**VHSL Conferences 2016-2017 - Round 03 - First Period, Fifteen Tossups**

1. Successive terms in these numbers are related by the Cassini and Catalan identities. The sums of the shallow diagonals to Pascal's triangle are equal to these number and they are given in closed-form by Binet's formula. These numbers are defined by the recurrence relation F sub n equals F sub n minus one plus F sub n minus two. The limiting ratio of these numbers is the golden ratio. For 10 points, name these numbers that begin 1, 1, 2, 3, 5, 8, 13, 21.
ANSWER: **Fibonacci** numbers [or **Fibonacci** sequence]

2. The tips of five fingers emerge from one of these locations in Punta del Este in Uruguay. A neighborhood known for one of these locations was referenced by a Stan Getz song performed in the *bossa nova* style. Several of these locations in Hawaii are colored black, thanks to small fragments of basalt. The Ipanema and Copacabana neighborhoods of Rio de Janeiro are known for their long stretches of these locations. For 10 points, name these sandy, oceanside locations.
ANSWER: **beach**es

3. This author wrote a novel in which the sisters Judith and Hetty are revealed to be illegitimate after the pirate Tom Hutter is scalped alive. That novel was attacked in an essay by Mark Twain about this author's "literary offenses." Besides *The Deerslayer*, he wrote a novel about the daughters of Colonel Munro and their trip to Fort William Henry with the frontiersman Natty Bumppo. For 10 points, name this American author of *The Last of the Mohicans*.
ANSWER: James Fenimore **Cooper**

4. This was the name of a king whose uncle was John of Gaunt and who was targeted by Wat Tyler's Peasants' Revolt. That king with this name was overthrown by the future Henry IV of England. Another king with this name teamed with Philip II and Barbarossa on the Third Crusade. A ruler with this name had a brother who signed the Magna Carta and was named John. For 10 points, what was the name of the English king known as the "Lionheart"?
ANSWER: **Richard** [or **Richard** I; or **Richard**  II]

5. This quantity remains unchanged for a pulled rigid-body according to the stretch rule. This quantity is derived by taking the integral of the squared distance to the axis over the entire mass. This quantity multiplied by the angular acceleration gives the torque. This value can be found for an arbitrary axis by adding a term according to the parallel axis theorem. For 10 points, what is the rotational analog of mass?
ANSWER: **moment** of **inertia** [or **rotational inertia**; or **angular mass**; or **second moment** of **mass**; or ***I***]

6. The Northern Securities Company combined various examples of these businesses. A man whose company made objects used by this industry founded a notorious company town near Lake Calumet, Illinois. It doesn't involve water, but Cornelius Vanderbilt dominated this industry, which was opposed in the Pullman Strike. For 10 points, the Union and Central Pacific companies completed the first transcontinental example of what transportation system in 1869?
ANSWER: **rail**road industry [or **rail**way; or **train**s; prompt on shipping]

7. This author wrote a story whose circus performer protagonist is buried with his straw and replaced by a panther. In a novella by this author, a group of boarders listen to Grete play the violin, but leave without paying rent after seeing the protagonist. In that novella by this author of "A Hunger Artist," Gregor Samsa wakes up one day to find himself transformed into an insect. For 10 points, name this Czech-German author of *The Metamorphosis*.
ANSWER: Franz **Kafka**

8. This company's present size came after merging with Norwest in 1998 and acquiring Wachovia in 2008. Its CEO, John Stumpf, promised to forfeit 41 million dollars in pay. This company was assessed a record 100 million dollars in fines from the Consumer Financial Protection Bureau after creating over a million unauthorized checking and savings accounts for their customers. For 10 points, name this embattled banking company headquartered in San Francisco.
ANSWER: **Wells Fargo** & Company

9. These cells undergo beta- and positive-selection steps before being tested for autoreactivity. They are the primary cells that recognize epitope- (EP-uh-tohp) bound MHC proteins. These cells mature in the thymus after their progenitors migrate from the bone marrow. Their CD8-plus "killer" type destroys infected cells. For 10 points, name these white blood cells whose CD4-plus "helper" type is targeted by HIV.
ANSWER: **T** cells [or **T** lymphocytes; or killer **T** cells; or cytotoxic **T** cells; or helper **T** cells; or memory **T** cells; or **T-h** cells; or **thymocyte**s]

10. While playing for this team, Hall of Famer Gary Payton won his only championship. Since 1995, former Lakers and Knicks coach Pat Riley has been this team's president. It won back to back championships behind a "Big Three" that included Chris Bosh. In 2010, LeBron James left Cleveland to "take his talents" to this team and join star Dwyane (DWAYNE) Wade. For 10 points, name this NBA team that plays in southern Florida.
ANSWER: **Miami** Heat [or **Heat**]

11. A commercial skyscraper in this city's financial district is known as the "Gherkin" because it resembles a cucumber. Renzo Piano designed a 95-storey skyscraper in this city referred to as the "Shard of Glass." This city is home to Europe's tallest Ferris wheel, once known as the "Millennium Wheel." Christopher Wren was tasked to design St. Paul's Cathedral here after a 1666 fire. For 10 points, name this English city where Big Ben can be found.
ANSWER: **London**

12. The anarchist Alexander Berkman wounded this man's partner, Henry Clay Frick. In his essay "The Gospel of Wealth," he encouraged charity through such means as endowing public libraries. This man eventually sold his company to J.P. Morgan for 480 million dollars. In 1892, the Homestead Strike targeted his main plant in Pennsylvania. For 10 points, what Scottish businessman founded a very successful steel company?
ANSWER: Andrew **Carnegie**

13. The dissociation constant for these substances can be approximated as fourteen minus the pKa. In the Bronsted-Lowry theory, these substances can be protonated. Lewis defined these substances as electron pair donors, whereas Arrhenius defined them as substances which supplied hydroxide in water—although that definition does not account for the pH of ammonia. For 10 points, what substances have a pH greater than 7?
ANSWER: **base**s [or **alkali**s]

14. These things were given electric shocks during an experiment by Martin Seligman that led to the development of learned helplessness theory. While conducting experiments on these things' digestive habits, a researcher coined the term "psychic secretion." The system of classical conditioning arose from experiments on these animals. For 10 points, what kind of animals were trained by Ivan Pavlov to salivate at the sound of a bell?
ANSWER: **dog**s

15. In Robert de Boron's account, this man was the son of a demon, but was baptized by Blaise to remove the evil. He helped a man enter into Tintagel castle in disguise to father a son with his enemy's wife. A story collected by Geoffrey of Monmouth claims that this man constructed Stonehenge. He reportedly died after being imprisoned by the Lady of the Lake, preventing him from aiding his ruler against Morgan le Fay. For 10 points, name this wizard who aided King Arthur.
ANSWER: **Merlin**

 **VHSL Conferences 2016-2017 - Round 03 - Directed Period**

1A. What name was held by an English nobleman known as the "Black Prince," and his father, the English king and third ruler of this name, who began the Hundred Years War?
ANSWER: **Edward** [or **Edward** III]

1B. What bridge, painted in International Orange, lies at the opening of San Francisco Bay?
ANSWER: **Golden Gate** Bridge

2A. What group of characters tell Macbeth he will become the Thane of Glamis and the Thane of Cawdor?
ANSWER: the Three **Witches** [or the **Weird Sisters**]

2B. The "Bacchanale" is an orchestral interlude from *Samson and Delilah*, opera by what French composer of *Danse macabre*?
ANSWER: Camille **Saint-Saëns** [or Charles-Camille **Saint-Saëns**]

3A. This is a 20-second calculation question. If angle A is in the second quadrant and sine of A is 5/13, what is cotangent A?
ANSWER: **-12/5** or **-2.4** [In the second quadrant, cosine, and cotangent, are both negative; and we are working with a 5-12-13 triangle.]

3B. This is a 20-second calculation question. Find the value of the sum of 0.9 to the nth power for integer n's from 0 to infinity.
ANSWER: **10** [this is a geometric sequence so the answer follows that 1/(1 - 0.9) = **10**]

4A. What two-faced Roman god presided over gateways, doorways, and passageways?
ANSWER: **Janus**

4B. Six molecules of what compound are used to reduce 1-3-BPG to a single G3P in the Calvin cycle?
ANSWER: **NADPH** [or **nicotinamide adenine dinucleotide phosphate**]

5A. What June 1969 riots in Greenwich Village are considered a landmark event in the gay liberation movement?
ANSWER: **Stonewall** riots

5B. Languages such as Portuguese and Italian are part of what group of languages that evolved from Latin and added grammatical articles?
ANSWER: **Romance** languages [or **Romanic** languages; or **Neo-Latin** languages; do not accept "Romantic languages"]

6A. The name of which amphibian is adapted to form a word that can mean either a being that dwells in fire or a mass of iron that is left behind at the bottom of a blast furnace?
ANSWER: **salamander** [or **salamandrine**]

6B. Three NBC television shows about fire fighters, police officers, and doctors are set in what city?
ANSWER: **Chicago**

7A. What is the SI unit for temperature, on which the definition of absolute zero is based?
ANSWER: **Kelvin**s

7B. What is the familiar, two-word name of the Islamic extremist group active in Nigeria that abducted over 200 schoolgirls in April 2014?
ANSWER: **Boko Haram**

8A. This is a 30-second calculation question. What is the area of an isosceles triangle with two legs of length 6 meeting at a vertex angle measuring 30 degrees?
ANSWER: **9** [An altitude from one base vertex to the opposite leg creates a 30-60-90 triangle, so the height of the isosceles triangle is 6\*(1/2)=3 if its base is a leg. The area is (1/2)\*6\*3=9.]

8B. This is a 30-second calculation question. If A and B are independent events, the probability of event A is 0.25, and the probability of event B is 0.45, what is the probability of the event A and B?
ANSWER: **.1125** [or **9/80**] [If the two events are independent, then their joint probability is the product of their individual probabilities.]

9A. In what novel by E. M. Forster does Lucy Honeychurch experience a romantic and spiritual awakening when she is kissed by George Emerson?
ANSWER: *A* ***Room with a View***

9B. The words "slithy" and "frumious" appear in what nonsense poem by Lewis Carroll?
ANSWER: "**Jabberwocky**"

10A. Which final English colony established in the seventeenth century was named for a devout Quaker?
ANSWER: **Pennsylvania** [or Province of **Pennsylvania**; or Commonwealth of **Pennsylvania**]

10B. The Very Large Array in New Mexico observes astronomical objects using what waves that have the longest wavelength in the electromagnetic spectrum?
ANSWER: **radio** waves

 **VHSL Conferences 2016-2017 - Round 03 - Third Period, Fifteen Tossups**

1. A king with this name was the father of a queen known as Joanna the Mad. With his wife, a king with this name expelled all Jews from his country with the Alhambra Decree. The Emirate of Granada fell to a king with this name, ending the Reconquista (ree-CONE-kees-ta) in 1492. For 10 points, what was the name of the king of Aragon who sponsored the voyages of Christopher Columbus and was married to Isabella of Castile?
ANSWER: **Ferdinand** [or **Ferdinand** II; or **Ferdinand** V; or **Ferdinand** III; or **Ferdinand** the Catholic]

2. For most of his career, this man's political opponent was the head of the Centre (CENTER) Party, Baron Ludwig Windthorst. He insisted that the "great questions of the time" would be resolved "by iron and blood." This Prussian was largely responsible for the anti-Catholic policies of *Kulturkampf* (CULL-toor-KAMPF), and he was forced out of his highest position by Wilhelm II. For 10 points, name this first German Chancellor.
ANSWER: Otto von **Bismarck** [or Otto Eduard Leopold, Prince of **Bismarck**]

3. The rapper Logic appears on a pop song by a member of this family called "Like a Bird." Tony Schwartz claimed to have "put lipstick on a pig" by writing a book with the head of this family. Three members of this family appeared in a photo with the caption "This is about an insider versus an outsider." A member of this family tweeted an analogy about three poisoned Skittles in a candy bowl. For 10 points, name this family that includes Melania, Ivanka, and Donald.
ANSWER: **Trump** family

4. Catalase breaks down a toxic compound into water and this molecule. This molecule is "evolved" in the water-splitting complex in PS two. A "great event" named for this molecule resulted from its production by cyanobacteria (sigh-AN-oh-"bacteria"). It is the final electron acceptor in the electron transport chain, and in its absence ATP can be made using fermentation. For 10 points, name this gas molecule required for aerobic respiration and carried by blood.
ANSWER: **oxygen** [or **O2**]

5. The main character of this novel is employed as a "mute" by Mr. Sowerberry, who forces him to act melancholy at funerals. In this novel, Bill Sikes accidentally hangs himself after he pummels Nancy to death in a fit of anger. This novel's title character loses a draw to ask for an additional portion of gruel at a workhouse. For 10 points, name this novel about an orphan who falls in with pickpockets led by Fagin, a work of Charles Dickens.
ANSWER: ***Oliver Twist***

6. In 1980, Samuel Doe took control of this country by killing many leaders of the True Whig Party. Another leader of this country once escaped from a Massachusetts prison and gave Pat Robertson the rights to mine for diamonds. Once led by the warlord Charles Taylor, it is currently led by Africa's first female head of state, Ellen Johnson Sirleaf. For 10 points, what West African country was founded by freed American slaves?
ANSWER: Republic of **Liberia**

7. A director from this country made a movie that introduced the instrumental "The Ecstasy of Gold." Another director from here made a film whose title refers to the approximate number of movies he had made at the time, *8 ½*. A director from this country made numerous westerns starring Clint Eastwood, such as *The Good, the Bad, and the Ugly*. For 10 points, the directors Sergio Leone (LEE-own-EE) and Federico Fellini hailed from what European country?
ANSWER: **Italy** [or **Italian** Republic]

8. This artist depicted a horse whose front left hoof rests on an orb in a statue in Padua. This artist, who used wood to create his *Penitent Magdalene*, allegedly ordered his sculpture of the prophet Habakkuk to "speak." This artist, who portrayed the mercenary Erasmo of Narmi in the equestrian statue *Gattamelata*, depicted a nude, sword-wielding boy stepping on the head of Goliath. For 10 points, name this early Renaissance artist who made a bronze *David*.
ANSWER: **Donatello** [or Donato di Niccolo di **Betto Bardi**]

9. A sonnet by this author originated from a contest with Horace Smith. This poet wrote, "We look before and after, and pine for what is not," in a poem whose speaker asks the addressee to "teach me half the gladness that thy brain must know." He also wrote a sonnet in which a "traveller from an antique land" describes the two stone legs of an ancient statue in the desert. For 10 points, name this Romantic poet of "To a Skylark" and "Ozymandias."
ANSWER: Percy Bysshe **Shelley**

10. The speaker of this poem declares that his "echoing song" will not be heard in a "marble vault" after imagining "deserts of vast eternity." This poem ends with the determination to make the sun "run." Its speaker imagines passing the "long love's day" with its addressee, whose actions would be "no crime" if the speaker did not hear "time's winged chariot." For 10 points, name this seduction poem that begins, "Had we but world enough and time," a work of Andrew Marvell.
ANSWER: "**To His Coy Mistress**"

11. In this country, Noble Drew Ali founded the Moorish Science Temple. This country has the oldest Baha'i (BAH-hye) House of Worship in the world. In 1930, Wallace Fard Muhammad started a religion in this country that preached "Allah is God and the white man is the devil." That religion here has been led by Elijah Muhammad and Louis Farrakhan (FAIR-uh-CONN). For 10 points, what country was where the Nation of Islam was founded in Detroit?
ANSWER: The **United States** of America [or the **U.S.**A.; prompt on America]

12. In some stories, this person spends ten years in Egypt because the local population refuses her to let her leave with her lover. This person was the fulfillment of Aphrodite's promise to a man who deemed a goddess the most beautiful of three deities. Though she had many suitors, she selected the Spartan king Menelaus (men-uh-LAY-us) as her husband. For 10 points, name this woman whose elopement with Paris touched off the Trojan War.
ANSWER: **Helen** of Troy

13. Though not volcanoes, these structures can release massive amounts of carbon dioxide when they erupt. Their meromictic examples contain layers that do not mix. Many of these structures that are situated in endorheic regions have drastically shrunk over time. Meandering river valleys feature their oxbow examples, which are studied in the field of limnology. For 10 points, what structures contain freshwater in a basin and are surrounded by land?
ANSWER: **lake**s [prompt on ponds]

14. This number is the highest oxidation state for xenon and osmium. This number of hydrogen atoms are found in propane, which only has single bonds and has three central carbon atoms bound to each other. Sulfur commonly exists in rings of this many atoms. Elements have this many electrons when they have a full valence shell. For 10 points, give this number of carbons in octane and the atomic number of oxygen.
ANSWER: **eight**

15. In 2016, a president celebrated the opening of a housing project in this city by having miles of its streets lined with a red carpet. This city's citadel is where a national symbol called the Eagle of Saladin was first used. This capital city's 6th of October Bridge honors the 1973 date when troops crossed into Israeli territory. This city's Tahrir Square hosted several protests in 2011. For 10 points, name this city where tourists visit the tomb of King Tut, the capital of Egypt.
ANSWER: **Cairo**, Egypt

 **VHSL Conferences 2016-2017 - Round 03 - Tiebreaker Questions**

1. An apprentice to Asclepius (ess-KLEEP-ee-USS), Paeon, was turned into this type of object by Zeus. A lover of Apollo was turned into this type of object after he was struck by a stray discus. A man from Greek myth who lends his name to a variety of this type of object was cursed by Nemesis so that he fell in love with his own reflection in a pond. For 10 points, identify this type of object, varieties of which are named after Hyacinth and Narcissus.
ANSWER: **flower**s [or **Hyacinth**us until "Hyacinth" is read; or **Narcissus** until "Narcissus" is read; prompt on plants]

2. According to the Golden Bull of Charles IV, the ruler of this empire was selected by seven electors, including the King of Bohemia. A man who ruled this empire defeated the Magyars at the Battle of Lechfeld and was crowned by the Pope in 962. Both Otto the Great and Charlemagne are claimed to be the first rulers of this empire. For 10 points, name this large European empire, whose name references an ancient world power.
ANSWER: **Holy Roman** Empire [or **HRE**; do not accept or prompt on "Roman Empire"]

3. Contemporary leaders of this school of thought include the author of *The Moral Landscape*, Sam Harris. A notorious activist from this school of thought was kidnapped and murdered in 1995 and was named Madalyn Murray O'Hair. This philosophical school of thought is vigorously advanced by the English biologist and author of *The Selfish Gene*, Richard Dawkins. For 10 points, name this belief that there is no God.
ANSWER: **atheism** [or New **Atheism**; prompt on secularism; prompt on humanism]

4. The difference between the *n*th and *n* minus first numbers of this type is always two *n* minus one. A special factorization formula for quadratics involves recognizing the difference of two numbers of this type. A right triangle with sides of seven and twenty-four has a hypotenuse that is one of these numbers, twenty-five. For 10 points, what type of numbers are defined as a positive integer raised to the second power?
ANSWER: **square** numbers [or perfect **squares**]

5. In a poem by this author, an old hag transforms into a beautiful girl after saving her future husband from execution by teaching him that what women want is dominion over their spouses. He also wrote a poem in which John is tricked into hiding in a bathtub by his wife so she can have an affair with Nicholas. This man wrote poetic tales narrated by such characters as the Miller and the Wife of Bath. For 10 points, name this medieval poet of *The Canterbury Tales*.
ANSWER: Geoffrey **Chaucer**

In triangle ABC, side BC is nine units long, side AC is six units long, and angle ACB is 120 degrees. What is the length of side AB?
ANSWER: square **root** of **171** [Use the law of cosines, and the fact that the cosine of 120 degrees is -1/2 to get x²=9²+6²-2\*9\*6\*-1/2=81+36+54.]

What is the shared surname of the Victorian poet Robert, who wrote "Rabbi Ben Ezra," and his wife Elizabeth, who wrote *Sonnets from the Portuguese*?
ANSWER: **Browning** [or Robert **Browning**; or Elizabeth Barrett **Browning**]