



The Illinois Mathematics and Science Academy of Aurora, IL,



in partnership with Loyola Academy of Wilmette, IL, present

# IMSANITY 3

## -ROUND 11-

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## Tossups

- (1) The western border of this body of water is partially formed by island groups which include the cities of Kirkwall and Lerwick. Underwater features in this body of water include a sandbank known as central Dogger Bank, and its southeastern portion includes the Wadden Sea. This sea is connected to another sea to its east by the artificial Kiel canal, and it is connected by the (\*) Strait of Dover to the English Channel. Site of the mouths of the Thames and Rhine, for ten points, name this European sea bordering Britain, Scandinavia, and the Netherlands.

ANSWER: North Sea

- (2) One composer from this country wrote an opera about the personification of death Nekrotzer, *Le Grande Macabre*, while another created a namesake pedagogical method redefining solfege with moveable instead of fixed do [pronounced “doh”]. One composer from this country created a work culminating in “Six Dances in Bulgarian Rhythm”, a set of 153 progressively harder piano pieces. In addition to that creator of *Mikrokosmos*, one of this country’s composers created a set of twelve (\*) *Transcendental Etudes*, as well as setting this country’s native music to a set of “Rhapsodies.” For ten points, name this home of Bela Bartok and Franz Liszt.

ANSWER: Hungary

- (3) One novel by this author follows the life of Irish nationalist Roger Casement, and in another novel, Urania Cabral returns to the Dominican Republic thirty-five years after fleeing the Trujillo regime. This author of *The Dream of the Celt* and *The Feast of the Goat* wrote a novel that follows the conflict between the Brazilian military and an apocalyptic cult led by Antonio Conselheiro. The Jaguar leads a group of cadets at Leoncio Prado Military Academy in a novel by this author of (\*) *The War of the End of the World*, and this author created the character of Pedro Camacho. For ten points, name this Peruvian author of *The Time of the Hero* and *Aunt Julia and the Scriptwriter*.

ANSWER: Mario Vargas Llosa

- (4) An excellent weather forecast by James Stagg enabled this event to begin before the next full moon, and Hobart's Funnies proved very successful in it. A rehearsal for this event that succumbed to friendly fire and enemy ships was Exercise Tiger, and goods were supplied through Mulberry harbors during this event. One side was tricked into believing that similar events would take place in Norway and Calais as part of Operation Fortitude. Large guns at Pointe du Hoc were part of the (\*) Atlantic Wall, which contributed to stiff resistance for the U.S. forces at Omaha Beach during this event. For ten points, name this 1944 event that captured a foothold in France to begin the process of ending World War II.

**ANSWER:** D-Day (or Operation Neptune or Operation Overlord or the Normandy invasion or equivalents)

- (5) The Gibbs adsorption isotherm relates how solutes affect this quantity, and it remains constant after the critical micelle concentration is reached. Its dependence on temperature is explained by the Eötvös Rule, and it can be measured with a Wilhelmy Plate or a Du Nouy ring in units of dynes per centimeter. Capillary action occurs due to this phenomenon, it results in (\*) menisci for most liquids, and detergents lower the value of this quantity because they are surfactants. For ten points, name this property of liquids which allows small bugs to walk on water.

**ANSWER:** surface tension

- (6) This doctrine is held to be the first sermon, but not the last, by the Nichiren form of its religion. A concept mentioned in this doctrine is considered in the metaphor of an obstructed wheel. One of these tenets refers to the *Samudaya*, or origin, of another concept; the former of which is linked to *Upadana*, one of the three poisons, which translates to "attachment". The third of these tenets shows the way to the cessation of *dukkha*, while the last includes (\*) right speech, right action, and right concentration in its definition of the Eightfold Path. For ten points, name this group of statements developed by Buddha, the first of which can be summarized as "Life is suffering".

**ANSWER:** The Four Noble Truths (accept Cattari Ariyasaccani or Catvari Aryasatvani)

- (7) Terence Tao used a Selberg sieve to show that this problem could not be solved in sublinear time. Agrawal, Kayal, and Saxena proved that this problem can be solved in polynomial time. Algorithms to solve this problem named for Miller-Rabin and for Lucas are both based on Fermat's Little Theorem. An early algorithm for this problem checked if the input survived the (\*) Sieve of Eratosthenes, while another checks all numbers up to the square root of the input to see if they are divisors. Closely related to the problem of factoring, for ten points, identify this problem which attempts to determine if a given positive integer has only one proper factor.

**ANSWER:** primality testing (accept anything about determining whether a number is prime, do not accept finding primes or equivalents)

- (8) This author wrote about Charlotte Henley's love for George Morton in *Heart*, which was collected as part of his *Tale for Fifteen*. Bob Betts and The Neshamy come to rescue Mark Woolston, who had been abandoned with the Raucous, in one novel, and another novel followed the romance between the title character, Jasper Western, and Mabel Dunham. This author of *The Crater* wrote a story in which Uncas and Cora die together, although Duncan Heyward succeeds in rescuing (\*) Alice Munro from Magua. He followed Natty Bumppo in *The Pathfinder* and *The Deerslayer*, part of his *Leatherstocking Tales*. For ten points, name this author of *Last of the Mohicans*.

**ANSWER:** James Fenimore Cooper

- (9) One man from this country started the newspaper *The Autonomist*, and he and Benjamin Herrera founded the Republican University. After "narco cassettes" were found, Samper was forced out of office in this country in the 8,000 Process. The Declaration of Sitges ended a civil war that began when Jorge Eliecer Gaitan was assassinated, and this country gained its independence at the Battle of Boyaca. In addition to to the War of a Thousand Days and (\*) La Violencia, other problems in this country include a Medellin drug cartel and the guerrilla group FARC. For ten points, name this South American nation with capital at Bogotá.

**ANSWER:** Republic of Colombia

- (10) Although it is not the medulla oblongata, this body part's TIDA neurons in its arcuate nucleus regulate prolactin secretion. This organ produces two nearly identical sulfur-bridge-containing hormones, one of which acts by increasing the number of aquaporin channels in its target tissue. This organ also synthesizes somatostatin, which acts antagonistically to another hormone produced here, GHRH. It releases vasopressin and oxytocin and is also a major source of neurohormones including (\*) "releasing hormones" whose target cells lie in the anterior pituitary gland. For ten points, name this region of the brain responsible for homeostasis.

ANSWER: hypothalamus

- (11) An incompetent general this man refused to fire was known as "Agent 13" to the Spanish; that general was James Wilkinson. He argued that a large republic could better protect against factionalism in Federalist No. 10 and argued for a system of checks and balances in Federalist No. 51. Supporters of nullification cite a document he wrote, the Virginia Resolution. As (\*) President, he signed the charter for the Second Bank of the United States. His wife saved a portrait of George Washington when the White House was burned in the War of 1812. For ten points, name this President who is known as the "Father of the Constitution."

ANSWER: James Madison

- (12) In one myth, Howori uses the jewel shiho-mitsu-tama to create one of these entities that nearly kills his brother Hoderi. In another myth, Nuwa kills a black dragon and uses the ashes from the surrounding weeds to end one of these entities. One of these takes place after an eel makes the frog Tiddalik laugh, and Dardanus fled Samothrace after surviving one of these events. All of Cessair's party except Fintan is killed by one of these events in Ireland. New (\*) humans were created from stone to replace those killed by one survived by Pyrrha and Deucalion. For ten points, identify this event which Noah survived by building an ark.

ANSWER: flood (accept equivalents like deluge)

- (13) In 1883, this building saw the removal of its two bell towers nicknamed the "ass's ears" that had been designed by Gian Lorenzo Bernini. The original pediment of this building is still visible, even though certain features being cut too short forced a new lower pediment to be added; those features were the sixteen Corinthian columns supporting its portico. Five rows of indentations called coffers appear below the building's only source of light, an (\*) oculus, which sits at the top of the world's largest unreinforced concrete dome. Originally commissioned by Marcus Agrippa and rebuilt by Hadrian, for ten points, name this temple dedicated to all Roman gods.

ANSWER: Pantheon

- (14) Tears of wine are caused by a form of this process involving surface tension, the Marangoni effect. In another form of this phenomenon, polymers move inward toward a rotating rod; that is the Weissenberg effect. The most common form of this process, which forms namesake cells, is called the Rayleigh-Benard type. This process can either be forced or natural, with the latter type being significantly diminished in zero-gravity. Another type of this process occurs due to buoyancy in the stack effect. This process occurs in the atmosphere to form (\*) thunderstorms and Hadley cells and occurs in the mantle to form hotspots. For ten points, name this type of heat transfer in which the material itself moves, contrasted with radiation and conduction.

ANSWER: convection

- (15) This author wrote a description of studies in hysteria, titled *The Freud Scenario*, and in a story by this author, Pierre Dumaine and Eve Charlier are resurrected for 24 hours to prove their love. This author of *The Chips are Down* wrote a play where the title creatures leave after one character kills his mother, and in another a member of the Proletarian Party of Illyria, Hoederer, is assassinated by Hugo. In addition to *Dirty Hands*, he wrote about the “sweetish sickness” of Antoine (\*) Roquentin and wrote a play in which Estelle, Inez, and Garcin are trapped in a room before discovering that “Hell is other people”. For ten points, name this French existentialist author of *The Flies*, *Nausea*, and *No Exit*.

ANSWER: Jean-Paul Sartre

- (16) Daniel Webster asked, “Is this, Sir, consistent with the character of a free Government?” in an 1814 speech opposing this concept. *Rostker v. Goldberg* established that the exclusion of women from this practice was legal. *Cohen v. California* was ruled in favor of a man who showed up to a courtroom wearing a jacket making this practice the subject of obscenity. The defendant of *Schenk v. United States* passed out leaflets opposing it. In 1863, riots occurred in (\*) New York City against it. In *United States v. O’Brien*, the Supreme Court ruled it was legal to burn objects related to it, and this practice last occurred in December 1972. Overseen by the Selective Service System, for ten points, name this process of forcing people to serve in the military.

ANSWER: the draft in the United States (or involuntary conscription, do not accept “Selective Service System”)

- (17) One poem by this author asks “Will time say nothing but I told you so? / If I could tell you I would let you know” and he ordered quotations alphabetically by theme in *A Certain World*. This poet repeats “What instruments we have agree / The day of his death was a dark cold day,” in a poem addressed to a man that “Mad Ireland had hurt into poetry.” This author of *In Memory of W.B. Yeats*, wrote a poem begins with the speaker sitting “in one of the dives / on Fifty-second Street,” and another started “About (\*) suffering, they were never wrong, The Old Masters” and described the *Landscape With the Fall of Icarus*. For ten points, identify this author of *September 1, 1939* and *Musée des Beaux Arts*.

ANSWER: Wystan Hugh Auden

- (18) This man’s legitimacy to fill a certain position was called into doubt by the Tascón List, which resulted in a recall referendum in 2004 which this man won. In June 2012, he refused to challenge a political opponent in a public debate because he would be “ashamed” to debate a “non-entity”. Although he has historically praised atheism, he wept for Jesus to give him life during Easter Mass in 2012 before traveling to (\*) Cuba for cancer treatment, and on October 8th he defeated a member of the Justice First Party who is the grandson of Jewish Holocaust survivors. For ten points, name this South American socialist who defeated Henrique Capriles Radonski to win his fourth term as President of Venezuela.

ANSWER: Hugo Chavez

- (19) A man lying in the lower left of this painting wears only a blue sock and a white shirt. On the right of this painting can be seen people standing in front of a building obscured by smoke. On the left, a man with a sword in a blue cap uses a stone to pull himself up, and near the center, a man stands on his hands and knees staring up intently. A (\*) boy holding two pistols stands next to the central figure, who wears a Phrygian cap and carries a bayonet. Featuring the bare-breasted title figure carrying a tri-color flag, for ten points, identify this painting by Eugene Delacroix.

ANSWER: Liberty Leading the People (or La Liberte Guidant le peuple)

- (20) The twinned variety of these objects is hypothesized to be produced by oblate spheroids, and glass beads make one half of the normal size. Grossmann made a confirmed observation of its third-order variety, which is often swamped by a zero-order glow. Alexander’s dark band is a common feature in these phenomena, and diffraction produces its supernumeraries. Reflection from a (\*) body of water can produce one centered above the horizon, but usually a high sun cannot produce this. For ten points, name this phenomenon where light is internally reflected inside raindrops, producing a colorful arc.

ANSWER: rainbows

- (21) Seven years after one character's death in this novel, a son is born whose name links the entire group together. One protagonist of this novel met the title character because his employer suffered from gout, and another character is proposed to three times in the same day. One character feeds his fly collection to his spiders, and his spiders to his sparrows, and after he is refused a kitten, Renfield eats his sparrows. Although they can't save the Texan Quincey Morris or the sleep-walking Lucy Westenra, the characters of Mina Murray, (\*) Jonathan Harker and Professor van Helsing do eventually succeed in killing the title character. For ten points, identify this novel by Bram Stoker about a Transylvanian vampire.

ANSWER: Dracula



## Bonuses

- (1) In certain molecules, it can result in a glycosidic linkage. For ten points each:
- [10] Name this formation of a covalent bond between two monomers that sees removal of a water molecule.  
**ANSWER:** dehydration synthesis
- [10] A repeated chain of monomers joined by dehydration synthesis can result in this type of macromolecule, examples of which include DNA.  
**ANSWER:** polymer
- [10] The backbone of DNA is formed by this type of bond which occurs between two five-carbon sugars and a phosphate group.  
**ANSWER:** phosphodiester
- (2) This philosopher explored knowledge of God in his *Critique of Practical Reason*. For ten points each:
- [10] Name this philosopher who also attempted to establish a priori knowledge in his *Critique of Pure Reason*.  
**ANSWER:** Immanuel Kant
- [10] Kant put forth three formulations of this guiding principle of moral philosophy, including a command to act in accordance with a maxim which one would will to be a universal law.  
**ANSWER:** categorical imperative
- [10] Kant described this phrase as the motto of the titular period in his essay *What is Enlightenment?* This phrase, borrowed from Horace, describes the desire of man to use reason and logic to gain understanding.  
**ANSWER:** sapere aude (or dare to know)
- (3) Answer the following about pickles in literature for ten points each.
- [10] In this novel, Zeena decides to get rid of Mattie Silver, whom the title character loves, when she discovers that her favorite pickle dish was broken.  
**ANSWER:** Ethan Frome
- [10] In this play, Dunyasha drops and breaks a dish after Yasha calls her what is translated as either 'little cucumber' or 'little pickle'. Both of those characters are servants for Leonid Gayev.  
**ANSWER:** The Cherry Orchard (or Vishnovy Sod)
- [10] Saleem Sinai works in a pickle factory in this Salman Rushdie novel. In it, children born on August 15, 1947 have magical powers.  
**ANSWER:** Midnight's Children

- (4) After a successful attempt to capture Helen, he and his friend Pirithous tried to kidnap Persephone and were trapped in the underworld. For ten points each:  
 [10] Identify this Athenian hero who killed the minotaur.  
**ANSWER:** Theseus  
 [10] This woman gave Theseus a ball of thread to help him find his way out of the labyrinth. She was later abandoned on Naxos.  
**ANSWER:** Ariadne  
 [10] This god fell in love with Ariadne at Naxos and fathered Thoas with her. Ikarios was murdered after sharing a gift this god had given to him.  
**ANSWER:** Dionysus
- (5) Samuel Huntington was the actual First President of the United States. Answer the following about other stuff we ignore because it happened under the Articles of Confederation for ten points each.  
 [10] This man served as President of the United States Congress in 1785. He was the first to sign the Declaration of Independence, with a famously large signature.  
**ANSWER:** John Hancock  
 [10] This 1786 Rebellion of Massachusetts farmers highlighted the numerous flaws in the Articles of Confederation, prompting the writing of the Constitution.  
**ANSWER:** Shays' Rebellion (do not accept or prompt on "Shay")  
 [10] The Newburgh Conspiracy, in which unpaid soldiers planned to force Congress to pay them, was ended when this man gave a speech that began "Gentlemen, you will permit me to put on my spectacles, for I have not only grown gray but almost blind in the service of my country."  
**ANSWER:** George Washington
- (6) These were first developed by John Napier, although Henry Briggs introduced the "common" form. For ten points each:  
 [10] Identify these functions which are inverses of exponential functions. The "natural" version has a base of  $e$  and is abbreviated "L-N".  
**ANSWER:** logarithm  
 [10] This function is the derivative of the natural logarithm of  $x$ . As a result,  $\ln(x)$  [pronounced "L N of X"] can be computed by integrating this function from 1 to  $x$ .  
**ANSWER:**  $1/x$  (or "one over  $x$ " or "1 divided by  $x$ " or  $x^{-1}$ )  
 [10] The difference between  $\ln(k)$  [pronounced "L N of K"] and the sum over  $x$  from 1 to  $k$  of  $1/x$  approaches a constant named for this Greek letter. Euler computed its value to be roughly 0.577, and Mascheroni introduced this letter to refer to it.  
**ANSWER:** lowercase gamma

- (7) Identify the following composers who wrote about Orpheus for ten points each.
- [10] This 16th century Italian composer of nine books of madrigals wrote one of the earliest operas, *L'Orfeo*, in addition to one about the crowning of Nero's mistress, *The Coronation of Poppea*.
- ANSWER:** Claudio Monteverdi
- [10] This man's *Infernal Gallop*, often simply called "the can-can song", appears in his operetta *Orpheus in the Underworld*. He also wrote of a troubled German writer in his opera *The Tales of Hoffman*.
- ANSWER:** Jacques Offenbach
- [10] This composer wrote an opera entitled *Orpheus and Eurydice* in addition to one based on a play by Euripides of the same name, *Iphigenia in Tauris*.
- ANSWER:** Christoph Willibald Gluck
- (8) It predicted the Munich agreement in a scene where Europe decided to give away China. For ten points each:
- [10] Identify this novel, which begins with Captain van Toch discovering the title creatures and using them for pearl farming. After the Salamander Syndicate is formed, Mr. Povodra starts collecting newspapers articles.
- ANSWER:** War with the Newts (or Valka s mloky)
- [10] In this play by the author of *War with the Newts*, Domin proposes to Helena, saying that if she doesn't marry him, she'll marry one of the others. It coined the term "robot."
- ANSWER:** R.U.R. (or Rossum's Universal Robots)
- [10] This author wrote *War with the Newts* and *R.U.R.*, and collaborated with his brother Josef on *The Gardener's Year*.
- ANSWER:** Karel Capek
- (9) He fought in World War II and Vietnam and was honored for his service with a medal in the Légion d'honneur before returning to his home country. For ten points each:
- [10] Name this former sub-Saharan military dictator and contemporary of Idi Amin who was crowned emperor on a falcon-shaped throne made of pure gold in a manner reminiscent of the coronation of Napoleon Bonaparte.
- ANSWER:** Jean-Bédel Bokassa (or Bokassa I of Central Africa or Salah Eddine Ahmed Bokassa)
- [10] Bokassa was crowned emperor of this nation south of Chad with capital at Bangui. It was formerly known during colonial rule as Ubangi-Shari, after the two main rivers that flow through it.
- ANSWER:** Central African Republic (or Central African Empire, prompt on "C.A.R." or "C.A.E.")
- [10] This European country, the former colonial owner of the Central African Republic as well as Mali and the Ivory Coast, launched Operation Barracuda to remove Bokassa from power.
- ANSWER:** France

- (10) According to webcomics, there are advantages and disadvantages to dating librarians. For ten points each:

[10] In this webcomic, Dora broke up with Martin Reed and started dating his boss, Tai. This webcomic was written by Jeph Jacques and also includes the robots Pintsize and Momo.

**ANSWER:** Questionable Content

[10] This other webcomic had one character start to destroy a book so he wouldn't need to visit his librarian girlfriend's family. Created by Randall Monroe, it is a webcomic of "romance, sarcasm, math, and language".

**ANSWER:** xkcd

[10] In one panel of this Zach Weiner webcomic, Mr. Sanders states that "Knife goes in. Blood comes out" as he explains what happens to those who don't return library books on time.

**ANSWER:** Saturday Morning Breakfast Cereal (accept SMBC)

- (11) Answer the following about the Sermon on the Mount for ten points each:

[10] The Sermon on the Mount opens with this collection of verses including "blessed are the meek: for they shall inherit the earth".

**ANSWER:** Beatitudes

[10] This model prayer was first recited by Jesus during the Sermon on the Mount and includes requests to "give us our daily bread" and "lead us not into temptation".

**ANSWER:** Lord's Prayer (or Pater Noster or Our Father)

[10] During the Sermon on the Mount, Jesus tells his listeners that they are "[this] of the earth" in addition to being the "light of the world".

**ANSWER:** salt

- (12) (Note to moderator: Do not read any alternate answer lines after the first part unless they are given.)

Voltaire once said, “Nothing is better known than [this battle].” For ten points each:

[10] Dragut Reis and 3,000 janissaries died during the capture of Fort St. Elmo during this battle. It ended when 8,000 Sicilian reinforcements arrived to reinforce Jean de la Valette’s Knights of St. John.

**ANSWER:** Great Siege of Malta (accept Great Siege of 1565 or anything about the Ottoman Empire attacking Malta, prompt on “Malta” or “attack on Malta” or equivalents)

[10] This ruler ordered the attack on Malta. He also defeated Louis II at the Battle of Mohacs and unsuccessfully besieged Vienna.

**ANSWER:** Suleiman I or Suleiman the Magnificent (or Suleiman the Lawgiver, prompt on “Suleiman”)

[10] Suleiman the Magnificent ruled this empire from Constantinople. It was later called the “sick man of Europe” and was dissolved after World War I.

**ANSWER:** Ottoman Empire (prompt on “Turkish Empire”, do not prompt on or accept “Turkey”)

- (13) Identify the following colorful Stephen Crane works for ten points each.

[10] In this novel, Henry Fleming watches Jim Conklin die and finally gets the hoped-for wound and returns to fight with the Union army.

**ANSWER:** The Red Badge of Courage

[10] In this short story, the sheriff Jack Potter avoids death because Scratchy Wilson decides not to shoot an unarmed man.

**ANSWER:** The Bride Comes to Yellow Sky

[10] This poem lends its title to a collection of poems by Crane. It describes the title entities who “came from the sea” with a “clang clang of spear and shield” and “clash clash of hoof and heel.”

**ANSWER:** The Black Riders

- (14) It was found to be highest among members of ingroups. For ten points each:

[10] Identify this effect studied by Solomon Asch by testing whether subjects would give an obviously incorrect response to a question if peers had first given the same incorrect response.

**ANSWER:** conformity

[10] In what was ostensibly a vision test, the subjects in Asch’s conformity experiment were shown pictures of three of these objects and asked which was the largest.

**ANSWER:** lines or line segments

[10] One common explanation for the results of Asch’s experiment uses this phenomenon, studied by Leon Festinger, in which a person simultaneously holds two conflicting beliefs.

**ANSWER:** cognitive dissonance

- (15) Amino acids exhibit this phenomenon, in which the same structural formula gives rise to two versions of the molecule. For ten points each:

[10] Name this phenomenon in which a molecule is not superimposable on its mirror image. Your hands also exhibit this phenomenon.

**ANSWER:** chirality

[10] All organic chiral molecules exhibit one of these features, which is usually a carbon atom with four different substituents but may also be an sp<sup>2</sup> hybridized carbon in alkenes.

**ANSWER:** stereocenters

[10] A pair of enantiomers which each contain two stereocenters are known by this name. They need not necessarily be chiral if their stereocenters are in opposite configurations.

**ANSWER:** diastereomers

- (16) “To be, or not to be, that is the question.” For ten points each:

[10] Identify this Shakespearean tragedy in which the title character accidentally stabs Polonius and poisons his mother, then intentionally stabs Claudius, but is killed in the process. He causes Ophelia to kill herself.

**ANSWER:** The Tragedy of Hamlet, Prince of Denmark

[10] This play featured two minor characters from Hamlet. One character shouts fire to demonstrate the misuse of free speech, and after a coin comes up heads 92 consecutive times, one character questions whether he could have avoided being executed in England.

**ANSWER:** Rosencrantz and Guildenstern Are Dead

[10] Tom Stoppard wrote *Rosencrantz and Guildenstern are Dead* as well as this play which shared cucumber sandwiches, Gwendolyn, Cecily, and more with *The Importance of Being Earnest*. Characters included Vladimir Lenin, James Joyce, and Henry Carr.

**ANSWER:** Travesties

- (17) Joule heating is proportional to this property of a material. For ten points each:

[10] Name this property of a material, the inverse of conductance, which in DC circuits equals voltage over current according to Ohm’s Law.

**ANSWER:** electrical resistance

[10] In this type of circuit, the total resistance is equal to the sum of the resistances of its individual parts.

**ANSWER:** series circuit

[10] This quantity equals resistance in a “pure resistor”, but it usually has a complex value including a phase angle.

**ANSWER:** impedance

- (18) Works in this movement include Antonio Saint'Elia's design for *La Citta Nuova*. For ten points each:
- [10] Name this artistic movement exemplified by the painting *The Street Enters the House* and the sculpture *Unique Forms of Continuity in Space*, both by Umberto Boccioni.
- ANSWER:** futurism
- [10] The futurist movement was centered in this country. Boccioni depicted a scene in this country in his early work *The Grand Canal in Venice*.
- ANSWER:** Italy
- [10] Another movement centered in Venice was this one, which focused on elongated features and included the artists Tintoretto and the man who painted *Self-Portrait in a Convex Mirror* and *Madonna with the Long Neck*, Parmigianino.
- ANSWER:** mannerism
- (19) This war led to the rise of the Thirty Tyrants. For ten points each:
- [10] This war ended with the Battle of Aegospotomai, where Lysander attacked the beached enemy ships while the sailors were away, winning a decisive naval victory. Unable to bring in grain by sea, one side was forced to surrender this war.
- ANSWER:** Second Peloponnesian War
- [10] Alcibiades proposed an expedition to capture this largest Mediterranean island, but a defeat while besieging Syracuse on this island destroyed Athens' hopes of conquering this island near Italy.
- ANSWER:** Sicily
- [10] Despite assertions that Spartans always fought to the death, a hundred Spartan elites surrendered in a 425 BC battle at this location after failed peace negotiations. A major battle in the War of Greek Independence took place here.
- ANSWER:** Navarino Bay or Pylos (or Sphacteria)
- (20) Answer the following about tilings of the plane for ten points each.
- [10] This is the largest regular polygon which can tile the plane. The Honeycomb Conjecture asserted that this tiling minimized total perimeter.
- ANSWER:** hexagon
- [10] This other regular polygon can tile the plane, and when that tiling is truncated, it becomes a tiling with this polygon and octagons.
- ANSWER:** square
- [10] This non-periodic tiling of the plane uses irregular quadrilaterals called darts and kites.
- ANSWER:** Penrose tiling

(21) Identify the following about Boolean algebra for ten points each.

[10] Boolean algebra attempts to determine when propositions possess this property, denoted by 1 or the letter  $T$ . A namesake table can be used to determine for which inputs a proposition will have this property.

**ANSWER:** truth (accept word forms)

[10] In mathematical logic, this term refers to a proposition which is true for all inputs. An example of one of these is the Law of the Excluded Middle, which asserts  $p$  OR NOT  $p$ .

**ANSWER:** tautology

[10] Another example of a tautology is that the proposition  $p$  IMPLIES  $q$  is equivalent to this related proposition, NOT  $q$  IMPLIES NOT  $p$ . A statement can be proved indirectly by proving this statement instead.

**ANSWER:** contrapositive