1. With an Italian colleague, this mathematician names the constant that is the difference between the harmonic series and the natural logarithm. He names a line which connects a circumcenter, centroid, and orthocenter. The summation of one over n-factorial from n equals zero to infinity converges to his namesake number. That number raised to the i times pi power is equal to negative one. For 10 points, identify this Swiss mathematician whose number is the base of the natural logarithm function.
ANSWER: Leonard **Euler**

189-13-74-01101

2. In a price-versus-quantity graph of this market structure, the point at which marginal cost equals average revenue occurs at the right side of a triangle that represents a deadweight loss to consumer surplus. When extremely high barriers to entry are present, such as in telephone or water distribution networks, the "natural" form of this structure arises. For 10 points, identify this microeconomic structure which occurs when a market has only one seller.
ANSWER: **monopoly**

019-13-74-01102

3. This poet was inspired by the rhyme scheme of the Finnish epic *Kalevala* for a poem featuring the West Wind's seduction of Nokomis's daughter. He brought Homeric dactylic hexameter into English for a poem titled for Gabriel Lajeunesse's Cajun lover. This author of *Evangeline* also wrote about a native prince who loves Minnehaha, and the hanging of lamps at the Old North Church. For 10 points, name this American poet of *The Song of Hiawatha* and "Paul Revere's Ride."
ANSWER: Henry Wadsworth **Longfellow**

104-13-74-01103

4. Italy and Romania disastrously entered the First World War just before this country's 1915 and 1916 offensives failed. This country's army made a Great Retreat after losing at Gorlice-Tarnow (gor-LICH-tar-now). Its forces destroyed the Austro-Hungarian Army as a fighting force during the Brusilov Offensive. This country was defeated at Tannenberg when it opened Germany's Eastern front. For 10 points, name this country that exited World War I after the overthrow of Nicholas II, its final tsar.
ANSWER: **Russia**n Empire [do not accept or prompt on "USSR" or "Soviet Union"]

153-13-74-01104

5. In 2010, members of this organization placed Adrian Schoolcraft in a mental hospital after Schoolcraft released undercover tapes. In October 2011, a union representing members of this organization protested when sixteen of its members were charged in a "ticket-fixing" scandal. In 2012, a member of this organization, Gilberto Valle (vye-EY), was accused of plotting to kidnap and eat women. For 10 points, name this 34,000-member organization which is led by Ray Kelly and patrols in Brooklyn and Manhattan.
ANSWER: the **NYPD** [or **New York** City **Police Department**]

019-13-74-01105

6. The presence of this phenomenon causes an 11-cis isomer to become all-trans, causing transducin to break down cGMP by action of rhodopsin. In plants, a cycle dependent on this phenomenon occurs at the stroma and thylakoid membrane, while another which doesn't require it uses RuBisCO. Exposure to this form of radiation inhibits melatonin and helps trigger vitamin D synthesis. For 10 points, name this electromagnetic radiation in the visible spectrum.
ANSWER: visible sun**light** [prompt on **photon**s]

7. This leader's "Swing Around the Circle" was a public speaking tour during which he was often drunk. This Democrat caused a crisis by attempting to appoint Lorenzo Thomas to the Cabinet. He succeeded to one office after replacing Hannibal Hamlin. After this President violated the Tenure of Office Act, the Radical Republicans challenged his view of Reconstruction by impeaching him. For 10 points, name this man who became President after the assassination of Abraham Lincoln.
ANSWER: Andrew **Johnson**

8. The Japanese noun "sunahama" is often translated as this English word, though it is more common in Japanese to use a word that literally refers to another place, the metonym "umi," to refer to these things. Many Romance languages trace their word for this place to a Latin noun meaning "stripe." In Russian, this place is called a "plyazh" (PLOSH), and it is "la plage" (PLOJ) in French and "la playa" (PLIE-uh) in Spanish. For 10 points, identify this place which might be found near "la mer" or "the sea."
ANSWER: "**beach**"

9. A predecessor to this play, probably written by Thomas Kyd, has been lost, and is referred to as its "Ur" version. T. S. Eliot wrote an essay about the "problems" of this play's protagonist, which calls this play an "artistic failure." Ernest Jones wrote a psychoanalytic critique emphasizing the embodiment of the Oedipus complex in its title character's relationship with his uncle Claudius and his mother Gertrude. For 10 points, name this tragedy whose title prince wonders, "To be, or not to be."
ANSWER: ***Hamlet***

10. This war's result was deemed too little by Albert Beveridge's "March of the Flag" speech. During this war, Leonard Wood was suddenly promoted to brigadier general. Charles Gridley received the command "You may fire when ready" in this war. The Teller Amendment was passed before this war, in which Commodore George Dewey won the Battle of Manila Bay. For 10 points, name this 1898 war, started after the sinking of the USS *Maine,* in which the US invaded the Philippines and Cuba.
ANSWER: **Spanish-American** War

11. The shape of the namesake curve of these objects is independent of temperature, according to Wien's (VEENS) displacement law. The fact that the Rayleigh-Jeans law describing them fails at high frequencies led to the ultraviolet catastrophe. That catastrophe regarding these objects was resolved by a law that took into account the fact that only certain wavelengths can be emitted, Planck's law. For 10 points, name these objects which absorb all incident electromagnetic radiation.
ANSWER: **blackbodies** [or a **blackbody**]

12. One character in this novel tells the protagonist not to "struggle so like a wild, frantic bird, that is rending its own plumage in its desperation." That same protagonist is locked in the "red room," and other characters in this novel include Helen Burns and Bertha Mason, the latter of whom burns down Thornfield Manor. Its title character ultimately marries Edward Rochester. For 10 points, identify this Victorian novel by Charlotte Bronte.
ANSWER: *Jane Eyre*

13. This person was said to have a thigh made of gold, and he advocated arbitrary restrictions such as always putting on one's right shoe first and never eating beans. The central tenet of his philosophy was "metempsychosis," the idea that one's soul migrates into other beings after death. He ordered the murder of Hippasus for proposing irrational numbers, which contradicted his math-based philosophy. For 10 points, identify this pre-Socratic thinker who discovered a namesake theorem about triangles.
ANSWER: **Pythagoras**

14. This campaign started after Raynald of Chantillon's beheading and Guy of Lusignan's capture at the Battle of Hattin. Leopold V of Austria left this campaign after his standard was cast down following a victory at a double siege. After Acre (AH-ker) fell, Philip II of France also left, leaving another commander in this campaign to win at Arsuf and sign a treaty allowing pilgrims to visit a Muslim-held Jerusalem. For 10 points, name this crusade in which Saladin fought Richard Lionheart.
ANSWER: **Third** Crusade

15. The grammarian Servius wrote a commentary on this poet's works, which incude a four-book farming manual in epic meter, the *Georgics*. Christians believed he foretold the coming of the Messiah in the fourth of his *Eclogues*. The hero of his most famous poem reaches Carthage after a frightening storm, where he meets Queen Dido. In that poem, Juno conspires to stop a Trojan prince from becoming the ancestor of the Romans. For 10 points, name this ancient Roman poet of the *Aeneid*.
ANSWER: **Vergil** [or Publius **Vergil**ius Maro]

1A. What 2012 game for the Nintendo 3DS allows players to summon in-game characters by placing real action figures on the "Portal of Power?"
ANSWER: *Skylanders: Spyro's Adventure*

1B. In what novel by Gunter Grass does Oskar Matzerath stop growing at age three?
ANSWER: *The **Tin Drum*** [or *Die **Blechtrommel***]

2A. What angular estate for the Kauffmann family, designed by Frank Lloyd Wright, juts out over a Pennsylvania river?
ANSWER: **Fallingwater**

2B. Name the kingdom whose army used an oblique order under the direction of a "great" Hohenzollern ruler at the Battle of Leuthen (LOY-ten).
ANSWER: **Prussia** [or **Preussen**; or **Prusy**]

3A. This is a 20-second calculation question. The mean of three numbers is four. The largest number is nine and the smallest number is one. What is the third number?
ANSWER: **2**

3B. This is a 20-second calculation question. How many diagonals are there in a convex pentagon?
ANSWER: **5**

4A. What religious figure's nature, or possible dual nature, was the subject of the Nestorian, Monophysite, and Arian heresies?
ANSWER: **Jesus** Christ of Nazareth [or Jesus **Christ**]

4B. The biggest Bauhaus-style neighborhood in the world is found in the White City of what Israeli metropolis, which is administratively combined with the port of Jaffa?
ANSWER: **Tel Aviv**

5A. What term can refer to, in biology, the rate of diffusion through a membrane or, in physics, the amount of a magnetic field passing through a surface?
ANSWER: **flux**

5B. Name the Joss Whedon-direct comic book movie in which Black Widow and Hawkeye join a team to recover the Tesseract from Loki.
ANSWER: *The **Avengers*** [or ***Marvel's The Avengers***]

6A. What mineral, commonly found in drywall, has a value of 2 on the Mohs hardness scale?
ANSWER: **gypsum**

6B. What E-flat major symphony with a second-movement funeral march was originally dedicated to Napoleon until he crowned himself emperor?
ANSWER: Ludwig van **Beethoven**'s Symphony No. **3** [or **Third** for "3"; prompt on answers that give a number without specifying the composer; or **Eroica** Symphony]

7A. This is a 30-second calculation question. Find all solutions to the equation $x^3 + 3x^2 - 4x - 12 = 0$ (READ: "x cubed plus three x squared minus four x minus twelve equals zero").
ANSWER: **2, -2, and -3** [or x= **2**, x = **-2**, and x=**-3**; accept answers in any order; do not accept partial answers]

7B. This is a 30-second calculation question. Find all solutions between x = 0 and x = 2 pi, inclusive, to the equation: sin 2x = 0.
ANSWER: **{0, pi/2, pi, 3pi/2, 2pi}** [or x=**0**, x=**pi over 2**, x = **pi**, x = **3 pi over 2**, and x = **2 pi**; accept answers in any order; do not accept partial answers]

8A. What Jane Austen novel focuses on Willoughby's interactions with the emotional Marianne and her sister Elinor Dashwood?
ANSWER: ***Sense and Sensibility***

8B. Green River, Gilette, and Rock Springs are cities in what state, where only three cities, including Casper and Laramie, exceed thirty thousand people in population?
ANSWER: **Wyoming**

9A. What vector quantity is multiplied by mass to determine the force on an object?
ANSWER: **acceleration**

9B. What painting, subtitled "The Great Western Railway," is a depiction of a small rabbit running away from a train by J.M.W. Turner?
ANSWER: ***Rain, Steam, and Speed****-The Great Western Railway*

10A. What powerful, anti-American president of Venezuela sought treatment for cancer once again in December 2012?
ANSWER: Hugo **Chavez** Frias

10B. Which team, whose days in Memorial Stadium featured shortstop Cal Ripken, lost to the Yankees in the 2012 AL Division Series?
ANSWER: **Baltimore** Orioles [or Baltimore **Orioles**]

1. In 1984, Tak Wah Mak discovered these cells's receptors, which had a similar structure but totally different genetic origin than antibodies. They are let out from their organ of origin if they do not attack "self" macrophages, since, if they did, they would attack good cells. These cells with natural killer, cytotoxic, and helper varieties are differentiated by namesake receptors from NK cells and B-cells. For 10 points, name this group of lymphocytes named for their place of origin, the thymus.
ANSWER: **T**-cells

2. This novel features the real-world facility of Weedpatch Camp. Near its end, Al announces that he will marry Agnes Wainwright while in a boxcar. In its third chapter, a truck runs into and flips over a plodding turtle, which the protagonist picks up. In this novel, Rose of Sharon breastfeeds a starving stranger, and a policeman kills retired preacher Jim Casy, who meets Tom in Oklahoma. For 10 points, name this novel about the Joad family's move to California, written by John Steinbeck.
ANSWER: *The **Grapes of Wrath***

3. This molecule cannot be synthesized in the body without the GULO enzyme. This molecule is a cofactor for two enzymes that add OH groups to proline to form hydroxyproline, making this antioxidant nutrient helpful for synthesis of collagen. Nobel-winning chemist Linus Pauling advocated for megadoses of this vitamin, whose deficiency causes diseased gums from scurvy. For 10 points, name this vitamin found in citrus fruits.
ANSWER: Vitamin **C** [or L- **ascorbic acid**; or **ascorbate**]

4. In this war, Charles Salaberry won the Battle of Chateauguay, and Isaac Brock died at the Battle of Queenston Heights. During this larger war, a regional conflict erupted that ended at Horseshoe Bend and was called the Creek War. At the Battle of the Thames in this war, William Henry Harrison's forces killed a leader who helped capture Detroit; that was Tecumseh. For 10 points, name this war in which Washington, D.C., was burned, which was ended by the Treaty of Ghent.
ANSWER: War of **1812**

5. This author wrote a play in which Gooper attends a party honoring his father's release from the Ochsner Clinic. That character created by this man despises "mendacity" and tries to reunite with his son Brick. In another of his plays, a "gentleman caller" visits a crippled young woman who collects figurines. This author of *The Glass Menagerie* wrote a play featuring the brutal Stanley Kowalski and Blanche DuBois. For 10 points, name this playwright of *A Streetcar Named Desire.*
ANSWER: Tennessee **Williams** [or Thomas Lanier **Williams**]

6. On a closed interval, functions with this property will also possess the uniform type of it. This is a necessary condition for use of the intermediate and extreme value theorems. The first fundamental theorem of calculus says all functions of this type will have antiderivatives. It is a necessary condition for being differentiable, and does not occur at singularities and jumps. For 10 points, name this property, possessed by functions that can be drawn without lifting the pencil.
ANSWER: **continuity** [or **continuous**]

7. Great Palm Island and Orpheus National Park are located between this structure and the mainland. A lab on Heron Island is the center of scientific work on this structure, which began forming during the Miocene Epoch. Its characteristic colors have been reduced by half since 1985 as a result of bleaching and the introduction of the predatory crown-of-thorns starfish. For 10 points, the Trunk, Dingo, and Kangaroo are components of what 1600-mile mass in the Coral Sea off the coast of Australia?
ANSWER: the **Great Barrier Reef**

8. The luminosity and rotation speed of these bodies is compared in the Tully-Fisher relation. These bodies inhabit the right half of Hubble's tuning fork. The youngest and most luminous stars in this type of body are the furthest from its central bulge. A hybrid of this type of body and an elliptical galaxy forms a lenticular galaxy. One variety of this type of body contains a bar through the middle, connecting its arms. For 10 points, name this type of galaxy that includes the Milky Way.
ANSWER: bar-**spiral** galaxy [prompt on **galaxy**]

9. One measure of these entities' effectiveness, in inverse seconds, is as high as 40 million for an example of them within the peroxisome, and is called the turnover number. Briggs and Haldane updated the Michaelis-Menten model of their kinetics. Competitive and non-competitive inhibition can weaken these molecules. Substrates bind to the active site of these molecules, whose names often end in "-ase." For 10 points, name these proteins that act as catalysts for biological reactions.
ANSWER: **enzyme**s

10. One opera based on this play includes the aria "Morte Io non temo" and uses a loosely adapted libretto by Felice Romani. Another opera based on this play features the "Je veux vivre" (jeh veh VEEV-ruh) waltz aria, in which one title character declares "I want to live." The "Dance of the Knights" appears in Prokofiev's ballet based on this play, which was adapted into a French opera by Charles Gounod. For 10 points, name this play, the basis for Vincenzo Bellini's opera *The Capulets and the Montagues*.
ANSWER: *Romeo and Juliet*

11. This empire put down a rebellion of African slaves near Basra called the Zanj Rebellion. This dynasty had a powerful family called the Barmarkids, who were suppressed by its fifth ruler. That ruler of this empire built the House of Wisdom and was named Harun Al-Rashid. This empire came to power in a 750 CE coup and had its capital at Baghdad, which was sacked by the Mongols. For 10 points, name this caliphate that overthrew the Umayyads and ruled the Middle East for five hundred years.
ANSWER: **Abbasid** Caliphate [or **Abbasid** Dynasty, Empire, etc.]

12. Eighteen years before this event, a letter to Grand Duchess Christina of Tuscany laid out one side's position on Joshua 10:13. Legend has it that the subject of this event muttered "and yet it does move" at its end. It targeted a man who was warned by Cardinal Bellarmine and was accused of mocking Urban VIII. The accused recanted at this 1633 event, agreeing to live under house arrest. For 10 points, name this event in which the Roman Inquisition tried an Italian for his work in astronomy.
ANSWER: heresy **trial** of **Galileo** Galilei

13. A Friedrich Nietzsche concept named after this deity represents order in *The Birth of Tragedy.* A wind from Zephyrus blew this god's fatal discus throw at Hyacinthus. This deity's plague arrows strike the Greeks in the Iliad. Daphne became a laurel tree to avoid this god, who the oracle of Delphi served. Hermes gave this god a lyre in his role as god of poetry and music. For 10 points, name this brother of Artemis, who, like Helios, represents the sun.
ANSWER: Phoebus **Apollo** [or **Apollon**; or "the **Apollonian**"]

14. One play by this man features a man who uses a tortoise named Plautus as a paperweight, and begins with a discussion of the phrase "carnal embrace." This author wrote about the investigations of Hannah Jarvis and Bernard Nightingale into the story of Thomasina Coverly and Septimus Hodge. In another of his plays, one character continually wins a coin-flipping game. For 10 points, identify this British playwright of *Arcadia* and *Rosencrantz and Guildenstern Are Dead.*
ANSWER: Tom **Stoppard** [or Tomas **Straussler**]

15. One structure commonly used in this field is governed by an activation function, usually non-linear, such as a sigmoid. A thought experiment involving an English-speaking translator with no knowledge of Chinese was developed by John Searle to discredit the "strong" type of this phenomenon. An interrogator attempting to distinguish between a human and a machine is the basis for Alan Turing's test for it. For 10 points, John McCarthy coined what term in reference to thinking machines?
ANSWER: **artificial intelligence** [or **AI**; prompt on **machine learning**]

1. This man unsuccessfully tried to nominate his counsel Harriet Miers to the Supreme Court. The headline "How Can 59,054,087 People Be So Dumb?" was produced by the *Daily Mirror* in response to this man winning an election. He controversially told FEMA head Michael Brown he was "doing a heckuva job" after Hurricane Katrina. This man won the presidency in an election that featured "hanging chads" and "butterfly ballots" in Florida. For 10 points, name this President during the 9/11 attacks in 2001.
ANSWER: George **W**alker **Bush** [or **Bush II**; or **Bush 43**; or anything distinguishing him from his father; prompt on **Bush**; do not accept "George Herbert Walker Bush"]

052-13-74-01132

2. After working as a janitor at St. Olaf College, this man drops out and joins up with Dan Cody. When he dies, his funeral is attended by his father Henry, from North Dakota, and a man known only as "Owl Eyes." This character works with the gangster Meyer Wolfsheim, but is ultimately killed by George Wilson, who thinks this man ran over Myrtle. This man has a mansion at West Egg and is in love with Daisy Buchanan. For 10 points, name this title millionaire of an F. Scott Fitzgerald novel.
ANSWER: Jay **Gatsby** [or **Jay** Gatsby; or James **Gatz**; or **James** Gatz]

052-13-74-01133

3. The quality of this process can be improved by zone refining, and it can be performed in Craig tubes. Decanting is used to remove impurities during this process, which can only occur in a supersaturated solution. This process causes orderly structured solids to precipitate out of a solution. Induced by a seed material, this process can create quartz and other minerals. For 10 points, name this process that is used to make rock candy and salt crystals.
ANSWER: **crystallization**

149-13-74-01134

4. One book within this novel equates the "Death-Worship" ideology with neo-Bolshevism. Mr. Charrington betrays the protagonist of this novel, who is told to imagine the future as "a boot stamping on a human face - forever." Emmanuel Goldstein and Eastasia are enemies of Airstrip One in this novel, in which O'Brien uses rats in Room 101 to torture Julia's rebellious lover Winston Smith. For 10 points, name this dystopian novel in which Big Brother is watching, by George Orwell.
ANSWER: *Nineteen Eighty-Four*

104-13-74-01135

5. The principle of maximum work would apply exactly to this state, at which a reaction's change in Gibbs free energy equals its change in enthalpy. At this state, a boson gas condenses into a single quantum state. Superfluids and superconductors form when this physical state is approached, although scientists have only gotten within one hundred picokelvins of reaching it. For 10 points, name this temperature at which matter has no thermal energy, equal to zero Kelvin.
ANSWER: **absolute zero** [or **0 Kelvin** until it is read]

190-13-74-01136

This is a calculation question. The angles of a quadrilateral are an arithmetic progression, with smallest angle measuring 60 degrees. Find the next smallest angle.
ANSWER: **80** degrees

Emil Fischer won a Nobel Prize for studying what substance, produced in plants via photosynthesis?
ANSWER: **glucose**