-oh-nye-sus]</b> , thinking he was a wealthy prince. After learning that they had taken an Olympian, they were eventually transformed into these aquatic animals.	<b><u>dolphins</u></b> (do not accept "fish")
3	Pentheus, a king of this city, tried to ban the worship of Dionysus. The god then sent his Maenads, including Pentheus' own mother, to tear him to pieces.	<b><u>Thebes</u></b>



**Extra Question #8: Science – Biology**

*10 points per part*

This tube is about four inches long and protrudes from the <b>cecum</b> [SEE-kum].		
<b>1</b>	Name this organ that scientists believed was necessary when humans ate more leaves.	vermiform <b><u>appendix</u></b>
<b>2</b>	An ongoing scientific debate concerns whether or not the appendix has this property, meaning that it is now functionless.	<b><u>vestigial</u></b> (accept other word forms)
<b>3</b>	These muscles of the outer ear are considered to be <b>vestigial</b> [ves-TIJ-ee-ul].	<b><u>auricular</u></b> muscles (accept muscles of the <b><u>auricular</u></b> or <b><u>auricles</u></b> )

**Extra Question #9: Science – Biology**

*10 points per part*

Listen closely and identify these parts in and around ears.		
<b>1</b>	Nicknamed the stirrup, this bone next to the <b>malleus</b> [MAL-ee-us] and <b>incus</b> [EEN-kus] is the smallest bone in the human body.	<b><u>stapes</u></b>
<b>2</b>	This spiral cavity in the ear contains the Organ of Corti, which in turn contains the auditory nerve receptors.	<b><u>cochlea</u></b>
<b>3</b>	This conical prominence of the temporal bone is located just behind the ear.	<b><u>mastoid process</u></b> (prompt on “mastoid”)



**Question #1: Social Studies – Religion**

*15 points*

<p>God warned this man, the first tiller, that “whoever sheds the blood of man, by man shall his blood be shed.” God indicated to this man that a <b>bow [boe]</b> in the clouds would symbolize an everlasting covenant with God. <b>Canaan [kay-nahn]</b> was founded by Ham, a son of this figure. He released a raven that went to and fro, then released a dove that brought back an olive branch. Living to be 950 years old, Name this Old Testament man who gathered up two of each animal and put them on his ark.</p>	<p><b><u>Noah</u></b> (accept <b><u>Noe</u></b>)</p>
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**Question #2: Miscellaneous – Technology**

*15 points*

<p>PayPal’s logo was designed by one of the founders of this website, Chad Hurley. This site’s April Fools jokes have included a “100th Anniversary” button, as well as links that turned page layouts upside down. The first item posted on this site depicted co-founder Jawed <b>Karim [kah-REEM]</b>, and was titled “Me at the zoo.” In 2006, Google bought out the owners of this site for \$1.65 billion. Name this website where people can upload and stream videos.</p>	<p><b><u>YouTube</u></b> (accept <b><u>youtube.com</u></b>)</p>
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**Question #3: Science – Chemistry**

*15 points*

Though this is not drying solvents, it can use a Perkin triangle when some of the chemicals are air-sensitive in the vacuum type of this process. Another type uses repeated pressure swings in the same direction. The most common method can use randomly packed **Raschig [RAASCH-ig]** rings to provide a large surface area inside a column. That method, contrasted with the simple type which can be used when there is a wide spread in boiling points, is the fractional type. Name this method of separating mixtures.

distillation (accept other word forms such as distilling)

**Question #4: Language Arts – Grammar**

*15 points*

Depending on the position of the jaw, these can be described as either high or low; modern English features more pronounced high ones due to a major shift in them. Diphthongs are **phonemes [FOE-neems]** that consist entirely of them. Based on the position of the tongue, these can be classified as front, central, or back. Name these sounds, which in English include A, E, I, O, and U.

vowels



**Question #5: Social Studies – US History**

*15 points*

<p>At the Battle of Contreras, this Brigadier General fell off his horse, breaking his leg. During his campaign for President, he had to gain a two-thirds majority to secure the Democratic nomination, after which he faced his former commander, General Winfield Scott, who ran as a Whig. His presidency saw the death of his vice president, William Rufus King. He was not nominated for re-election two years after signing the Kansas-Nebraska Act. Name this US President, the successor to Millard Fillmore.</p>	<p>Franklin <u>Pierce</u></p>
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**Question #6: Science – Health**

*15 points*

<p>One class of treatments for this disease consists of ethers and <b>tertiary amines</b> [TER-shee-air-ee uh-MEENS], which are known as <b>anticholinergic</b> [an-tee-koe-luh-NER-jik] agents and block <b>acetylcholine</b> [ah-SEET-ul-koe-leen]. In people with this disease, protein aggregates called Lewy bodies are found inside neurons, which stop working inside the <b>substantia nigra</b> [sub-STANCH-ya NEE-grah]. People with it have trouble making facial expressions and have a variety of movement problems. Some treatments include <b>levodopa</b> [lev-uh-DOPE-uh], which increases <b>dopamine</b> [DOPE-uh-meen] levels. Name this disease that mainly affects older people and is characterized by tremors.</p>	<p><u>Parkinson</u>'s disease (accept variations such as parkinsonism)</p>
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**Question #7: Math – Algebra**

*10 points per part*

This function is used to create the <b>Richter [RIK-tur]</b> and decibel scales.		
<b>1</b>	Name this function that is the inverse of <b>exponentiation [ex-poe-NEN-shee-ay-shun]</b> .	(common or natural) <b>logarithm</b>
<b>2</b>	Find the log base eight of four.	<b><u>2/3</u></b> (accept <b><u>.6 repeating</u></b> )
<b>3</b>	This number is the base of common logarithms.	<b><u>10</u></b>

**Question #8: Math – Algebra**

*10 points per part*

This property holds for multiplication over addition and for exponents over multiplication.		
<b>1</b>	Name this property which allows an operation to apply to both parts of a quantity separately rather than the quantity as a whole.	<b><u>distribution</u></b> (accept word forms such as <b><u>distributive</u></b> or <b><u>distributivity</u></b> )
<b>2</b>	These structures consisting of a set with two operations follow the distributive property. Though some of these are fields, these structures do not necessarily have <b>multiplicative commutativity [mul-tih-PLIK-uh-tiv KOM-you-tiv-uh-tee]</b> and multiplicative inverses.	<b><u>rings</u></b>
<b>3</b>	Use the distributive property to raise the quantity $5x^2y^3$ to the third power. Express the coefficient as a number rather than a power.	<b><u>125x<sup>6</sup>y<sup>9</sup></u></b>



**Question #9: Social Studies – World History**

10 points per part

His horse <b>Bucephalus</b> [byoo-SEF-uh-lus] was mortally wounded in a battle along the <b>Hydaspes</b> [high-DAS-pees] River.		
<b>1</b>	Name this legendary <b>Macedonian</b> [MAA-suh-DOE-nee-un] king who took a sword to the Gordian knot.	<b>Alexander the Great</b> (accept <b>Alexander III</b> )
<b>2</b>	Alexander the Great succeeded this king, who was assassinated by <b>Pausanias</b> [pau-SAA-nee-us].	<b>Philip II</b> of Macedon (prompt on “Philip”)
<b>3</b>	Alexander forced the Persian king Darius III to flee after this 333 BCE battle, in which Alexander had <b>Parmenio</b> [pah-MAIN-ee-oh] hold the sea. Alexander also captured Darius’ wife and children after this battle.	Battle of <b>Issus</b>

**Question #10: Social Studies – World History**

10 points per part

He was appointed as Prime Minister following the murder of <b>Giacomo Matteotti</b> [jah-KOE-moe mah-tay-OH-tee].		
<b>1</b>	Name this signatory to the Pact of Steel, who was known as “ <b>il Duce</b> [il DOOCH-ay]” to members of his Fascist party in Italy.	<b>Benito Amilcare Andrea Mussolini</b>
<b>2</b>	This group of Mussolini loyalists would later form the Voluntary Fascist Militia for National Security. An organized group of them gathered in Naples for the March on Rome that would bring Mussolini to power.	<b>Blackshirts</b> (accept <b>camicie nere</b> , <b>CCNN</b> , or <b>squadristi</b> )
<b>3</b>	In 1929, Mussolini signed this treaty, which established Catholicism as the state religion. It also included provisions for mandatory religious education, as well as requiring that leaders outside of Rome be Italian citizens.	<b>Lateran</b> Pact (accept equivalents for Pact)



### Question #11: Fine Arts – Jazz

10 points per part

His First Great Quintet featured Sonny Rollins, Red Garland, Paul Chambers, and Philly Joe Jones.		
1	Name this trumpeter whose sextet recorded the album <i>Kind of Blue</i> .	Miles Dewey <u>Davis</u> III
2	This Miles Davis album featuring nine musicians contains songs such as “Jeru” and “ <b>Boplicity [bop-LIS-uh-tee]</b> .” It was recorded in 1949 and 1950 but released in 1957.	<u><i>Birth of the Cool</i></u>
3	Davis also made an album of songs from this George Gershwin opera featuring the song “Summertime.”	<u><i>Porgy and Bess</i></u>

### Question #12: Fine Arts – Jazz

10 points per part

Name these jazz vocalists.		
1	Though more respected as a trumpeter, this man nicknamed Satchmo used his raspy voice on songs such as “What A Wonderful World.”	Louis <u>Armstrong</u>
2	Louis Armstrong played cornet on this vocalist’s recording of “St. Louis Blues.” She was nicknamed Empress of the Blues.	Bessie <u>Smith</u>
3	This singer whose autobiography was <i>Lady Sings the Blues</i> performed the songs “God Bless the Child” and “Strange Fruit.”	Billie <u>Holiday</u>



### Question #13: Science – Chemistry

10 points per part

These generally occur between atoms with similar <b>electronegativities</b> [ee-LEK-troe-neg-uh-TIV-uh-tee].		
1	Name these bonds characterized by the sharing of pairs of electrons. These include sigma and pi bonds.	<b><u>covalent</u></b> bonds
2	This scientist, whose namesake dot structures are used to show covalent bonds in molecules, is credited with discovering covalent bonds.	Gilbert Newton <b><u>Lewis</u></b>
3	This chemical contains a covalent triple bond between two carbon atoms, each of which also is bonded to a hydrogen atom.	<b><u>Acetylene</u></b> (accept <b><u>Ethyne</u></b> , prompt on “C <sub>2</sub> H <sub>2</sub> ”)

### Question #14: Science – Chemistry

10 points per part

The best known example decomposes water into hydrogen and oxygen gas.		
1	Name this method of using potential difference and current to drive a chemical reaction.	<b><u>electrolysis</u></b>
2	This British scientist devised two laws to quantify electrolysis, which can use his namesake constant of approximately ninety six thousand coulombs per mole.	Michael <b><u>Faraday</u></b>
3	Name the two scientists who are the namesakes of the process that uses electrolysis to obtain pure aluminum.	Charles Martin <b><u>Hall</u></b> and Paul <b><u>Heroult</u></b> (either order)



**Question #15: Social Studies – US Government**

*15 points*

All required forms sent to this organization are archived and searchable through EDGAR. William O. Douglas chaired this organization immediately prior to becoming a Supreme Court Justice. President Franklin Roosevelt tapped Joseph Kennedy as the first chairman of it. Issues stemming from information contained within Ten-Ks and Ten-Qs are resolved by this group's Corporate Finance division. Name this government agency that monitors financial markets and publicly traded companies.

SEC (accept Securities and Exchange Commission)

**Question #16: Literature – US Literature**

*15 points*

One of his poems describes purple fish playing hide and seek. The speaker in that poem is “down on the floors of salt and wet.” In one of his poems, the title entity orders, “pile the bodies high at Austerlitz and Waterloo.” This author of “Bones” and “Grass” wrote of another natural phenomenon that “sits looking over harbor and city on silent haunches.” It also “comes on little cat feet.” Name this author of “Fog” who wrote of the “City of the Big Shoulders” in “Chicago.”

Carl Sandburg



**Question #17: Fine Arts – Art History**

15 points

This artist split his work *Episode from a Bullfight*, part of which is now known as *The Dead Toreador*. His picture of a musician with one foot in the air while sitting on a blue bench is called *The Spanish Singer*. Another work shows a clothed maid holding flowers while the foreground character lies in bed wearing only shoes. This artist also painted a woman in white wading in water in a background while the foreground shows two bearded men sitting with a naked woman. Name this French artist of *Olympia* and *The Luncheon on the Grass*.

Edouard Manet  
(Note to moderator: do not accept Monet; ask the player to spell if unsure)

**Question #18: Science – Physics**

15 points

This quantity equals the magnetic **dipole [DIE-pole]** moment crossed with the magnetic field or the electric dipole moment crossed with the electric field, so it equals zero when the moments and fields align with each other. **Precession [pree-SESH-un]** is often classified based on whether or not this is present; it is present in the **gyroscopic [JAI-roe-scop-ic]** type and is generally supplied by gravity. Equal to the rate of change of angular momentum, this quantity is often calculated using displacement cross force, or as moment of inertia time angular acceleration. Name this quantity which is the rotational analogue of force.

torque



**Question #19: Math – Conceptual Math**

15 points

Fermat's [fehr-mahs] little theorem uses this type of number as a modulus. When one more than twice one of these numbers shares their property, then they are classified as the Germain type, and raising two to the power of one of these numbers and subtracting one gives a Mersenne number. When these numbers differ by two, they are classified as twins, and two large numbers of this type are multiplied in RSA cryptography. Name these numbers left behind by the sieve [siv] of Eratosthenes [eh-rah-TOS-thuh-nees], the integers greater than one that are not composite.

primes (accept prime numbers)

**Question #20: Literature – Mythology**

15 points

In *The Odyssey*, Homer claimed that this figure “knew the depths of all the seas,” and called him baleful. With Pleione [PLAY-oh-nee], he fathered the Pleiades [PLAY-ah-dees], and with one of his daughters, fathered Maia. Residing by the waters of the Khremetes [CRAY-meh-tees], Typhon threatened to send Zeus to Libya to replace him. In one telling, Hera's envy of Ephesus [eh-FEES-us] led to this Titan leading a revolt against Zeus. As this figure was immortal, he picked the Apples of the Hesperides [hes-PEHR-uh-dees] for Heracles. Name this Titan tasked with supporting the sky on his shoulders.

Atlas



**Question #21: Social Studies – Economics**

10 points per part

A firm in this market sets its price and production points at the point where marginal revenue equals marginal cost.		
1	Name this kind of market in which there is a single seller of a good. Power companies are an example of a geographic one.	<u>monopoly</u>
2	By setting the price where marginal revenue equals marginal cost, the seller in a monopoly maximizes this. In economics, it is calculated as revenue from a sale less the opportunity cost of the inputs.	economic <u>profit</u> (do not accept “income”)
3	This phenomenon occurs because the monopolistic seller sets the price above the equilibrium price in order to maximize profit. In any market, it is the potential for gain that is realized by neither producer nor consumer.	<u>deadweight loss</u> (prompt on “deadweight”)

**Question #22: Social Studies – Economics**

10 points per part

In one tome, he described the community as having three classes: landlords, workers, and the owners of capital.		
1	Name this British economist who authored the <i>Principles of Political Economy and Taxation</i> . He opposed the Corn Laws, claiming that manufacturers’ profits would take a hit.	David <u>Ricardo</u>
2	In <i>Principles of Political Economy and Taxation</i> , David Ricardo put forth this theory, which claims that relative efficiencies in production <b>lead [leed]</b> to entities concentrating on producing different goods.	<u>comparative advantage</u>
3	Ricardo also argued that as population increased, the economic form of this also increased, due to the increased demand for food. Ricardo defined it as being relative to the amount produced using the original soil.	<u>rent</u>



**Question #23: Science – Biology**

*10 points per part*

These are classified based on whether their energy comes from light or inorganic compounds.		
1	Name these organisms also known as producers.	<u>autotrophs</u>
2	Most autotrophs that live in water are these <b>eukaryotes</b> [yoo-KAR-ee-otes]. Examples include <b>chlorophyta</b> [KLOR-oh-fie-tuh] and <b>rhodophyta</b> [ROE-doe-fie-tuh].	<u>algae</u>
3	This <b>gelling</b> [JEL-eeng] agent derived from red algae is used to grow bacteria and <b>fungi</b> [FUN-gee] in labs.	<u>agar</u> (accept <u>agar-agar</u> )

**Question #24: Science – Biology**

*10 points per part*

This property applies to all somatic cells in humans.		
1	Give this name for cells that have two sets of chromosomes.	<u>diploid</u>
2	This term describes an organism that has different <b>alleles</b> [uh-LEELS] for the same trait. It also often describes that different pair of alleles.	<u>heterozygous</u>
3	Statistical studies show that being heterozygous for this disease provides some protection against tuberculosis. This disease destroys nerve cells, causing death at a young age.	<u>Tay-Sachs</u> disease



**Question #25: Literature – US Literature**

10 points per part

John Waller gave this slave the name “Toby.”		
1	Name this son of Omoro and Binta, who had a foot cut off after he tried to escape. He jumped the broom with Bell, and fathered Kizzy.	<b><u>Kunta Kinte</u></b> (accept either half)
2	<b>Kunta Kinte</b> [KOON-tah KIN-tay] is one of the central figures of <i>Roots</i> , written by this African-American, who had a number of interviews published in <i>The Atlantic Monthly</i> .	Alex Murray Palmer <b><u>Haley</u></b>
3	Among Haley’s interviewees was this black militant leader. Haley later co-wrote the autobiography of this successor to Elijah Muhammad as the leader of the Nation of Islam.	<b><u>Malcolm X</u></b> (accept El-Hajj Malik el- <b><u>Shabazz</u></b> )

**Question #26: Literature – US Literature**

10 points per part

In its opening line, the narrator orders that its tattered ensign be torn down.		
1	Name this poem extolling the virtues of a ship, the “eagle of the sea.” The speaker asks that its holy flag be nailed to the mast, and it be given to the god of storms.	<b>“<u>Old Ironsides</u>”</b>
2	“Old Ironsides” was written by this Schoolroom Poet, who also wrote about the life of a small sea animal in “The Chambered Nautilus.”	Oliver Wendell <b><u>Holmes</u></b> , Senior
3	Holmes penned a work about this figure “at the Breakfast-Table,” who describes the reputation of Aristotle entering a third stage. Holmes “shook the same bough again” when writing this man’s “Autobiography.”	the <b><u>Autocrat</u></b>



**Question #27: Math – Analytic Geometry**

*10 points per part*

Find the following for the graph of all points that satisfy the equation $4x^2 - y^2 = 64$ .		
<b>1</b>	The type of shape formed by the graph	<b><u>hyperbola</u></b>
<b>2</b>	The distance from one vertex of the hyperbola to the other vertex	<b><u>8</u></b>
<b>3</b>	The slope of the <b>asymptote [AS-im-tote]</b> that goes through the first and third quadrants	<b><u>2</u></b> (do not accept “-2” or any answer including -2)

**Question #28: Math – Analytic Geometry**

*10 points per part*

This name is applied to a shape of one sheet and a shape of two sheets.		
<b>1</b>	Name this shape that can be generated by the equation $x^2 + y^2 - z^2 = 1$ .	<b><u>hyperboloid</u></b> of one sheet
<b>2</b>	If that hyperboloid of one sheet, $x^2 + y^2 - z^2 = 1$ , is sliced by the plane $z=0$ , the intersection is this shape.	<b><u>circle</u></b> (prompt ellipse)
<b>3</b>	Give the area of that circle.	<b><u>pi</u></b>



**Question #29: Literature – British Literature**

15 points

<p>The society depicted in this novel follows the motto “Community, Identity, Stability.” This novel opens with a tour where students learn about the <b>Bokanovsky [boe-kah-NOV-skee]</b> process. In this work, <b>Thomakin [TOE-mah-kin]</b> left his pregnant wife behind in New Mexico; their return prompts his resignation as head of the Central London Hatchery. Linda died from an overdose of <b>soma [SOE-mah]</b>, and John the Savage hung himself at the end of this novel. Name this <b>dystopian [dis-TOPE-ee-un]</b> novel by Aldous Huxley.</p>	<p><u><b>Brave New World</b></u></p>
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**Question #30: Math – Conceptual Math**

15 points

<p>These points on an elliptic curve form a Hesse configuration, and any curve dividing the cover of a sphere into two sections of equal area contains at least four of these. Intersections that are also these are <b>biflcnodes [bie-FLEC-nodes]</b>, and the graph of a polynomial of degree <math>n</math> has at most <math>n-2</math> of these. When critical points are not a local max or min, they are these types of points, where a curve goes through its tangent line. Name these points where the second derivative of a function changes from positive to negative or vice versa while equaling zero, changing the direction of curvature.</p>	<p><u><b>inflection</b></u> point (accept point of <u><b>inflection</b></u> or <u><b>flex</b></u>)</p>
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**Question #31: Science – Biology**

15 points

<p>This organelle is the location of binding <b>immunoglobulin [ih-MYOON-oh-GLAH-byoo-lin]</b> protein and the enzyme protein <b>disulfide-isomerase [die-SUL-fide ie-SOME-uh-rase]</b>. That protein is located in its lumen, which is with the layers of the nuclear envelope. Like the <b>Golgi [GOLE-jee]</b> apparatus, it has regions called <b>cisternae [sis-TEHR-nay]</b>. Some of it is bonded to <b>ribosomes [RIE-boe-somes]</b>, and together they synthesize proteins. Name this organelle near the nucleus which has rough and smooth regions.</p>	<p>rough <b><u>endoplasmic reticulum</u></b> (prompt on “ER”)</p>
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**Question #32: Social Studies – World History**

15 points

<p>One side in this conflict lost access to the silver mines at <b>Laureion [LOR-ay-on]</b> after a fortress was built at <b>Decelea [deh-KEL-ay-ah]</b> by <b>Agis II [AH-gis the second]</b>. During this conflict, <b>Brasidas [BRAH-see-dahs]</b> sparked a number of uprisings, as well as capturing Amphipolis. That immediately led to the exile of <b>Thucydides [thoo-SI-duh-dees]</b>, who penned a history of this conflict. Name this 5th century BCE conflict between Athens and Sparta.</p>	<p><b><u>Peloponnesian</u></b> War</p>
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**Extra Question #1: Fine Arts – Classical/Opera Music**

15 points

Around the time that this composer wrote his *Treatise on Instrumentation*, he wrote his *Roman Carnival Overture* based on his opera about the life of sculptor **Benvenuto Cellini** [ben-vay-NOO-toe che-LEE-nee]. He surrounded his audience with four offstage brass bands in his requiem written to honor people who died in the July Revolution, his *Grande Messe des morts* [grahnd mess day mort], and he also used offstage musicians in his opera *Les Troyens* [lay troy-ens]. The last three sections of another piece are *Scene in the Country*, *March to the Scaffold*, and *Dream of a Witches' Sabbath*. Name this French composer of *Symphonie fantastique* [sim-foe-nee fahn-tahs-teek].

Hector **Berlioz**

**Extra Question #2: Science – Earth Science**

15 points

This substance consists of copal that has lost the chemical that is the main ingredient in turpentine. The process that creates this typically begins with the *Hymenaea* genus of trees in tropical climates or with certain conifers in other climates, and much of it is near the Baltic Sea. Its color can vary widely, though it is often yellowish, and it consists of fossilized tree resin. Name this substance which often preserves organisms for over one hundred million years.

**amber** (prompt on “fossil resin”)



**Extra Question #3: Social Studies – World History**

15 points

During his rule, the “Chosen Council” was headed by Silvestr and Aleksey **Adashev** [ah-dah-SHEF]. He also led the capture of **Kazan** [KAH-zahn] and the annexation of Astrakhan, which gave him control of the Volga. He was later forced to give up territory on the Gulf of Finland after signing an armistice that ended the **Livonian** [lih-VOE-nee-un] War with Sweden. His son Fyodor was the last Rurik emperor. He was the first to summon the *zemski sobor*, and established the *oprichnina* [oh-PREECH-nee-nah]. Name this Russian tsar whose nickname stemmed from his temper.

**Ivan IV** (accept **Ivan the Terrible**, **Ivan Grozny**, or **Ivan Vasilyevich**, prompt on “Ivan”)

**Extra Question #4: Literature – British Literature**

15 points

He lured the **dholes** into a bee ambush, but the subsequent battle was the last for Akela. Named for a frog, this character was taken to Council Rock for examination by the Seeonee. Taken to the Cold Lairs by the Bandar-Log, one of his rescuers feasted on the kidnappers, a tribe of monkeys. Raised by wolves, he was rescued by the python Kaa, the panther Bagheera, and the bear Baloo. Name this boy, the protagonist of Rudyard Kipling’s *The Jungle Books*.

**Mowgli**



**Extra Question #5: Math – Conceptual Math**

*15 points*

The **dihedral** [**die-HEED-ru**] angles for this shape have a cosine equal to one-third, and the angle between an edge and an opposite face has a cosine of one over the square root of three. Its volume can be found by cubing an edge length and multiplying by the square root of two over twelve, and its surface area can be found by squaring an edge length and multiplying by the square root of three. This is the three-dimensional simplex. Name this Platonic figure for which each vertex is the vertex of three triangles and that has four faces.

**tetrahedron** (accept **triangle-based pyramid** or **triangular-based pyramid**, prompt on “pyramid” or “simplex”)



### Extra Question #6: Social Studies – US History

*10 points per part*

Under the terms of this agreement, Article XI of the Treaty of <b>Guadalupe-Hidalgo</b> [gua-day-LOOP-ay ee-DAHL-goe] was nullified.		
<b>1</b>	Name this agreement, which also negated Articles VI and VII of the Treaty, as the terms defining a specific boundary at the Rio Grande were outdated.	<b><u>Gadsden Purchase</u></b>
<b>2</b>	Most of the land in the Gadsden Purchase is now in this state.	<b><u>Arizona</u></b>
<b>3</b>	Prior to his appointment as minister to Mexico, Gadsden negotiated the removal of this Florida tribe to Oklahoma, which led to a second namesake war.	<b><u>Seminole</u></b> Indians

### Extra Question #7: Social Studies – US History

*10 points per part*

As he surrendered to the police, he uttered “I am a Stalwart.”		
<b>1</b>	Name this supporter of Roscoe Conkling, a psychopath who felt “divine pressure” to shoot the President.	Charles Julius <b><u>Guiteau</u></b>
<b>2</b>	Charles <b>Guiteau</b> [gee-toe] was found guilty of shooting this president, who refused to appoint him as minister to Austria or consul general to Paris.	James Abram <b><u>Garfield</u></b>
<b>3</b>	Guiteau also wrote many letters to this Secretary of State and former Senator from Maine, arguing that he deserved a post as a “personal tribute.”	James Gillespie <b><u>Blaine</u></b>



**Extra Question #8: Math – Probability**

*10 points per part*

This type of probability often is computed by dividing the probability of an intersection by another probability.		
<b>1</b>	Identify this type of probability problem that seeks to find the probability of an event given that a different event occurs.	<u>conditional</u> probability
<b>2</b>	This theorem uses one conditional probability to compute another one using a ratio of simple probabilities.	<u>Bayes</u> Theorem
<b>3</b>	Find the probability of A given B if the probability of A is 0.5, the probability of B is 0.6, and the probability of both A and B is 0.2.	<u>1/3</u> (accept <u>.3 repeating</u> )

**Extra Question #9: Math – Probability**

*10 points per part*

When all outcomes are equally likely, probability equals successful outcomes divided by total outcomes, while this quality equals successful outcomes divided by unsuccessful outcomes.		
<b>1</b>	Name this ratio often associated with gambling.	<u>odds</u>
<b>2</b>	If the probability of an event is 1/5, what are its odds? Do not use odds against, which is what many gamblers use.	<u>1/4</u> (accept <u>1 to 4</u> or <u>1:4</u> )
<b>3</b>	If the odds of an event are 3/7, what is its probability?	<u>3/10</u> (accept <u>.3</u> )



**Question #1: Math – Conceptual Math**

15 points

Any positive **integer** [IN-tuh-**jer**] can be expressed as the sum of four or fewer of these numbers according to a theorem attributed to **Lagrange** [lah-grahnj]. Four of these are added together in an identity attributed to **Euler** [OY-lur], and two of them are added in a similar identity attributed to **Brahmagupta** [brah-mah-GOOP-tah] and **Fibonacci** [FIH-boe-nahch-ee]. These numbers have an odd number of factors, and they are found by adding consecutive odd numbers starting from one. When two of them add to give a third, the three numbers correspond to a Pythagorean Triple. Give these numbers which include 1, 4, 9, 16, and 25.

perfect squares (accepts square numbers or squares of integers or squares of natural numbers)

**Question #2: Literature – Mythology**

15 points

According to the *Argonautica*, one weapon utilized by this deity lies buried on **Drepane** [dreh-PAH-nay]. In the *Theogony* [thee-OG-oh-nee], his wife cast **Eurynome** [yoo-REE-noh-mee] into Tartarus as this “crafty counselor” overpowered **Ophion** [oh-FIE-on]. He ruled during the “Golden Age,” but Metis engineered his downfall by giving him an **emetic** [ee-meh-tik] potion. The youngest of the Titans, he used an **adamantine scythe** [aa-dah-MAN-teen skithe] to castrate his father, and swallowed his children to prevent an uprising. Name this Titan who preceded Zeus as the supreme deity of Greek myth.

Cronus (accept Kronos, Saturn, or Saturnus)



**Question #3: Social Studies – World History**

*15 points*

This ruler took the advice of Anton von Kaunitz in switching alliances from Great Britain to France and Russia in the “Diplomatic Revolution.” This prompted an invasion of Saxony, and led to a conflict that ended when this leader signed the Treaty of **Hubertusberg** [*hyoo-BER-tus-berg*], which recognized Prussian control of **Silesia** [*sie-LEE-shah*]. Holy Roman Emperor Charles the Sixth issued the Pragmatic Sanction to ensure her ascension to the throne. Name this empress of Austria-Hungary.

**Maria Theresa** (prompt on partial answer)

**Question #4: Miscellaneous – Sports**

*15 points*

The 1985-86 Chicago Bears’ only loss came at the hands of this team. This team won a Super Bowl behind the No-Name Defense and running backs Mercury Morris and Larry **Csonka** [*TSONK-uh*]. Before coaching at Alabama, Nick **Saban** [*SAY-bun*] left LSU to coach this team. In 1972, this team went 17-0, the only team to go undefeated. Quarterbacks for this team have included Bob **Griese** [*GREES-ee*] and Dan **Marino** [*muh-REEN-oe*], and this year they were quarterbacked by Ryan **Tannehill** [*TAN-ee-hil*]. Name this AFC East team that used to have a mascot named Flipper.

**Miami Dolphins** (accept either)



**Question #5: Science – Biology**

15 points

<p>This tissue has a significantly higher sugar concentration than <b>mesophyll</b> [MEHS-oe-fill]. The movement within it away from sugar sources, the so-called loading of this tissue, is explained through the mass flow hypothesis, which is also known as the pressure flow hypothesis. Two of its components are companion cells and <b>sieve</b> [siv] tubes. This is the innermost bark layer in trees, and it transports the products of photosynthesis. Name this living tissue located just outside of the <b>xylem</b> [ZIE-lem].</p>	<p><u>Phloem</u></p>
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**Question #6: Literature – US Literature**

15 points

<p>In one of his stories, the title object, instead of a bullet, is dropped through a skull. The narrator of that story used a mystical object to discover Captain Kidd's treasure. Another of his stories is set during a time of "supreme madness," and centers on a revenge stemming from "a thousand injuries." He also wrote of a brother and sister who were the product of incest; one mimicked a corpse when sleeping. At the end, the house that Roderick and Madeleine lived in fell into a tarn. Name this author of "The Masque of the Red Death" and "The Fall of the House of Usher."</p>	<p>Edgar Allan <u>Poe</u></p>
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**Question #7: Social Studies – Geography**

*10 points per part*

Major suburbs of this city include <b>Geelong [GEE-long]</b> and Carlton.		
<b>1</b>	Port Philip lies on the shores of this major city of southeastern Australia, home to the Docklands and Eureka Tower.	<u>Melbourne</u>
<b>2</b>	Melbourne, the capital of Victoria, is the second most populous city in Australia. The most populous is this capital of New South Wales with a famous opera house.	<u>Sydney</u>
<b>3</b>	Victoria is separated from the island of Tasmania by this body of water. Its eponymous triangle was the sight of the <b>Valentich [VAL-en-tich]</b> Disappearance.	<u>Bass</u> Strait

**Question #8: Social Studies – Geography**

*10 points per part*

The Za Qo is the chief headstream of this river, which is also fed by the Tha, <b>Ou [ue]</b> , and <b>Ngum [n-GOOM]</b> .		
<b>1</b>	Name this river of southeast Asia that passes through <b>Vientiane [vee-YEN-tee-ahn]</b> and Phnom Penh.	<u>Mekong</u> River (accept <u>Menam Khong</u> , <u>Mae Nam Khong</u> , <u>Song Tien Giang</u> , <u>Lancang Jiang</u> , or <u>Lantsang Chiang</u> )
<b>2</b>	The <b>Mekong [MEE-kong]</b> enters this country near the Ca Mau Peninsula before reaching its namesake delta.	<u>Vietnam</u>
<b>3</b>	At its delta, the Mekong empties into this sea. Vietnam's government is involved in a dispute over the Spratlys and Paracels, island chains found within this body of water.	<u>South China</u> Sea (accept <u>Nan Hai</u> )



### Question #9: Math – Probability

10 points per part

This type of algorithm uses random numbers to simulate a system.		
1	Name this type of algorithm named after a casino near France.	<b>Monte Carlo</b> method (accept <b>Monte Carlo</b> algorithm)
2	One application of Monte Carlo algorithms is evaluating these calculus operations that find the area between a function and the x-axis.	<b>integral</b> (accept word forms such as <b>integrate</b> or <b>integration</b> , accept <b>quadrature</b> , accept additional information such as approximate, definite, or Riemann)
3	If a Monte Carlo simulation was used for a spinner with equally probable spaces labeled one through five, what would the expected sum be for 100 spins?	<b>300</b>

### Question #10: Math – Probability

10 points per part

This principle is named for spaces that can only hold one of a particular type of animal.		
1	Name this principle which states that if you try to put $n+1$ objects into $n$ spaces, then at least one space will have at least two objects.	<b>Pigeonhole</b> Principle (accept <b>Dirichlet</b> 's Principle)
2	If there are 10 distinguishable pairs of socks in a drawer, how many individual socks do you need to pull out to guarantee that you have at least one matching pair?	<b>11</b>
3	If without replacement you pulled two random socks from the same drawer with ten pairs of socks, what is the probability that you would get a pair?	<b>1/19</b>



### Question #11: Literature – World Literature

10 points per part

After Duke John <b>Parricida</b> [paer-ih-SIH-dah] killed his uncle, he sought refuge from this forester.		
1	Name this fictional folk hero, who was arrested for failing to bow to a cap atop a pole.	<b>William Tell</b> (accept either half or <b>Wilhelm</b> )
2	William Tell was a hunter from this country. He lived in one of the cantons surrounding Lake Lucerne.	<b>Switzerland</b>
3	William claimed that had his arrow missed the apple atop his son's head, he would have killed this governor with a second arrow. Before he could run over an old woman, William killed this tyrant with an arrow to the heart.	Hermann <b>Gessler</b> (prompt on "Hermann")

### Question #12: Literature – World Literature

10 points per part

Her husband often called her a skylark, but she called him nothing more than a stranger before leaving behind her husband and children.		
1	Name this wife of Torvald whose loan from Krogstad turned into a source of blackmail.	<b>Nora Helmer</b> (accept either half)
2	Nora Helmer was created by this Norwegian playwright who wrote <i>A Doll's House</i> .	Henrik <b>Ibsen</b>
3	Krogstad's blackmail was an attempt to earn a promotion at his job at this type of establishment. Torvald worked as a vice president here, and Nora convinced her husband to offer Christine Linde a job there.	<b>bank</b>



### Question #13: Science – Physics

10 points per part

He wrote a paper titled “On the Physical Lines of Force”.		
1	Name this Scottish scientist who unified four equations describing electric and magnetic fields.	James Clerk <u>Maxwell</u>
2	Maxwell added a correction for the law named after this Frenchman handling the magnetic field around a closed loop.	Andre-Marie <u>Ampere</u>
3	Formulations of Ampere’s Law often involve this constant also known as the magnetic constant and represented as mu sub zero.	<u>permeability of free space</u> (accept <u>vacuum permeability</u> , prompt on “permeability”)

### Question #14: Science – Physics

10 points per part

Let’s see what you know about the speed of light.		
1	To one significant figure, give the speed of light in a vacuum in meters per second in scientific notation.	<u><math>3 \times 10^8</math></u>
2	This value for a material equals the speed of light in a vacuum divided by the speed of light in the material.	<u>index of refraction</u> (accept <u>refractive index</u> , prompt on “n” or partial answers)
3	Many efforts to measure the speed of light have involved these instruments that take advantage of the wave nature of light and typically involve a half mirror and full mirrors.	<u>interferometers</u>



**Question #15: Fine Arts – Classical/Opera Music**

15 points

This composer wrote an opera about the daughter of the Water-Goblin. That opera, which contains the “Song to the Moon,” is *Rusalka* [roo-S AHL-kah]. He used the songs of the scarlet tanager [TAN-uh-ger] in his American Quartet, which he wrote in Spillville, Iowa shortly after spending time in New York, where he wrote his last symphony. He also wrote two sets of eight nationalistic pieces, his *Slavonic Dances*. Name this Czech composer whose last symphony is nicknamed *From the New World*.

Antonin Dvorak (accept answers pronounced Dvorzhak)

**Question #16: Science – Chemistry**

15 points

In cell fluids, this role is performed by a combination of dihydrogen phosphate and hydrogen phosphate. Another example of this is the combination of carbonic acid and bicarbonate in blood plasma, the breakdown of which leads to *alkalosis* [al-kuh-LOE-sis]. Another solution that commonly plays this role is *acetic* [uh-SEE-tik] acid with sodium *acetate* [AS-uh-tate]. These are often used to make enzymes effective in solution. Name these solutions, often the combination of an acid and a salt, which help solutions maintain a relatively constant pH level.

(pH) buffer (prompt on “pH maintenance” or related answers)



**Question #17: Social Studies – Economics**

15 points

<p>In one work, this thinker distinguished between <b>amiable</b> [AY-mee-uh-bul] virtues, which stem from sympathy, and respectable virtues, which come from moderation of passion. In another work, he argued that the true measure of commodity value was labor. This author of <i>The Theory of Moral Sentiments</i> claimed that the division of labor was the best way to improve productivity, citing the example of a pin factory. Name this author of <i>Wealth of Nations</i>, a Scottish economist.</p>	<p>Adam <u>Smith</u></p>
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**Question #18: Literature – World Literature**

15 points

<p>Her father commended her Egyptian ways, “wandering through wild forests, battered by storms and the scorching sun.” She compared the Chorus to the gods when begging for a “kindness that she could never hope to have received from anyone else.” After her capture, her father called her “his one remaining eye,” as he had stabbed his own out following Jocasta’s suicide. Name this sister of <b>Ismene</b> [is-MAY-nay], the title character of the third play in Sophocles’ <i>Oedipus</i> trilogy.</p>	<p><u>Antigone</u></p>
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**Question #19: Science – Astronomy**

*15 points*

One of this planet’s moons has a ridge that goes about halfway around it, and that moon is white as snow on one side and darker than asphalt on the other. Some of its moons are classified into the Gallic, Norse, and Inuit groups. Its largest moon, which has hydrocarbon lakes, was the landing spot of the **Huygens [HOY-gens]** probe. Plumes of ice come from its moon **Enceladus [en-suh-LAH-dus]**, while the orbit of its moon **Mimas [MIE-mus]** is responsible for the gap between the **Cassini [kah-SEE-nee]** Division and its B Ring. Name this gas giant which is orbited by Titan and which is the sixth planet from the sun.

**Saturn**

**Question #20: Social Studies – US History**

*15 points*

The dissenting opinion in this case included the argument that “the legislation in question was inconsistent with the equality of rights that pertain to citizenship;” that opinion was written by the lone dissenter, John Harlan. This Supreme Court case arose out of a planned test of an act which affected railway cars, and the plaintiff was arrested after purchasing a ticket to ride with whites, but he was 1/8 black. Name this Supreme Court case that established the legality of a “separate but equal” policy.

Homer Adolph **Plessy** v Ferguson  
(accept **Plessy** v The State of  
Louisiana)



**Question #21: Literature – Mythology**

10 points per part

His father, Ban, was killed by Claudas of Berry.		
1	Name this Knight of the Round Table who had an affair with Queen <b>Guinivere [GWIN-uh-veer]</b> .	Sir <b><u>Lancelot</u></b> du Lac
2	This son of Lancelot was the only Knight able to sit in the Siege Perilous without dying, on account of procuring the Holy Grail.	Sir <b><u>Galahad</u></b>
3	Galahad's birth was contrived by <b>Pelles [PEHL-ees]</b> , a descendant of this Biblical figure. After the Last Supper, this figure procured the Grail, and used it to collect Jesus' blood during the Crucifixion.	<b><u>Joseph</u></b> of <b><u>Arimathea</u></b> (prompt on "Joseph")

**Question #22: Literature – Mythology**

10 points per part

At his trial, this hero was represented by Apollo, and ended up being acquitted via a hung jury.		
1	Name this brother of Electra who was pursued by the Furies for killing his mother, Clytemnestra, and <b>Aegisthus [aa-gis-thus]</b> .	<b><u>Orestes</u></b>
2	<b>Orestes [oh-RES-tees]</b> was the son of this Trojan War hero and <b>Mycenaean [my-seh-NAY-un]</b> king. At one point, he was prepared to sacrifice his daughter to appease <b>Artemis [AHR-teh-mis]</b> .	<b><u>Agamemnon</u></b>
3	This daughter of <b>Agamemnon [aa-gah-MEM-non]</b> was summoned to the sacrifice under the ruse of marriage to Achilles. Euripides wrote about her <i>at Aulis</i> and <i>at Tauris</i> .	<b><u>Iphigenia</u></b>



### Question #23: Fine Arts – Art History

10 points per part

Its right panel shows ears with a knife blade, and its left panel shows God presenting Eve to Adam.		
1	Name this <b>trptych</b> [TRIP-tik] completed around 1500.	<i>The <u>Garden of Earthly Delights</u></i>
2	Name this painter who created <i>The Garden of Earthly Delights</i> .	Hieronymus <b>Bosch</b>
3	Bosch made another triptych showing the temptation of this saint. The work is in the National Museum of Ancient Art in Portugal.	Saint <b>Anthony</b>

### Question #24: Fine Arts – Art History

10 points per part

This work is believed to show the artist's future wife, <b>Aline Charigot</b> [ah-leen char-ee-goe], holding a dog, and its subjects are dining on a balcony overlooking the <b>Seine</b> [sayn].		
1	Name this work that also shows <b>Gustave Caillebotte</b> [goos-tahv kie-bote] sitting backwards, though this work is not by him.	<i><u>Luncheon of the Boating Party</u></i> (or <i>Le <u>dejeuner des canotiers</u></i> )
2	Name this impressionist artist of <i>Luncheon of the Boating Party</i> who also painted <i>A Girl with a Watering Can</i> .	Pierre-Auguste <b>Renoir</b>
3	Renoir's picture of the girls Alice and Elisabeth Cahen d'Anvers is often referred to using these two colors as a nickname.	<b>Pink</b> and <b>Blue</b> (either order)



**Question #25: Science – Chemistry**

*10 points per part*

In an ideal gas, this quantity varies directly with the average kinetic energy of the molecules.		
<b>1</b>	Give this quantity often measured in Kelvins.	absolute <u>temperature</u>
<b>2</b>	This constant equal to the ideal gas constant divided by Avogadro's constant and represented by the letter k is often used to show the relationship between temperature and kinetic energy.	<u>Boltzmann</u> 's constant
<b>3</b>	The theorem named for this scientist states that reversible engine efficiency depends only on temperature limits.	Nicolas Leonard Sadi <u>Carnot</u> (accept <u>Carnot</u> 's Theorem)

**Question #26: Science – Chemistry**

*10 points per part*

The structural type of this involves atoms bonded in different orders.		
<b>1</b>	Name these compounds that are different from each other despite having identical molecular formulas.	<u>isomers</u>
<b>2</b>	This term applies to a molecule that is not identical to its mirror image. Matching pairs of them are called <b>enantiomers</b> [ee-NAN-tee-oh-mers] or optical isomers.	<u>chirality</u>
<b>3</b>	This is the only amino acid that is not chiral. It and <b>cysteine</b> [SIS-teen] are created from <b>serine</b> [SEHR-een] in the homocysteine cycle.	<u>Glycine</u>



**Question #27: Social Studies – US History**

*10 points per part*

This Confederate General earned his famous nickname at the first Battle of Bull Run.		
<b>1</b>	Name this leader who led the capture of Harpers Ferry three years after John Brown’s raid, but was ultimately shot by one of his own men, which led to his left arm being amputated.	Thomas Jonathan “Stonewall” <b><u>Jackson</u></b>
<b>2</b>	Stonewall Jackson was shot after returning from the site of this May 1863 battle fought near the Potomac River, where Robert E. Lee was ultimately victorious over Joseph Hooker.	<b><u>Chancellorsville</u></b>
<b>3</b>	Jackson led a number of raids that prevented Union forces from mounting an offensive against this city, the Confederate capital at the time.	<b><u>Richmond</u></b> , Virginia

**Question #28: Social Studies – US History**

*10 points per part*

It began when American settlers woke General Mariano Vallejo [vah-YAY-ho], and demanded he capitulate.		
<b>1</b>	Name this uprising, initially led by William Ide but taken over by John C. Fremont.	<b><u>Bear Flag</u></b> Revolt
<b>2</b>	The Bear Flag revolt took place in this state, which was admitted as a free state as part of the Compromise of 1850.	<b><u>California</u></b>
<b>3</b>	The original Bear Flag, designed by William L. Todd, was destroyed in the earthquake that struck this city in 1906.	<b><u>San Francisco</u></b>



**Question #29: Math – Conceptual Math**

15 points

<p>Types of these called principal or canonical are used to represent the relationships between <b>Euclidean</b> [yoo-KLID-ee-un] spaces. Three of these named after <b>Euler</b> [OY-ler] are combined when handling certain transformations in three dimensions, and one for a complex number is sometimes called the argument. The adjective reflex is used for large ones, and these used to be measured in mils or grads. Vertical ones are always congruent, as are the alternate interior ones formed by a transversal through parallel lines. Name these figures formed by two rays with the same endpoint.</p>	<p><u>angles</u></p>
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**Question #30: Literature – British Literature**

15 points

<p>One character had visions of him as a flaming figure with dragon's wings. That character was forced by this leader to make up a poem about the walls being utilized during a beating. This successor to <b>Hygelac</b> [huh-GEL-ak] utilized a sword he found underwater, as Unferth's was ineffective. Earlier, he had taken on a descendant of Cain and ripped one of the monster's arms from its socket. Name this leader of the Geats who was rewarded by Hrothgar for defeating Grendel.</p>	<p><u>Beowulf</u></p>
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**Question #31: Social Studies – World History**

*15 points*

In the build-up to this conflict, Emilio Mola was offered the post of Minister of War by Diego Martinez Barrio. The Trotskyist POUM swelled its numbers at the beginning of this conflict; the POUM supported the elected Popular Front government. At the Battle of **Brunete** [**broo-NAY-tay**] in this conflict, the Lincoln and Washington Battalions merged. This military uprising had the clear backing of King Alfonso XIII. Name this conflict that saw Francisco Franco take control of an Iberian nation.

**Spanish Civil War** (accept equivalents)

**Question #32: Science – Physics**

*15 points*

Recent study on this phenomenon has included compounds combining iron with elements from the nitrogen group, particularly arsenic, in addition to materials containing layers of copper and oxygen. Like an earlier studied compound combining **lead** [**led**] and bismuth, those materials are classified as Type Two because they exhibit a mixed state **Meissner** [**MIES-ner**] effect, unlike the Type One materials which completely exclude magnetic fields. Type One materials are explained by BCS Theory, which includes Cooper pairs of electrons. Name this phenomenon usually occurring at very low temperatures that involves the absence of electrical resistance.

(type II) **superconductivity**  
(accept word forms, as long as the answer includes superconduct, do not accept “conductivity”)



**Extra Question #1: Social Studies – US History**

*15 points*

<p>In the build-up to the 1948 Presidential election, Harry Truman offered to run as the vice president for this man, who instead became the head of Columbia University. He launched a program that lent uranium to developing nations, Atoms for Peace. He declared “there must be no second-class citizens in this country” when he sent federal troops to Central High School in Little Rock. He warned about the “military-industrial complex” in his farewell address. Name this former Allied general who ran for President using the slogan “I like Ike.”</p>	<p>Dwight David <u>Eisenhower</u></p>
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**Extra Question #2: Math – Conceptual Math**

*15 points*

<p>The area of this regular polyhedron is three times the radius of its circumscribed circle squared. In a truncated trihexagonal tiling, each vertex borders one of these, a square, and a hexagon. It contains 54 diagonals, and it has the same number of sides as the Platonic solid with pentagon faces or as a standard cross. Its internal angles are 150 degrees, so its external angles are 30 degrees, as are the central angles that subtend a side. Name these regular polygons with twelve sides.</p>	<p><u>dodecagon</u> (prompt on “12-gon”)</p>
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**Extra Question #3: Fine Arts – Art History**

15 points

<p>This painter included stage curtains on the side of his <i>The Secret Player</i> and his first version of <i>The Lost Jockey</i>. He also drew a picture frame hanging on a plaster wall through which red bricks can be seen, and, in another work, huge spherical iron bells float in the sky. His work <i>The Treachery of Images</i> includes the French words meaning, “This is not a pipe,” and his <i>Time Transfixed</i> shows a train coming out of a fireplace. Name this artist whose work <i>The Great War</i> has a hidden face, similar to his <i>The Son of Man</i>.</p>	<p>Rene <u>Magritte</u></p>
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**Extra Question #4: Science – Physics**

15 points

<p>This unit is equivalent to a weber per second, which is useful in analyzing Faraday’s law of induction or what happens to a field when magnetic flux is reduced at a weber per second. This is also equivalent to a henry ampere per second, which can be used to analyze the impact of an inductor. This unit is also equivalent to a Newton meter per coulomb, which is helpful when calculating the amount of work done by an electric field, which is commonly measured as this unit per meter. Name this unit which by Ohm’s Law equals an ampere times an ohm and which is used to measure the difference in electric potential.</p>	<p><u>Volt</u></p>
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**Extra Question #5: Literature – Mythology**

*15 points*

The Pan-Ionian Games celebrated this deity. Though he was not a Titan, one of his sons was named Atlas. Homer called him *gaienokhos* [gie-noh-kose], or “Holder of the Earth.” During the *Gigantomachy* [jie-gan-toe-mahk-ee], this Olympian used a chunk of *Nisyros* [nih-SIE-rose] as a weapon against *Polybotes* [poh-LEE-boe-tees]. His mother tried hiding him among lambs. He sent *Cetus* [SIT-us] to devour Andromeda, as *Cassiopeia* [kass-ee-oe-PEE-ah] claimed that the maiden surpassed the *Nereids* [NEHR-ay-ids] in beauty. He lost a contest to Athena when he offered a saltwater spring or a horse. Name this Greek god of the sea.

**Poseidon** (accept **Neptune**)



**Extra Question #6: Literature – US Literature**

10 points per part

One of this author’s novels features the bullfighter Pedro Romero, and former middleweight boxing champion Robert Cohn.		
1	Name this author of <i>The Sun Also Rises</i> who also wrote about bullfighting in <i>Death in the Afternoon</i> .	Ernest Miller <u>Hemingway</u>
2	In this Ernest Hemingway short story, the two central figures catch an 18-foot marlin, only to be left with bones after sharks munch on the corpse.	“The <u>Old Man and the Sea</u> ”
3	In “The Old Man and the Sea,” Manolin’s symbol of hope is this former Yankee great. Manolin also compares Santiago to this slugger in describing the young man’s skill.	“Joltin’” Joe <u>DiMaggio</u>

**Extra Question #7: Literature – US Literature**

10 points per part

This poem describes an event that took place “on the eighteenth of April, in Seventy-five.”		
1	Name this poem, which describes an order to “Hang a lantern aloft in the <b>belfry</b> [BEL-free] arch” with the specific instructions “one if by land, and two if by sea.”	“ <u>Paul Revere’s Ride</u> ”
2	“Paul Revere’s Ride” was penned by this poet of “Evangeline” and “The Village Blacksmith.”	Henry Wadsworth <u>Longfellow</u>
3	“Paul Revere’s Ride” was part of this collection, whose title locale was fashioned after the Howe Tavern.	<u>Tales of a Wayside Inn</u>



**Extra Question #8: Math – Geometry**

*10 points per part*

This inequality sometimes is written as $a+b > c$ .		
<b>1</b>	Identify this inequality named for a shape which states that the magnitude of the sum of two nonparallel vectors is less than the sum of their magnitudes.	<b><u>Triangle</u></b> Inequality
<b>2</b>	If two sides of a triangle are of length 5 and 9, what is the greatest lower bound of the length of the third side?	<b><u>4</u></b>
<b>3</b>	This inequality sometimes additionally named for Bunyakovsky states that the absolute value of an inner product is less than or equal to the product of vector magnitudes.	<b><u>Cauchy-Schwarz</u></b> Inequality

**Extra Question #9: Math – Geometry**

*10 points per part*

This type of quadrilateral can be inscribed in a circle.		
<b>1</b>	Name these quadrilaterals whose opposite angles are supplementary.	<b><u>cyclic</u></b>
<b>2</b>	A formula to find the areas of cyclic quadrilaterals is named after this Indian mathematician.	<b><u>Brahmagupta</u></b>
<b>3</b>	<b>Brahmagupta's [brah-mah-GOOP-tahs]</b> formula uses the semiperimeter. Find the semiperimeter of a quadrilateral with side lengths of 5, 6, 8, and 9.	<b><u>14</u></b>



**Question #1: Social Studies – US History**

*15 points*

<p>In this election, James Monroe's Treasury Secretary ran as a Democrat-Republican, as did every presidential candidate. The sitting Speaker of the House also ran, as did Monroe's Secretary of State. In the Electoral College, William Crawford finished third, but he was not on the ballot in the House of Representatives, while Andrew Jackson was. Name this election in which the "Corrupt Bargain" was allegedly made between Henry Clay and president-elect John Quincy Adams.</p>	<p>United States Presidential Election of <u>1824</u></p>
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**Question #2: Math – Conceptual Math**

*15 points*

<p>The operation in a semigroup must follow this property, and a weak form of this is its power type. In Lie [lee] algebras, the Jacobi [jah-KOBE-ee] identity is used instead of this property. While this property does hold for matrix multiplication, it does not hold for subtraction. This is used in problems involving the same operation at least twice. This changes the order of the application of the operations in contrast with demonstrating commutativity [kuh-MYOOT-uh-ti-vi-tee]. Name this operation that says <math>a+b+c</math> has the same value even when you change the placement of parentheses.</p>	<p><u>associativity</u> (accept <u>associative</u> property)</p>
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**Question #3: Literature – British Literature**

15 points

<p>This novel opens in Black Hill Cove at the Admiral Benbow. One character in this novel suffered a knife wound to the shoulder but was able to reload his pistols to shoot Israel Hands. After falling into a barrel in pursuit of an apple, the protagonist of this novel overhears talk of a mutiny, but is eventually saved by Ben Gunn and Squire Trelawney, who leave the title locale via the <i>Hispaniola</i>. Name this novel by Robert Louis Stevenson featuring Long John Silver.</p>	<p><u>Treasure Island</u></p>
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**Question #4: Fine Arts – Art History**

15 points

<p>Dorm rooms in this architect's Ezra Stiles College at Yale University are known for their lack of right angles. His last work, which has a 192 foot high spire, was the hexagonal North Christian Church in Columbus, Indiana, and he also designed the MIT Chapel, which is next to his <b>Kresge [KREHS-gee]</b> Auditorium. He also designed <b>Dulles [DULL-uhs]</b> Airport, which has a roof in the same shape as his famous St. Louis landmark. Name this Finnish-American architect of the Gateway Arch.</p>	<p>Eero <u>Saarinen</u></p>
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**Question #5: Science – Physics**

15 points

<p>To determine whether or not an image has the limitation named after this phenomenon, you use the Rayleigh criterion. That criterion is used when this creates Airy’s disc. One type of this phenomenon can be evaluated using a Cornu spiral, but when an image caused by this is far from the object causing it, that spiral cannot be used with the <b>Fraunhofer [fraun-HOE-fur]</b> type. This is used to study atomic spectra using its namesake grating. Name this wave phenomenon associated with interference patterns that involves curving around an obstacle.</p>	<p><b><u>diffraction</u></b> (accept other word forms, do not accept “refraction”)</p>
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**Question #6: Literature – World Literature**

15 points

<p>He gave a box of jewels and pearls to a group of colonists who found him; the group led by Captain Harding then sealed him within his ship. He obtained food, textiles, and fuel from the “Living Infinite.” He procured two members of his crew from the <i>Abraham Lincoln</i>; they were the harpooner Ned Land and scientist Aronnax. Name this captain of the <i>Nautilus</i>, the protagonist of Jules Verne’s <i>20,000 Leagues Under the Sea</i>.</p>	<p>Captain <b><u>Nemo</u></b></p>
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### Question #7: Fine Arts – Classical/Opera Music

10 points per part

One of the arias in this opera is “Papagena! Papagena! Papagena!”		
1	Name this work in which the Queen of the Night orders <b>Tamino</b> [tah-MEE-noe] to rescue <b>Pamina</b> [pah-MEE-nah].	<i>The <u>Magic Flute</u></i> (or <i>Die <u>Zauberflote</u></i> )
2	<i>The Magic Flute</i> , <i>Idomeneo</i> [ee-doe-may-NAY-oh], and <i>Così fan tutte</i> [KOE-see fahn TOO-tay] are some of the many operas written by this composer.	Wolfgang Amadeus <u>Mozart</u>
3	This family commissioned Mozart’s 35th Symphony and his 7th Serenade, and their name is often used in the titles of those works.	<u>Haffners</u>

### Question #8: Fine Arts – Classical/Opera Music

10 points per part

The first part of this piece has five scenes and ends with the “His yoke is easy” Chorus.		
1	Name this oratorio whose second part ends with the Hallelujah Chorus.	<u>Messiah</u>
2	<i>Messiah</i> was written by this composer of <i>Music for the Royal Fireworks</i> .	George Frideric <u>Handel</u>
3	The Hallelujah Chorus was originally written in this key signature. Transcriptions for novice musicians are sometimes in C Major.	<u>D</u> Major (do not accept “D Sharp”, “D Flat”, or “D Minor”)



### Question #9: Literature – British Literature

10 points per part

His sister was severely beaten by Orlick.		
1	Name this youth, hired by Miss Havisham to be a playmate for Estella.	<b>Pip</b> (accept <b>Philip</b> or <b>Pirrip</b> )
2	Pip is the protagonist of this Charles Dickens novel, in which he is educated and given the financial backing to become a gentleman.	<b><u>Great Expectations</u></b>
3	Pip's great expectations are backed by this former convict. Pip treated him kindly in the graveyard, and he paid the lad back after moving to Australia and doing well in the sheep trade.	<b><u>Abel Magwitch</u></b> (accept either)

### Question #10: Literature – British Literature

10 points per part

In one essay, he wrote about how young Europeans thought an elephant was worth more than a <b>Coringhee</b> [koe-REEN-gee] coolie.		
1	Name this author of "Shooting an Elephant," who wrote about Winston Smith and Big Brother in 1984.	George <b><u>Orwell</u></b> (accept Eric Arthur <b><u>Blair</u></b> )
2	In George Orwell's <i>Animal Farm</i> , this pig utilized vicious dogs to drive away Snowball. He ordered that Boxer be sent to the glue factory, and his orders were justified by his spokesman, Squealer.	<b><u>Napoleon</u></b>
3	Despite urinating on Snowball's design for one of these, Napoleon ordered that one be built. During an attack by humans, dynamite undoes the progress made in the attempt to build it.	<b><u>windmill</u></b>



**Question #11: Math – Geometry**

*10 points per part*

In polygons with this property, all of the angles are less than 180 degrees.		
<b>1</b>	Name these shapes that contain all of the segments connecting pairs of their points.	<b><u>convex</u></b>
<b>2</b>	Name these segments that connect nonadjacent vertices in a polygon. They go through the interior of convex polygons.	<b><u>diagonals</u></b>
<b>3</b>	This is the number of diagonals in a convex decagon.	<b><u>35</u></b>

**Question #12: Math – Geometry**

*10 points per part*

One definition of this shape is any three dimensional object which can be expressed with a single parameter.		
<b>1</b>	Name this shape that commonly consists of two circles and the space between them.	<b><u>cylinder</u></b>
<b>2</b>	This is the total surface area of a cylinder with a radius and height each equal to one.	<b><u>4 Pi</u></b>
<b>3</b>	This is the volume of a cylinder with a radius and height each equal to two.	<b><u>8 Pi</u></b>



**Question #13: Science – Biology**

*10 points per part*

Scientists often divide animal tissues into four categories.		
<b>1</b>	This type of tissue is divided into skeletal, cardiac, or smooth. The skeletal and cardiac tissues are striated.	<b>muscle</b> (accept word forms such as muscular)
<b>2</b>	This type of tissue includes the epidermis of the skin and lines the surfaces of organs.	<b>epithelium</b> (accept word forms such as <b>epithelial</b> )
<b>3</b>	These epithelial cells secrete <b>mucin</b> [MYOO-sin], which combines with water to form mucus.	<b>goblet</b> (cells)

**Question #14: Science – Biology**

*10 points per part*

Identify these parts of leaves.		
<b>1</b>	Most leaves have these pores, or openings, that take in air and release water vapor and other gases.	<b>stomata</b>
<b>2</b>	This waxy covering, on the other hand, controls the release of water vapor.	<b>cuticles</b> (accept <b>cutin</b> or <b>cuticular membrane</b> )
<b>3</b>	These pairs of curved cells surround stoma.	<b>guard</b> cells



**Question #15: Miscellaneous – Pop Culture**

15 points

In one game, this character utilizes “Sky Pop” to fly, and “Marine Pop” to travel through Sarasaland and defeat Tatanga. In one film, his brother was played by John Leguizamo, while he was played by Bob Hoskins. He acts as the referee in *Mike Tyson’s Punch-Out*. Power-ups obtained by this character include the Tanooki Suit and the Super Leaf, which allow him to fly, while the Fire Flower lets him shoot fireballs. Originally appearing as Jumpman in the Donkey Kong arcade game, name this Nintendo character, the brother of Luigi.

Mario Mario

**Question #16: Social Studies – World History**

15 points

During the Flavian dynasty, this region expanded to include the Agri **Decumates** [deh-kyoo-MAH-tees]. In 390 BCE, Brennus led **Celts** [kelts] from this region in a conquest of Rome. Its capital was later moved to Augusta Treverum, which was also the capital of **Belgica** [BEL-jee-kah]. It was added to the Roman Empire after **Vercingetorix** [vehr-seen-GET-or-iks] was defeated by Julius Caesar. Name this region of the Roman empire that included modern-day France.

Transalpine Gaul (accept Gallia Transalpina, do not accept “Cisalpine Gaul” or “Gallia Cisalpina”)



**Question #17: Literature – US Literature**

15 points

One person living in this town claimed her husband, “got me with child,/ Knowing that I could not bring forth life/ Without losing my own.” One resident of this town claims that, “A man can never avenge himself/ On the monstrous ogre Life.” Another resident asked, “who can tell/ How men and women will interact/ On each other, or what children will result?” That character was the pharmacist Trainor, who died performing an experiment. Its residents spoke from beyond the grave in free verse epitaphs. Name this subject of an “Anthology” by Edgar Lee Masters.

Spoon River

**Question #18: Science – Astronomy**

15 points

This person is the namesake of the Orbiting Astronomical Observatory 3 that discovered several long period pulsars. The ray-crater named after this scientist is in the Oceanus **Procellarum** [pro-chel-LAR-um] on the moon and was created around the beginning of the time period named for him that began a little over a billion years ago and is still current. His most important work was *On the Revolutions of the Celestial Spheres*, which was published just before his death and had its impact blunted by a letter by Andreas **Osiander** [oh-see-AN-der]. Name this Polish astronomer who pushed for a **heliocentric** [hee-lee-oe-SEN-trik] model of the solar system.

Nicolaus Copernicus



**Question #19: Social Studies – US History**

*15 points*

The victorious forces at this battle were led on land by Holland “Howling Mad” Smith, and trapped the defending forces at Kitano Point to force a surrender. The Marine forces took the Quarry and isolated Mount Suribachi before ascending it. Name this World War II battle, after which Joe Rosenthal snapped a picture of six soldiers raising an American flag.

Battle of **Iwo Jima** (accept Operation **Detachment**)

**Question #20: Science – Biology**

*15 points*

Birds have an extension of this bone called a keel. In apes, these have seven sections, which led Galen to believe the same was true in humans, though **Vesalius [veh-SAY-lee-us]** discovered that these have only three sections. Its top section is the **manubrium [maa-NOO-bree-um]**, which is flanked by the **clavicles [KLAV-uh-kuls]**. Its lowest section is the **xiphoid [KSIE-foid]** process, which can be injured during CPR. Name this bone at the front of the rib cage also known as the breastbone.

**sternum** (prompt on “breastbone”)



**Question #21: Literature – US Literature**

10 points per part

This figure is seen in a carriage with the speaker and Immortality.		
1	Name this title entity that “knew no haste” and drove a carriage whose horses’ heads were toward eternity.	<u>Death</u>
2	This poet from Amherst wrote about the afterlife in “Because I Could Not Stop for Death.”	Emily <u>Dickinson</u>
3	Dickinson wrote about this figure that stood between the light and the narrator, with a blue, uncertain, stumbling buzz.	a <u>fly</u> (from “I Heard a Fly Buzz When I Died”)

**Question #22: Literature – US Literature**

10 points per part

The two central figures in this novel are hired to buck barley, after one of them was nearly lynched for grabbing at a woman’s red dress.		
1	Name this novel about the travels of George Milton and the simple giant Lennie Small, who crushed Curley’s hand with a simple squeeze.	<u>Of Mice and Men</u>
2	<i>Of Mice and Men</i> was written by this Californian. He wrote about his dog in <i>Travels with Charlie</i> .	John Ernst <u>Steinbeck</u>
3	In their dream farm, Lennie is offered the chance to feed and pet these animals, if he does what he is told. George tells Lennie the story of the farm involving these animals right before George shoots Lennie in the head.	<u>rabbits</u>



### Question #23: Math – Trigonometry

10 points per part

This trigonometric function is sometimes represented as y over x.		
1	Name this function equal to sine divided by cosine.	<b>tangent</b> (do not accept cotangent)
2	If the input of the tangent function is in radians, this is the period of the tangent function.	<b>pi</b>
3	Between zero and two pi, these are the two values of x that satisfy the equation tangent x equals the square root of three.	<b>pi/3 &amp; 4pi/3</b> (either order, accept equivalents)

### Question #24: Math – Trigonometry

10 points per part

This sometimes arises when solving triangles for which the measures of two sides and an angle not between them are known.		
1	Name this situation that arises when there are two possible triangles with the measurements given.	<b>ambiguous</b> case
2	In the ambiguous case, two angles that are not congruent have the same sine. Name the relationship between those two angles.	<b>supplementary</b> (accept answers stating that they add to 180 or pi)
3	If one of the supplementary angles is 75 degrees, what is the degree measure of the other one?	<b>105</b> degrees



**Question #25: Social Studies – World History**

10 points per part

At the battle of Salamanca, his forces defeated “40,000 Frenchmen in 40 minutes,” and his greatest opponent referred to him as a “Sepoy general.”		
1	Name this general, who stormed into Toulouse four days following the second abdication of Napoleon I.	1st Duke of <b>Wellington</b> (accept Arthur <b>Wellesley</b> , prompt on “Iron Duke” or “marquess of Douro”)
2	The Duke of Wellington forced the abdication of Napoleon following this 1815 battle, where Napoleon was hampered by the incompetency of Michel Ney and Emmanuel de Grouchy.	Battle of <b>Waterloo</b>
3	Urged on by August von <b>Gneiseneau</b> [nice-eh-noe], this Prussian commander provided timely reinforcements that helped turn the tide at the Battle of Waterloo.	Gebhard Leberech von <b>Blücher</b>

**Question #26: Social Studies – World History**

10 points per part

The Agadir Crisis saw the <i>Panther</i> , a German gunboat, deployed to a port of this modern-day country.		
1	Name this country, separated from the Iberian peninsula by the Strait of Gibraltar.	Kingdom of <b>Morocco</b>
2	Sparked by a reaction from the German Empire, the 1905 <b>Algeiras</b> [al-jeh-sehr-ahs] Conference resulted in Morocco becoming a protectorate of this European power. Théophile Delcassé represented this country at the conference.	<b>France</b>
3	Worried about the influence of the <b>Polisario</b> [poe-lee-SAHR-ee-oe] front, Spain capitulated and reneged on its promise to grant independence to this disputed non-self-governing territory.	<b>Western Sahara</b> (accept <b>Sahara Occidental</b> )



**Question #27: Science – Physics**

10 points per part

When these collide with their associated particles, annihilation typically takes place.		
1	Name these particles that typically have the same mass and opposite electric charge of the particles they are associated with. Most subatomic particles are associated with one.	<u>antiparticles</u>
2	This is the antiparticle of the electron.	<u>positron</u>
3	This scientist suggested in 1937 that some particles could be their own antiparticles. In 2012, researchers claimed to find examples of these particles.	Ettore <u>Majorana</u> (accept <u>Majorana particle</u> or <u>Majorana fermion</u> )

**Question #28: Science – Physics**

10 points per part

His <i>Principia Mathematica</i> was published in 1687.		
1	Name this scientist known for, among other things, his three laws of motion.	Isaac <u>Newton</u>
2	Newton's first law is commonly associated with this principle, the resistance to change in motion.	<u>inertia</u>
3	In the 18th century, this scientist developed his equations of motion for a rigid body and gave his two laws of motion, which were the conservation of linear and angular momentum.	Leonhard <u>Euler</u>



**Question #29: Literature – Mythology**

15 points

In *The Republic*, Plato claimed they sang with the Sirens and were the daughters of **Ananke** [ah-NAHN-kee]. Hesiod claimed that Zeus gave them the greatest honor, which involved giving mortals both good and evil. **Eileithya** [ay-lay-THEE-ah], the goddess of childbirth, accompanied them. They gave a special log to Althaea at the birth of **Meleager** [meh-lay-AH-ger]. Consisting of Atropos, Clotho and Lachesis, name this trio from Greek myth who determined the destinies of mortals.

**Fates** (accept **Moirae**)

**Question #30: Math – Conceptual Math**

15 points

This operation is used to find each entry in a **Jacobian** [jah-KOBE-ee-un] matrix, and its directional type is found by taking the dot product of a unit vector with the gradient of a function. If this operation can be applied everywhere to a function, then it must be continuous and locally linear. Methods for finding this include the product rule and the chain rule. The value of this either does not exist or equals zero at critical points, which are often but not always at a local maximum or minimum. The most common method of finding this involves finding a limit as  $h$  approaches zero. Name this operation that finds the slope of a tangent line of a function, a major subject of calculus.

(partial or first) **derivative** (accept **differentiation**)



**Question #31: Social Studies – US History**

*15 points*

<p>In the aftermath of this event, Mayor Roswell Mason had General Philip Sheridan declare martial law. On the 40th anniversary of this event, reporter Michael Ahern claimed to have started a popular rumor about this event, which started at 13 DeKoven Street in a barn. According to one popular myth, it was started by a cow belonging to Mrs. Catherine O’Leary. Name this event of October 1871, where hundreds of buildings in a Midwestern city were destroyed.</p>	<p>Great <b><u>Chicago Fire</u></b></p>
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**Question #32: Science – Chemistry**

*15 points*

<p>One of this person’s rules states that the number of different kinds of constituents in a crystal tends to be small. Also known as the rule of parsimony, that is the last of his five rules on ionic crystals. He worked with Robert Corey and Herman Branson on the structure of DNA molecules, mistakenly proposing a triple helix structure. He also devised a since-revised commonly used scale that uses dissociation energies to measure electronegativity. Name this scientist whose Nobel Prizes, won for his work with chemical bonds and for opposing nuclear weapons testing, were in Chemistry and Peace.</p>	<p>Linus <b><u>Pauling</u></b></p>
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**Extra Question #1: Math – Conceptual Math**

15 points

<p>A method to calculate this using four variables with iteration is the Gauss-Legendre algorithm, and a shorter set of methods is known as the Machin-Like formulas. The Archimedes recurrence formula to find this is based on inscribed and circumscribed polygons with many sides, and this can be found experimentally with Buffon's needle. The Gregory series finds this by finding 4 minus 4/3 plus 4/5 minus 4/7, etcetera. This equals the integral from negative infinity to infinity of dx over the quantity one plus x squared. This also equals the number of radians equivalent to 180 degrees. Give this irrational number about equal to 22 over 7.</p>	<p><u>Pi</u></p>
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**Extra Question #2: Fine Arts – Art History**

15 points

<p>This artist showed a black dog at the right end of one painting and an old dark woman crouching near a white bird at the left end. Other works depict the crucifixion taking place during 19th century in the French countryside, his green and yellow Christs. His <i>Spirit of the Dead Watching</i> is one of several works showing Tahitian women. Name this Frenchman who painted <i>Where Do We Come From? What Are We? Where Are We Going?</i></p>	<p>Paul <u>Gauguin</u></p>
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**Extra Question #3: Literature – World Literature**

15 points

<p>While venturing home from the library, the protagonist of this novel was captured by the Forest Brotherhood. In this novel, after a former businessman committed suicide on a train, the lawyer Victor Komarovsky claimed it was due to alcoholism. The title character believes that he was turned into a modern-day Adam by Strelnikov, who commits suicide after talking with the title character. Name this novel in which Lara is an object of affection for the title medical professional, a work by Boris Pasternak.</p>	<p>Doctor <u>Zhivago</u></p>
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**Extra Question #4: Science – Biology**

15 points

<p>These animals make up most of the metatherians. An extinct example, the thylacine, is similar to a wolf, and its monito del monte is located primarily in Chile. Females in this infraclass have two uteri, and these mammals are characterized by the immaturity of their newborns. Often contrasted with monotremes and placental mammals, the examples native to North America are opossums. Other examples include Tasmanian devils, wombats, and koalas. Name these mammals whose infants, known as joeys, live in their mothers' pouches.</p>	<p><u>marsupials</u></p>
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**Extra Question #5: Social Studies – World History**

*15 points*

The forces behind it captured Nicaea before laying siege to Antioch, where Bishop Adhemar of Le Puy died. During it, the pillaging by forces under Walter Sans-Avoir led to the sacking of Belgrade. The leaders of the attack on Antioch were Tancred and Geoffrey of Bouillon. Peter the Hermit led the People's Crusade that coincided with it. Name this crusade called by Pope Urban II in 1095.

**First Crusade**



**Extra Question #6: Science – Physics**

*10 points per part*

This quantity is often contrasted with the scalar distance traveled.		
<b>1</b>	Name this vector found by subtracting final position minus initial position.	<b><u>displacement</u></b>
<b>2</b>	To find the displacement of an object that starts at rest and moves with constant acceleration, you multiply this number times the product of acceleration and time squared.	$\frac{1}{2}$ (or 0.5 or .5)
<b>3</b>	The principle named after this Frenchman states that for any closed system the sum of the quantity displacement times the quantity force minus mass times acceleration equals zero.	Jean le Rond <b><u>d’Alembert</u></b>

**Extra Question #7: Science – Physics**

*10 points per part*

Physics allows people to predict the trajectories of projectiles.		
<b>1</b>	If you assume that the Earth is flat and there is no air resistance, a projectile trajectory follows this shape.	<b><u>parabola</u></b>
<b>2</b>	If you assume that the Earth is round, there is no air resistance, and the projectile is slower than escape velocity, a projectile trajectory follows this shape.	<b><u>ellipse</u></b>
<b>3</b>	If you assume the earth is flat and launch a projectile from ground level, its range will be the fraction initial speed squared over little g, end quantity, times this function of the launching angle theta.	<b><u>sine two theta</u></b> (accept equivalents such as <b><u>two sine theta cosine theta</u></b> , do not accept “sine theta” or “cosine theta” or “cosine two theta”)



**Extra Question #8: Social Studies – World History**

*10 points per part*

This former head of the Justicialist Party served as Vice President under Edelmiro Farrell.		
<b>1</b>	Name this two-time President of Argentina, who made his second wife, Isabel Martinez, Vice President.	<b>Juan Domingo <u>Peron</u></b> (prompt on “Peron”)
<b>2</b>	During his first stint as President, this wife of Juan Peron gained the support of the unions through generous wage increases, and also mandated religious education in all schools.	Maria <b><u>Eva</u></b> Peron (accept <b><u>Evita</u></b> )
<b>3</b>	Evita helped sweep her husband into power through gaining support from this group of the working and lower classes, whom she called this term, from the Spanish word for “shirtless ones.”	<b><u>descamisados</u></b>

**Extra Question #9: Social Studies – World History**

*10 points per part*

During the “Long War,” one branch of this organization carried out a series of bombings and assassinations, and expanded its attacks to continental Europe.		
<b>1</b>	Name this paramilitary organization that saw a spike in enrollment after Bobby Sands’ death as a result of a 66-day hunger strike.	<b><u>Irish Republican Army</u></b> (accept <b><u>IRA</u></b> , do not accept “Real IRA”)
<b>2</b>	This political party is seen as a wing of the IRA. Most of its membership left after Eamon de Valera resigned to form the Fianna Fáil.	<b><u>Sinn Fein</u></b>
<b>3</b>	The IRA failed in its plot to assassinate this Prime Minister at a conference at the Brighton Grand Hotel. This leader redrafted a speech, claiming that “all attempts to destroy democracy by terrorism will fail.”	Margaret <b><u>Thatcher</u></b> (prompt on “Iron Lady”)