



Ægis Questions

New Trier Varsity 2006

Round 1

Tossup 1: Science (Biology)

Along with the thymus, this is one of the two items that can be used to make sweetbread. The function of this organ was discovered when two scientists removed it from a living dog, and then noticed flies buzzing around a pool of the dog's urine. Identify this gland that, when not present, caused the dog's urine to have an unusually high sugar content, and which contains the Islets (*EYE-lits*) of Langerhans.

Answer: **Pancreas**

Bonus 1: Social Studies (U.S. History)

Given a description, identify these facts related to a silver or gold rush.

A: In 1859, this richest silver ore deposit was discovered in Nevada.

B: In 1848, a gold rush began at this California man's mill.

C: Silver ore deposits were found by Captain John M. Bullard in 1870 in the territory that became this state.

D: This gold rush in the Yukon territory began in 1896 after gold was found at Rabbit Creek.

Answers: A: **Comstock Lode** B: **John Sutter** C: **New Mexico** D: **Klondike Gold Rush**

Tossup 2: Literature (Literature)

Ironically, the plant referred to in the title, which symbolized perseverance and aspirations to a better life in the book, is actually a weed associated more with destruction than achievement. Its persistent growth parallels the struggle of the novel's young protagonist, Francie, to keep a positive outlook despite her family's poverty. Name this novel of ordinary life by Betty Smith.

Answer: **A Tree Grows in Brooklyn**

Bonus 2: Miscellaneous (Other)

Identify the following pieces of video game hardware.

A: This Seventh Generation console, originally known as 'Revolution', relies heavily on infrared sensitivity and internal accelerometers for control.

B: This 16-Bit era system featured innovative peripherals such as a mouse, the Multitap, and the Super Scope.

C: Sega's final video game console, it was the first console to integrate online capabilities off the shelf. Despite being discontinued in early 2001, games are still being made for it.

D: Pushed to an early release in order to fill the gap in time before the N64, this unpopular console featured red and black graphics and achieved 3D visuals through the use of parallax.

Answers: A: **Nintendo Wii** B: **Super Nintendo Entertainment System** (*accept SNES*) C: **Sega Dreamcast** D: **Nintendo Virtual Boy**

Tossup 3: Math (Algebra) -- Computational (30 Seconds)

Calculate 259 squared minus 241 squared. You can do this by squaring each number and then subtracting your two results, though it would be much easier to realize that the final result is equal to a difference of squares, and can be separated into the product of a sum and difference which is much easier to compute. Either way, what is 259 squared minus 241 squared?

Answer: **9000**

Bonus 3: Literature (Literature)

War! What is it good for? A lot of well known novels, that's what. Given a description, identify the war novel.

A: This novel set during the Napoleonic invasion of Russia contains the characters Pierre Bezukhov and Petya Rostov.

B: This novel about Henry Fleming is set during the American Civil War.

C: Yossarian is the dissatisfied main character of this novel by Joseph Heller.

D: This novel set during World War I is about an ambulance driver named Frederic Henry.

Answers: A: **War and Peace** B: **Red Badge of Courage** C: **Catch-22** D: **A Farewell to Arms**

Tossup 4: Fine Arts (Music)

Though its 1904 premiere was not very successful, it is now one of the most frequently performed operas. The tragic events begin when Goro, the matchmaker, sets up a local girl with a naval lieutenant, despite the protestations of the girl's family and Sharpless, the American consul. After the lieutenant leaves, he marries an American wife, abandoning the title character, who commits seppuku. Name this opera about a Japanese geisha girl and her devotion to Lieutenant B.F. Pinkerton, written by Giacomo Puccini.

Answer: **Madama Butterfly** (accept *Madame Butterfly*)

Bonus 4: Science (Astronomy)

Estimate these quantities related to the sun, all to within fifteen percent.

A: In whole minutes, this is how long it takes the sun's light to reach earth.

B: In miles, this is the distance between the earth and sun.

C: In miles, this is the diameter of the sun.

D: In Kelvins, this is the surface temperature of the sun.

Answers: A: **8 minutes** (7-9) B: **93 million miles** (79-107) C: **865,000 miles** (735,000-995,000) D: **5778 Kelvins** (4900-6650)

Tossup 5: Social Studies (Geography)

97 million cubic yards of sediment were moved to create it, and in the first 15 years of its operation 3,000 ships were grounded because it was so narrow. During its first year, only 2 ships a day passed through its waters, which include Lake Manzala, Lake Timsah, and the Bitter Lakes. Name this waterway, located between the delta of the Nile and the Sinai Peninsula, that connects the Red Sea to the Mediterranean Sea.

Answer: **Suez Canal** (prompt on Suez; accept *Qanat as-Suways*)

Bonus 5: Math (Other)

Find the probabilities of the following events occurring when you roll two fair six-sided dice.

A: You get an even sum.

B: You roll two of the same number.

C: You get a prime sum.

D: You get a sum greater than eight.

Answers: A: **1/2** B: **1/6** C: **5/12** D: **5/18**

Tossup 6: Science (Chemistry)

With formula C₇H₅N₃O₆, it stains skin bright yellow, leading to the nickname "canary girls" for the World War I workers who handled it. First made by Joseph Wilbrand in 1863, name this chemical formally named methyl-1,3,5-trinitrobenzene, a famous explosive with a three-letter name.

Answer: **TNT** (accept *trinitrotoluene*)

Bonus 6: Fine Arts (Visual Art)

Identify the French painters of the following paintings.

A: Impression, Sunrise

B: The Dance Class

C: Paris Street, Rainy Weather

D: The Origin of the World

Answers: A: **Claude Monet** (*not Manet*) B: **Edgar Degas** C: **Gustave Caillebotte** D: **Gustave Courbet**

Tossup 7: Literature (Literature)

His friend Arthur Hugh Clough was the inspiration for this poet's work *Thyrsis*. Midway through his career he switched from poetry to focusing on critical essays. The son of a schoolteacher, his most famous work ended with the lines "Swept with confused alarms of struggle and flight/ Where ignorant armies clash by night." Name this Victorian poet who wrote *Dover Beach*.

Answer: **Matthew Arnold**

Bonus 7: Social Studies (World History)

Identify these facts related to the Silk Road.

A: At one point it travels through this country, that includes the city of Kandahar.

B: This man who is credited with coining the term was the uncle of a famous World War I fighter pilot nicknamed the Red Baron.

C: This Italian traveled with his father Niccolo and met with Kubla Khan.

D: The Silk Road became partly obsolete when this man found an all-water route to India.

Answers: A: **Islamic Republic of Afghanistan** B: **Ferdinand Freiherr von Richthofen** C: **Marco Polo** D: **Vasco da Gama**

Tossup 8: Miscellaneous (Entertainment)

This song's title comes from words that the writer's friend spray-painted on his wall. He thought it was some sort of motto, but after the song's release, he found out that it simply referred to the brand of his girlfriend's deodorant. Despite this song's almost unintelligible lyrics, it has been hailed as the anthem of a generation, and catapulted his band and the grunge rock movement to recognition. In 2001, its lines "I feel stupid and contagious / here we are now, entertain us" were voted third best song lyrics in the U.K. Name this song written by Kurt Cobain, the first hit single of Nirvana.

Answer: **Smells Like Teen Spirit**

Bonus 8: Math (Geometry)

Find the area of the following geometric figures.

A: An equilateral triangle with sides of length 10.

B: A regular hexagon with sides of length 2.

C: A regular hexagon with apothem (*uh-POTH-em*) of three root three.

D: A regular pentagon with sides twice the length of the sides of a pentagon whose area is 20.

Answers: A: **25 root 3** B: **6 root 3** C: **54 root 3** D: **80**

Tossup 9: Math (General)

It is the x-coordinate of the global maximum of x to the one over x power. Alternatively, it is the limit of the quantity $1 + 1/n$, close quantity, to the n power, as n approaches infinity. Besides that, it is also the sum of the reciprocals of the factorials of the whole numbers. Famously, raising it to the i times π power yields negative one. Name this number, the base of natural logarithms, approximately equal to 2.718.

Answer: **e**

Bonus 9: Literature (Language Arts)

Correctly spell the following words.

A: Vitreous

B: Temerity

C: Coccygeal (*KOK-si-GEE-ul*)

D: Mnemonic

Answers: A: **VITREOUS** B: **TEMERITY** C: **COCCYGEAL** D: **MNEMONIC**

Tossup 10: Social Studies (U.S. History)

This man graduated from New Trier High School in 1950, and has held the same cabinet position under two different presidents, though they were 30 years apart. He worked under President Nixon, and was the Secretary of Defense under Gerald Ford. Name this man who is about to relinquish his position to Robert Gates, and thus on December 18th will no longer be the Secretary of Defense.

Answer: **Donald Henry Rumsfeld**

Bonus 10: Science (Physics)

Name the official SI unit that measures each of the following quantities.

A: Force

B: Energy

C: Electric charge

D: Illuminance

Answers: A: **Newton** B: **Joule** C: **Coulomb** D: **Lux** (*do not accept candela or lumen*)

HALFTIME

Tossup 11: Math (Geometry) -- Computational (30 Seconds)

Points A, B, C, and D lie on a circle. You draw two intersecting chords, one through points A and B, and another through points C and D. The two chords intersect at point X. If AX is 3, BX is 4, and CX is 2, what is the length of DX? This problem can be easily solved if you recall a power theorem from geometry that relates two intersecting chords.

Answer: **6**

Bonus 11: Literature (Literature)

Given a group of characters, name the work by Ernest Hemingway.

A: Manolin and Santiago

B: Brett Ashley and Jake Barnes

C: Ford Maddox Ford and James Joyce

D: Roger Davis and Thomas Hudson

Answers: A: **Old Man and the Sea** B: **The Sun Also Rises** C: **A Movable Feast** D: **Islands in the Stream**

Tossup 12: Miscellaneous (Technology)

According to the Red Book, these store data in 2352-byte sectors, 75 of which are read every second. That data must be sampled at 44,100 hertz, and encoded in two-channel 16-bit Pulse Code Modulation. Because this amounts to over 10 megabytes every minute, they can only store up to about 80 minutes worth of data. Name this medium abbreviated CDDA, a circular disc used to store sound.

Answer: **Audio CDs** (*accept reasonable equivalents, do not accept data CD*)

Bonus 12: Fine Arts (Music)

Name these operas by Gioacchino Rossini.

A: His last opera, it is rarely performed because it is six hours long, but everyone can whistle the cavalry charge in its overture.

B: In this opera, the titular character, Isabella, tries to find Lindoro after a shipwreck off the coast of Algeria.

C: This opera is partially based off of a common fairytale, using the philosopher Alidoro instead of a fairy godmother.

D: Subtitled "The Moor of Venice," this opera is partially based off of a Shakespeare play, though its plot is very different from the original.

Answers: A: **William Tell** (*accept Guillaume Tell*) B: **The Italian Girl in Algiers** (*accept L'italiana in Algeri, prompt on Italian in Algiers*) C: **Cinderella** (*accept La Cenerentola*) D: **Otello**

Tossup 13: Social Studies (U.S. History)

The surprise element of this battle may have resulted from drunkenness among the mercenary army being attacked. During this battle, the Continental Army was able to cross by boat from Pennsylvania into New Jersey. Name this battle where the Continental Army led by George Washington won a spectacular victory after crossing the Delaware to surprise the Hessian garrison of the battle's namesake New Jersey city.

Answer: **Battle of Trenton**

Bonus 13: Science (Chemistry)

Give the systematic IUPAC names of the following acids in solution.

A: HClO₄

B: HI

C: H₃PO₄

D: H₃BO₃

Answers: A: Perchloric acid B: Hydroiodic acid C: Phosphoric acid D: Boric acid

Tossup 14: Science (Earth Science)

There have been four major ones, with the most recent one ending roughly ten thousand years ago. A miniature one occurred roughly from 1400 to 1800, and its effects enabled the Stradivari family to make excellent violins but also caused several societies, such as the Greenland Norse, to collapse. Give the term for a long-term global decline in temperature.

Answer: Ice Age

Bonus 14: Math (Calculus)

Find the derivatives of the following functions at x equals 1.

A: X cubed plus ten x squared minus five.

B: E to the five x.

C: The inverse tangent of x.

D: The natural log of seven x.

Answers: A: 23 B: 5 e⁵ (5 e to the fifth power) C: 1/2 D: 1

Tossup 15: Literature (Mythology)

Reports of their number varies between two and five, and they were believed to be the daughters of Achelous. Jason had been warned about them by Chiron about them and brought Orpheus along to provide resistance to them. Odysseus's strategy involved his men tying him to the mast and putting beeswax in their ears. What mythological figures tried to lure sailors to disaster with their beautiful song?

Answer: The Sirens

Bonus 15: Social Studies (Geography)

Identify these facts about Mt. McKinley.

A: What state is it located in?

B: What national park is it in?

C: Rounded to the nearest thousand, how tall is Mt. McKinley in feet?

D: This 12,000 foot mountain, which shares its name with a city in West Virginia, is south of Mt. McKinley.

Answers: A: Alaska B: Denali National Park and Preserve C: 20,000 Feet D: Mt. Huntington

Tossup 16: Fine Arts (Visual Art)

This 1793 painting, famous for its depiction of a Swiss-born scientist and journalist, is often compared to Michelangelo's Pietà since both works depict long arms hanging down from a dead body. The central figure has some sort of white cloth wrapped around his head and is holding a pen in one hand and a paper in the other. The paper the man is holding actually names his assassin, Charlotte Corday. Identify this painting depicting a man murdered while taking a bath by Jacques-Louis David.

Answer: The Death of Marat

Bonus 16: Literature (Literature)

Given a fictional family, name the author who created it.

A: Sutpen

B: Finch

C: Tyrone

D: Glass

Answers: A: **William Faulkner** B: **Harper Lee** C: **Eugene O'Neill** D: **Jerome David Salinger**

Tossup 17: Math (Other) -- Computational (30 Seconds)

What is the probability that you roll a sum of less than five on three six-sided dice? To solve this problem, you can realize that the only sums that satisfy this question are three and four, and that the answer is simply the number of ways you can roll a three or a four, divided by the total number of results possible.

Answer: **1/54**

Bonus 17: Miscellaneous (Entertainment)

Did you watch TGIF when you were younger? Well, you should have, because it would really help you with this bonus. Given a list of characters, name the show that appeared in ABC's TGIF lineup.

A: Shawn Hunter, Topanga (*tuh-PANG-guh*) Lawrence, and Cory Matthews.

B: Harvey Kinkle, Salem Saberhagen the talking cat, and Zelda Spellman.

C: J.T. Lambert, Dana Foster, and Jean-Luc Rieuepeyroux (*ree-pah-ROO*).

D: Carl Winslow, Waldo Geraldo Faldo, and Steve Urkel.

Answers: A: **Boy Meets World** B: **Sabrina the Teenage Witch** C: **Step by Step** D: **Family Matters**

Tossup 18: Social Studies (World History)

This group was created by the National Convention on April 6 1793. It had 12 members and acted as the executive government of France until 1795. Famous members included the scientist Lazare Carnot; the mayor of Paris, Jerome de Villeneuve; and the politician Georges Danton. While being led by its most famous Jacobin member, it launched its policies of Total War and The Reign of Terror. Name this committee led by Maximilien Robespierre which denounced thousands of Frenchman as enemies of the French Revolution, and had them executed by guillotine.

Answer: **The Committee of Public Safety**

Bonus 18: Science (Biology)

Name these lobes of the human brain.

A: This anterior lobe of the brain controls judgment and personality.

B: This caudal lobe of the brain contains the primary auditory cortex and helps process auditory signals, comprehension, and verbal memory.

C: This smallest posterior lobe of the brain contains the primary visual cortex and processes visual data.

D: This cranial posterior lobe of the brain is not well understood, but is known to integrate sensory information.

Answers: A: **Frontal lobe** B: **Temporal lobe** C: **Occipital lobe** D: **Parietal lobe**

Tossup 19: Literature (Literature)

Its publication was an extraordinary event in Soviet literary history, as it was the first account of Stalinist repression to be openly distributed. Name this novel, which describes the life of a prisoner in a labor camp in the 1950s, by Alexander Solzhenitsyn.

Answer: **One Day in the Life of Ivan Denisovich**

Bonus 19: Math (Algebra)

Given the matrix with top row 8, 5, and bottom row 6, 5, find the following.

A: Its inverse.

B: Its trace.

C: Its transpose.

D: That matrix multiplied by the matrix with top row 2, 3, and bottom row 4, 1.

Answers: A: **Top row 1/2, -1/2, bottom row -3/5, 4/5** B: **13** C: **Top row 8, 6, bottom row 5, 5** D: **Top row 36, 29, bottom row 32, 23**

Tossup 20: Science (Physics)

Though it usually doesn't need to be considered, its derivative, jounce, was used in designing the Hubble Space Telescope. Roller-coaster designers also need to pay attention to it, because high values can cause whiplash. When multiplied by mass, it's called yank. Sometimes called surge, lurch, or jolt, name this quantity with units meters per second cubed, the third time-derivative of position, and the first derivative of acceleration, which indicates how quickly the acceleration of an object is changing.

Answer: **Jerk** (*accept surge, lurch, jolt before mentioned*)

Bonus 20: Social Studies (U.S. History)

Answer the following about the American Civil War.

A: This confederate submersible itself sunk as a result of its successful attack on the USS Housatonic.

B: Winfield Scott devised this plan to win the war, which involved blockading the major Confederate ports and capturing the Mississippi River in order to split the South.

C: This Confederate general was accidentally shot by his own troops and died later after complications from an amputated arm and pneumonia.

D: This embarrassing Union defeat fought from April 30 to May 6, 1863, was called General Robert E. Lee's "perfect battle" due to his risky split of his own troops in the face of a much larger opposing force.

Answers: A: **H.L. Hunley** (*do not accept if any mention of 'CSS'; it was not commissioned*) B: **The Anaconda plan** C: **Thomas Jonathan "Stonewall" Jackson** D: **Battle of Chancellorsville, Virginia**

TIEBREAKERS/REPLACEMENTS:**Tossup 21: Literature (Literature)**

He is the brother of Halga, the husband of Wealtheow, and nephew of Hrothulf. He built the great mead hall Heorot. Name this king of the Danes, whose people are terrorized by Grendel in the epic, Beowulf.

Answer: Hrothgar

Bonus 21: Science (Chemistry)

Name these important polymers.

A: This polymer has two forms, a pure plastic-like form, and an expanded form with gas bubbles, known as Styrofoam.

B: This is a DuPont Company brand name, referring to a polymer of para-aramid fibers said to be five times stronger than steel, and can be found in many bullet-proof vests.

C: This plastic is technically called polychloroethene, though it lends a different three-letter name to a type of white plastic pipe material.

D: This is typically not thought of as a polymer, though it is formed by four repeating nucleotide monomers, none of which is uracil.

Answers: A: Polystyrene B: Kevlar C: PVC (accept *polyvinyl chloride*) D: DNA (accept *deoxyribonucleic acid, do not accept RNA*)



Ægis Questions

New Trier Varsity 2006

Round 2

Tossup 1: Math (Other) -- Computational (30 Seconds)

Find the root mean square, or RMS, of the set 1, 2, 3, 4, 5. To compute this, you can use the fact that the RMS squared is equal to the sum of the mean squared and the population standard deviation squared. However, it would probably be easier to remember that the RMS is defined as the square root of the quotient of the sum of the squares of the numbers, divided by the number of numbers. In other words, you can simply add up one squared through five squared, divide by five, and take the square root.

Answer: $\sqrt{11}$

Bonus 1: Social Studies (U.S. History)

Identify these facts related to the 1890 Congress.

A: That congress convened during the term of this 23rd president.

B: This act was the first legislative attempt to interfere with business.

C: Named after a future president, this protective tariff rewarded nations that used American goods.

D: Because of the large amount of money it spent, the 1890 congress became known as this.

Answers: A: Benjamin Harrison (*prompt on Harrison*) B: Sherman Anti-Trust Act C: McKinley Tariff D: Billion-Dollar Congress

Tossup 2: Literature (Literature)

Bertram Roomford says of him "I could carve a better man out of a banana," and the novel is a non-sequential series of his blunders. After being captured along with Roland Weary, he is held as a prisoner of war. Twenty years later, he suffers a terrible head injury in a plane crash, making him unable to perform his job as an optometrist in Ilium, New York. Name this character who became "unstuck in time," the protagonist of Slaughterhouse-Five?

Answer: Billy Pilgrim

Bonus 2: Fine Arts (Music)

Identify the Russian composers of the following works.

A: Peter and the Wolf

B: The Queen of Spades

C: Prince Igor

D: Scheherazade

Answers: A: Sergei Prokofiev B: Pyotr Ilyich Tchaikovsky C: Alexander Borodin D: Nikolai Rimsky-Korsakov

Tossup 3: Miscellaneous (Other)

Founded in 1892, it originally sold sporting goods, including the rifle that Ernest Hemingway killed himself with. In 1909 it started publishing its catalog, which has created controversy in recent years. Also controversial are logos on the clothing it sells, including possibly racist caricatures, and sexist phrases like "Who needs brains when you have these" printed on the front of female clothing. Name this clothing company founded by two men, whose catalog came under fire in the late 1990s for its pictures of nude models.

Answer: Abercrombie & Fitch (*prompt on Abercrombie*)

Bonus 3: Math (Algebra)

Simplify the following complex numbers. All your answers should be in $a + bi$ form.

A: The quantity $2 + 2\sqrt{3}i$, close quantity, to the sixth power.

B: The quantity $1 + 7i$ divided by the quantity $3 + i$.

C: The quantity $2 + i$ times the quantity $1 + 6i$.

D: The quantity $1 - i$, quantity squared.

Answers: A: **4096 + 0i** B: **1 + 2i** C: **-4 + 13i** D: **0 - 2i**

Tossup 4: Science (Astronomy)

After all of a star's hydrogen is fused into helium, they expel their outer material and all that remains is these hot cores. A million times more dense than the sun, they cannot weigh more than 1.4 solar masses, the Chandrasekhar limit, because above that mass they will instead collapse as neutron stars or explode as supernovas. Name these bright dense stars, a category to which Happy and Grumpy also belong.

Answer: **White dwarf stars** (*prompt dwarf*)

Bonus 4: Literature (Literature)

Identify the Arthur Miller play from a description.

A: Eddie Carbone harbors illegal immigrants, who are also his wife's relatives, in this play.

B: This play is about the title character, Willy Loman, and his delusional faith in the American dream.

C: Abigail Williams and John Proctor are characters in this play set during the Salem witch trials.

D: The Keller and Deever families are prominent in this play about a businessman who sold broken airplane parts to the government during World War II.

Answers: A: **A View from the Bridge** B: **Death of a Salesman** C: **The Crucible** D: **All My Sons**

Tossup 5: Social Studies (Current Events)

In 1998 he was detained in Britain because the Spanish wanted to extradite him for his role in torturing Spanish citizens during his reign. In 2001, back in his home country, he had his immunity taken from him, though he was eventually deemed unfit for defending himself in court. He was connected to Operation Columbo, in which many leftists simply disappeared. That event occurred in 1975, two years after his takeover of Salvador Allende's government. Name this former Chilean dictator who died on December 10, 2006.

Answer: **Augusto Pinochet Ugarte**

Bonus 5: Science (Biology)

Given the name of a disease caused by a vitamin deficiency, give the deficient vitamin that causes it.

A: Night-blindness

B: Beriberi (*BERRY-BERRY*)

C: Scurvy

D: Rickets

Answers: A: **Vitamin A** (*accept retinol*) B: **Vitamin B1** (*accept thiamine, prompt on "B"*) C: **Vitamin C** (*accept ascorbic acid*) D: **Vitamin D**

Tossup 6: Math (General)

An unusual one is Knuth's (*kuh-NOOTH's*) quater-imaginary one using $2i$, which is capable of expressing all complex numbers with the digits 0, 1, 2, and 3. More typical integral ones are able to express all real numbers with the same number of distinct digits. Name this generalized type of positional number system, often used with sixteen for hexadecimal, two for binary, or most commonly, ten for decimal.

Answer: **Number base** (*accept radix*)

Bonus 6: Miscellaneous (Technology)

Apple's line of iPods has been getting larger and larger.

A: In gigabytes, this is the largest capacity of iPod now available.

B: First introduced in 2004, this line of iPods was updated in 2005 and discontinued later that year.

C: The iPod Shuffle's promotional tagline was that "Life is" this, much like the Shuffle itself.

D: The iPod Shuffle was the first iPod to use this type of memory which is much smaller but more expensive than small hard drives. The Nano now also uses it.

Answers: A: **80 GB** B: **iPod Mini** C: **Random** D: **Flash**

Tossup 7: Fine Arts (Visual Art)

This founder and first President of the Royal Society of London also made a number of advances in medicine, being the first person to successfully inject a substance into the bloodstream of an animal. However he is most notable for his work in architecture, designing buildings such as the Royal Observatory, and the Library at Trinity College in Cambridge. Name this Knight of the British Empire, who designed a total of 53 churches in London alone, but is best known for designing St. Paul's Cathedral.

Answer: **Sir Christopher James Wren**

Bonus 7: Social Studies (Geography)

Given a description, identify the United States lake.

A: This Vermont lake, named after a Frenchman, is considered the "sixth" Great Lake.

B: This is the man-made lake created by Hoover Dam.

C: This is the deepest lake in the United States.

D: The levees on this lake near New Orleans broke during Hurricane Katrina.

Answers: A: **Lake Champlain** B: **Lake Mead** C: **Crater Lake** D: **Lake Pontchartrain**

Tossup 8: Literature (Language Arts)

Spell the one-word name of the medical profession sometimes abbreviated ENT. Though practitioners are known also as "head and neck surgeons," their primary focus, as this word suggests, is on ears, noses, and throats. Spell otolaryngology (*OH-toh-LAIR-in-JAH-luh-GEE*).

Answer: **OTOLARYNGOLOGY** (accept grammatical variants, accept OTORHINOLARYNGOLOGY before end)

Bonus 8: Science (Chemistry)

Give the common charge of each of the following ions.

A: Magnesium ion

B: Ferrous ion

C: Ammonium ion

D: Plumbic ion

Answers: A: **+2** B: **+2** C: **+1** D: **+4**

Tossup 9: Social Studies (World History)

The combatants of this era included the Yan, Wei, Qi (*CHEE*), Chu, and Han. The era led to the rise of the Chinese philosophies of Legalism, Taoism, and Confucianism, and is often considered to be the latter half of the Zhou (*JOE*) Dynasty, even though they lost control of their country. Name this period of factionalized conflict starting in the fifth century B.C., which was ended in 221 B.C. by China's reunification under the Qin (*CHIN*) dynasty.

Answer: **Period of Warring States** (accept close equivalents)

Bonus 9: Math (Calculus)

Find the derivatives of the following functions.

A: $7x$ to the sixth power plus $10x$ to the fifth power minus $4x$ to the fourth power.

B: The quantity $5x$ squared plus 2, quantity squared. Fully expand your answer.

C: $\cos x$ over $\sec x$. Simplify your answer so that only one trig function remains.

D: $8e$ to the power of $4x$ squared.

Answers: A: **$42x$ to the fifth plus $50x$ to the fourth minus $16x$ cubed** B: **$100x$ cubed plus $40x$** C: **negative sine of $2x$** D: **$64x$ times e to the power of $4x$ squared**

Tossup 10: Science (Biology) -- Computational (30 Seconds)

An established colony of flying purple people-eaters is sampled, and it is found that 16% have two horns. A researcher wants to know how many are homozygous for the one-horned trait. If the population is at Hardy-Weinberg equilibrium, and two-hornedness is a recessive allele (*uh-LEEL*), then 16% must be homozygous recessive, and the number of homozygous dominant can be found by squaring the dominant allele frequency. What percentage of people-eaters are homozygous one-horned?

Answer: **36%**

Bonus 10: Literature (Literature)

Answer these questions about *The War of the Worlds*.

A: The original 1898 novel was written by this author of "The Invisible Man."

B: This actor from the Mercury Theater made a famous 1938 radio adaptation of the novel which caused some panics when some listeners mistook the newscasts for real.

C: In the original novel, Martian spaceships land on Earth and begin to attack society. In which country do the spaceships land?

D: This is how many weeks elapse between the first Martian landing and the date on which all the Martians are found dead from common Earth diseases.

Answers: A: **H.G. Wells** (*prompt Wells*) B: **Orson Welles** (*prompt Welles*) C: **England** (*accept Britain, Great Britain, or United Kingdom*) D: **3 weeks**

HALFTIME

Tossup 11: Social Studies (Geography)

This region's name comes from Caledonii, a 5th century tribe, and some its natives include Alexander Graham Bell and James Watt. The Stone of Scone was returned to its capital in 1996, and the British navy was anchored at Scapa Flow in the Orkney Islands during World War II. The Hebrides are also off its coast, and Glasgow is its largest city. Name this part of Great Britain north of England whose capital is Edinburgh.

Answer: **Scotland**

Bonus 11: Math (Geometry)

Find the number of sides that a regular polygon must have, for the following to hold.

A: It has exactly 119 diagonals.

B: Its circumradius is equal to its side length.

C: It has an area of $9\sqrt{3}$, and a side length of 6.

D: It has interior angles of 108 degrees.

Answers: A: **17** B: **6** C: **3** D: **5**

Tossup 12: Fine Arts (Music)

He is famous for German songs like "Ellens dritter Gesang," (*ELL-unz DREE-tur gez-AHNG*), "Winter Journey," "The Beautiful Mill-Girl," and "Swan Song," though he is perhaps even better known for his "Moments Musicaux" (*MOH-moh MOO-zee-KOH*), the "Trout Quintet," and several of his symphonies, including the Tragic, the Great, and the Unfinished. Catalogued by the Deutsch system, name this Austrian composer who died at age 31, but wrote over six hundred songs, including Ave Maria.

Answer: **Franz Schubert**

Bonus 12: Literature (Mythology)

Identify the following mythological nasties.

A: Reputed to be the king of all serpents and said to cause death by a single glance; it is often contrasted with the cockatrice.

B: These Japanese demons are often depicted with green, red, black or even pink skin, and favor the tetsubo as a weapon.

C: This Norse wolf, an offspring of Loki, will eventually devour Odin at Ragnarök.

D: This other progeny of Loki is eventually killed by Thor, but its venom causes Thor to die as well.

Answers: A: **Basilisk** B: **Oni** C: **Fenrir** (*also accept Fenris*) D: **Jörmungandr** (*also accept Midgard Serpent*)

Tossup 13: Science (Chemistry)

Some uncommon scales for measuring it include the Alfred-Rochow scale, expressed in terms of effective charge divided by radius squared, and the Mulliken scale, the average of ionization energy and electron affinity, expressed as an energy value. Typically measured instead in Paulings on a scale from 0.7 to 4.0, name this property of atoms that expresses how strongly atoms attract electrons in chemical bonds.

Answer: **Electronegativity**

Bonus 13: Miscellaneous (Entertainment)

Given a famous line, name the movie from which it is taken.

A: "Roads? Where we're going we don't need roads."

B: "You can't handle the truth."

C: "That's what I love about these high school girls, man. I keep getting older, they stay the same age."

D: "Fasten your seatbelts. It's going to be a bumpy night."

Answers: A: **Back to the Future Part I** B: **A Few Good Men** C: **Dazed and Confused** D: **All About Eve**

Tossup 14: Literature (Literature)

From 1948-1953, this man hosted a radio show called Hallmark Playhouse. In 1920 his first well known novel, Catherine Herself, was published. A term that is a synonym for a utopia comes from the setting of his most famous work. Name this author who created the fictional area of Shangri-La in his novel "Lost Horizon."

Answer: **James Hilton**

Bonus 14: Science (Physics)

An object is shot out of a cannon at $15\sqrt{2}$ (*fifteen root two*) meters per second, at 45 degrees to the horizontal.

A: What is the vertical component of its velocity?

B: Ignoring air resistance and using 10 meters per second squared as gravitational acceleration, for how many seconds will the object stay airborne?

C: How far will it travel horizontally before falling?

D: What will its maximum height be?

Answers: (*prompt for units*) A: **15 meters/second** B: **3 seconds** C: **45 meters** D: **11.25 meters** (*or 45/4*)

Tossup 15: Math (Calculus) -- Computational (30 Seconds)

Simplify your answer so that it contains only one trig function, which is not raised to any power. Find the derivative of the function f of x equals 13 times the sine squared of $2x$. Remember to use the chain rule, and that your answer can be simplified using a particular double angle identity.

Answer: **26 sine of 4x**

Bonus 15: Social Studies (U.S. History)

Answer the following questions about the 1968 Democratic National Convention.

A: In what city was it held?

B: What candidate did the delegates end up selecting?

C: There was quite the fracas outside the convention. What nickname was given to the group, including Abbie Hoffman and Jerry Rubin, that was charged with inciting to riot?

D: What swinish candidate did this group attempt to nominate as President, as a member of the Yippie Party?

Answers: A: **Chicago, IL** B: **Hubert Humphrey** C: **The Chicago Seven** (*accept Chicago Eight*) D: **Pigassu the Immortal**

Tossup 16: Miscellaneous (Sports)

They are impossible to truly achieve in baseball, but the classic “Bottom of the ninth, two outs, full count, bases loaded, down by one” scenario is a close representation. Derek Fisher had one to defeat the Spurs in the 2003-2004 NBA playoffs. Name this two-word sports feat, accomplished by Adam Vinateri in the New England Patriots’ first two Super Bowl victories and by any number of athletes making a desperation shot at the very end of a quarter, half, or game.

Answer: **Buzzer Beater** (*accept clear-knowledge equivalents*)

Bonus 16: Math (Other)

There are 3 red balls, 2 green balls, and 5 blue balls in a bag.

A: What is the probability of selecting a red ball and then a green ball, assuming that the first ball selected is put back in the bag before the second is drawn?

B: What are the odds against selecting a blue ball?

C: What are the odds in favor of selecting a red ball? Remember to answer with odds, not probability, for this and the previous part.

D: If it costs 1 dollar to select a ball, and red balls are worth 2 dollars, green balls are worth 3 dollars, and blue balls are 1 dollar, what is the expected value of your change in money?

Answers: A: **3/50** (*or 6%*) B: **1 to 1** (*do not accept 1 or 1 over 1*) C: **3 to 7** (*do not accept 3 over 7*) D: **Positive \$.70** (*or 70 cents*)

Tossup 17: Social Studies (U.S. History)

It was originally known as Little Hunting Creek Plantation, and the most well known owner's half brother Lawrence renamed it in honor of his commander. The most famous owner lived there from 1759 until his death in 1799. That owner's remains are on the grounds, as well as other family members, including wife Martha. Name this Virginia estate on the Potomac, the former home of George Washington.

Answer: **Mount Vernon**

Bonus 17: Literature (Literature)

Identify the following from from The Merchant of Venice.

A: The first name of the title character.

B: The man who borrows money from Shylock.

C: What is inside the correct casket that Portia's husband selects.

D: Shylock's daughter, she sells a ring Shylock gave her mother and marries the Christian Lorenzo.

Answers: A: **Antonio** B: **Bassanio** C: **Portrait of Portia** (*accept equivalents*) D: **Jessica**

Tossup 18: Science (Earth Science)

Renamed the Sea River Mediterranean after repairs, it was on its 28th voyage on March 23, 1989.

Leaving its namesake terminal in Alaska with a full 52 million gallons, it hit a reef in Prince William Sound, and spilled an estimated 10.8 million gallons of oil into the ocean. Name this oil tanker whose operating company merged with Mobil in 1999.

Answer: **Exxon Valdez** (*prompt partial answer*)

Bonus 18: Fine Arts (Visual Art)

Given a description, identify the American artist.

A: This lowan is most famous for a work in which he portayed his sister and his dentist as a farm couple. The dentist was holding a pitchfork.

B: This female artist was raised in Pennsylvania but later lived in France. Among her works are "Summertime" and "The Child's Bath."

C: This landscape painter, who spent much of his life in Maine, painted "Eight Bells" and "Mending the Nets."

D: This man from Missouri painted murals in the Missouri State Capitol and Truman presidential Library.

Answers: A: **Grant DeVolson Wood** B: **Mary Stevenson Cassatt** C: **Winslow Homer** D: **Thomas Hart Benton**

Tossup 19: Literature (Literature)

He wrote the screenplay for Shakespeare in Love. His Arcadia splits its action between 1809 and 1989 in the same house. His The Real Inspector Hound is about two theatre critics who somehow become involved in the action onstage. This author's most famous play borrows its title characters from Shakespeare. Identify this Czech author of Rosencrantz and Guildenstern are Dead.

Answer: **Tom Stoppard**

Bonus 19: Social Studies (World History)

There were quite a few wars in the 18th century. Given a war, name the treaty that ended it. For all answers, please use the word "Treaty" instead of "Peace."

A: War of Spanish Succession

B: War of Austrian Succession

C: Seven Years War

D: American Revolution

Answers: A: **Treaty of Utrecht** B: **Treaty of Aix-la-Chappelle** (*accept Treaty of Aachen*) C: **Treaty of Paris** (*accept Treaty of Hubertusburg*) D: **Treaty of Paris**

Tossup 20: Math (Algebra) -- Computational (30 Seconds)

It takes 24 minutes for a faucet to fill a sink, and 6 minutes for a hose to fill the same sink. You want to know how long it would take for both to fill the sink together. This can be accomplished by summing the fractions of the sink that each fills up every minute, and realizing that the answer to this question multiplied by that fraction must equal one. Using this or any other method, find the time it would take to fill the sink with the faucet and hose simultaneously.

Answer: **24/5 minutes** (*or 4.8*)

Bonus 20: Science (Biology)

Answer these questions about blood types.

A: If a couple has the blood types A and AB, what is the one blood type their children cannot have?

B: Because they have neither anti-A nor anti-B antibodies, a person with this blood type can be transfused with any type of blood.

C: Because it has neither A nor B antigens, this blood type can be transfused into anyone.

D: The plus and minus that accompany blood type designations indicate the presence or absence of the D antigen of this factor named after a type of monkey.

Answers: A: **O** B: **AB** C: **O** D: **Rhesus factor** (*accept Rh*)

TIEBREAKERS/REPLACEMENTS:

Tossup 21: Social Studies (World History)

He was ostracized in the 470's BC, and ironically joined the Persians, his former arch enemies. He is considered the father of Athens navy, and increased its size by 200 ships. Name this Athenian most famous for his victory over the Persians at Salamis during the Persian Wars.

Answer: **Themistocles**

Bonus 21: Social Studies (Geography)

Given a country, name its largest city.

A: Morocco

B: China

C: Switzerland

D: South Africa

Answers: A: **Casablanca** B: **Shanghai** C: **Zurich** D: **Johannesburg**



Ægis Questions

New Trier Varsity 2006

Round 3

Tossup 1: Literature (Literature)

His next book is rumored to be about Sofia Kovalevskaya, the first major female Russian mathematician. This eclectic author is well known for the blend of "high" and "low" culture in his works, ranging from allusions to Nabokov's *Lolita* to Thelonious Monk and the Beatles. His two cameos on the Simpsons are the only times his voice has been broadcast in the media. Name this author of *Vineland*, *Mason & Dixon*, *The Crying of Lot 49* and *Gravity's Rainbow*.

Answer: **Thomas Ruggles Pynchon V**

Bonus 1: Math (Geometry)

Find the areas of the following figures.

A: A circle with circumference 10.

B: A square with diagonal of 4.

C: A triangle with sides of 3, 3, and 5.

D: A regular hexagon with sides of length 2.

Answers: A: **25 / pi** B: **8** C: **5 root 11 / 4** (or $5/4 \text{ root } 11$) D: **6 root 3**

Tossup 2: Science (Biology)

For some reason, pufferfish have very minimal ones. It is unknown why they exist, though their discoverers were awarded the 1993 Nobel Prize in Medicine. They sometimes enhance splicing, perhaps by altering the secondary structure of RNA, and some even are ribozymes that splice themselves, though most are thought to be simply junk DNA without a purpose. Name these sections of DNA not used in transcription, with a name short for "intervening sequences."

Answer: **Introns** (accept "intervening sequences" before last clue)

Bonus 2: Miscellaneous (Other)

Identify the following fads of the 80s and 90s.

A: Each of these stuffed animals came with a heart shaped tag with a bit of poetry inside attached.

B: It appears to be a cross between a hamster, a cat and an owl, but one can not be quite sure.

These obnoxious things talked to each other and made an awful racket.

C: This toy sold by Bandai, named for the Japanese word for 'egg', was banned at pretty much every school due to children constantly having to clean up its poop during classes.

D: This craze is named after a juice made from passion fruit, orange and guava. It features a hellogoodbye music video, and a tournament is held with these.

Answers: A: **Beanie Babies** B: **Furby** C: **Tamagotchi** (not *Giga Pets* or *Nano Pets*, they weren't sold by Bandai) D: **Pogs** (begrudgingly also accept *Milkcaps*)

Tossup 3: Social Studies (World History)

The Koran refers to her as Bilqis, and in Ethiopia, where her kingdom is believed to have been located, she is called Makeda. She is not mentioned in the Bible by name, but she appears in First Kings and Second Chronicles. In those passages, she visits King Solomon with many gifts, including four and a half tons of gold. Impressed with Solomon's wisdom and wealth, she sings the praises of the Hebrew God. What royal figure of legendary wealth is rumored to have an affair with King Solomon?

Answer: **The Queen of Sheba**

Bonus 3: Science (Chemistry)

Name these chemical measurements calculated using moles.

A: This is the number of moles of a solute per liter of solution.

B: This is the number of moles of a solute per kilogram of solvent.

C: In acid-base chemistry, this is the number of moles of ionizable hydrogen or hydroxide groups per liter of solution.

D: This dimensionless quantity is the number of moles of one substance divided by the number of moles of another substance.

Answers: A: **Molarity** (*not molality*) B: **Molality** (*not molarity*) C: **Normality** D: **Mole ratio**

Tossup 4: Math (Algebra) -- Computational (30 Seconds)

You are trying to figure out the exact number of minutes after 3:00 that the minute and hour hands will first be at the same position. You know that to solve this problem, you have to express both hand positions as angles, and that the hour hand moves one twelfth as much as the minute hand for each minute that elapses. Given these facts, and that the hour hand starts perfectly horizontal, exactly how many minutes after 3:00 will the two hands overlap?

Answer: **180/11 minutes**

Bonus 4: Social Studies (Geography)

Identify these facts about Spain.

A: Along with Portugal, Spain is situated on this peninsula.

B: This city is Spain's capital.

C: This southern region lies on the Mediterranean, and contains the city of Seville.

D: This city, a former Moorish stronghold, is where La Alhambra is located.

Answers: A: **Iberian Peninsula** B: **Madrid** C: **Andalucia** D: **Granada**

Tossup 5: Fine Arts (Music)

Its sound is produced by the namesake objects, which are arranged in ranks, and can be called diapasons (*DI-a-PAY-zonz*), strings, or flutes, depending on the sound they produce. The person playing the instrument can control which ones are used by setting various stops for the manuals or pedalboard at the console. Called by Mozart the "king of instruments," name this large instrument often found in churches, which looks somewhat like a piano.

Answer: **Pipe organ** (*prompt organ*)

Bonus 5: Literature (Literature)

Given a description of a Herman Hesse novel, name the work.

A: This novel follows the title character's spiritual journey, and it includes the characters Kamala and Vasudeva.

B: This work centers on Harry Haller, and is partly autobiographical.

C: Sometimes titled *Magister Ludi*, this novel follows Joseph Knecht.

D: The subtitle of this work is "The Story of Emil Sinclair's Youth", and Gnosticism is referenced in it.

Answers: A: **Siddhartha** B: **Steppenwolf** C: **The Glass Bead Game** D: **Demian**

Tossup 6: Science (Astronomy)

Located from 50 to 100 thousand astronomical units from the sun, it is a very large sphere beginning at the outside of the Kuiper belt. If it exists, it is left over from the nebula that formed the sun, and contains millions of comet nuclei, some of which enter the solar system. Name this theoretical cloud named after a Dutch astronomer, that only contains one discovered object, Sedna.

Answer: **(Öpik-)Oort cloud**

Bonus 6: Fine Arts (Visual Art)

Given a description of a Spanish speaking artist, name the artist.

A: This muralist's *Man at the Crossroads* was torn down after it was discovered it had communist pictures in it.

B: This wife of the answer to Part A painted many self portraits after an accident left her bedridden. Many of these portraits showed off her facial hair.

C: This Colombian artist is best known for his depictions of plump women. He also released paintings about the Abu Ghraib scandal.

D: This artist liked to paint about Mexican history. In 1966, he won the Lenin Peace Prize.

Answers: A: **Diego Rivera** B: **Frida Kahlo** C: **Fernando Botero** D: **David Alfaro Siqueiros**

Tossup 7: Literature (Mythology)

After deciding a contest between Hjalmgunnar (*he-YALM-gun-err*) and Agnar she is put in a magical sleep by Odin, and is surrounded by a ring of fire of such magnitude that only a hero could traverse it. She is eventually awakened by Sigurd, to whom she willingly gives herself. Following his death, she throws herself on his funeral pyre. Identify this shieldmaiden and titular Valkyrie of one of Wagner's operas.

Answer: **Brünnhilde** (*also accept Brynhildr*)

Bonus 7: Science (Physics)

Find the total resistance of the circuits with the following configurations of resistors. Give exact answers.

A: 6 ohms and 4 ohms connected in parallel.

B: 8 ohms and 3 ohms connected in parallel.

C: Four 3 ohm resistors connected in parallel.

D: 1 ohm connected in parallel to a series of a 2 ohm and a 4 ohm resistor.

Answers: A: **12/5 ohms** B: **24/11 ohm** C: **3/4 ohms** D: **6/7 ohms**

Tossup 8: Math (General)

The characteristic polynomial is found by setting it equal to zero. When applied to the Jacobian, it returns a value used in the substitution rule for multiple integrals. It is equal to the product of the eigenvalues of its input. Non-zero values indicate that the input is invertible. It is equivalent to the scalar triple product of three three-dimensional vectors, and in general, returns the n-dimensional volume enclosed by n n-dimensional vectors. Used in Cramer's rule, name this value associated with square matrices that, for a two-by-two matrix, is equal to a d minus b c.

Answer: **Determinant**

Bonus 8: Literature (Literature)

Identify these facts related to Jack London.

A: London was born in this California city.

B: This novel, London's most famous work, was about a dog named Buck.

C: This poet, who wrote *A Wine of Wizardry*, was a close friend of London's.

D: Humphrey van Weyden is helped out by the captain of the *Ghost* in this London work.

Answers: A: **San Francisco** B: **Call of the Wild** C: **George Sterling** D: **Sea-Wolf**

Tossup 9: Social Studies (U.S. History)

Its name was taken in part from words spoken by Winston Churchill in 1940, and it lasted from December 16th, 1944 to January 16th, 1945. Occurring in the Ardennes Forest, the 101st Airborne became famous there for surviving while being surrounded at Bastogne. Patton's Third Army finally broke through the encirclement in late December, which led to the evacuation of the Germans. Name this final German offensive of World War II.

Answer: **Battle of the Bulge** (accept Ardennes Offensive before Ardennes is mentioned)

Bonus 9: Math (General)

You have six beads, three of which are identical.

A: In how many distinguishable ways can you order the beads in a straight line?

B: How many more distinguishable ways would you have to order the beads if you could tell the identical beads apart?

C: How many distinguishable pairs of beads can you take out of these six beads? Order does not matter.

D: How many distinguishable necklaces can you make out of the six beads and a piece of string?

Answers: A: **120** B: **600** C: **7** D: **20**

Tossup 10: Miscellaneous (Sports)

From 1992 to 1995, he managed four straight Rookies of the Year; Eric Karros, Mike Piazza, Raul Mondesi, and Hideo Nomo. He retired in 1996, but was the third base coach in the 2001 All Star Game when Vladimir Guerrero's bat splintered towards him, knocking him over. Name this longtime manager of the Los Angeles Dodgers, who also managed the 2000 US Olympic baseball team to the gold medal.

Answer: **Tommy Lasorda**

Bonus 10: Social Studies (World History)

Answer the following questions about the Medici family.

A: This Italian city was the Medici stronghold.

B: This Medici, known as the Magnificent, is the most famous of all the family members and lived during the Renaissance.

C: This member of the Medici family was the Queen of France and the wife of Henry II.

D: This building, which is now an art gallery that has works such as Primavera, was once an office building for the Medicis.

Answers: A: **Florence** B: **Lorenzo de Medici** C: **Catherine de Medici** D: **Uffizi Gallery**

HALFTIME

Tossup 11: Miscellaneous (Interdisciplinary)

In topology, it defines identical dynamical systems. In group theory, it is a map of "x" defined by "a" times "x" times the inverse of "a." In physics, it defines quantities linked by the Heisenberg uncertainty principle. In chemistry, it describes a group of atoms bonded with alternating single and double bonds. To bacteria, it is caused by F-plasmids, and results in the asexual transfer of genes. In algebra, it means taking the opposite of the imaginary part of a complex number. Most commonly used in grammar, it refers to modifying an infinitive to a different verb form.

Answer: **Conjugation** (accept different forms)

Bonus 11: Science (Earth Science)

Name these zones of the ocean.

A: Also known as the intertidal zone, this zone's name means "shore," and refers to the region between the high and low water marks.

B: Meaning "open sea," this zone refers to all the water in the water column that is not near the shore or sea floor.

C: This zone of the ocean encompasses all the areas not exposed to sunlight.

D: This zone is right above the sea floor, and is the lowest zone of the ocean.

Answers: A: **Littoral zone** B: **Pelagic zone** C: **Aphotic zone** D: **Benthic zone**

Tossup 12: Social Studies (U.S. History)

Arlen Specter cited Scots law to issue a vote of "Not Proven," though it was recorded as not guilty. Either way, that vote did not matter, as the Senate generally voted along party lines, leaving votes of 45-55 for perjury and 50-50 for obstruction of justice, both short of conviction. Name this trial which acquitted the 42nd President.

Answer: **Impeachment of Bill Clinton** (accept equivalents)

Bonus 12: Literature (Language Arts)

Name these literary techniques for making stories more interesting.

A: Also known as a "story within a story," this type of novel is named after the way it encapsulates a complete story within another story.

B: This type of novel is written as a series of letters or diary entries.

C: This type of writing originates in Latin America. In this technique, realistic events are described in terms of local customs, in such a way to seem unreal.

D: The name for this technique comes from the Latin for "in the middle of things," and not surprisingly, refers to starting a novel in the middle of a story.

Answers: A: **Frame story** B: **Epistolary novel** C: **Magic realism** D: **In medias res**

Tossup 13: Math (Geometry) -- Computational (30 Seconds)

Find the volume of an ellipsoid whose semi-axes are of length 2 centimeters, 10 centimeters, and 3 centimeters. It may help you to know that an ellipsoid is like a sphere with a different length, width, and height, and its semi-axes are its three radii in those directions. Consequently, the formula for the volume of an ellipsoid is like the formula for the volume of a sphere, except each radius is different.

Answer: **80 pi cubic centimeters** (accept centimeters cubed; prompt for units)

Bonus 13: Miscellaneous (Sports)

Answer the following questions regarding the 2006 FIFA World Cup Final.

A: This country, whose national soccer landscape has been rocked by a match-fixing scandal involving teams such as Juventus, won the World Cup.

B: This country lost in the finals of the World Cup. They last won in 1998.

C: This striker holds the record for most goals by an active player for his national team. His teammate, Zinedine Zidane (*zin-eh-deen zi-dahn*), holds third place.

D: Zidane's most infamous moment came in the 2006 final where he headbutted this opposing player and was red-carded.

Answers: A: **Italy** B: **France** C: **Thierry Henry** D: **Marco Materazzi**

Tossup 14: Literature (Literature)

Many versions include additions by Thomas Middleton, primarily the addition of Act Three, Scene Five, in which the witches meet with Hecate. Soon after the title character defeats a rebel army from Ireland and Norway, the king fulfills a prophecy by giving him the title of Thane of Cawdor, causing him to consider forcefully making a second prophecy come true. Due to his wife's pressure, he finally kills Duncan at Inverness Castle, and thus begins the tragedy. Name this play by William Shakespeare in which the title Scot becomes king, only to be killed by a man who is not of woman born.

Answer: **Macbeth**

Bonus 14: Math (Calculus)

Find the indefinite integrals of the following functions. Do not include a constant of integration.

A: 10 cosine of 5 x

B: 3 over the quantity nine x squared plus one

C: 20 x cubed plus 4 x

D: One over the quantity x times the natural log of three

Answers: A: **$2 \sin(5x)$** B: **$\arctan(\text{gent}) \text{ of } 3x$** (or "inverse tan(gent)") C: **$5x^4 + 2x^2$** D: **log, base 3, of x** (or natural log of x over natural log of 3)

Tossup 15: Science (Physics) -- Computational (30 Seconds)

Ignore friction and significant figures. A 500 kilogram truck is traveling at 10 meters per second. It hits a stationary object and starts traveling with that object, but at a speed of only 8 meters per second. Assuming momentum is conserved, what was the mass of the object it hit?

Answer: **125 kilograms** (prompt for units)

Bonus 15: Social Studies (Current Events)

Answer these questions related to recent happenings at the United Nations.

A: This man has served as UN Secretary General for the last ten years, and his term will expire on December 31, 2006.

B: This is the African country from which the current Secretary General hails. Its capital is Accra.

C: This South Korean will replace him as Secretary General from 2007 to 2011.

D: The UN recently voted for bans on exporting luxury goods like plasma televisions and iPods to this country, to punish its leader for the country's October 2006 nuclear testing.

Answers: A: **Kofi Annan** B: **Ghana** C: **Ban Ki-moon** (prompt on Ki-moon) D: **North Korea**

Tossup 16: Fine Arts (Visual Art)

Currently at the Museo del Prado, when closed, it pictures the earth as a disc within a transparent sphere. Opening the shutters reveals three portions, the leftmost representing Eden, prominently featuring the Tree of Knowledge. The rightmost portion represents hell, including pictures of the seven deadly sins. The middle portion, for which this work is named, shows how humanity gained its sinfulness, representing hedonists as they stand around nude. Name this 1504 oil triptych (*TRIP-tich*) by Hieronymous Bosch.

Answer: **The Garden of Earthly Delights**

Bonus 16: Literature (Literature)

Identify the authors of the following works that have baseball as their subject.

A: The Natural

B: Bang the Drum Slowly

C: Shoeless Joe

D: Casey at the Bat

Answers: A: **Bernard Malamud** B: **Mark Harris** C: **W. P. Kinsella** D: **Ernest Lawrence Thayer**

Tossup 17: Math (Other) -- Computational (30 Seconds)

Find the harmonic mean of the set 5, 10, 15. Remember that the harmonic mean is a measure of central tendency, equal to the number of numbers, divided by the sum of the reciprocals of the numbers.

Answer: **90/11**

Bonus 17: Science (Biology)

If, for the sake of science, I were to poke you in the arm with a germ-covered pin, your immune system would respond in these ways to keep you from getting sick.

A: The first response to irritation or infection is usually this, a nonspecific response that causes redness and swelling, and would perhaps make you feel like your arm was on fire.

B: Next, the memory type of this type of white blood cell would respond to antigens in your blood, multiplying into many plasma cells.

C: Those cells would then release many of these Y-shaped proteins that bind to antigens, the mediators of humoral immunity.

D: This type of white blood cell controls cell-mediated immunity, and would trigger macrophages to attack any foreign cells.

Answers: A: **Inflammatory response** B: **B cell** C: **Antibody** D: **T cell**

Tossup 18: Social Studies (Geography)

The first Europeans to see this lake were Sir Richard Burton and John Hanning Speke in 1858, 13 years before a famous meeting there. The Lukugua River flows out of it, and it is situated in the southern part of the Western Rift Valley. Name this lake located between Congo and Tanzania, the second deepest in the world, where in 1871 Henry Stanley found Dr. Livingstone.

Answer: **Lake Tanganyika**

Bonus 18: Fine Arts (Music)

Name the composers of the following symphonic poems.

A: Prelude to the Afternoon of a Faun

B: Danse Macabre (*DAHNS muh-KAHBR*)

C: The Sorcerer's Apprentice

D: Night on Bald Mountain

Answers: A: **Claude Debussy** B: **Camille Saint-Saëns** C: **Paul Dukas** D: **Modest Mussorgsky**

Tossup 19: Literature (Literature)

This writer battled clinical depression and bipolar disorder, though she was still a confessional poet. She was married to future British Poet Laureate Ted Hughes, and she is known mainly for one novel and the fact that she committed suicide. Name this writer, who made Peanut Butter and Jelly sandwiches for her children before sticking her head in the oven, that wrote Daddy and The Bell Jar.

Answer: **Sylvia Plath**

Bonus 19: Math (Algebra)

Answer the following questions about the conic section with equation $9x^2 + 18x + 16y^2 = 135$.

A: What type of conic section is it?

B: What are the coordinates of its center?

C: What is the length of its major axis?

D: What are the coordinates of one of its foci?

Answers: A: **Ellipse** B: **(-1,0)** C: **8** D: **(-1 - $\sqrt{7}$,0) or (-1 + $\sqrt{7}$,0)** (accept either or both)

Tossup 20: Science (Chemistry)

First patented in 1908 by its namesake, he won a Nobel Prize in 1918 for developing it. To favor the forward reaction, it is typically used at 200 atmospheres of pressure and 500 degrees celsius, along with an osmium, uranium, or more commonly, iron catalyst. Name this chemical process used to make artificial fertilizers, that converts nitrogen and hydrogen gas into ammonia.

Answer: **Haber-Bosch process**

Bonus 20: Social Studies (U.S. History)

Identify the following facts about the formation of U.S. Steel.

A: A Pittsburgh based company started by this Scotsman was formed a large part of U.S. Steel.

B: Elbert Gary owned this Chicago based Steel company that was also crucial to the merger.

C: This well known financier helped buy out the answer to Part A.

D: This man was the first president of U.S. Steel; a well known contemporary finance business shares his name.

Answers: A: **Andrew Carnegie** B: **Federal Steel Company** C: **John Pierpont Morgan** D: **Charles Michael Schwab**

TIEBREAKERS/REPLACEMENTS:**Tossup 21: Science (Biology)**

Mostly effective against gram-positive bacteria, its original discoverer thought it would not be useful for humans. Combined, however, with the drug probenecid, it lasted longer in the body before being excreted, a discovery which, along with its mass production, won the 1945 Nobel Prize in Medicine for Howard Florey, Ernst Chain, and its original discoverer, Alexander Fleming. Name this common antibiotic which was isolated from a similarly-named mold.

Answer: **Penicillin** (accept *penicillium*)

Bonus 21: Science (Physics)

Name these classes of particles from particle physics.

A: These fundamental particles come in six flavors, the most heavy of which is the "top."

B: These fundamental particles also have six flavors, including the muon, tau, and electron.

C: Like protons and neutrons, these particles are always made up of three quarks.

D: This type of boson mediates a force, like the W, Z, and photon.

Answers: A: **Quark** B: **Lepton** C: **Baryon** (do not accept fermion) D: **Gauge boson** (accept vector boson)



Ægis Questions

New Trier Varsity 2006

Round 4

Tossup 1: Science (Chemistry)

With formula $C_{10}H_{14}N_2$, it can be found in tomatoes, eggplants, and potatoes, though it is more commonly thought of in another plant. Highly toxic, it is a part of many insecticides. 50 milligrams could be enough to kill an adult human, but its flash point of 95 degrees Celsius means that humans don't inhale as much when they expose themselves to it. Name this molecule named after a genus of nightshade plants, the addictive chemical in tobacco.

Answer: **Nicotine**

Bonus 1: Social Studies (Current Events)

Identify these facts about a military coup that occurred this month.

A: Laisenia Qarase was the Prime Minister of this country where a coup began on December 4th.

B: This Commodore led the coup.

C: This president supposedly dismissed the parliament of the answer to part A.

D: The main portion of the coup occurred in this capital city.

Answers: A: **Republic of Fiji Islands** B: **Commodore Josaia "Frank" Voreqe Bainimarama** (*bay-NEE-muh-RAH-muh*) C: **Ratu Josefa Iloilo** D: **Suva**

Tossup 2: Literature (Literature)

In this work, falling off a stool and hitting his side against the wall was the cause for the main character's death. The title character's son kisses his hand right before he dies, in one of his few moments of clarity. At the beginning of the book, the title character's colleagues are thinking of how they can gain from his demise. Name this novella by Leo Tolstoy.

Answer: **The Death of Ivan Ilyich**

Bonus 2: Math (General)

Perform the following operations with the complex number x equals $5 + 7i$. Give all complex answers in $a + bi$ form.

A: Find x cubed.

B: Find the complex modulus, or norm, of x .

C: Find x multiplied by the quantity $2 - 3i$.

D: Find the complex conjugate of x .

Answers: A: **-610 + 182i** B: **root 74** C: **31 - i** D: **5 - 7i**

Tossup 3: Social Studies (U.S. History)

The law that got this president into trouble was proposed by the Radical Republicans to prevent his attempted removal of Secretary of War, Edwin Stanton. That law was the Tenure of Office Act, which was passed in 1867, two years into this man's presidency. Name this impeached 17th president, the successor to Abraham Lincoln.

Answer: **Andrew Johnson** (*prompt on Johnson*)

Bonus 3: Fine Arts (Music)

Composing sometimes runs in the blood. Given the first names of related composers, identify each common surname.

A: From the Classical period, Leopold and his son Wolfgang Amadeus.

B: From the Romantic period, Felix and, before she married, his sister Fanny.

C: From the Baroque period, Johann Ambrosius, his son Johann Sebastian, and J.S.'s two sons Wilhelm Friedemann, and Carl Philipp Emanuel.

D: From the Baroque period, Francesco, his brother Alessandro, and Alessandro's son Domenico.

Answers: A: **Mozart** B: **Mendelssohn** C: **Bach** D: **Scarlatti**

Tossup 4: Math (Algebra) -- Computational (30 Seconds)

There are no parentheses in this problem. Simplify the following product: the log base four of ten, times the log base three of four, times the log base ten of three. The only way to solve this problem is to use the change of base formula, which states that the log base b of a is equal to the natural log of a over the natural log of b.

Answer: **1**

Bonus 4: Social Studies (World History)

Identify these facts related to the Edict of Nantes.

A: In what year was the Edict issued?

B: The Edict granted freedoms to what French group of people?

C: What King issued the Edict?

D: What later French king, known as the Sun King, repealed the Edict?

Answers: A: **1598** B: **Huguenots** (*prompt French Calvinists*) C: **Henry IV of Navarre** (*prompt on Henry*) D: **Louis XIV** (*prompt on Louis*)

Tossup 5: Fine Arts (Visual Art)

This Italian painter is considered one of the first great representatives of the Baroque style of painting. He was influenced by a number of great painters such as Titian, but also developed his own skills, including popularizing the technique of tenebroso, a technique of painting that creates contrasts between light and dark more violent than chiaroscuro, to create great emotion for the viewer. Name this painter who is most famous for his paintings Death of the Virgin and The Denial of Saint Peter.

Answer: **Michelangelo Merisi da Caravaggio**

Bonus 5: Miscellaneous (Entertainment)

High school sports movies are touching, aren't they?

A: In this movie set in Indiana, Gene Hackman becomes the basketball coach of a small town high school.

B: This movie starring Denzel Washington as coach Herman Boone tells the story of the T.C. Williams football team after it was integrated in the early 1970s.

C: This 2002 movie based on a true story stars Dennis Quaid, a high school baseball coach who tries out for the big leagues, and eventually makes it with the Tampa Bay Devil Rays.

D: Based on a book, this movie stars Billy Bob Thornton as a Texas football coach. Tim McGraw also has a role in the movie.

Answers: A: **Hoosiers** B: **Remember the Titans** C: **The Rookie** D: **Friday Night Lights**

Tossup 6: Social Studies (Geography)

The first settlement on this island nation was founded by Diego Velazquez de Cuellar in 1511, four years before its capital city was founded. Its motto translates to "Homeland or Death," and its flag has a red triangle with a white star on the left side of it. Name this Caribbean nation 90 miles south of Miami, that has its capital at Havana.

Answer: **Republic of Cuba**

Bonus 6: Math (Geometry)

Find the surface area of the following three-dimensional solids.

A: A cube circumscribed about a sphere with a surface area of 16π square centimeters.

B: A square pyramid with height of 4 centimeters and base side length of 6 centimeters.

C: A tetrahedron with side length of 4 centimeters.

D: A sphere whose great circle has an area of 173 square centimeters.

Answers: (accept "centimeters squared" for "square centimeters", prompt for units) A: **96 square centimeters** B: **96 square centimeters** C: **16 root 3 square centimeters** D: **692 square centimeters**

Tossup 7: Miscellaneous (Other)

Name the product in question. Though originally awarded 2.7 million dollars in punitive damages and 200,000 in compensatory damages, a judge reduced Stella Liebeck's winnings from her lawsuit to 640,000 in 1994. The case started after Liebeck needed eight days in a hospital and two years of subsequent treatment for third-degree burns to her skin underneath her cotton sweatpants. Name the 190 degree liquid that burned her, bought at a drive-thru at McDonald's.

Answer: **McDonald's coffee**

Bonus 7: Literature (Mythology)

Identify the following women in mythology.

A: This woman unleashed all the worlds evils when she opened a namesake box.

B: This daughter of Oedipus buried her brother in spite of her uncle's wishes.

C: This queen of Carthage was quite smitten of Aeneas.

D: This woman was the wife of Hector and mother of Astyanax.

Answers: A: **Pandora** B: **Antigone** C: **Dido** D: **Andromache**

Tossup 8: Math (Other)

It satisfies the Jacobi identity and is distributive over addition, but it is not associative. Unlike a related operation, it only exists in Euclidean three-space, and its result is called a pseudo-vector because it does not transform like other vectors. It is anti-commutative, and its sign is popularly determined using the "right hand rule." Name this binary vector operation that finds a vector perpendicular to two other vectors.

Answer: **Cross product**

Bonus 8: Science (Biology)

Name these parts of nerve cells.

A: The cell body of a nerve cell, it is Greek for "body."

B: Nerve cells transmit signals away from the cell body along these long finger-like projections.

C: Around those projections is this sheath, providing electrical insulation and speeding up the nervous impulses.

D: These glial (*GLEE-uhl*) support cells grow around the nerve cell projections, secreting the aforementioned insulating sheath that surrounds them.

Answers: A: **Soma** B: **Axon** (accept nerve fibers, prompt on nerves) C: **Myelin sheath** D: **Schwann cells**

Tossup 9: Literature (Literature)

This expatriate poet influenced figures like T.S. Eliot and H.D.. Though his short poems such as "In a Station of the Metro" are frequently reproduced, he is perhaps best known for a long, unfinished work with which he himself remained unsatisfied. As that work's title suggests, it is an attempt to unite melody and poetry. Identify this frontman for the Imagist movement and author of The Cantos.

Answer: **Ezra Weston Loomis Pound**

Bonus 9: Math (Geometry)

Name these points related to triangles.

A: The intersection of the perpendicular bisectors of the sides, this is the center of a circle that goes through the triangle's three vertices.

B: The intersection of the three angle bisectors, this is the center of the largest circle that can fit inside the triangle.

C: The intersection of the three medians, this is the center of mass of the triangle.

D: The intersection of the three altitudes of the triangle, this center only lies within the triangle if the triangle has no obtuse angles.

Answers: A: **Circumcenter** B: **Incenter** C: **Centroid** D: **Orthocenter**

Tossup 10: Science (Physics)

For it to occur, the Coulomb barrier must be overcome so that nuclei come within one femtometer, at which point the strong interaction can overcome electromagnetic repulsion. This requires so much energy that it can probably only happen at very high temperatures, though some have claimed to observe it at room temperature. Usually occurring with hydrogen, it is also undergone by helium and even lithium. Name this nuclear process in which nuclei combine.

Answer: **Nuclear fusion** (*do not accept fission*)

Bonus 10: Literature (Literature)

Answer the following about Emily Dickinson.

A: She hails from what city in Massachusetts?

B: Many would claim that she had a favorite punctuation mark that appears an inordinate number of times in her poetry. Identify this mark, which is longer than a hyphen.

C: Within 15, how many poems did Dickinson write?

D: Because of her use of common meter, it is said that one is able to sing most of her poetry to the tune of what TV theme song?

Answers: A: **Amherst** B: **Dash** C: **1,789** (*accept anything between 1,774 and 1,804*) D: **Gilligan's Island**

HALFTIME

Tossup 11: Literature (Literature)

As in the other two parts, the last word of this canticle is "stelle," or "stars." Its author's guide is Beatrice, the perfect woman, modeled after a real woman he met in Florence. Instead of descending through terraces or circles, however, the author ascends through concentric spheres. After going through nine spheres, Beatrice leaves the author with Saint Bernard, who allows him to meet Jesus and Mary, and eventually, transcends existence and sees three rings representing God himself. Name this 33-canto work by Dante, the last section of The Divine Comedy.

Answer: **Paradiso** (accept Paradise, prompt on Heaven)

Bonus 11: Miscellaneous (Sports)

Given a description of a Big Ten basketball team, identify the team. Either school name or nickname will be accepted.

A: This team won the 1989 NCAA tournament, and are now coached by Tommy Amaker.

B: Alando Tucker is back to lead this team, who plays their home games at the Kohl Center.

C: High school senior Eric Gordon backed out of a verbal commitment to Illinois to sign with this school, which hired Kelvin Sampson this year.

D: Thad Matta has brought top recruits to this university, including Greg Oden, a likely lottery selection in the next NBA draft.

Answers: A: **Michigan Wolverines** (accept either half of name) B: **Wisconsin Badgers** (accept either half of name) C: **Indiana Hoosiers** (accept either half of name) D: **Ohio State Buckeyes** (accept either half of name)

Tossup 12: Math (Geometry) -- Computational (30 Seconds)

Find the area of a triangle with sides of length 4, 5, and 7. Instead of attempting to construct the triangle, it is much easier to use Heron's formula on the three side lengths, recognizing that the semiperimeter is 8.

Answer: **$4\sqrt{6}$ square units**

Bonus 12: Science (Chemistry)

Given the molecule CH₄, and assuming carbon has an atomic mass of 12, and hydrogen of 1, answer the following questions.

A: What is the mole fraction of hydrogen in that molecule?

B: What is the name of that molecule, a gas at standard temperature and pressure?

C: What is the mass of 11.2 liters of that gas, at standard temperature and pressure?

D: If one mole of it fully combusted in air, how many moles of oxygen would be consumed?

Answers: A: **$\frac{1}{4}$** (accept .25, 25%; do not accept answer if it has units) B: **Methane** C: **8 grams** D: **2 moles**

Tossup 13: Miscellaneous (Entertainment)

He attended Johns Hopkins University but was expelled for cheating. Following this, he went on to attend the University of Michigan, where he graduated with his M.D., specializing in infectious disease and nephrology. He had muscle in his right quadriceps removed due to it becoming necrotic after an infarction he had suffered. Like his inspiration, he has a drug addiction, and only has one good friend. While cocaine was the drug of choice for that inspiration, Sherlock Holmes, he instead is addicted to Vicodin. Identify this character, who espouses that "everybody lies" and is played by Hugh Laurie on the FOX drama that shares his name.

Answer: **Gregory House, M.D.**

Bonus 13: Fine Arts (Visual Art)

Identify these facts related to Louis Sullivan.

A: Sullivan helped design this 10-story St. Louis building.

B: This was the architect with whom Sullivan collaborated on the answer to Part A.

C: Along with Daniel Burnham, Sullivan was associated with this school of architecture.

D: Sullivan used this three word phrase to describe that a building should be designed with its intended use in mind.

Answers: A: **Wainwright Building** B: **Dankmar Adler** C: **Chicago School of Architecture** D: **Form follows function** (accept "Form ever follows function")

Tossup 14: Science (Chemistry) -- Computational (30 Seconds)

Write the following situation as a chemical equation, including both the reactants and the products. Don't include phases, but balance the equation with integer coefficients. The situation is, sodium metal is dropped into water. After the violent reaction is finished, you are left with a gas and a basic solution.

Answer: **2Na + 2H₂O -> 2NaOH + H₂** (order can be reversed as long as they stay on the correct side of the arrow; arrow can be read as "yields," "makes," etc.)

Bonus 14: Social Studies (Geography)

Name the capitals of the following countries. All the answers begin with the letter P.

A: Cambodia

B: Haiti

C: North Korea

D: Papua New Guinea

Answers: A: **Phnom Penh** B: **Port-au-Prince** C: **Pyongyang** D: **Port Moresby**

Tossup 15: Fine Arts (Music)

Writing it after his eighth symphony, its composer tried to avoid the "curse of the ninth" by not numbering it, instead subtitled it "a symphony for tenor, contralto, and large orchestra." In six movements all based on Chinese poetry, it starts with The Drinking Song of Earth's Misery, and ends with The Farewell, which is alone half the length of the entire piece. Name this unnumbered symphony by Gustav Mahler about our planet.

Answer: **The Song of the Earth** (accept *Das Lied von der Erde*)

Bonus 15: Science (Biology)

Name these terms related to intercellular transport.

A: The opposite of endocytosis, it occurs when molecules are released out of a cell's membrane.

B: This type of endocytosis means "cellular eating," and occurs when large particles are enveloped into the cell's membrane.

C: This type of endocytosis means "cellular drinking," and occurs when liquids are engulfed by cells.

D: All of these kinds of transport involve this type of membrane-bound compartment merging with the cell's outer membrane.

Answers: A: **Exocytosis** B: **Phagocytosis** C: **Pinocytosis** D: **Vesicle** (accept *vacuole*)

Tossup 16: Social Studies (Current Events)

He is from a town called Searchlight and was once caught on tape trying to strangle a person who tried to bribe him. He once referred to President Bush with the statement: "The man's father is a wonderful human being. I think this guy is a loser." Name this Senator from Nevada who is in the process of changing from the Senate Minority Leader to the Senate Majority Leader.

Answer: **Harry Reid**

Bonus 16: Math (Algebra)

Solve the following equations for x.

A: 2 to the quantity $x + 4$, equals 8 to the quantity $x - 1$.

B: 2 to the x equals 5 to the x.

C: $x^2 - 6x + 9 = 0$.

D: In radians, the smallest positive solution of sine of x equals cosine of x.

Answers: A: $x = \frac{7}{2}$ (3.5) B: $x = 0$ C: $x = 3$ D: $x = \frac{\pi}{4}$

Tossup 17: Science (Biology)

It requires calorimetry to measure directly, though Harris and Benedict derived equations to approximate it. For a typical Scholastic Bowl player, it might be somewhere around 1600 kilocalories per day. Regulated by the hypothalamus, much of it powers the liver and brain. Name this measurement of energy expenditure not including the sympathetic nervous division, the minimum number of calories necessary to maintain bodily processes.

Answer: **Basal metabolism rate** (accept *BMR*, accept *resting metabolism rate (RMR)*, prompt on *metabolism rate*)

Bonus 17: Literature (Literature)

Given the name of a trilogy, name the author. Some of them are considered trilogies even though additional books have been written.

A: The Foundation Trilogy

B: The Nova Trilogy

C: The USA Trilogy

D: The VALIS Trilogy

Answers: A: **Isaac Asimov** B: **William Seward Burroughs II** C: **John dos Passos** D: **Philip Kindred Dick**

Tossup 18: Math (Calculus) -- Computational (30 Seconds)

Find the average value of the sine of x plus the cosine of x, from x equals zero to x equals pi. To solve this problem, remember that the average value of a continuous function can be found by dividing the definite integral over the length of the interval.

Answer: **$\frac{2}{\pi}$**

Bonus 18: Social Studies (U.S. History)

Given a description, identify the famous assassin.

A: This man was on a mission to kill the seven most powerful rulers in the world; however, he wasn't able to kill anyone else after William McKinley.

B: This Palestinian immigrant became famous when, at the Ambassador Hotel, he shot Robert Kennedy.

C: This man, who couldn't obtain a government job, shot James Garfield at a train station.

D: There has been much debate over whether this man acted alone; however, there wasn't much time to ask him as Jack Ruby shot him on November 24th, 1963.

Answers: A: **Leon Czolgosz** (*CHO-guh-loash*; accept reasonable pronunciations) B: **Sirhan Bishara Sirhan** C: **Charles J. Guiteau** D: **Lee Harvey Oswald**

Tossup 19: Literature (Language Arts)

Winston Churchill supported its use, though critics said that his inspirational phrase "blood, toil, sweat, and tears," would be translated as "blood, hard work, eyewash and body water." Created in 1930, it is supposed to take only seven weeks to learn, and was intended as an international language which native English speakers could understand without needing to learn. Name this constructed language created by Charles Kay Ogden which consists of reduced grammar and 850 words.

Answer: **Basic English**

Bonus 19: Science (Astronomy)

Name these firsts in space.

A: The first American satellite in space.

B: The first animal in space.

C: The first American in orbit.

D: The first woman in space.

Answers: A: **Explorer I** (*prompt on Explorer*) B: **Laika** (*prompt on dog*) C: **John Glenn** D: **Valentina Tereshkova**

Tossup 20: Social Studies (World History)

John le Carré featured this thoroughfare in a few of his novels. This symbol of the Cold War was located at the intersection of Friedrich-strasse, Zimmer-strasse and Mauer-strasse. Today, there is a museum here, which struggles to keep a balance between what is viewed as an embarrassment and a tourist destination. Identify this crossing point on the wall between East and West Berlin that is named for the third letter in the NATO alphabet.

Answer: **Checkpoint Charlie**

Bonus 20: Literature (Literature)

Identify the following works and then answer a question about them.

A: D.H. Lawrence's novel about a mother's love for her children, and her disillusionment with her husband Walter Morel's career.

B: This novel by Richard Llewellyn tells the story of the Morgans, a poor family from South Wales.

C: Emile Zola's undisputed masterpiece, it follows Etienne Lantier and is named for a month of the French Revolutionary Calendar.

D: What profession do all three of these novels have in common?

Answers: A: **Sons and Lovers** B: **How Green Was My Valley** C: **Germinal** D: **Coal Mining** (*accept equivalents, prompt on mining*)

TIEBREAKERS/REPLACEMENTS:**Tossup 21: Science (Chemistry)**

They are usually categorized according to their precursors, like the isoquinoline group, which contains opiates, and the xanthine group, which contains caffeine and its metabolites. All contain nitrogen, often replacing carbon in ring structures. Pyridines, purines, and terpenoids are all types of what chemical family, defined as naturally-occurring amines, and whose name is related to the word for basic chemicals?

Answer: **Alkaloids** (*do not accept alkalines*)

Bonus 21: Literature (Literature)

Name the following terms or items from Brave New World.

A: This process allows a fertilized egg to bud into create anywhere from eight to ninety-six identical embryos.

B: This recreational drug allows users happiness with few side effects, though overdoses can lead to fatalities.

C: These recreational shows cater to the visual and auditory senses like our movies, but have advanced to encompass scent and touch as well.

D: This accessory, named after the economist and author of An Essay on the Principle of Population, holds necessary contraceptives.

Answers: A: **Bokanovsky's Process** B: **Soma** C: **Feelies** D: **Malthusian belt**



Ægis Questions

New Trier Varsity 2006

Round 5

Tossup 1: Social Studies (U.S. History)

Known as the "Lone Eagle", this man made advances in medicine, inventing the glass perfusion pump, which allows organs to be kept outside the body during surgery. Bruno Hauptmann is strongly linked to this man, Time magazine's first Man of the Year, as Hauptmann was convicted for the famous kidnapping and murder of this man's son. Identify this man, the first to pilot a solo non-stop flight across the Atlantic Ocean.

Answer: **Charles Augustus Lindbergh, Jr.**

Bonus 1: Literature (Language Arts)

Given a description, give the grammatical term that is being described.

A: It has a subject and a predicate, and forms part of a sentence or can stand alone, depending on whether it's independent or not.

B: A sequence of two or more words arranged in a grammatical construction and acting as a unit in a sentence.

C: It has a subject and a predicate, conveys a complete thought, and has a terminal punctuation mark.

D: A subject and a predicate that cannot stand alone and often answers the questions "Who?", "How?", or "Why?"

Answers: A: **Clause** B: **Phrase** C: **Sentence** D: **Adverbial Clause**

Tossup 2: Math (Algebra) -- Computational (30 Seconds)

Find the determinant of the following 3 by 3 matrix: First row 6, 5, 1, second row 0, 3, 2, third row 11, 10, 8. One way to find the determinant would be to expand by minors along the left column, realizing that the determinant is equal to 6 times the determinant of the bottom-right two-by-two matrix, plus 11 times the determinant of the upper-right two-by-two matrix. Using this or any other technique, find the determinant of the matrix.

Answer: **101**

Bonus 2: Science (Biology)

Given a taxonomic classification of the leopard, name whether it is a kingdom, phylum, class, order, family, genus, or species.

A: Chordata

B: Felidae

C: Mammalia

D: Panthera

Answers: A: **Phylum** B: **Family** C: **Class** D: **Genus**

Tossup 3: Literature (Literature)

He blames Southwark ale for any potential faults in his storytelling. The narrator who records his story apologizes in advance of the tale, asking the reader to "reflect a little, and don't hold me to blame/There's no sense making earnest out of game." His livelihood is made better by pressing his "golden thumb" down on scales of measured grain. Name this pilgrim with a large red wart on his nose from Chaucer's Canterbury Tales.

Answer: **The Miller**

Bonus 3: Social Studies (Other)

Name these systems of philosophy.

A: Started by Jeremy Bentham, this system holds that it is best to produce the greatest good for the greatest number of people.

B: Often criticized by Friedrich Nietzsche, this outlook states that human existence is without any purpose or value.

C: This related system based on the work of Soren Kierkegaard attempts to understand the purpose of human existence, but believes that there is a purpose.

D: This theory named after a Greek philosopher states that the greatest good is to seek moderate pleasure for one's self.

Answers: A: Utilitarianism B: Nihilism C: Existentialism D: Epicureanism

Tossup 4: Science (Chemistry) -- Computational (30 Seconds)

To the nearest gram, what is the gram equivalent mass of carbonic acid? One equivalent is the amount of acid required to produce one mole of hydrogen atoms in solution. Because carbonic acid is diprotic (*die-PRAH-tic*), this is equivalent to half a mole of carbonic acid.

Answer: 31 grams

Bonus 4: Literature (Literature)

Given a description, name the work by Edith Wharton.

A: This novel, whose title is taken from Ecclesiastes, contains the characters Lawrence Selden and Lily Bart.

B: This novel set in New York is about Ellen Olenska, May Welland, and Newland Archer.

C: This novel that Wharton was working on when she died is about young women debuting in London.

D: Set in Starkfield, this novel is about the title character and his wife Zeena, as well as Mattie Silver. The titular character and Mattie attempt to commit suicide by sledding into a tree, but they fail.

Answers: A: The House of Mirth B: The Age of Innocence C: The Buccaneers D: Ethan Frome

Tossup 5: Social Studies (Geography)

First recognized in 1843, it became the protectorate of Basutoland, finally gaining autonomy in 1965. After the Basotho National Party lost elections in 1970, they imprisoned the opposition and remained in power until a 1986 coup. But you don't need to hear the rest of their history. Name this African country of under 12,000 square miles, with capital at Maseru, with official languages of English and Sesotho, which is entirely contained within the country of South Africa.

Answer: Kingdom of Lesotho (*leh-SOO-doo*)

Bonus 5: Math (General)

Fully factor the following polynomials.

A: $x^3 - 6x^2 + 12x - 8$

B: $2x^2 - 9x - 5$

C: $x^2 + 5x + 6$

D: $3x^2 + 31x + 56$

Answers: (*accept quantities in any order*) A: $(x-2)^3$ B: $(x-5)(2x+1)$ C: $(x+3)(x+2)$ D: $(x+8)(3x+7)$

Tossup 6: Fine Arts (Music)

This Lithuanian was born in Maryland in 1937, and at age 15 entered the University of Chicago. He then studied at the Juilliard School of Music, and in France worked on the film score to Chappaqua with Ravi Shankar, before traveling to India and converting to Buddhism. His pieces use additive rhythms, and he calls it "theater music" though most other people call it something else. Name this composer of Strung Out, The Fall of the House of Usher, Music in Twelve Parts, and Einstein on the Beach, a three-and-a-half hour minimalist opera.

Answer: **Philip Glass**

Bonus 6: Science (Chemistry)

Name this laboratory equipment named after people or places.

A: You knew we were going to ask about this, a common laboratory heating device that burns a steady stream of flammable gas.

B: Also known as a conical flask, this flask has a flat bottom, and unlike a beaker, tapers up to a narrow neck.

C: Also known as a boiling flask, this flask is often spherical at the bottom with a long neck, and is named after an Italian town, not a woman's first name.

D: This glassware is used to separate any compound from a solid by dissolving it in a solvent.

Answers: A: **Bunsen burner** B: **Erlenmeyer flask** (*prompt on flask*) C: **Florence flask** (*prompt on flask*) D: **Soxhlet extractor**

Tossup 7: Science (Biology)

Based on the mean corpuscular volume, it can be macrocytic, caused by low B vitamin intake or a so-called "pernicious" condition that prevents B vitamin absorption. It can also be microcytic, caused by low iron intake, or special conditions like sickle-cell disease. Another variety is normocytic, caused by acute blood loss. All of these lead to hypoxia and possibly faintness or more serious problems. Name this condition, from the Greek for "without blood," a deficiency in red blood cells.

Answer: **Anemia**

Bonus 7: Social Studies (U.S. History)

Identify these facts related to the Cuban Missile Crisis.

A: It occurred during this year, which was during JFK's presidency.

B: The Soviet Union placed missiles in Cuba partly because of this failed American invasion of Cuba.

C: This man was the Soviet premier during the Crisis.

D: The flights of these types of spy planes were instrumental in receiving information about the situation; the most famous flight of one, thought it was not over Cuba, was by Gary Powers.

Answers: A: **1962** B: **Bay of Pigs Invasion** C: **Nikita Sergeevich Khrushchev** D: **Lockheed U-2** (*prompt Dragon Lady*)

Tossup 8: Miscellaneous (Technology)

First standardized in 1963, its less common codes include Shift Out, Vertical Tab, and Form Feed. In total, it has 33 control characters and 95 printable characters, starting with Null and ending with tilde. Name this common way to represent English characters in computer text files, a text encoding scheme which is currently being superseded by Unicode.

Answer: **ASCII** (*accept "American Standard Code for Information Interchange"*)

Bonus 8: Fine Arts (Visual Art)

Given a description of a Northern European artist, name him.

A: This painter of "Girl With a Pearl Earring" spent much of his life in Delft.

B: This father of a painter with the same name painted "The Tower of Babel."

C: This Flemish painter developed oil painting, and painted such works as "The Arnolfini Portrait."

D: This 20th century painter is known for his mathematical related works, including "Drawing Hands."

Answers: A: **Jan Vermeer** B: **Pieter Brueghel the Elder** (*prompt on Brueghel*) C: **Jan Van Eyck** D: **M(aurits) C(ornelis) Escher**

Tossup 9: Math (Calculus) -- Computational (30 Seconds)

Calculate the limit, as h approaches zero, of three to the power of the quantity three plus h, close quantity, minus 27, all divided by h. Because this limit is of the form zero over zero, you can evaluate it using l'Hopital's rule, or alternatively, by recognizing that it is the limit definition of a derivative.

Answer: **27 ln 3** (*27 times the natural log of 3*)

Bonus 9: Science (Earth Science)

Identify these terms related to glaciers.

A: There are two main categories of glaciers, the continental type, and this type found near mountains.

B: As a glacier moves, it leaves behind this, a name for glacial sediment.

C: From the Welsh for "valley," this three letter word refers to a curved region with a lip formed by glacier movement.

D: Glaciers can also form curved hills, called this from the Gaelic for "hill crest."

Answers: A: **Alpine glacier** B: **Moraine** C: **Cwm** (*pron. coom*) D: **Drumlin**

Tossup 10: Literature (Mythology)

It is sometimes lent to Athena, and in rare cases to Apollo. In the Iliad, Apollo uses it to push the Achaeans back to their ships prior to reviving the wounded Hector. In some stories it is made from the flayed skin of various defeated enemies, both of Athena and of Zeus. This awful to behold item is sometimes described as adorned with golden tassels and a likeness of a gorgon in the center of it. Identify this protective item, which, as a shield, features into an epithet of Zeus in the Iliad, and according to Homer was forged for him by Hephaestus.

Answer: **Aegis**

Bonus 10: Miscellaneous (Other)

Identify the following webcomics.

A: This is arguably the most famous webcomic, featuring dialogue rife with vulgarities, cracks about the video game industry, and characters Gabe and Tycho.

B: This is another very popular webcomic, produced by Fred "Piro" Gallagher, who draws it in the style of a Japanese manga.

C: Written by Scott Kurtz, this comic is about a magazine publishing company, and features characters Brent, Jade, Cole, Francis and Skull the Troll.

D: It is a gaming related webcomic and animated series written by Tim Buckley, known online as Absath. It is named for an unpopular computer keyboard shortcut.

Answers: A: **Penny Arcade** B: **Megatokyo** C: **PvP or Player vs. Player** D: **Ctrl+Alt+Del** (*"Control Alt Delete"*)

HALFTIME

Tossup 11: Science (Biology)

Though a fairly common process, the ethidium bromide dye and acrylamide medium it often uses are both toxic, and require special handling. This process can separate any molecules by size, though it is typically used on negatively-charged restriction fragments of DNA. Name this method of comparing DNA fragments that generates several columns of fluorescent bands called DNA ladders.
Answer: **Gel electrophoresis** (accept DNA electrophoresis)

Bonus 11: Math (Algebra)

Compute the following sums.

A: The sum from $x = 1$ to $x = 101$, of the cosine of πx .

B: The sum of the first ten perfect squares.

C: The sum of the first five prime numbers.

D: The sum of the first hundred natural numbers.

Answers: A: **-1** B: **385** C: **28** D: **5050**

Tossup 12: Literature (Literature)

Under the contract of its production, no film adaptation can be made of this play until the West End production of it has been closed for at least six months. This performance has been running non-stop since November 25, 1952, making it the longest continuously running play anywhere. In it, the characters become snowed in to a new hotel converted from the old Monkswell Manor. Detective Sergeant Trotter arrives on skis to tell the guests that he believes a murder may be on his way to the hotel. Following the subsequent murder of Mrs. Boyle, one of the guests, it is obvious that the murderer is already there. Identify this play, at the conclusion of which, by tradition, the audience is asked not to reveal the murderer to anyone outside the theatre and which is Agatha Christie's most famous.

Answer: **The Mousetrap**

Bonus 12: Fine Arts (Music)

Identify each of the following instruments as single-reed, double-reed, or no-reed.

A: Clarinet

B: French horn

C: English horn

D: Bassoon

Answers: A: **Single reed** B: **No reed** (accept zero, etc) C: **Double reed** D: **Double reed**

Tossup 13: Math (Geometry) -- Computational (30 Seconds)

Find the diameter of a right circular cylinder with a volume of 250 over π , and a base circumference equal to its height. To solve this problem, you need to realize that $\pi r^2 h$ equals 250 over π , and that the base circumference and height are equal to π times the diameter, or $2\pi r$. With these considerations, you should be able to easily find the radius or height, by which you can solve for the diameter of the cylinder as required by this question.

Answer: **10 over pi**

Bonus 13: Science (Physics)

All scientists know that imperial units are pretty awful. Given a non-SI unit, state the physical quantity it measures.

A: Slug

B: Pound

C: Pole

D: Kenning

Answers: A: **Mass** (do not accept weight) B: **Force** (accept weight, do not accept mass) C: **Length** (accept distance) D: **Volume**

Tossup 14: Miscellaneous (Interdisciplinary)

The letter's the same. The ticker symbol for U.S. Steel Corporation, the symbol used in chemistry to designate a generic halogen, the symbol for birth and death in Kabbalah, a windowing system for Posix systems, the symbol for 50-proof alcohol, the prefix of experimental U.S. aircrafts, the surname of members of the Nation of Islam, the first letter of a two-letter Coldplay album, the repetition operator in Perl, a measurement of optical disc drive speeds, an abbreviation for the prefixes "trans," "cross," and "Christ," and the female chromosome in the human sex-determination system. Name this letter.

Answer: **X**

Bonus 14: Literature (Literature)

Given a description, identify the work by Tennessee Williams.

A: In this play set in Mexico, a former Priest-turned-tour bus driver named Shannon is accused of raping a teenager.

B: Many people, including Brick Pollitt, are vying for the fortune of Big Daddy Pollitt in this Williams play.

C: Tom and Laura Wingfield are main characters in this play about a group of prized possessions that includes a unicorn.

D: In this play, Blanche DuBois is raped by Stanley Kowalski.

Answers: A: **Night of the Iguana** B: **Cat on a Hot Tin Roof** C: **The Glass Menagerie** D: **A Streetcar Named Desire**

Tossup 15: Social Studies (World History)

In 1810, this man joined Chilean nationalist rebels fighting for independence from Spain. The rebels were defeated in 1814, but 1817 they went back on the offensive defeating the Spanish with the help of Argentine general José de San Martín. Name this liberator and first head of state of Chile, a man with an unusual name due to his joint Spanish and Irish heritage.

Answer: **Bernardo O'Higgins**

Bonus 15: Math (Geometry)

Find the volumes of the following cubes.

A: The cube whose circumscribed sphere has a surface area of 48 pi square inches.

B: The cube whose inscribed sphere has a volume of 8 pi cubic inches.

C: The cube whose great diagonal has a length of root 147 inches.

D: The cube whose total length of edges equals 60 inches.

Answers: (accept "inches cubed" for "cubic inches", prompt for units) A: **64 cubic inches** B: **48 cubic inches** C: **343 cubic inches** D: **125 cubic inches**

Tossup 16: Fine Arts (Visual Art)

The garden in front of it contains a bronze statue that honors Dmitry Pozharsky and Kuzma Minin, two military heroes of The Time of Troubles. This building was first commissioned by Ivan the Terrible to commemorate the capture of Kazan. Legend dictates that Ivan had the architect, Postnik Yakovlev, blinded so that he could never create a more magnificent building for anyone else. Identify this colorful cathedral that consists of nine chapels united by a single central tower that stands right next to the Kremlin.

Answer: **Cathedral of St. Basil the Blessed** or **St. Basil's Cathedral** (also accept *The Cathedral of Intercession of the Virgin on the Moat*)

Bonus 16: Social Studies (World History)

Identify these facts related to the vikings.

A: This colorful man was exiled from Iceland because of his supposed connection to some murders.

B: The answer to Part A founded a colony on this island, the largest in the world.

C: This man, the son of the answer to Part A, is thought to have been the first European to enter the Americas.

D: The answer to Part C landed in what is now this Canadian province.

Answers: A: **Erik the Red** (prompt on Eric) B: **Greenland** C: **Leif Ericson** D: **Newfoundland**

Tossup 17: Math (Other)

This term was first introduced by the Smalltalk programming language in the 1970s, which also introduced many of its key features, like inheritance. Polymorphism and encapsulation through message passing are other features found in most implementations. Name this programming paradigm used by the dot NET framework and Java, which supports methods, classes, and the namesake type of class instance.

Answer: **Object Oriented Programming** (accept OO, OOP; prompt "object")

Bonus 17: Miscellaneous (Sports)

Name the following athletes born on November 18th.

A: This quarterback's record of 70,553 passing yards, combined between the NFL and CFL, was surpassed in September 2006. He was elected to the NFL Hall of Fame as a Seattle Seahawk in 2006.

B: This pitcher was drafted by the Chicago Cubs in 1984, and was traded, along with Rafael Palmeiro, to the Texas Rangers in 1988. He has won over 200 games and currently pitches for Philadelphia.

C: This University of Maryland basketball player was drafted second overall by the Boston Celtics in 1986, but tragically died of a drug overdose less than two days after the draft.

D: This baseball player was released by the Minnesota Twins after the 2002 season, and signed with the Boston Red Sox. He has been a perennial MVP candidate, regardless of his position as a designated hitter.

Answers: A: **Warren Moon** B: **Jamie Moyer** C: **Len Bias** D: **David Ortiz** (prompt on "Big Papi")

Tossup 18: Social Studies (U.S. History)

In 1856, two years after a namesake act that repealed the Missouri Compromise, this state was the site of John Brown's Pottawatomie Massacre that killed five people that were pro-slavery. The LeCompton Constitution, which supported slavery, was not passed by this state, and in 1861 it entered the union as free state. Name this "bleeding" state, whose capital city's Board of Education lost a landmark 1954 Supreme Court case to Oliver Brown.

Answer: **Kansas**

Bonus 18: Literature (Literature)

Given a character, name the Jane Austen heroine he married.

A: Colonel Brandon

B: Mr. Knightley

C: Captain Wentworth

D: Edward Ferrars

Answers: A: Marianne Dashwood B: Emma Woodhouse C: Anne Elliot D: Elinor Dashwood

Tossup 19: Science (Chemistry)

Four standard chemical quantities are this, including osmotic pressure. Another is vapor pressure, because Raoult's law depends on the mole fraction of each component of a solution. Name this type of chemical property of solutions, the other two being boiling-point elevation and freezing-point depression, that depend only on the molality (*moh-LAL-i-tee*) of solute particles in the solution.

Answer: Colligative

Bonus 19: Math (Calculus)

$f(x)$ (*f of x*) is an odd function. If its definite integral from 0 to 5 is 2, from -2 to 5 is 7, and from 1 to 5 is 4, then find the following.

A: The definite integral of $f(x)$ from 0 to 1.

B: The definite integral of $f(x)$ from 2 to 5.

C: The definite integral of $2f(x)$ from 1 to 5.

D: The definite integral of $f(x-1)$ from 2 to 3.

Answers: A: -2 B: 7 C: 8 D: -3

Tossup 20: Literature (Literature)

This man's father was murdered by his serfs after he was cruel towards them. His first work was the praised "Poor Folk," though he is more famous for other works, including one about Prince Myshkin, an idiot. Another of his works told the story of three brothers, while his most famous novel was about a student named Raskolnikov (*rass-CAWL-nih-kov*). Name this author of the Brothers Karamazov (*kehr-uh-MAH-zov*) and Crime and Punishment.

Answer: **Fyodor Mikhailovich Dostoyevsky** (*accept Fedor Dostoevsky*)

Bonus 20: Social Studies (Current Events)

On November 1, 2006, a former Russian intelligence officer suddenly fell ill from an apparent case of poisoning.

A: Name this Russian dissident who died on November 23 amidst worldwide media coverage.

B: He fell ill from radiation poisoning after ingesting the radioactive 210 isotope of this element.

C: He was previously a lieutenant-colonel in this Russian security organization, the modern successor to the KGB.

D: Formerly Eastern Orthodox, during his illness he converted to this religion, and reportedly asked for burial rites in the same tradition.

Answers: A: **Alexander Litvinenko** B: **Polonium-210** C: **FSB** D: **Islam**

TIEBREAKERS/REPLACEMENTS:**Tossup 21: Literature (Literature)**

With Dave Barry and Stephen King, she is a member of the literary garage band Rock Bottom Remainers. She is an outspoken advocate for patients with Lyme disease, with which she was diagnosed in 1999. Her complicated relationship with her own mother led her to write such novels as *The Bonesetter's Daughter* and *The Kitchen God's Wife*. Name this Chinese-American author of *The Joy Luck Club*.

Answer: **Amy Tan**

Bonus 21: Math (Geometry)

Find the degree measure of an interior angle of each of the following regular polygons.

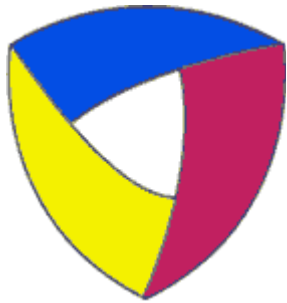
A: Nonagon

B: Dodecagon

C: 20-gon

D: 75-gon

Answers: A: **140 degrees** B: **150 degrees** C: **162 degrees** D: **175.2 degrees** (*accept 876/5*)



Ægis Questions

New Trier Varsity 2006

Round 6

Tossup 1: Social Studies (World History)

Born Tafari Makonnen, his father was the governor of Harar, and died when he was only 13. At age 19, he inherited the post, and in 1928, at age 36, was crowned king by Empress Zewditu. Selected by Time Magazine in 1935 as Man of the Year, five years after receiving his final post, only one year later, Italy invaded his country, and he was sent into exile. Name this man who Rastafarians consider God incarnate, who acted as Emperor of Ethiopia from 1930 until 1974.

Answer: **Emperor Haile Selassie I**

Bonus 1: Literature (Literature)

Identify the following about a short story.

A: In this short story, two people, Bill Driscoll and the narrator, try to raise money for a town-lot scheme through the title action.

B: The father of the title figure, whom the narrator calls "respectable and tight" and "a mortgage fancier."

C: The title event takes place in and right outside this Alabama town.

D: At the end, the two main characters end up forking over how much money?

Answers: A: **The Ransom of Red Chief** B: **Ebenezer Dorset** (*accept Dorset*) C: **Summit** D: **\$250**

Tossup 2: Math (Geometry) -- Computational (30 Seconds)

How many sides does a regular polygon have, if each internal angle measures 171 degrees? This problem is easiest if you recall that the external angles of the polygon must add up to 360 degrees, that there is one external angle per side, and that each external angle is supplementary to an internal angle.

Answer: **40**

Bonus 2: Science (Astronomy)

Name these comets.

A: In 1994, this comet collided with Jupiter.

B: Seen every 75 years, Mark Twain was born and died in years that this comet passed by Earth.

C: This very bright comet with a hyphenated name is sometimes known as "The Great Comet of 1997," for the last time it passed by Earth.

D: Also known as "The Great Comet of 1996," this comet is named after the Japanese amateur astronomer who discovered it.

Answers: A: **Shoemaker-Levy 9** B: **Halley('s) comet** C: **Hale-Bopp** D: **Hyakutake**

Tossup 3: Literature (Literature)

Scholars have noted that the form of this 1889 poem, one short line following a longer line, actually mimics the content of the poem. The wavelike nature of that form is very appropriate for this poem, which is largely considered to be composed as the author's own elegy, as the poem has a tone of finality about it. Identify this poem, an extended metaphor comparing death to traversing a sandbar, that traditionally closes out any anthologized versions of Alfred, Lord Tennyson's poetry.

Answer: **Crossing the Bar**

Bonus 3: Social Studies (U.S. History)

Given the campaign slogan, name the man who used it.

A: "He kept us out of war."

B: "I like Ike."

C: "A Chicken in every pot. A car in every garage."

D: "Are you better off now than you were four years ago?"

Answers: A: **Woodrow Wilson** B: **Dwight David Eisenhower** C: **Herbert Hoover** D: **Ronald Reagan**

Tossup 4: Science (Chemistry)

A silver-gray metal, its 99m isomer undergoes beta decay with a half-life of 6 hours. It is used extensively in nuclear medicine to image the circulatory system, spleen, and damaged heart tissue. First synthesized by Emilio Segré and Carlo Perrier in 1937, it only exists naturally on Earth as a product of uranium fission. Name this chemical element with atomic number 43, the lightest synthetic element.

Answer: **Technetium**

Bonus 4: Literature (Literature)

Many literary works have identical or similar titles. Answer the following from the descriptions that are given.

A: A play by Lillian Hellman or a poem by Henry Wadsworth Longfellow

B: A narrative by Geoffrey Chaucer or a play by William Shakespeare

C: A short story by Ray Bradbury or a poem by Walt Whitman.

D: A play by Sophocles or a play by Jean Anouilh (*zhawn ahn-oo-EEL*)

Answers: A: **The Children's Hour** B: **Troilus and Cressida** (also accept *Troilus and Criseyde*) C: **Sing the Body Electric** D: **Antigone**

Tossup 5: Social Studies (Other)

This term was coined by Jude Wanniski, a reporter for the Wall Street Journal, after he heard it explained to him in 1974 by its inventor, who supposedly sketched it on a napkin. Demonstrating the concept of taxable income elasticity, it depicts that there exists an optimum tax rate to maximize government revenue. Name this economic graph named after the man credited with its invention, a curve central to the theory of supply side economics.

Answer: **Laffer curve**

Bonus 5: Math (General)

Name the following concepts in mathematics related to prime numbers.

A: This conjecture states that every even integer greater than 2 can be written as a sum of two primes.

B: This algorithm named after a Greek mathematician is one way to find prime numbers by crossing off all numbers that are multiples of prime numbers, and thus are composite.

C: This conjecture states that there are infinitely many primes that are two greater than another prime number.

D: According to the prime number theorem, the chance of N being prime is approximately one over this function of N.

Answers: A: **Goldbach conjecture** B: **Sieve of Eratosthenes** C: **Twin prime conjecture** D: **Natural log** (accept "ln")

Tossup 6: Fine Arts (Music)

Give the first three syllables in order. They originally came from the first syllables in each phrase of the chant "Ut queant laxis." Later, the first was changed from "ut" to become more singable, and "ti" was added to the end. Known formally as the solfege (*SOHL-fej*) system, give the first three syllables of this system assigning a syllable to each note of the diatonic scale, the first of which doesn't actually mean "a female deer."

Answer: **Do re mi**

Bonus 6: Science (Biology)

Answer these questions about plant physiology.

A: This nonporous strip in the roots forces water and minerals to diffuse through cell membranes, filtering what is allowed into the plant.

B: These channels of dead cells carry water from the roots up to the leaves.

C: Because trees cannot pump water up their trunks, water is pulled up by this process after it evaporates from stomata.

D: These channels carry nectar up and down the trunk using osmotic pressure.

Answers: A: **Casparian strip** B: **Xylem** C: **Transpiration** D: **Phloem**

Tossup 7: Science (Earth Science)

They are chosen from six different lists that are rotated in six-year cycles. Every letter is used except for Q, U, X, Y, and Z. Each list alternates genders; three begin with male names and three with female names. Though these lists have been used since 1979, many names have been replaced, such as Katya replacing Katrina in 2005. Name this weather phenomenon that gets names like Chris, Alberto, Andrew, and Floyd.

Answer: **Hurricane names**

Bonus 7: Social Studies (U.S. History)

Answer the following questions about Francis Scott Key and the writing of our national anthem:

A: Key was inspired to write the lyrics while witnessing a battle during this war.

B: The poem he wrote was titled "The Defense of" this Fort which was being bombarded by the British.

C: Key observed the battle from the deck of this British ship.

D: This U.S. president, in 1931, signed the bill making the "Star Spangled Banner" the American national anthem.

Answers: A: **War of 1812** B: **Fort McHenry** C: **HMS Tonnant** D: **Herbert Hoover**

Tossup 8: Miscellaneous (Entertainment)

You only need to give the first three words. This seven-word phrase was rediscovered in 1999 by OverClocked ReMix, a website that tries to preserve old video game music. It was first penned by translators of the 1989 Japanese arcade game Zero Wing. In the introductory cut scene, a cyborg appears to the crew of a ship, informing them that the CATS organization has taken over their entire base, though it doesn't come out quite that way. Name the noun phrase that he says instead, sparking the creation of a Flash animation and subsequent internet craze, by making the boast that it, quote, "are belong to us."

Answer: **All your base are belong to us** (*do not accept grammatical alternatives*)

Bonus 8: Fine Arts (Visual Art)

Given the work of art, identify the location where the painting or sculpture can currently be found.

A: Venus de Milo, by Alexandros of Antioch

B: The Night Watch, by Rembrandt Harmenszoon van Rijn

C: Pietà, by Michelangelo

D: Las Meninas, by Diego Velázquez

Answers: A: **The Louvre** B: **Rijksmuseum** C: **St. Peter's Basilica** D: **Museo del Prado**

Tossup 9: Math (Algebra) -- Computational (30 Seconds)

You have the polynomial $x^3 + 6x^2 - 14x + 16$. You want to find the one real root of this equation, and you know that $1 + i$ is a root. Because taking out a single complex factor would result in imaginary coefficients, this problem would be easier to solve using the fact that the conjugate of $1 + i$ must also be a solution. Perhaps easiest, however, is to realize the product of the two complex roots is two, and that you can easily figure out the product of all three roots. No matter how you do it, what is the real root of the polynomial?

Answer: **-8**

Bonus 9: Science (Chemistry)

Give the formulas, without charges, of the following polyatomic ions.

A: Permanganate

B: Iodate

C: Dichromate

D: Cyanate

Answers: A: **MnO4** B: **IO3** C: **Cr2O7** D: **OCN**

Tossup 10: Literature (Literature)

Meaning "behold the man," it was first spoken by Pontius Pilate of Jesus. Napoleon supposedly said a French translation of the phrase when meeting Goethe. Also the title of a book, subtitled "How One Becomes What One Is," it contains sections called things like "Why I Am So Wise" and "Why I Write Such Good Books." It was the last book written by its philosopher author before he went insane, dying in 1900. Name this book explaining how significant its author was, written by the German philosopher Friedrich Nietzsche.

Answer: **Ecce Homo**

Bonus 10: Miscellaneous (Interdisciplinary)

Answer the following questions about valleys of death.

A: In what book of the Bible will you find the line "Yea, though I walk through the valley of the shadow of death, I will fear no evil"?

B: What national park is seventy-six miles east of the highest point in the continental U.S., Mount Whitney?

C: In what poem will you find the lines, "Into the valley of Death / Rode the six hundred"?

D: What 1995 rap song begins with "As I walk through the valley of the shadow of death / I take a look at my life and realize there's nothing left"?

Answers: A: **Psalms** (accept *Psalm 23*) B: **Death Valley** C: **The Charge of the Light Brigade** D: **Gangsta's Paradise**

HALFTIME

Tossup 11: Literature (Language Arts)

A few alphabetic ones have been created, though the most famous ones are geometric, like Boyd and Pitman, script like Gabelsberger, or ellipse-based, like Thomas, Teeline, and Gregg. Also called brachygraphy, this method simply indicates vowel and consonant sounds, often doing so with squiggles with lines intersecting them. Name this class of writing systems that can allow taking notes at over 300 words per minute, which are often used by court reporters.

Answer: **Shorthand systems** (*accept stenography*)

Bonus 11: Social Studies (World History)

Answer these questions about Carthage.

A: The ancient city of Carthage is located in this present-day North African capital.

B: Carthage was formed by colonists from this Phoenician city-state off the coast of modern day Lebanon, which was besieged by Alexander the Great in 332 B.C.

C: Name this mythical founder of Carthage, who commits suicide after Aeneas leaves her in The Aeneid.

D: Name the victorious Roman general who defeated Hannibal at the previously mentioned battle.

Answers: A: **Tunis** B: **Tyre** C: **Dido** D: **Scipio Africanus**

Tossup 12: Science (Biology)

Invented by Peter Mitchell in 1961, this theory explains how ATP synthase is powered. The electron transport chain pumps protons into the intermembrane space of the mitochondria, causing this type of potential to build up, and the energy they generate when rushing back into the matrix powers phosphorylation. Name this type of electrochemical potential energy likened to a concentration gradient.

Answer: **Chemiosmosis** (*prompt on proton gradient*)

Bonus 12: Math (Calculus)

Identify these theorems from calculus that apply to a function $f(x)$ (f of x), that is continuous on the interval a to b .

A: If d is between $f(a)$ and $f(b)$, there must be a value c between a and b such that $f(c)$ equals d .

B: There must be a value c between a and b such that f prime of c is equal to the slope of the secant line from $f(a)$ to $f(b)$.

C: If $f(a)$ equals $f(b)$, there must be a value c between a and b such that f prime of c equals zero.

D: If $f(x)$ is smooth, it can be expressed by a polynomial of infinite degree, centered around any point.

Answers: A: **Intermediate Value Theorem** B: **Mean Value Theorem** C: **Rolle's Theorem** (*prompt on Mean Value Theorem*) D: **Taylor's Theorem**

Tossup 13: Social Studies (U.S. History)

The defendant in this case had originally been a postmaster in Cherokee territory, so the governor of Georgia had him removed from that post so he could be arrested. He had violated a law that stated any white person had to have a license to live on Indian territory; however, if he had applied for a license it is unlikely he would have been granted one. In its decision, the Supreme Court mandated that the federal government could protect Native Americans from state governments. Name this 1832 case which is rumored to have prompted President Jackson to say, "John Marshall has made his decision; now let him enforce it!"

Answer: **Worcester v. Georgia** (*Pronounced WOR-ster; accept reasonable pronunciations*)

Bonus 13: Literature (Literature)

Given a description, name the work by Franz Kafka.

A: This novella is about how Gregor Samsa turns into a bug.

B: Karl Rossman comes to the United States in this novel.

C: This novel is about how Josef K. goes through the titular process.

D: A surveyor named K. travels to the title structure.

Answers: A: **Metamorphosis** B: **Amerika** (accept *The Stoker*) C: **The Trial** D: **The Castle**

Tossup 14: Math (Calculus) -- Computational (30 Seconds)

Find dy over dx for the equation y squared minus x squared equals two y . To find this derivative, you have to use implicit differentiation, applying the chain rule on the y terms, and then solving for dy over dx .

Answer: **$x / (y-1)$** (x over the quantity y minus one; accept $\pm \sqrt{y^2-2y}$ or $1 \pm \sqrt{x^2+1}$)

Bonus 14: Miscellaneous (Technology)

Name these web browsers other than Internet Explorer.

A: The most popular alternative browser, this browser by the Mozilla Foundation is currently at version 2.0.

B: Based on code from the Mozilla Foundation but independently developed, this browser is native to Mac OS 10. It is currently at version 1.0.3.

C: Currently at version 9.02, this web browser is developed by a company based in Norway. They have partnered with Nintendo to create versions of their browser for several recent Nintendo consoles.

D: Developed by Apple Computer, this browser currently at version 2.0.4 is bundled with Mac OS 10.

Answers: A: **Mozilla Firefox** B: **Camino** C: **Opera** D: **Safari**

Tossup 15: Fine Arts (Visual Art)

The first modern patent is thought to have been given to this Italian architect, for his design of a vessel that would be used to carry loads down a river. Throughout his life, he had a bitter rivalry with fellow sculptor Lorenzo Ghiberti, which included losing in a competition to create the second set of bronze doors for the baptistry of the cathedral in Florence, which eventually was called the "Gates of Paradise". Often credited with inventing linear perspective, name this architect who is most famous for his work on the Duomo in Florence.

Answer: **Filippo Brunelleschi**

Bonus 15: Social Studies (Other)

Name these economists.

A: This economist coined the term "conspicuous consumption" in his 1899 book, "The Theory of the Leisure Class."

B: This Canadian-born economist that died in 2006 coined such terms as "conventional wisdom" in his 1958 book, "The Affluent Society."

C: This American economist and prominent monetarist also died in 2006.

D: This 2006 winner of the Nobel Peace Prize founded the Grameen Bank and created the concept of "micro-lending."

Answers: A: **Thorstein Veblen** B: **John Kenneth Galbraith** C: **Milton Friedman** D: **Muhammad Yunus**

Tossup 16: Social Studies (Current Events)

This House Committee has been chaired by Pete Hoekstra, and it will soon be led by Silvestre Reyes. Reyes was chosen ahead of Jane Harman and Alcee Hastings. Its Subcommittees include Oversight and Terrorism, and it deals with issues involved in the collecting of information. Name this Committee that has been criticized because it did not challenge the contention that Iraq was building Weapons of Mass Destruction.

Answer: **Permanent Select Committee on Intelligence**

Bonus 16: Math (Other)

Name these terms from programming related to special areas of computers.

A: This term refers to a program that runs non-native programs as if it were another type of computer.

B: Java programs are able to run on many operating systems because Java runs programs through this sort of environment that acts like a platform-independent false computer.

C: Programmers like to play around, and, like small children, can do so in this sort of environment that isolates potentially dangerous code. One can be found on Wikipedia.

D: Sometimes systems are isolated and set up to intentionally attract hackers. They are given this name, because, like Winnie the Pooh, hackers get in trouble trying to get them.

Answers: A: **Emulator** B: **Virtual machine** (accept "virtual environment") C: **Sandbox** D: **Honeypot**

Tossup 17: Miscellaneous (Sports)

After receiving the pull, the handler might huck to someone deep down the field, or might throw to someone cutting in off of the stack, or if they are unable to break their mark, they might throw to their dump. Players who play this sport are sometimes called flatballers, and are generally some of the nicest people you might meet. Many attribute this to "The Spirit of the Game" which encompasses the principles of fair play, sportsmanship, and joy of play that all players abide by. This includes calling one's own fouls and penalties, while working them out with the player who committed them. Identify this sport, in which the 175 gram Ultra-Star is the only object sanctioned for championship play by the UPA and is surprisingly, not made by Wham-O.

Answer: **Ultimate Frisbee**

Bonus 17: Literature (Mythology)

Name these locations from Norse mythology.

A: Humans live in this world, surrounded by an impassable ocean.

B: Gods live in this world separate from the human world.

C: The rainbow bridge, it connects the world of the humans with the world of the gods.

D: The World Tree, it is thought to connect all nine worlds.

Answers: A: **Midgard** B: **Asgard** C: **Bifrost** D: **Yggdrasil**

Tossup 18: Math (General)

He moved to St. Petersburg in 1727, and after Daniel Bernoulli left, became the head of the local academy's mathematics department. Losing sight in his right eye in 1735, he was rendered completely blind by a cataract in his left. He remained productive afterwards, however, because of his phenomenal memory, which allowed him to recite the Aeneid from heart. Name this mathematician, the inventor of modern function notation and the calculus of variations, discoverer of the power series for arctangent and e, and Swiss namesake of the identity that zero equals one plus e to the i pi.

Answer: **Leonhard Euler**

Bonus 18: Science (Chemistry)

Give the name, not the formula, of the chemical that makes up each of the following four common household products.

- A: Baking soda
- B: Epsom salt
- C: Nail polish remover
- D: Borax

Answers: A: **Sodium bicarbonate** (accept sodium hydrogen carbonate) B: **Magnesium sulfate heptahydrate** C: **Acetone** (accept propanone) D: **Hydrated sodium tetraborate** (may be followed by "decahydrate" or "pentahydrate", but not necessary)

Tossup 19: Literature (Literature)

Scholars now point to its scribe as being Adam Pinkhurst, based on the lettering of an oath signed by him. Currently located in the Huntington Library of San Marino, California, it began to be assembled by the Lord Chancellor, Sir Thomas Egerton and Viscount Brackley. Following his death, it continued to be added to by his descendants. Its illustrations are much more elaborate than those of its companion, the Hengwrt. Identify this early 15th century manuscript of Chaucer's The Canterbury Tales.

Answer: **Ellesmere Manuscript of Chaucer's Canterbury Tales**

Bonus 19: Fine Arts (Music) -- Three Parts

Name these three Czech composers.

- A: Most famous for his Ninth Symphony, "From the New World," he is also known for the opera Rusalka and his second cello concerto.
- B: A Czech nationalist, he is famous for his comedic opera "The Bartered Bride," and a set of symphonic poems titled "Ma Vlast," or "My Country."
- C: Other than Bohuslav Martinu (*MAR-teen-oo*), this Czech composer is pretty much the only other one anyone knows about. He is mainly known for his operas, especially Jenufa and The Cunning Little Vixen.

Answers: A: **Antonin Dvořák** (*d'VOR-zhak*) B: **Bedrich Smetana** C: **Leos Janáček** (*yuh-NAH-check*)

Tossup 20: Science (Physics)

Carbon-13 is, though carbon-12 and carbon-14 are not. Photons and gluons are not, though leptons and quarks are. In general, an even number of these particles together is a boson, but an odd number together remains one of this type of particle. Because their wavefunctions are antisymmetric, they obey Fermi-Dirac statistics rather than Bose-Einstein, and therefore obey the Pauli exclusion principle. Name this type of particle that has half-integer spin, named after an Italian physicist.

Answer: **Fermion**

Bonus 20: Math (Algebra)

Find all the real zeros of the following polynomials.

- A: $x^3 - 15x^2 + 75x - 126$
- B: $x^3 + 7x^2 - 2x - 14$
- C: $5x^2 + 14x - 3$
- D: $x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$

Answers: (must have all answers in any order, but no additional answers) A: **6** B: **root 2, negative root 2, -7** C: **-3 and 1/5** ($1/5 = .2$) D: **-1**

TIEBREAKERS/REPLACEMENTS:**Tossup 21: Math (Geometry) -- Computational (30 Seconds)**

Find the distance between the point (3,4) and the line $4x + y = 3$. If you don't remember a formula for finding this distance, it can be constructed by dropping a line with perpendicular slope from the point (3,4), and determining the distance between that point and the point where the lines meet.

Answer: 19/5 (3.8)

Bonus 21: Literature (Language Arts)

Correctly spell the following words.

A: Kaleidoscope

B: Panegyric

C: Obeisance

D: Strathspey

Answers: A: KALEIDOSCOPE B: PANEGYRIC C: OBEISANCE D: STRATHSPEY



Ægis Questions

New Trier Varsity 2006

Round 7

Tossup 1: Science (Chemistry)

First discovered in 1965, this chemical has long been the subject of much controversy. In 1995, the FDA reported that it alone represented 75% of all reports of adverse effects to food ingredients. The methyl ester of phenylalanine (*FEE-nul-AL-uh-NEEN*) and aspartic acid, foods that contain this chemical are required to carry a warning for phenylketonurics (*FEE-nul-KEE-toh-NUR-iks*) because it could be deadly to them. Name this famous artificial sweetener, the one contained in Equal and NutraSweet.

Answer: **Aspartame** (*prompt Equal or NutraSweet before mentioned*)

Bonus 1: Literature (Literature)

Identify these facts related to Thomas Hardy.

A: Hardy used this fictional setting for many of his works.

B: This title girl is raped by Alec in an 1891 Hardy work.

C: Sue and Arabella are characters in this serialized novel, Hardy's last, that was published in full in 1895.

D: Clym Yeobright and Eustacia Vye are characters in this novel set mostly in Egdon Heath.

Answers: A: **Wessex** B: **Tess of the d'Urbervilles** C: **Jude the Obscure** D: **Return of the Native**

Tossup 2: Social Studies (World History)

It opens with text appearing on a stone wall, followed by shots of the sky and the assembling masses below Adolf Hitler's plane. It goes on to present speeches of other German leaders in addition to a large and memorable rally scene. Identify this documentary by filmmaker Leni Riefenstahl that is the most famous Nazi propaganda film of all time.

Answer: **Triumph of the Will** (*also accept Triumph des Willens*)

Bonus 2: Math (Algebra)

Identify the following about the function, f of x equals x squared plus x minus 2.

A: What type of conic section does it describe?

B: Give both of its roots. You must have both correct.

C: Find a vertex of the conic section, as an ordered pair.

D: If you divide f of x by the quantity x minus one, what are the coordinates of the resulting removable discontinuity?

Answers: A: **Parabola** B: **$x = 1$ and -2** (*in either order, must have both correct*) C: **$(-1/2, -9/4)$** ($-1/2, -2.25$) D: **$(1, 3)$**

Tossup 3: Literature (Literature)

The narrator of this work is stranded in the Sahara desert after a plane crash, a situation inspired by an actual accident the author had. While stranded, the narrator meets a strange person who immediately requests that he draw him a sheep. The narrator's first drawing is rejected for not being a sheep, but an elephant being eaten by a boa constrictor. The latter drawings are rejected until the narrator draws a box, with the sheep not visible, but inside. The boy who requested the drawing, it turns out, was originally from the asteroid B-612, which is home to three volcanoes and a rose. Identify this work, which focuses on the follies of man and the simple truths they tend to forget with age; the most famous novel of French aviator Antoine de Saint-Exupéry.

Answer: **The Little Prince** (*also accept Le Petit Prince*)

Bonus 3: Social Studies (U.S. History)

Identify the following terms from World War I by significant numbers.

A: 14, as in the 14th of Wilson's Fourteen Points, which laid the groundwork for the founding of this body that would serve to arbitrate world disputes.

B: 13, as in the 13 Republican Senators that were given this title. Led by Henry Cabot Lodge, they would not agree with Wilson's plan to ratify the Treaty of Versailles.

C: 3, as in the 3 nations involved in the Triple Alliance. Name all three, all or nothing.

D: 5, 7, and 15, as in the date of the sinking of this ship. Although denied at the time, it turns out that it was carrying contraband, along with 128 Americans.

Answers: A: **The League of Nations** B: **The Irreconcilables** (accept *Irreconcilable*) C: **Germany, Italy, and Austria-Hungary** (also accept *Austro-Hungarian Empire*; accept in any order) D: **Lusitania**

Tossup 4: Math (Geometry) -- Computational (30 Seconds)

You want to find the cost of the red plastic in one cylindrical plastic tumbler. You know that the tumblers have a radius of one and a half inches and a height of 5 inches, and have negligible width. The base is made of blue plastic, and the sides of red plastic, which costs four cents per pi square feet. Knowing that the amount of red plastic is equal to the lateral surface area of a tumbler, find the cost of red plastic in the tumbler.

Answer: **60 cents** (accept .60 dollars)

Bonus 4: Science (Chemistry)

Name these amino acids.

A: Abbreviated ALA, this amino acid has a methyl group attached to the central carbon.

B: This amino acid, with a name similar to the amino acid in the first part, has a phenyl group attached to the methyl group.

C: Abbreviated GLY, this is the simplest of amino acids, and has two hydrogens attached to the alpha carbon.

D: This is the only amino acid in proteins whose side group bonds cyclically to the backbone.

Answers: A: **Alanine** B: **Phenylalanine** C: **Glycine** D: **Proline**

Tossup 5: Miscellaneous (Other)

Invented in the mid-1910s, these are typically made of soft felt, though they can be made out of twill or even straw. They are named for the title female in a play by Victorien Sardou, a princess who wore them. Creased down the middle, these hats are called trilbys in Europe. Name this type of hat, of which a red one is worn by Shadowman, the character in the logo of Red Hat Linux, and which lends its name to a modern "Core" Linux distribution.

Answer: **Fedora**

Bonus 5: Literature (Literature)

Identify these facts related to a group of poets.

A: This poet, who was very fond of his sister Dorothy, wrote Lines Composed a Few Miles Above Tintern Abbey and Lines Written in Early Spring.

B: This friend of the answer to Part A wrote Lyrical Ballads with him, though this man is more famous for his Rime of the Ancient Mariner.

C: This poet wrote After Blenheim and the Curse of Kehama.

D: These three Romantic poets were known collectively as this group, named after an English district.

Answers: A: **William Wordsworth** B: **Samuel Taylor Coleridge** C: **Robert Southey** D: **Lake Poets**

Tossup 6: Social Studies (U.S. History)

This man was the son of a Presbyterian minister and attended Princeton. An opponent of Nasser, he ascended to the position he is most famous for in 1953, and he developed many of the plans by the United States during the Cold War. Name this Secretary of State under Eisenhower, who shares his name with a Washington D.C. airport.

Answer: **John Foster Dulles**

Bonus 6: Miscellaneous (Entertainment)

According to Forbes Magazine, these are, in order, Hollywood's four most expensive movies of all time, adjusting for inflation.

A: Most expensive was this 1963 movie starring Elizabeth Taylor in the title queen's role, at an adjusted price of 286 million dollars.

B: Second most expensive was this 1997 movie, at a price of 247 million dollars. Fortunately, it won a lot of Oscars, and grossed 2.3 billion dollars worldwide.

C: Third most expensive was this 1995 post-apocalyptic movie starring Kevin Costner, at a price of 229 million dollars.

D: Fourth most expensive was this 2003 movie, at a price of 217 million dollars. Its star became governor of California later that year.

Answers: A: **Cleopatra** B: **Titanic** C: **Waterworld** D: **Terminator 3: Rise of the Machines** (*accept T3, prompt on Terminator*)

Tossup 7: Math (Calculus) -- Computational (30 Seconds)

At time t , a particle moving along the x axis has a velocity of $4t^3 + 6t$, meters per second. At time t equals 0, it has a position of five meters. What is its position at the time when its acceleration equals 54 meters per second squared? To solve this question, you have to find both the acceleration and position functions, and realize that the position function is uniquely determined by the starting condition.

Answer: **33 meters** (*prompt for units*)

Bonus 7: Science (Biology)

They sound awfully similar. Name these molecules, but preferably not ten times fast.

A: This monosaccharide's D form is called dextrose, and it is created during photosynthesis.

B: This branched polysaccharide is stored in the muscles and liver, and is the primary storage for ingested sugar.

C: This polypeptide hormone is secreted by the alpha cells of the pancreas, and has the opposite effect from insulin.

D: Also called brain sugar, this monosaccharide is the constituent of lactose that wasn't the answer to the first part of this bonus.

Answers: A: **Glucose** B: **Glycogen** C: **Glucagon** D: **Galactose**

Tossup 8: Literature (Literature)

It is divided into four voyages, the third of which encompasses five different locations. In the second, the title character almost dies of exhaustion from performing too much, though the efforts of Glumdalclitch, a little girl, save him. In the first, his eyes are almost put out for treason, as he refuses to take sides in the battle between big-endians and little-endians. In his fourth and final journey, he comes to adore the society of the Houyhnhnms (*HOYN-ums*), though the horses finally kick him off of their island. Name this satire about the title character's journeys, by Jonathan Swift.

Answer: **Gulliver's Travels** (*prompt Gulliver*)

Bonus 8: Math (General)

Convert the number 27 (*read: two seven*), base 8, into the following bases. (*note: Answers must be given as two one two, not two-hundred and twelve*)

A: Base 3

B: Base 9

C: Base 16

D: Base 2

Answers: A: 2 1 2 B: 2 5 C: 1 7 D: 1 0 1 1 1

Tossup 9: Fine Arts (Music)

His personal life was troubled, as shown by his unsent love letter addressed to his "Immortal Beloved," as well as his 1802 Heiligenstadt (*HI-lig-en-SHTOT*) Testament written though also never sent to his brothers, in which he admits to his growing medical condition. Recent tests indicate this condition was possibly caused by lead poisoning. Name this late Classical and early Romantic composer who wrote such works as the Pathetique Sonata, Fidelio, nine symphonies, and the Moonlight Sonata, who spent the last part of his life deaf.

Answer: **Ludwig van Beethoven**

Bonus 9: Social Studies (Geography)

Given a description of an African country, name the country.

A: In 1994 there was a civil war in this country between the Hutus and the Tutsis, leaving hundreds of thousands dead. Its capital is Kigali (*kih-GAHL-ee*).

B: The smallest country in Africa, it is surrounded by Senegal and the Atlantic Ocean. Its capital is Banjul.

C: This country contains Cap Vert, the westernmost point on the mainland of Africa. Its capital is Dakar.

D: The majority of this country is covered by the Kalahari Desert. Its capital is Gaborone.

Answers: A: **Republic of Rwanda** (*accept Repbulika y'u Rwanda and République Rwandaise*) B: **Republic of the Gambia** C: **Republic of Senegal** (*Accept République du Sénégal*) D: **Republic of Botswana** (*Accept Lefatshe la Botswana*)

Tossup 10: Science (Biology)

Caused by the zonula occludens (*ZONE-u-lah ock-LOO-dens*) between certain capillary cells, it was first noticed by Paul Ehrlich in the late 19th century. It blocks most molecules weighing more than about 500 AMUs, though lipids like certain hormones are allowed through. Most studied is its effect on L-Dopa, which, unlike dopamine, can travel across it and help combat the symptoms of Parkinson's disease. Name this barrier which was not believed to exist until a 1913 experiment by Edwin Goldmann, when he injected dye directly into the spine and noticed that it could not move freely between the brain and the rest of the body.

Answer: **Blood-brain barrier** (*this is a specific term; only accept very close variants*)

Bonus 10: Fine Arts (Visual Art)

Identify these "colorful" works of art given a description.

A: This painting by Paul Gauguin depicts the titular character surrounded by three kneeling people.

B: This 1871 painting by James Whistler shows his mother wearing the title colors as she faces to the left.

C: In this Thomas Gainsborough painting, the titular character is standing with his left hand on his hip.

D: The Sun is visible in the background of this Van Gogh painting that features many people bending over while working in the title location.

Answers: A: **The Yellow Christ** B: **Arrangement in Grey and Black: The Artist's Mother** (*prompt on Whistler's Mother*) C: **The Blue Boy** D: **The Red Vineyard**

HALFTIME

Tossup 11: Literature (Literature)

The final, modest words of his most famous work are "I shall live on in the centuries to come." He was a contemporary of Virgil and Propertius, but, unlike them, did not accept the sponsorship of the poet-minded Emperor, Augustus. The opening lines to that most famous work, "My intention is to tell of bodies changed to different forms" lead into fifteen books describing the creation of the world and various transformations afterward. That work was not his most influential at the time, however, it was his Art of Love that may have led to his exile from Rome. Identify this Roman poet of the Metamorphoses.

Answer: **Pubius Ovidius Naso**

Bonus 11: Miscellaneous (Interdisciplinary)

Name these things that are not part of the Zodiac.

A: In mathematics, this is a surface of revolution shaped like a doughnut.

B: This NASA program was started in 1962 as the successor to the Mercury program. Comprising twelve missions, it was conducted using Titan II launch vehicles.

C: Also known as the Southern Tropic, this tropic is at 23 degrees south latitude, the southernmost latitude at which the sun can ever be seen directly overhead.

D: This Pope ruled from 440 to 461 AD, succeeding Pope Sixtus III. Sometimes given the epithet "The Great," he turned Attila the Hun away from Rome, and established the supremacy of the papacy.

Answers: A: **Torus** B: **Gemini** C: **Tropic of Capricorn** D: **Pope Leo I** (or *Leo the Great, prompt Leo*)

Tossup 12: Social Studies (U.S. History)

She revealed this real identity in 1980, and now claims that her lawyers Sarah Weddington and Linda Coffee forced her to take her case to court. Furthermore, she claims that she was not in fact raped, and now strongly opposes the court decision made in her favor in 1973 before the Supreme Court. Name this now pro-life woman, the real identity of the plaintiff in Roe v. Wade.

Answer: **Norma McCorvey** (prompt *Jane Roe*)

Bonus 12: Literature (Language Arts)

Identify these terms named after people.

A: This is a flattering adjective for slightly plump women, named after a Flemish painter who often featured them in his artwork.

B: This noun refers to switching corresponding syllables in a "tip of the slung," err, slip of the tongue, that was often committed by its namesake Oxford warden.

C: This noun named after a character from Richard Sheridan's "The Rivals" refers to incorrectly substituting a word with a similar word, like "pineapple" for "pinnacle."

D: This noun meaning "fanatical patriotism" is named after a French soldier who was wounded seventeen times but continued to fight for Napoleon. Now the term often refers to the belief that men are superior to women.

Answers: A: **Rubenesque** B: **Spoonerism** C: **Malapropism** D: **Chauvinism**

Tossup 13: Math (General)

If it were false, then according to the epsilon conjecture, the Shimura-Taniyama conjecture would also be false. Though it took until 1999 to prove the full Shimura-Taniyama conjecture, in 1995, it was shown true for all semistable elliptic curves, sufficient for Richard Taylor and Andrew Wiles to prove this theorem. Name this famous theorem in mathematics whose proof was supposedly too long for its originator to write down, which states that $x^n + y^n = z^n$ is not true for integer triplets when n is an integer above two.

Answer: **Fermat's last theorem**

Bonus 13: Social Studies (U.S. History)

Name these people who worked under Franklin Delano Roosevelt.

A: This Secretary of the Interior, who lived in Winnetka, was one of the two Cabinet members who served for all of FDR's presidency.

B: At various times, this man served as FDR's Vice President, Secretary of Agriculture, and Secretary of Commerce. In 1948 he ran for president on the ticket of the Progressive Party.

C: This man was the last Vice President under FDR.

D: This man, who served from 1933 to 1944, is the longest serving Secretary of State in American history.

Answers: A: **Harold LeClair Ickes** B: **Henry Agard Wallace** C: **Harry S. Truman** D: **Cordell Hull**

Tossup 14: Science (Physics) -- Computational (30 Seconds)

John has a long massless stick labeled with distances from one end. He is hanging a six-kilogram weight at the three-meter mark, and a four-kilogram weight at the eight-meter mark. Where can he place a fulcrum so that the stick balances? One way to solve this problem is to set x as the fulcrum point, and calculate the torques in terms of x , setting the net torque equal to zero.

Answer: **5 meters mark**

Bonus 14: Fine Arts (Music)

Answer these related questions about music theory.

A: This type of scale is in Ionian mode, and is often characterized as happy.

B: This type of scale is in Aeolian mode, often called sad.

C: Equivalent to playing all the black notes on a piano, this type of scale is named for the number of notes it has in each octave.

D: This type of scale has a lowered third and, unlike the "natural" and "melodic" varieties, a raised seventh.

Answers: A: **Major** B: **Minor** C: **Pentatonic** D: **Harmonic minor**

Tossup 15: Math (Algebra) -- Computational (30 Seconds)

Find the quantity $\sqrt[3]{3+i}$, close quantity, raised to the twelfth power, where i is the square root of negative one. One way to solve this problem would be to cube the quantity, and then raise it to the fourth power. It would be faster, however, to convert the complex number to polar form, and then apply De Moivre's theorem. Using these or any other techniques, find $\sqrt[3]{3+i}$, quantity raised to the twelfth power.

Answer: **4096** (accept "4096 cis 0" or "4096 plus zero i")

Bonus 15: Social Studies (World History)

Identify these revolutions named after plants or colors.

A: This revolution demanded the withdrawal of Syrian troops from Lebanon following the assassination of opposition leader Rafik Hariri in 2005.

B: Following disputed elections in 2003 in Georgia, this revolution led to the overthrow of Eduard Shevardnadze and his replacement by Mikhail Saakashvili.

C: This was an almost bloodless, leftist, military-led coup which started on April 25, 1974, in Lisbon, Portugal.

D: This is the name that was first used by hopeful commentators, and later picked up by President Bush, to describe democracy coming to Iraq in 2005. It was named for the semi-permanent ink with which voters' fingers were dyed to prevent double voting.

Answers: A: **Cedar Revolution** B: **Rose Revolution** C: **Carnation Revolution** D: **Purple Revolution**

Tossup 16: Miscellaneous (Technology)

(Pronounce first three as words) SOAP, REST, AJAX, RSS, Atom, JavaScript. A step ahead of the original static HTML websites of the early Internet, these technologies were given this collective name by Doug Dougherty, which was popularized by O'Reilly Media. Name this type of new web technology that claims to be a whole version ahead of the first.

Answer: **Web 2.0** *(prompt on related answers without "2.0")*

Bonus 16: Math (Other)

Find the probabilities of the following events occurring when you draw two cards from the top of a standard deck of cards, without replacing the first card before drawing the second.

A: Both cards have a number on them. That is, neither is an ace, jack, queen, or king.

B: The cards are in the same suit.

C: The cards are of the same rank.

D: The cards are of the same suit and rank.

Answers: A: **105/221** B: **4/17** C: **1/17** D: **0**

Tossup 17: Science (Astronomy)

It either plots the color index and absolute magnitude, or the temperature and luminosity. It has several lines, representing supergiants, bright giants, giants, subgiants, and the line that most stars lie on, the main sequence. Name this astronomic diagram named after two scientists, that depicts the lives of stars.

Answer: **Hertzsprung-Russell diagram** *(accept H-R diagram, HRD, color-magnitude diagram)*

Bonus 17: Literature (Literature)

"I think that I shall never see, a poem lovely as a tree."

A: Name the title of the famous poem that begins that way.

B: According to the poem, "Poems are made by fools like me, but only" this can make trees.

C: Name its author, an American poet born in 1886 and killed during World War I.

D: "I think that I shall never see, a billboard lovely as a tree. Indeed, unless the billboards fall, I'll never see a tree at all." Name the famous witticist and writer of light verse that penned this retort.

Answers: A: **Trees** B: **God** C: **Joyce Kilmer** D: **Ogden Nash**

Tossup 18: Literature (Mythology)

This deity is the son of the god of wisdom, Ea, who gives him control over humanity. The Enuma Elish describes how this god was made king of the gods by the Anunnaki after he slew the monster Tiamat, after which humans were created. Name this Mesopotamian sun god and patron god of Babylon.

Answer: **Marduk**

Bonus 18: Science (Physics)

Give the electric charges of each of the following particles.

A: Electron

B: Electron neutrino

C: Up quark

D: Bottom quark

Answers: A: **-1** B: **0** C: **2/3** D: **-1/3**

Tossup 19: Fine Arts (Visual Art)

Born in Idaho in 1867, his first major project, a sculpture of Robert E. Lee in Stone Mountain, Georgia, was aborted after his relations soured with the commissioners. This project, however, helped him develop certain important techniques, like the use of a large lantern to project a sketch onto the rock face on which he worked. His most famous project was thought up by Doane Robinson, and he died before finishing it, leaving his son Lincoln to direct the rest of its sculpting. Name this sculptor most famous for large-scale public memorials, especially Mount Rushmore.

Answer: **Gutzon Borglum**

Bonus 19: Math (Calculus)

Find the first four non-zero terms of the Taylor expansions of the following functions. Evaluate all factorials.

A: The hyperbolic cosine of x .

B: The cosine of x .

C: The sine of x .

D: e^x .

Answers: A: $1 + \frac{x^2}{2} + \frac{x^4}{24} + \frac{x^6}{720}$ B: $1 - \frac{x^2}{2} + \frac{x^4}{24} - \frac{x^6}{720}$ C: $x - \frac{x^3}{6} + \frac{x^5}{120} - \frac{x^7}{5040}$ D: $1 + x + \frac{x^2}{2} + \frac{x^3}{6}$

Tossup 20: Social Studies (Other)

Hamilton's rule states that you're more likely to exhibit it toward people you're closely related to, because everyone just wants to propagate their own genes anyway. Coined by Auguste Comte, founder of positivism, psychological egoism states that while some behavior might have this quality, people never are motivated by it. The dilemma behind the tragedy of the commons, name this concept of ethics, from the French for "other people," the practice of placing others before one's self.

Answer: **Altruism**

Bonus 20: Science (Chemistry)

Answer these questions about the laws of thermodynamics.

A: The first law states that a system's internal energy is equal to its heat minus the amount of this, that it performs on other systems.

B: The second law states that this quantity will tend to increase.

C: The third law of thermodynamics was developed by this chemist, who also created an equation relating to electrode potentials.

D: This law of thermodynamics states that thermal equilibrium is transitive.

Answers: A: **Work** B: **Entropy** (prompt on disorder) C: **Walther Nernst** D: **Zeroth law of thermodynamics**

TIEBREAKERS/REPLACEMENTS:

Tossup 21: Social Studies (World History)

His first public office was on the Lambeth Borough Council, to which he was elected in 1968. His first election to Parliament came in 1979, and in 1990 he became the leader of the Conservative Party. He stepped down from his seat in Parliament in 2001. Name this man, who immediately preceded Tony Blair as British Prime Minister.

Answer: **Sir John Major**

Bonus 21: Social Studies (Geography)

Identify the official national language of each of the following South American countries.

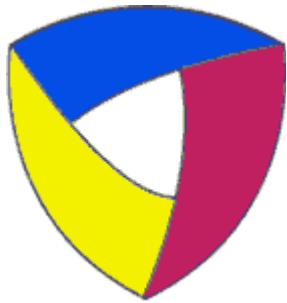
A: Brazil

B: Venezuela

C: Suriname

D: Guyana

Answers: A: **Brazilian Portuguese** B: **Spanish** C: **Dutch** D: **English**



Ægis Questions

New Trier Varsity 2006

Round 8

Tossup 1: Math (General)

For linear algebra, it states that all vector spaces share four fundamental subspaces. For curves, it states that a curve with non-zero curvature is determined by its curvature and torsion. For arithmetic, it states that every natural number has a unique prime factorization. For algebra, it states that every complex polynomial of degree n has exactly n complex roots. Most famously, for calculus, it states that integration and differentiation are inverse operations. Name this type of important theorem present in many branches of mathematics.

Answer: **Fundamental Theorem**

Bonus 1: Social Studies (Other)

Name these concepts from economics.

A: Goods that are wanted but not necessary, have this sort of utility that diminishes as someone has more and more.

B: Karl Marx was a major proponent of this theory that states that the worth of a good should be determined by the amount of work needed to manufacture it.

C: This conflicting theory states that the price of a good is determined by the price of the resources that made it.

D: This curve named after an American economist graphs the cumulative distribution of wealth in a society.

Answers: A: **Marginal utility** B: **Labor theory of value** C: **Cost-of-production theory of value** D: **Lorenz curve**

Tossup 2: Science (Biology)

It is named after the Latin word for sausage, because it can be found in badly-handled meat products, though in modern times, sodium nitrite has been used as a preservative to prevent bacterial growth. Likely the most potent toxin known to man, 100 grams would be enough to kill every human on earth. Despite this fact, it is commonly used in small doses to paralyze muscles for up to six months. Name this toxin used in Botox.

Answer: **Botulin(um) toxin** (*accept botulism*)

Bonus 2: Miscellaneous (Interdisciplinary)

AP. Two letters which strike fear into the hearts of high school students.

A: Those students likely associate AP with the Advanced Placement program run by this national examination board.

B: Most other people, however, would probably first think of this organization, the largest news agency in the world.

C: AP also stands for this, a general term for devices that allow wireless devices to connect to wired networks.

D: AP could also refer to this discharge of electric potential that occurs in neurons.

Answers: A: **College Board** B: **Associated Press** C: **Wireless Access Point** D: **Action potential**

Tossup 3: Literature (Literature)

The narrator of this book begins by saying he was born in 1857, assuring the reader that he does not in fact mean 1957. Written as if it were published 112 years after its actual publication date, this utopian novel consists mostly of the narrator expressing his awe at the wonders of modern society after he falls asleep for over a hundred years, waking up in the year 2000 in the house of Dr. Leete. Name this novel narrated by Julian West, and written by Edward Bellamy.

Answer: **Looking Backward: 2000-1887**

Bonus 3: Math (Algebra)

Find the eccentricity of each of the following conics.

A: An ellipse with equation $9x^2 + 18x + 4y^2 = 27$.

B: The conic with equation $x^2 + y^2 = 1$.

C: The parabola with equation $y = x^2 + 7x - 4$.

D: A hyperbola where the distance from the vertices to the foci is two, and the length of the semimajor axis is three.

Answers: A: $\sqrt{5}/3$ B: 0 C: 1 D: 5/3

Tossup 4: Social Studies (Current Events)

Santa Fe currently has the highest in the country. Of states, Washington leads, followed by Oregon, Connecticut, and Vermont. Five states don't have one explicitly, simply abiding by the federal guideline, which Congress is now seeking to raise. Illinois is sixteenth, but recently voted for a sharp increase on July 1 of next year, followed by additional yearly raises until 2010. Currently at \$5.15 federally and \$6.50 in Illinois, name this mandated level of pay that attempts to ensure that workers are not exploited.

Answer: Minimum wage (data as of December 2006)

Bonus 4: Fine Arts (Visual Art)

Identify the central figure or figures in each of the following paintings by name.

A: Self-portrait with bandaged ear

B: The School of Athens - Name both figures.

C: Primavera

D: Las Meninas

Answers: A: Vincent van Gogh B: Plato and Aristotle (either order) C: Venus (accept Aphrodite)

D: The Infanta Margarita (accept Margaret Theresa of Spain)

Tossup 5: Math (Algebra) -- Computational (30 Seconds)

Convert the following two by three matrix to reduced row echelon form. Its top row is 3, 4, 18, and bottom row 1, 2, 8. Remember that row-reduced echelon form means that there should be ones along the main diagonal and zeros below the main diagonal. You are allowed to swap rows, add a multiple of one row to another row, or multiply any row by a constant. It might be easier, however, to simply think of this matrix as a linear system, solve it, and convert back into a matrix.

Answer: Top row: 1, 0, 2; bottom row: 0, 1, 3 (this can be read in any way, but do not accept any other answer)

Bonus 5: Literature (Literature)

Identify these non-English speaking poets from a description.

A: This man, who wrote during the time of Augustus, created the phrase "Carpe Diem" and wrote Ars Poetica.

B: This 11th century Persian poet wrote the Rubaiyat.

C: This man's name has become synonymous with an Italian sonnet, and he often wrote to a woman named Laura.

D: This Chinese writer, known as the Poet Immortal, wrote Drinking Alone under the Moon.

Answers: A: Horace (accept Quintus Horatius Flaccus) B: Omar Khayyam C: Petrarch (accept Francesco Petrarca) D: Li Bo (accept Li Bai or Li Po)

Tossup 6: Miscellaneous (Entertainment)

She was first mentioned in 1999, simply as "a teenage bride with a baby inside." In 2002, in "By the Way," she will be at the theater, singing songs to a man beneath the marquee. She appears again in 2006, when her life and death are finally explained. Born in Mississippi, she led a life of crime and was finally shot by a North Dakota bounty hunter while trying to flee to Minnesota. Name this titular girl of a hit 2006 single from the album Stadium Arcadium, by the Red Hot Chili Peppers.

Answer: **Dani California**

Bonus 6: Science (Earth Science)

Name these supercontinents.

A: Existing from one billion to 800 million years ago, this supercontinent's name comes from the Russian for "homeland."

B: Best known is this supercontinent that existed from about 500 to 200 million years ago, whose name comes from the Greek for "all earth."

C: After the breakup of that supercontinent, two continents were formed. One was this continent named for its two subcontinents, North America and Eurasia.

D: This other continent contained the other modern continents, and is named after a group of people in India. Sometimes "land" is added to the end of the word, but it is redundant because the second half means "land" in their language.

Answers: A: **Rodinia** B: **Pangaea** C: **Laurasia** D: **Gondwana** (*accept Gondwanaland*)

Tossup 7: Fine Arts (Music)

Born in 1862, he was raised by the owners of a china shop, and later in life he was unable to compose without his favorite porcelain frog by his side. One of his most important early works depicted a scene with forest spirits, and is named a Prelude because he intended to write two more pieces in the set. His only opera, "Pelléas et Mélisande," heavily influenced the future of French music. Name this French impressionist composer responsible for popular piano music like the "Children's Corner" suite and "Clair de Lune," as well as the orchestral sketch "La Mer."

Answer: **Claude Debussy**

Bonus 7: Social Studies (World History)

Identify these famous families of Europe.

A: This family was in charge of Prussia for quite some time.

B: Perhaps the family with the most widespread influence, this family was in charge of Austria and more, and produced such rulers as Maria Theresa.

C: This family ruled Milan. Francesco I was the Duke of Milan.

D: The most well known member of this German banking family was Jakob.

Answers: A: **Hohenzollern** B: **Habsburg** (*accept Hapsburg*) C: **Sforza** D: **Fugger**

Tossup 8: Literature (Language Arts)

Anthropological studies tend to support it, for example, finding that the Piraha people were unable to learn arithmetic because "one," "two," and "many" were the only number words in their language.

Related to the idea of political correctness, name this linguistic hypothesis named after two people, that states that language influences how people view the world.

Answer: **Sapir-Whorf hypothesis**

Bonus 8: Math (General)

You have two binary numbers, A and B. A equals 0 1 1, and B equals 1 0 0. Perform the following operations and give your answers in binary.

A: A AND B

B: A OR B

C: A XOR (*x-or*) B

D: NOT A

Answers: A: 0 (*or 0 0 0*) B: 1 1 1 C: 1 1 1 D: 1 0 0

Tossup 9: Science (Chemistry)

Its existence was rebutted by Leo Szilard, saying that it would need to expend energy to measure the speed of molecules, and the total entropy of the system would increase anyway. Proposed in 1867, it refers to a being that stands between two partitioned gas chambers, opening a trapdoor to let faster molecules into one chamber, and slower molecules into another chamber. Name this thought experiment named after a Scottish physicist, that attempts to violate the second law of thermodynamics.

Answer: Maxwell's demon

Bonus 9: Literature (Mythology)

Identify the following mythological transformations.

A: This daughter of Tantalus was transformed into a rock as she wept over the loss of her fourteen children.

B: This nymph of Artemis and lover of Zeus was turned into a bear, and consequently was almost killed by her son during a hunt.

C: This nymph was changed into hollow water reeds in order to avoid the lecherous clutches of Pan.

D: This woman was turned into a white heifer after a brief affair with Zeus in the form of a cloud.

Answers: A: Niobe B: Callisto C: Syrinx D: Io

Tossup 10: Social Studies (U.S. History)

A parody of typical Campari alcohol advertisements, the false interview described a prominent Protestant minister's "first time" with Campari. Unlike real advertisements, however, this ad depicted him talking of the drunken tryst in the outhouse with his mother that resulted. He sued the magazine that ran the ad, claiming it was libel and led to emotional distress, though it was clearly marked as a parody. Name the 1988 Supreme Court case that resulted, ruling 8-0 that the pornographic magazine was not libelous.

Answer: Hustler Magazine v. Falwell (*accept Flynt v. Falwell*)

Bonus 10: Science (Chemistry)

Answer these questions about chemicals that are not the same.

A: Oxygen and ozone, or diamond, graphite, and fullerene. Though all pure elemental states of their atom, they are called these because they have different numbers of that atom.

B: Generically, chemicals with the same chemical formula but different structures are called these.

C: This specific term refers to some chemicals, like 1-propanol and 2-propanol, that have the same formula but different bond structures in 2D.

D: This specific term refers to chemicals that have the same bond structures in 2D, but not in 3D.

Answers: A: Allotrope B: Isomer C: Structural isomer (*prompt on isomer*) D: Stereoisomer (*prompt on isomer or geometric isomer*)

HALFTIME

Tossup 11: Social Studies (World History)

Also known as "Operation Hummingbird," the more popular name for this event refers to the slaughter of Vortigern's men by mercenaries in Arthurian myth. The SA, led by Ernst Rohm, stood as the only threat to the Nazi Party, and Hitler was under great pressure to lessen their influence. So, Hitler arrested Rohm, who was later shot, and ordered the murder of up to 400 men. What name is given to the night of June 30, 1934?

Answer: **The Night of Long Knives**

Bonus 11: Math (Other)

Name these standard Unix command-line utilities. All your answers should be two letter abbreviations.

A: This program deletes or removes files.

B: This program moves or renames files.

C: This program copies files from one location to another.

D: This program lists all the files in the current directory.

Answers: A: **rm** B: **mv** C: **cp** D: **ls**

Tossup 12: Literature (Literature)

In the introduction, a play is being put on for Christopher Sly, a drunk man who is being treated like a lord to play a trick on him. That play constitutes the rest of the actual work. In it, Hortensio wants to marry Bianca, but her father says that nobody may marry Bianca until her sister is married. Hortensio gets his friend to marry her for her large dowry, because his friend believes he can cure his new wife's bad temper. Name this play by William Shakespeare in which Petruchio successfully softens his ill-tempered wife Katherine.

Answer: **The Taming of the Shrew**

Bonus 12: Fine Arts (Music)

Name the American composers of the following operas.

A: Porgy and Bess

B: Treemonisha

C: Doctor Atomic

D: The Tender Land

Answers: A: **George Gershwin** B: **Scott Joplin** C: **John Adams** D: **Aaron Copland**

Tossup 13: Social Studies (Other)

One of the ten largest organized religions in the world, it has over 23 million members worldwide. It holds that humans should have an intimate relationship with God to achieve salvation, and must achieve this by meditating to ignore the Five Evils, as well as Maya, the worldly distractions that surround them. This religion was started in the early sixteenth century, and shaped by ten masters in the centuries that followed. Name this religion of the Punjab region in India founded by Guru Nanak, whose holiest city is Amritsar.

Answer: **Sikhism**

Bonus 13: Literature (Literature)

Identify the following Catholic authors.

A: She lived in Georgia and wrote the short story collection *A Good Man Is Hard To Find*.

B: The son of a famous Conservative, he wrote *Thank You For Smoking*.

C: This priest has written a lot of novels, including *Irish Crystal* and *The Passover Trilogy*, in addition to newspaper columns, homilies, and works of nonfiction.

D: He converted in 1930, fifteen years before completing *Brideshead Revisited*.

Answers: A: **Flannery O'Connor** B: **Christopher Buckley** C: **Andrew Greeley** D: **Arthur Evelyn St. John Waugh**

Tossup 14: Math (Calculus) -- Computational (30 Seconds)

x is restricted to be between negative π over two and π over two. Fully simplify your answer. Find the derivative, with respect to x , of the definite integral from zero to the sine of x , of the inverse sine of t , dt . You can solve this problem by evaluating the definite integral and then the derivative, though it would be easier to evaluate both at once, remembering to use the chain rule.

Answer: **$x \cos(x)$** (accept $\cos(x)$ times x ; note that the restricted domain ensures that $\arcsin(\sin(x)) = x$)

Bonus 14: Miscellaneous (Technology)

Name these ways of connecting peripherals to computers.

A: Now one of the most popular connectors, the 2.0 variety of this sends data at rates up to 480 megabits per second.

B: Also known as IEEE 1394, this comes in four- and six-pin varieties. It is used for camcorders and other high-volume operations because it travels up to 800 megabits per second.

C: Also known as "mini-DIN," this circular six-pin connector is often used for keyboards and mice.

D: This trapezoidal 25-pin port was once used for printers. It is named for the fact that it does not send data serially.

Answers: A: **USB** (*Universal Serial Bus*) B: **Firewire** C: **PS/2** D: **Parallel**

Tossup 15: Science (Biology)

Not present in bacterial plasmids, they occur only in linear chromosomes, in humans with the pattern TTAGGG. Comprising up to 300,000 base pairs of DNA, they allow DNA polymerase to act on entire chromosomes, because it is unable to copy all the way to the end. Consequently, these are shortened every time a cell divides, and their length is thought to be associated with aging. Name this buffer DNA at the ends of linear chromosomes.

Answer: **Telomere**

Bonus 15: Math (Other)

I'll give you two SI prefixes. You have to multiply them and give the resulting SI prefix. For example, if I say "kilo times kilo," you know that's a thousand times a thousand, or one million, so you respond "mega."

A: Hecto times deca

B: Giga times kilo

C: Mega times nano

D: Kilo times peta

Answers: A: **Kilo** B: **Tera** C: **Milli** D: **Exa**

Tossup 16: Miscellaneous (Interdisciplinary)

The name's the same. In math, it refers to a sequence of vector subspaces, each of which is a subspace of the next. In computer science, it refers to one or more bits that store a status value checked by other functions. In music, it is attached to the top of a note's stem, unless there's a bar instead. Drivers and chess players are often worried that it will fall before they are done. In common parlance, if it is red, it signals that something is wrong. Unless, of course, it is also white and blue. Name this term which most commonly refers to a piece of cloth that shows one's patriotism.

Answer: **Flag**

Bonus 16: Science (Physics)

The annus mirabilis papers were four papers written in 1905 by Albert Einstein.

A: Einstein won the Nobel Prize for a paper explaining this effect of light on metals.

B: Another paper dealt with this shaking motion of tiny particles in fluid.

C: A third paper extended Newtonian physics to objects moving near the speed of light in inertial reference frames, introducing this theory.

D: His fourth paper was titled "Does the inertia of a body depend upon its energy content?" and introduced this, his most famous equation.

Answers: A: **Photoelectric effect** B: **Brownian motion** C: **Special relativity** (*prompt relativity, do not accept general relativity*) D: **E=mc squared** (*accept equivalent*s)

Tossup 17: Math (Other) -- Computational (30 Seconds)

Find the length of the latus rectum of the ellipse given by the equation, $x^2/25 + y^2/9 = 1$. It may help you to know that the latus rectum is the line segment going through one focus, perpendicular to the major axis, starting and ending on the ellipse. To solve this problem, you must first locate one focus of the ellipse. Because this ellipse is horizontal, you know that you can find the y-coordinate of one end of the latus rectum by plugging in the x-value of the focus, and because it is centered about the origin, you can find the length of the latus rectum by doubling that y-coordinate.

Answer: **18/5** (3.6)

Bonus 17: Literature (Literature)

Name the Shakespeare characters that said each of these famous lines.

A: How beautiful mankind is! O brave new world, that has such people in't!

B: Friends, Romans, countrymen, lend me your ears.

C: Some are born great, some achieve greatness, and some have greatness thrust upon them.

D: We are such stuff as dreams are made on; and our little life is rounded with a sleep.

Answers: A: **Miranda** B: **Mark Antony** C: **Malvolio** D: **Prospero**

Tossup 18: Science (Physics)

It can be defined as the projection of the state vector onto the position basis. The square of its absolute value, integrated over all space, is equal to 1, meaning that its absolute square is a probability density function of a particle's location in a given region of space. Its namesake realized the problems it can pose before it collapses, creating a famous thought experiment with an unfortunate feline. Name this function of quantum mechanics named after Erwin Schrödinger.

Answer: **Schrödinger wavefunction** (*accept Schrödinger wave equation*)

Bonus 18: Social Studies (U.S. History)

Identify these events that occurred on December 16th.

A: This event, in which members of the Sons of Liberty dressed up as Mohawk Indians to protest taxes, occurred in 1773.

B: In 1811 a terrible earthquake occurred in this Missouri fault zone.

C: The battle for this Tennessee city was won by Union troops under George Thomas.

D: In 1960 during a snowstorm, two airplanes collided while one of them was approaching this New York airport.

Answers: A: **Boston Tea Party** (*prompt on Tea Party*) B: **New Madrid** C: **Nashville** D: **Idlewild Airport**

Tossup 19: Literature (Literature)

Twenty-fifth on the Modern Library's list of the best novels of all time, this novel begins as Mrs. Moore attempts to arrange a marriage between her son, Ronny Heaslop, and a young English girl she has brought along. Neither woman is familiar with local English customs, however, and both are overly polite and interested in the natives' affairs. Things begin to go wrong in Chandrapore as a local doctor offers to take them to the nearby Marabar Caves, and the young woman, Adela Quested, falsely accuses Dr. Aziz of attempting rape while she is in the cave. Name this 1924 novel by E.M. Forster about the relations between English and Indians.

Answer: **A Passage to India**

Bonus 19: Science (Biology)

Name these requisite features of chordates.

A: Though humans lose theirs before birth, all chordates must at some point have this feature extending past their anus.

B: Chordates don't need to have vertebrae; rather, they all have this flexible rod that might or might not turn into vertebrae.

C: Chordates also need these slits in their pharynx, similar to gills.

D: This hollow tube forms from dorsal ectoderm, and is later transformed into the brain and spinal cord. Arthropods have ventral ones instead.

Answers: A: **Postanal tail** B: **Notochord** C: **Pharyngeal slits** (*accept pharyngeal pouches*) D: **Dorsal hollow nerve cord** (*do not accept spinal cord*)

Tossup 20: Fine Arts (Visual Art)

The work is based on a real sailor uprising during the Russian Revolution of 1905. Composed of five episodes, its most famous and dramatic is the fourth, called "The Odessa Staircase," which features an apocryphal massacre of civilians by the Czar's forces on a very long staircase, where a dying woman knocks over her baby carriage, which totters down the stairs amidst the violence. Written in 1925 as a Bolshevik propaganda film, name this silent film by Sergei Eisenstein which was voted the greatest film ever at the 1958 World's Fair.

Answer: **The Battleship Potemkin**

Bonus 20: Social Studies (Current Events)

An Asian nation recently crowned its 13th king.

A: Name that nation, formerly ruled by Tuanku Syed Sirajuddin.

B: Name this capital where the crowning ceremony took place.

C: Name this new ruler of that country.

D: Name this former title of the answer to Part C; it is a historically Arabic term.

Answers: A: **Malaysia** B: **Kuala Lumpur** C: **Mizan Zainal Abidin** D: **Sultan**

TIEBREAKERS/REPLACEMENTS:**Tossup 21: Math (Geometry) -- Computational (30 Seconds)**

You want to find the total number of oranges in a square pyramid of oranges five levels high with base length of five oranges. The number of oranges in each level is an integer, and the top of the pyramid has one orange, because it's a square with side length of one orange. What is the total number of oranges in this square pyramid?

Answer: 55

Bonus 21: Math (General)

Solve the following problems that involve the numbers 5, 13, 16, 19 and the letter A.

A: What is the second leg of a right triangle with first leg 5 and hypotenuse 13?

B: What is the value of A in the conjugate of $13 + 16i$?

C: What is the absolute value of the difference between A, base 16, and one, three, base 16?

D: What is the second term of the expansion of the quantity x to the thirteenth power plus y to the sixteenth power, quantity raised to the fifth power?

Answers: A: 12 B: 13 C: 9 D: 5 times x to the 52nd power times y to the 16th power