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| High School Academic Pyramid Questions | **VHSL Scholastic Bowl**  **State Championships 2015**  **Round 4**  **First Period, Fifteen Tossups** |

1. In February 2015, this team sent its backup goaltender Marek Mazanec (MAIR-ek muh-ZAN-ek) to the Milwaukee Admirals, its AHL affiliate. This team was nearly moved to Kansas City in 2008 as part of a fraud scheme by Boots Del Biaggio, and has since begun a winning trend involving the throwing of catfish onto its ice at Bridgestone Arena. This team began play in 1998, one year before another Southern expansion franchise, the Atlanta Thrashers. For 10 points, name this NHL team that has a sabertooth tiger logo and is based in Tennessee.  
ANSWER: **Nashville** Predators [or **Predators**]

2. With David Bohm, this scientist names a causal interpretation of quantum mechanics also known as pilot-wave theory. Another theory made by this physicist was confirmed in an experiment where electrons produced the same diffraction pattern as X-rays, obeying Bragg’s Law. This man’s namesake wavelength equals the Planck’s constant divided by a particle’s momentum. The Davisson-Germer experiment confirmed one of this man’s statements. For 10 points, name this man who theorized that all particles have wave-like properties.  
ANSWER: Louis **de Broglie** [Louis Victor Pierre Raymond, 7th duc **de Broglie**]

3. This book analogizes three “metamorphoses of the spirit” to a camel, a lion, and a child. This book’s title character envisions man walking a “tightrope” away from his beastly nature, after a friendly eagle-snake duo joins him in descending from the mountains. The title holy man of this book, subtitled “A Book for All and None,” restates the ideas of eternal recurrence and hails the coming of the “ubermensch” (OO-bur-mensh). For 10 points, name this 1891 text by Friedrich Nietzsche (NEE-cheh), which puts ideas in the mouth of a Persian prophet.  
ANSWER: ***Thus Spoke Zarathustra*** [or ***Thus Spake Zarathustra***; or ***Also sprach Zarathustra***]

4. Numbers appearing in a series given this name appear in the closed-form solution to values of the Riemann zeta function at negative integers, and give the coefficients appearing in explicit formulas of power summations. L’Hopital’s (low-pee-TAHL’s) rule was actually discovered by a man with this surname. A single coin flip can be modeled by a probability distribution given this name; the sum of random variables generated by that distribution is a binomial distribution. For 10 points, give this surname of a Swiss family of mathematicians and scientists.  
ANSWER: **Bernoulli** [or Jacob **Bernoulli**; or Johann **Bernoulli**]

5. This city’s district of Eixample (eye-HAHM-play) features octagonal blocks designed by Ildefons Cerda (eel-DAY-fons SAIR-duh). The Magic Fountain of Montjuic (mont-WEEK) was built here for a 1929 International Exposition. Its Carmel Hill is home to a housing development named for Eusebi Guell (yoo-SAY-bee GWELL). A basilica here which will have eighteen spires upon its completion in 2026. For 10 points, Antoni Gaudí’s (gow-DEE’s) Sagrada Familia (sah-GRAH-dah fah-MEEL-ee-uh) is in what capital of Catalonia in northeastern Spain?  
ANSWER: **Barcelona**

6. This author created the fictional city of Whilomville as the setting for several of his short stories, including “The Monster.” An alcoholic mother named Mary yells, “Yeh’ve gone teh deh devil!” at the title prostitute of one of his novels. The body of shipwreck victim Billie the oiler washes ashore in his story “The Open Boat.” This author of *Maggie: A Girl of the Streets* wrote about a recruited soldier who meets the “tattered man” and receives the title blow to the head. For 10 points, name this author who created Henry Fleming in *The Red Badge of Courage.*  
ANSWER: Stephen **Crane**

7. Frederick Catherwood and John Lloyd Stevens made travelogues describing several cities of this civilization. Descendants of this civilization fought in the Caste Wars. A pyramid built by this civilization produces a shadow resembling a serpent during the equinoxes, and was a temple dedicated to Kukulkan (koo-kool-KAHN). This civilization’s sites include Palenque (pah-LAIN-kay) and Chichen Itza. For 10 points, name this civilization whose Long Count calendar predicted a cycle that ended on December 21, 2012.  
ANSWER: **Maya**n civilization

8. A group of these creatures uses tree trunks and stones to crush Caeneus (KAY-nee-uss). When one of them named Eurytion (yur-IT-ee-on) tries to assault Hippodamia (hipp-oh-DAY-mee-uh) at her wedding to Pirithous (PEER-ith-oos), a fight breaks out between these creatures and the Lapiths (LAY-piths). One of them tricks Deianira (DAI-uh-NAH-ruh) into giving Heracles a poisoned shirt; another tutors heroes such as Perseus and Achilles. For 10 points, name these creatures, exemplified by Chiron (KAI-ron), who are half-man, half-horse.  
ANSWER: **centaur**s [or hippo**centaur**s]

9. These structures formed en masse during the Heinrich events. Ancient air released by these structures creates a continuous crackling sound known as their namesake “seltzer.” The dry dock type of them has a U-shaped slot usually flanked by pinnacles. The largest recent example of these structures was a tabular one named B-15. These bodies are often formed when longitudinal stretching deepens crevasses to the point of calving. Many of them originate from the Ross Shelf. For 10 points, name these large structures that break off from glaciers and float in the ocean.  
ANSWER: **iceberg**s [or **ice island**s; or tabular **iceberg**s; or non-tabular **iceberg**s; or **berg**y bit; or **growler**; prompt on **ice**]

10. This man defined the intensification of feelings during spiritual communal gatherings as “collective effervescence.” He described “manners of acting, thinking, and feeling external to the individual” that influence individuals called “social facts.” In another book, he broke down an action into egoistic, anomic, altruistic, and fatalistic types, and found that it occurs at a higher rate among Protestants than Catholics. For 10 points, name this French sociologist who wrote *The Elementary Forms of the Religious Life* and *Suicide*.  
ANSWER: Emile **Durkheim**

11. In a debate, this man joked he would not exploit his “opponent’s youth and inexperience.” After giving the “Time for Choosing” speech to support Barry Goldwater, he was elected Governor of California. This man’s economic policies were dubbed “voodoo economics” by his future Vice-President. Early in his term as President, he fired striking air traffic controllers and was shot by the insane John Hinckley, Jr. For 10 points, name this Republican President who exhorted Mikhail Gorbachev to “tear down” the Berlin Wall and defeated Jimmy Carter in 1980.  
ANSWER: Ronald **Reagan** [Ronald Wilson **Reagan**]

12. This man sang “crime is increasing, trigger happy policing” on the final track of an album which opens with an Eli Fontaine saxophone riff, after striking for more creative control from label owner Berry Gordy. This singer of “Inner City Blues” was previously known for duets such as “Your Precious Love” with Tammi Terrell. He released his final album, *Midnight Love*, two years before being shot to death by his father in 1984. For 10 points, name this Motown singer of “What’s Going On,” “I Heard It Through The Grapevine,” and “Sexual Healing.”  
ANSWER: Marvin **Gaye** [or Marvin Pentz **Gay**, Jr.]

13. A type of these cells releases a web of chromatin (KROH-muh-tin) and proteases (PRO-tee-eyz-ez) called its namesake “extracellular trap.” Another type of them differentiates into a resident cell in the liver named after Kupffer. Some of these cells are derived from a myeloblast (MAI-loh-blast) progenitor and have multilobed nuclei and granules. Many immature ones are found during leukemia, which often affects their infection-fighting B type. For 10 points, name these immune cells, categorized as lymphocytes or leukocytes (LOO-koh-sites), that are not red.  
ANSWER: **white blood cell**s [**WBC**s; or **monocyte**s; or **macrophage**s; or **neutrophil**s; or **lymphocyte**s until it is read; or **leukocyte**s until it is read; or **eosinophil**s until it is read; or **B** cells until it is read]

14. This man gave a bulletproof carriage to Alexander II of Russia, who was killed after stepping out of it. He was the target of an assassination attempt by Felice Orsini (FEH-lee-cheh or-SEE-nee), a member of the Carbonari. With Count Cavour, he signed the Pact of Plombieres (PLOM-byair), securing an alliance against Austria. This emperor, who was captured by Prussian forces at Sedan, took power after an 1848 revolution forced Louis-Philippe (LOO-ee-fil-EEP) to abdicate. For 10 points, name this last emperor of France, the nephew of the loser at Waterloo.  
ANSWER: **Napoleon III** [or **Louis-Napoleon** Bonaparte; prompt on **Bonaparte**; prompt on **Napoleon**; do not accept “Napoleon Bonaparte”]

15. In a play by this author, a character says, “It’s finished,” before heading to the kitchen to wait for someone with a handkerchief over their face. Nagg and Nell remain in trash cans for the length of that play by this man, which also features Hamm and Clov. Another character created by this man owns the slave Lucky. Pozzo appears in a play by this author in which Vladimir and Estragon perform the title action. For 10 points, name this absurdist Irish playwright of *Endgame* and *Waiting for Godot.*  
ANSWER: Samuel **Beckett** [Samuel Barclay **Beckett**]

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| High School Academic Pyramid Questions | **VHSL Scholastic Bowl**  **State Championships 2015**  **Round 4**  **Directed Round** |

1A. In what Christopher Marlowe play does Barabas engineer the deaths of Mathias and Lodowick before dying when he falls into a boiling cauldron?  
ANSWER: *The* ***Jew of Malta***

1B. What territory, which is used by the European Space Agency for rocket launches, is the only portion of mainland South America that is part of a European country?  
ANSWER: **French Guiana** [or **Guyane Francaise** do not prompt on “Guyana”]

2A. Name the rebellion against the Qing (CHING) Dynasty in which the Ever-Victorious Army repulsed an attempt to take Shanghai by Hong Xiuquan (shee-KWAHN), who believed he was the younger brother of Jesus.  
ANSWER: **Taiping** Rebellion [or **Taiping** Tianguo]

2B. What Roman Emperor suppressed the revolt of Simon bar Kochba and built a namesake wall that marked the northern limit of Roman Britain?  
ANSWER: **Hadrian** [Caesar Traianus **Hadrian**us Augustus; or Publius Aelius **Hadrian**us; do not prompt on answers that do not include “Hadrian”]

3A. This is a 20-second calculation question. In right triangle ABC, angle B measures 60 degrees. Line EB is parallel to segment AC. What are the two possible values for the sum of the measures of angles ABE and CBE?  
ANSWER: **120** and **240** degrees

3B. This is a 20-second calculation question. A student has quiz scores of 85, 75, and 82. What score does the student need on the last quiz to have an average score of 83?  
ANSWER: **90**

4A. What dictator banned abortions with his Decree 770 and was executed by firing squad with his wife Elena on Christmas Day 1989?  
ANSWER: Nicolae **Ceausescu** (chow-CHESS-kyoo)

4B. What Jewish festival, which ends on the twenty-first day of Tishrei (TISH-ray), involves the building of a structure with a roof made of organic materials and the movement of four specific plants?  
ANSWER: **Sukkot** [or **Sukkos**]

5A. What physicist invented a mercury barometer and names a unit of pressure equal to roughly 133 Pascals?  
ANSWER: Evangelista **Torricelli** [prompt on **torr**]

5B. What 2014 Tolkien-based video game earned praise for its Nemesis system?  
ANSWER: *Middle Earth:* ***Shadow of Mordor***

6A. In what Jorge Luis Borges (HOR-hay loo-EES BOR-hays) short story does the German spy Yu Tsun murder Stephen Albert in order to convey a secret message?  
ANSWER: “The **Garden of Forking Paths**” [or “El **Jardin de senderos que se bifurcan**”]

6B. What five-letter word beginning with “u” means to “take someone’s position,” often used in the context of dynastic struggles?  
ANSWER: “**usurp**”

7A. What diacritical mark is used in French to indicate the historical presence of an “s” or other letter that has since disappeared from a word, and can be found above the “o” in “l’hopital” [LO-pee-tal]?  
ANSWER: **circumflex** [or accent **circonflexe**]

7B. Cramer’s rule uses determinants to solve what collections of formulas over a common set of variables, which can be dependent, independent, or inconsistent?  
ANSWER: **system**s of linear **equation**s [or **linear system** of equations; or **SLE**s]

8A. This is a 30-second calculation question. What is the square root of the expression 1 plus 2 to the t plus 2 to the quantity one-half t plus 1?  
ANSWER: **1 plus 2 to the quantity one-half t** [or **1 plus** square **root** of **2 to the t**; or **1 plus rad**ical **2 to the t**]

8B. This is a 30-second calculation question. When the sun is 30 degrees above the horizon, a child casts a shadow 70 inches long. To the nearest inch, how tall is the child?  
ANSWER: **40** inches [or **3 feet 4 inches**]

9A. What polyatomic ion with a minus-three charge is added to proteins by kinases (KAI-nay-zez) and alternates with a sugar residue to form the backbone of DNA?  
ANSWER: **phosphate** [or **PO4**-three minus]

9B. What author wrote about her friendship with Picasso through the eyes of her lover in *The Autobiography of Alice B. Toklas*?  
ANSWER: Gertrude **Stein**

10A. What Hungarian composer combined sounds of nature with dissonance in the “night music” style used for his *Concerto for Orchestra* and *Music for Strings, Percussion and Celesta*?  
ANSWER: Béla **Bartók** [Béla Viktor János **Bartók**]

10B. What man died in July 2014 when he was put in an illegal chokehold by a NYPD officer on Staten Island, prompting numerous protests?  
ANSWER: Eric **Garner**

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| High School Academic Pyramid Questions | **VHSL Scholastic Bowl**  **State Championships 2015**  **Round 4**  **Third Period, Fifteen Tossups** |

1. This country was home to a group of directors called the “kinoks” (KEE-noks), one of whom explored different cinematic techniques in *Man with a Movie Camera*. A director from this country depicted a climactic battle fought atop a frozen lake, in which the Teutonic Knights were defeated. A film from this country opens with several sailors complaining about rotten rations and includes a scene depicting a massacre on the Odessa Steps. For 10 points, name this home country of Dziga (JEE-guh) Vertov and Sergei Eisenstein, the director of *Battleship Potemkin*.  
ANSWER: **USSR** [or **Soviet** Union; or Union of **Soviet** Socialist Republics; or **Sovetskij** Soyuz; or **SSSR**; or **Soyuz Sovetskikh Sotsialisticheskikh Respublik**; prompt on **Russia**]

2. This apostle had a vision in which God presented a tablecloth filled with unclean foods. At Jesus’s arrest, this man used a sword to cut off a servant’s ear. When Herod threw him into jail, he was miraculously freed at night by an angel. This apostle tried to walk on water but sank due to his lack of faith, and he was traditionally crucified upside-down. Jesus anointed this apostle as the rock upon which the church would be built. For 10 points, name this apostle who denied knowing Jesus three times.  
ANSWER: **Peter** [or Simon **Peter**; or **Petrus**; or **Cephas**]

3. In this city, Gail Halvorsen earned the nickname “Uncle Wiggly Wings” during Operation Vittles. The electrician Peter Fechter was shot on the “death strip” in this city. A construction project in this city was undertaken by the government of Walter Ulbricht (OOL-brikt). Lucius Clay responded to a blockade of this city by organizing an airlift. A structure in this city was crossed by Checkpoint Charlie and torn down in 1990. For 10 points, name this city that was divided into “East” and “West” sections by a wall during the Cold War.  
ANSWER: **Berlin** [or East **Berlin**; or **West Berlin**]

4. This character wishes that a blow “might be the be-all and the end-all,” and begins by stating, “If it were done when ‘tis done, then ‘twere well it were done quickly.” In another speech, this character claims, “Life’s but a walking shadow, a poor player that struts and frets his hour upon the stage,” calling it “a tale told by an idiot, full of sound and fury.” This character’s kingship is predicted by three witches he meets while traveling with Banquo. For 10 points, name this Shakespearean title character, who kills Duncan to become King of Scotland.  
ANSWER: **Macbeth**

5. An order to make this place a “howling wilderness” was issued by Jacob H. Smith, who also issued the order here to “kill everyone over ten.” U.S. soldiers were killed here in the Balangiga (BAH-lahn-GEE-guh) Massacre. This place was subjugated by Frederick Funston, following the declaration of the Malolos (mah-LOH-lohs) Constitution by Emilio Aguinaldo (ah-gwee-NAHL-doh). William Howard Taft then served as its governor. For 10 points, name this Southeast Asian island group where a rebellion against U.S. rule arose after the Spanish-American War.  
ANSWER: the **Philippines**

6. The interaction of this property with a particle’s orbital angular momentum produces a splitting of spectral lines. The direction of this quantity rotates in Thomas precession. Its existence was demonstrated in an experiment sending silver atoms through a magnetic field. It is half-integer for fermions and cannot be the same for two particles in the same orbital, according to the Pauli exclusion principle. For 10 points, identify this term for the intrinsic angular momentum of a particle, which for an electron is either “up” or “down.”  
ANSWER: **spin**

7. Hugo Chavez attempted to rename one of these features Kerepakupai Vena (keh-reh-paa-KOOP-ai), using the indigenous Pemon (peh-MOHN) language. A deep U-shaped chasm at one of these features is nicknamed the “Devil’s Throat.” The tallest example of these features is located in Venezuela and is named for American pilot Jimmie Angel. For 10 points, identify these features that include Iguazu (ee-goo-AH-zoo), which allegedly caused Eleanor Roosevelt to say “Poor Niagara!”  
ANSWER: **waterfall**s

8. During this event, Clint Hill jumped onto a moving automobile. The person who carried it out later went to a movie theater after killing police officer J.D. Tippit. This event resulted in the wounding of Governor John Connally, who was present at Dealey Plaza. The Warren Commission controversially concluded thart this event was carried out only by Lee Harvey Oswald. For 10 points, name this November 1963 event in which an American President was killed in Dallas.  
ANSWER: the **assassination** of John Fitzgerald **Kennedy** [or **assassination** of **JFK**; or equivalents for “assassination” such as **murder** or **shooting**]

9. In 2015, this country concluded a lengthy trial of Douglas Mwonzora (muh-wun-ZOR-uh), who called its president a “goblin.” This country’s president was elected leader of the African Union in February 2015, after which he stumbled on a red carpet while disembarking from an airplane. That incident caused a flurry of speculation over whether this country’s ninety-year-old dictator is healthy enough to continue opposing the Movement for Democratic Change. For 10 points, name this country which suffered hyperinflation under Robert Mugabe (moo-GAY-bay).  
ANSWER: **Zimbabwe** [Republic of **Zimbabwe**]

10. A theorem about these things states that the function pi of N is asymptotically equal to N over the natural log of N, so these things occur less frequently as N grows large. Dirichlet’s (dee-reesh-LAY’s) theorem states that there exists an infinite number of them in certain arithmetic progressions. Bertrand’s postulate states that at least one of them exists between n and two n for n greater than two. These things can be found with the Sieve of Erathosthenes (air-uh-TOSS-thuh-neez). For 10 points, name these numbers which have no divisors but one and themselves.  
ANSWER: **prime** numbers

11. This author described his seafaring adventures with Ed Ricketts in *The Log from the Sea of Cortez.* The central family of a novel by this man meets Ivy and Sairy Wilson on Highway 66. Jody Tiffin owns the title animal of this author’s *The Red Pony.* In another of his novels, a strike in a peach orchard is organized by the discouraged former preacher Jim Casy. In that novel by this author, Tom Joad travels to California with his family of “Okies.” For 10 points, name this American novelist of *The Grapes of Wrath.*  
ANSWER: John **Steinbeck** [John Ernst **Steinbeck**, Jr.]

12. Pinkerton detective James McParland infiltrated a secret society of men of this profession in the 1880s. The Colorado National Guard killed about twenty of these people, who were on strike, in the Ludlow massacre. “Big Bill” Haywood led a union of these people during strikes in the Cripple Creek district. Six of these people were executed for their roles as Molly Maguires. The CIO was begun by John L. Lewis, who campaigned for this profession as president of the UMW. For 10 points, name this profession which extracts coal and minerals.  
ANSWER: **miner**s [or word forms; or more specific answers such as coal **miner**s, silver **miner**s, etc.]

13. This character dreams of his best friend turning into a woman and offering to suckle him. This character stubbornly stands with his arms crossed for a whole night until his father lets him join some ascetics, and he later apprentices with a wise ferryman. A snakebite kills his child’s mother, the courtesan Kamala (kah-MAH-luh). This character leaves the Samanas (sah-MAH-nahz) when he and Govinda (goh-VIN-duh) hear about Gotama (goh-TAH-muh), a man said to have reached Nirvana. For 10 points, name this title character of a novel by Hermann Hesse.  
ANSWER: **Siddhartha**

14. The Ebola therapeutic ZMapp consists of these proteins made in tobacco plants. A type of them produced by hybridomas (hai-brid-OH-muz) can treat some cancers. Protein A is used in affinity chromatography of these proteins, which bind other proteins in a Western blot. Enzymatic digestion of these proteins may yield one Fc and two Fab fragments. They have two heavy chains and two light chains that form a “Y” shape. Their IgG type gives fetuses passive immunity. For 10 points, name these proteins secreted by plasma B cells which bind to antigens.  
ANSWER: **antibodies** [or **immunoglobulin**s; or monoclonal **antibodies**; or m**Ab**s]

15. A painting by this man depicts Paul Lhote (LOAT), in yellow shoes and a straw hat, dancing with a woman with a red bonnet who was also the model of his *Girl Braiding Her Hair*, named Suzanne Valadon. This painter of *Dance at Bougival* (boh-gee-VAHL) showed his friends in a Montmartre (mohn-MAR-treh) dance hall, and in a painting where a red-and-white canopy hangs over the title meal. For 10 points, name this Impressionist painter of *Bal du Moulin de la Galette* (moo-LAHN day la gah-LET) and *Luncheon of the Boating Party*.  
ANSWER: Pierre-Auguste **Renoir**

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| High School Academic Pyramid Questions | **VHSL Scholastic Bowl**  **State Championships 2015**  **Round 4**  **Tiebreaker/replacement questions** |

1. The protagonist of this novel wastes his last bullet by mercifully killing an enemy about to fall to his death. This novel begins with General Webb planning an expedition to Fort William Henry. Two sisters of contrasting temperaments in this novel are Cora and Alice Munro, the daughters of a commander during the French and Indian War. The title character of this novel is Uncas, the son of the chieftain Chingachgook (chin-GOTCH-GUK), who is friends with Natty Bumppo. For 10 points, name this second Leatherstocking Tale by James Fenimore Cooper.  
ANSWER: *The* ***Last of the Mohicans***

2. The Akra-Bazzi method analyzes the runtime of functions that use this technique. Space requirements can be reduced by the "tail" type of this technique, which avoids adding to the call stack. The Ackermann function is defined using this technique, which is used to split problems into sub-problems by divide and conquer algorithms. The factorial of n can be calculated using this technique by multiplying n by the factorial of n minus 1 until the base case is reached. For 10 points, name this technique in which a function calls itself.  
ANSWER: **recursion**

3. The Sumerian god Dumuzi is taken to this type of place as punishment when he does not weep for Inanna. In the *Popol Vuh* (PAH-pul-woo), rulers of one of these places play a ball game with Hunahpu (hoo-NAH-poo) and Xbalanque (shib-uh-LAHN-kay). The Norse god Hermod travels to this type of place to retrieve his brother Balder, but is told that Balder cannot leave unless the whole world cries. In Greek mythology, Persephone (per-SEH-fuh-nee) is trapped in one of these places after eating a pomegranate seed. For 10 points, what kind of realm is ruled by Hades?  
ANSWER: **underworld**s

4. This city’s namesake river features the polluted and seasonal Tequendama (TAY-cain-DAH-mah) Falls, and its southernmost locality contains the largest paramo (pah-RAH-moh) moorland in the world, the Sumapaz (soo-MAH-pahz). This city is located on a namesake “savannah” which is actually part of the Eastern Cordillera (cord-ee-YAIR-uh). It’s not in Venezuela, but this city’s government district is called the Plaza de Bolivar. For 10 points, name this city in the Andes, the capital of Colombia.  
ANSWER: **Bogotá**

5. This man’s father was an illustrator who worked on books such as *Treasure Island* and was named N.C. This man frequently painted Anna and Karl Kuerner, who lived on a farm at Chadds Ford, and another neighbor, Helga Testorf. This man’s most famous painting used as a model a woman suffering from polio. That painting by him is of a woman lying in a field, looking at a house and barn. For 10 points, name this American painter of *Christina’s World*.  
ANSWER: Andrew **Wyeth**

What composer included “The Swan of Tuonela” in his *Lemminkainen Suite* and wrote the patriotic *Finlandia*?  
ANSWER: Jean **Sibelius** [or Johan Julius Christian **Sibelius**]

This is a calculation question. If the diagonals of a kite are 12 inches long and 6 inches long, what is the area of the kite?  
ANSWER: **36** square inches