

Maryland Spring 2014 - Get Your Pencil and Paper Ready for Round 12

Packet 10

Questions by Dan Puma, Isaac Hirsch, Jordan Brownstein, Chris Manners, Brian McPeak, Sohan Vartak, Chris Ray, Eric Mukherjee, Daniel Galitsky, Jeff Amoros, Stephen Meyer, Victor Prieto, Stavros Greenbatcha, and Arun Chonai

Tossups

1. **This composer's first opera is based on a Jean-Jacques Rousseau drama about a sculptor from Ovid's *Metamorphoses*. In a comic opera by this composer, Ernesto declares his love for Norina, despite the protestations of his uncle Don Pasquale. A character in one of this man's operas sings the aria "Una furtiva lagrima" after learning that the (*) potion given to him by Doctor Dulcamara has "worked" on Adina. The title character of one of this man's operas sings "Il dolce suono" during her "Mad Scene," where she imagines marrying Edgardo after killing her fiance Arturo. For 10 points, name this Italian operatic composer of *The Elixir of Love* and *Lucia di Lammermoor*.**

ANSWER: Gaetano Donizetti

2. **One poem by this author describes "the swaying mass, their eager faces turning" and exclaims "oh heart! heart! heart!" One of his works asks "what is the count of the scores or hundreds of years between us?" while addressing "you men and women of a generation." This poet described "sea-gulls oscillating their bodies" in a poem that begins (*) "flood-tide below me! I watch you face to face." One poem by this author tells its subject that "our fearful trip is done" and repeatedly notes that the title figure has "fallen cold and dead." For 10 points, name this American poet who included "Crossing Brooklyn Ferry" and "O Captain! My Captain!" in his collection *Leaves of Grass*.**

ANSWER: Walt Whitman

3. **One song by this man declares "I suppose I want to be" the title of the song, and this artist behind "Successful" asked "what am I doing/ what am I doing" before answering "I'm doing me/ I'm doing me" in another song. One song by this man repeats the refrain (*) "They know" ten times in its chorus, and this rapper behind "Over" rapped "Now my whole team's here" in one song. This man, who released "Headlines" and "Started from the Bottom," may be better known for the song "The Motto," which popularized the term "YOLO." For 10 points, name this Canadian rapper born Aubrey Graham, often criticized for being soft.**

ANSWER: Drake (or Aubrey Graham before read)

4. **The maximum angular resolution of an aperture is equal to 1.22 times this quantity over the diameter of the aperture, according to the Rayleigh criterion. One type of this quantity is given by Planck's constant over mass times the speed of light and represents the value for this quantity a particle would have if it were a (*) photon. Bragg's law relates this quantity to lattice spacing and angle of incidence in X-ray crystallography. Another type of this quantity that represents particle-wave duality in matter is equal to Planck's constant divided by the momentum and is named for de Broglie. Speed of light over frequency is, for 10 points, what quantity that represents the distance between the crests of a wave?**

ANSWER: wavelength [prompt on lambda]

5. **One of this man's victories is commemorated with the statue of the Vargas Swamp Lancers. This man ordered Daniel O'Leary to burn his diaries, and he escaped an assassination attempt with the help of Manuela Saenz. He described his hopes for a continental republic in his (*) Letter from Jamaica. This leader allowed the murder of a certain group with the Decree of War to the Death, which was issued during his Admirable**

Campaign. This ally of Jose San Martin won the battles of Carabobo and Boyaca. For 10 points, name this liberator of South America and namesake of a country with two capitals.

ANSWER: Simon Bolivar

6. While travelling with Hoenir and Odin, this god slew Ótr. This son of Laufey took the form of a mare to mate with Svadilfari, producing the eight-legged horse Sleipnir. In the guise of the giantess Thökk, this figure refused to weep, saying “Let Hel hold to that she hath!” He will kill and be killed by (*) Heimdall during Ragnarök, and this father of Jörmungandr and Fenrir was bound to a rock with the entrails of his son. This god’s wife Sigyn holds a bowl above his head to prevent a serpent’s venom from dripping onto his forehead. For 10 points, name this Norse trickster god who tricked Hodr into killing Baldr with mistletoe.

ANSWER: Loki (accept Lopt)

7. Structures that connect cells into a syncytium in this tissue include the fascia adherens, macula adherens, and gap junctions; those structures are known as intercalated discs. Action potential in this tissue is activated by sodium but then prolonged by (*) calcium influx into an extended plateau phase. Special types of this tissue make up the SA node, and its activity is recorded in an EKG. This tissue is more resistant to fatigue than smooth or skeletal types. For 10 points, name this muscle tissue found in the heart.

ANSWER: cardiac muscle (accept heart muscle tissue until mentioned)

8. In one scene, another character tells this character that “you always look so cool.” A man claims that this character is “a regular Belasco” after discovering that his books aren’t fake. As a teenager, this character rowed out to Dan Cody’s yacht on Lake Superior, and he associates with a man who wears cufflinks made of human teeth. This character calls (*) everyone “old sport” and is killed while relaxing in his swimming pool after Myrtle is hit by a car in the Valley of Ashes. He often watches a symbolic green light from his mansion in West Egg. For 10 points, name this man who loves Daisy Buchanan, the title billionaire of a novel by F. Scott Fitzgerald.

ANSWER: Jay Gatsby (accept either name; accept *The Great Gatsby* or James Gatz)

9. Many of the themes in this symphony were inspired by the singing of Harry T. Burleigh. This symphony’s second movement, its longest, is in 4/4 time in D-flat major and opens with an English horn solo. William Arms Fisher adapted a theme from that *Largo* movement into the song “Goin’ Home.” This symphony was composed shortly before its composer’s String Quartet No. 12, which was inspired by a vacation in (*) Spillville, Iowa. This symphony includes a first movement flute passage reminiscent of “Swing Low Sweet Chariot,” and scenes from Longfellow’s *Song of Hiawatha* were a strong influence on its composition. For 10 points, name this symphony inspired by a trip to the United States, a work of Antonin Dvořák.

ANSWER: From the New World (or Dvořák’s Symphony No. 9 in E minor)

10. One invasion of this country took place after the capture of sailors from the *Dolphin* and was led by Henry Mayo. The St. Patrick’s Battalion was formed to support this country following a declaration of war on this country by a larger neighbor. This country was invaded during the Tampico Affair after this country refused to fly another country’s flag on its soil. A war between the United States and this country was the subject of Abraham Lincoln’s (*) Spot Resolutions. This country was also invaded after a raid on Columbus, New Mexico and that invasion was led by John “Black Jack” Pershing. For 10 points, name this country that was invaded after a raid by Pancho Villa, and signed the Treaty of Guadalupe Hidalgo with the United States.

ANSWER: Mexico (or United Mexican States)

11. This equation predicts an inversion temperature equal to $27/4$ times the critical temperature, and the critical exponents predicted by this equation place it in the same universality class as the Ising model. This equation can be derived by considering a hard-sphere potential with a sixth power dropoff, and this equation

incorrectly predicts oscillatory isotherms around the critical point. This equation adds variables accounting for (*) intermolecular forces and the excluded volume of individual particles, which are labelled a and b respectively. For 10 points, name this modification of the ideal gas law, an equation of state named for a Dutch chemist.

ANSWER: van der Waals equation

12. Members of this religion are expected to overcome the Five Thieves, which include *kaam* and *krodh*. Houses of worship in this religion provide *Karah Parshad* and contain communal kitchens called *langars*. During the festival of Baisakhi, members of this religion commemorate the founding of the Panth (*) Khalsa. The central text of this religion is recited continuously during Akhand Path, and the first shabad in that text is the Mool Mantar. The central text of this religion is the Adi Granth, and a famous gurdwara of this religion is the Golden Temple in Amritsar. For 10 points, name this Punjabi religion founded by Guru Nanak.

ANSWER: Sikhism

13. One character in this work relates how she tore some pages from a book her fifth husband was reading. In one part of this work, January sees his wife May having sex in a peach tree and, in another, a student convinces a man to hang some tubs from his ceiling to prepare for a flood. Three men (*) poison and stab each other after setting out to kill Death in another part. One story from this collection centers on the question “what do women desire most,” while another ends with the marriage of Palamon and Emily after the former kills his friend Arcite. Featuring stories from the Wife of Bath and the Knight, for 10 points, name this work centering on a group of pilgrims by Geoffrey Chaucer.

ANSWER: The Canterbury Tales (anti-prompt on “Wife of Bath’s Tale,” “Knight’s Tale,” “Merchant’s Tale,” or “Pardoner’s Tale”)

14. The artist of this painting included his name and the year on two jutting pieces of wood on its right side. In this painting, a pantsless man wearing one sock lies on his back, and a flag is being raised on fortress partially obscured by clouds. A bearded man with a tophat in this work is no longer thought to be a self portrait of the artist. The central (*) figure of this painting stands next to a boy with two pistols, wears a phrygian cap, and is bare-breasted. That character holds a three-colored flag and looks back at the motley group of soldiers behind her. For 10 points, name this Eugene Delacroix painting in which Marianne, the titular figure, leads the forces of revolution.

ANSWER: Liberty Leading the People (or La liberté guidant le peuple)

15. The War of the League of Cognac began after the repudiation of a treaty named for this city. The Paracuellos Massacre took place during a siege in this city in which the term the “fifth column” was coined. Francis I signed a humiliating treaty named for this city after being captured by Charles V at the Battle of Pavia. The Partido Popular of Jose Maria Aznar was swept out of power after a (*) terrorist bombing in this city by Islamic militants was blamed on the ETA in 2004. The site of a long siege by the Nationalists during the Spanish Civil War, for 10 points, name this home to Prime Minister Mariano Rajoy and King Juan Carlos I, the capital of Spain.

ANSWER: Madrid

16. In one story by this author, a poor shoemaker takes in a fallen angel who he finds lying naked next to a shrine. The protagonist of another of his stories drops dead after running all day to claim land from the Bashkir tribe. A novella by this author of “What Men Live By” ends with a judge touching the face of his son as he dies from an (*) injury he sustained while hanging curtains. Another of his novels begins with the assertion that “all happy families are alike” and features a woman who has an affair with Count Vronsky and eventually

throws herself under a train. For 10 points, name this author of *The Death of Ivan Ilyich*, *Anna Karenina*, and *War and Peace*.

ANSWER: Leo Tolstoy

17. A suspect in this event was thought to have also committed the Waltham murders. During a television interview following this event, a man from Montgomery Village, Maryland, emphatically denounced his nephews as “losers.” An infamous photo from this event showed Carlos Arredondo wheeling the legless Jeff Bauman away in a wheelchair. The security officer Sean (*) Collier was shot and killed shortly after this event, which was followed by a firefight and manhunt in nearby Watertown. For 10 points, name this 2013 event in which the brothers Tamerlan and Dzhokhar Tsarnaev used pressure cooker bombs to attack runners at an event in New England.

ANSWER: Boston Marathon bombings

18. This country’s capital is the name for a term for taking ships away from a defeated fleet. The Victual Brothers were pirateers who were formed after the capture of Albert of Mecklenburg by a queen of this modern-day nation. This nation paid the Sound Dues while ruled by the son of Margaret I, Eric of (*) Pomerania. Along with a northern nation, the House of Oldenbourg ruled this nation while it was joined with Norway. This nation along with Sweden and Norway made up the Kalmar Union. For 10 points, name this nation whose kings are frequently named Frederick and Christian, and whose major port and capital is Copenhagen.

ANSWER: Denmark

19. One of these figures was actually named Arthur James Caley and was named for Middlebush. One of these figures from American mythology was a sea captain from Massachusetts named Captain Stormalong. One of these figures was supposedly found by two men hired to dig a well, but it was planted there by a man named George Hull. That one of these figures was later duplicated by PT Barnum and was named for (*) Cardiff. One story about another one of these figures from American folklore declares that he created Minnesota’s 10,000 lakes, and that one of this figures had a blue ox named Babe. For 10 points, name these figures exemplified by Paul Bunyan, which are known for their large size.

ANSWER: giants

20. These data structures can be improved with the move-to-front heuristic. One can reduce the typical two fields needed in one variety of these to only one using a namesake “XOR” variation. In LISP, these data structures are constructed from cons cells that contain the car and cdr fields. Many of these layered on top of each other is known as a (*) skip. Each node in one of these data structures contains a pointer to the next node and a pointer to the previous node in a “double” version. For 10 points, name these data structures that consist of nodes connected in a sequential order.

ANSWER: linked lists

Bonuses

1. This character helps Friar John establish an abbey at Thelema with only one rule, “Do what thou wilt.” For 10 points each:

[10] Name this giant who begins calling for ale as soon as he is born and later fathers Pantagruel.

ANSWER: **Gargantua**

[10] Gargantua and Pantagruel are creations of Rabelais, a 16th century author from this nation. Other early writing from this nation includes Thomas Malory’s *Le Morte d’Arthur*.

ANSWER: **France** [or **French Republic**]

[10] In the fifth book of *Gargantua and Pantagruel*, Pantagruel seeks out a “holy oracle” that is actually one of these objects to ask it whether Panurge should marry or not.

ANSWER: a **bottle**

2. Some people like hockey. Answer some questions about it. For 10 points each:

[10] Last year, the Chicago Blackhawks won this trophy, which is given to the winner of the NHL playoffs. Players often put their babies inside this trophy.

ANSWER: the **Stanley Cup**

[10] This team won the Stanley Cup in 2012. They were the first 8th seeded team to ever win the Cup, and they were led by players Jonathan Quick and Anze Kopitar. They’re often confused with a basketball team in the same state.

ANSWER: **Los Angeles Kings** (accept either underlined part; do not accept “Sacramento Kings”)

[10] The finals MVP last year was this Blackhawks right wing, who is known for his frequent drunken appearances and assault charges off the ice. He’s currently out with a leg injury.

ANSWER: Patrick **Kane**

3. This quantity can be measured in pascals or atmospheres. For 10 points each:

[10] Name this quantity, the ratio of force to the area over which the force is distributed.

ANSWER: **pressure** (prompt on “p”)

[10] This law named after a Frenchman states that, at constant volume, pressure and temperature are proportional.

ANSWER: **Gay-Lussac’s law**

[10] This Italian scientist first invented the mercury barometer, and formulated a namesake law relating the speed a fluid exiting a hole to its height, later found to be a special case of Bernoulli’s law. A unit of pressure equal to 1/760 of an atmosphere is named for him.

ANSWER: Evangelista **Torricelli**

4. This man liked to dress up as a Continental soldier to show his support for the American Revolution. For 10 points each:

[10] Name this radical Whig who supported the French Revolution and had a heated rivalry with William Pitt the Younger.

ANSWER: Charles James **Fox**

[10] Fox didn’t care for this Chancellor of the Exchequer who is perhaps best known for his namesake acts that taxed things like glass and paper.

ANSWER: Charles **Townshend** (pronounced “Town-send”; or The **Townshend** Acts)

[10] Lord North was rumoured to be the brother of this English king who was sometimes put in a straitjacket by Dr. Francis Willis after going insane in his later years and was king during the American Revolution.

ANSWER: **George III** (prompt on “George”)

5. Let’s talk about a certain Stanford psychology experiment. For 10 points each:

[10] The Stanford experiment was meant to simulate this kind of environment, with certain participants being assigned the role of “guards.” The Panopticon is a proposed version of this kind of place.

ANSWER: prisons or jails

[10] The Stanford Prison Experiment was conducted by this professor, who later wrote about it in *The Lucifer Effect*.

ANSWER: Philip Zimbardo

[10] The most notorious guard in the Stanford Prison Experiment earned this nickname, though he was actually modeling his behavior on Strother Martin in *Cool Hand Luke*.

ANSWER: “John Wayne”

6. The Mensalão scandal threatened the president of this country in 2005. For 10 points each:

[10] Name this country that is set to host the 2016 Summer Olympics in Rio De Janeiro.

ANSWER: Brazil

[10] That aforementioned scandal occurred during the presidency of this man, who was replaced by Dilma Rousseff in 2011.

ANSWER: Luiz Inácio Lula da Silva

[10] Lula allowed an alleged terrorist from this nation to stay in the country via a controversial 2010 decision. That man was a member of the PAC, a group that, along with the Red Brigades, led attacks in this country during its Years of Lead.

ANSWER: Italy (or the Italian Republic; or Italia)

7. This behavior is the subject of nonlinear dynamics, and large Lyapunov exponents are characteristic of it. For 10 points each:

[10] Name this property of a system in which it is extremely sensitive to small changes of initial conditions, leading to unpredictable time evolution.

ANSWER: chaos or chaotic

[10] The double form of this system exhibits chaotic motion. The single form of this device is almost simple harmonic, but has restoring force proportional to the sine of the displacement instead of the displacement.

ANSWER: pendulum

[10] A map of this name is a simple nonlinear recurrence relation that generates chaotic behaviour. A curve of this name was used by Verhulst to model population growth, and it is a special case of a sigmoid.

ANSWER: logistic map or logistic curve (prompt on “sigmoid”)

8. Answer some things about modern writers from Great Britain. For 10 points each:

[10] Ian McEwan’s *Atonement* follows several characters who take part in this war. In the novel, Robbie dies at Dunkirk, while his love Cecilia dies in a German bombing raid.

ANSWER: World War II

[10] Ian McEwan is close pals with Martin, a member of this literary family, whose father Kingsley wrote the novel *Lucky Jim*.

ANSWER: Amis

[10] The author of *Look Back in Anger*, John Osborne, won an Oscar for his adaptation of this Henry Fielding novel about a foundling who falls in love with Sophia Western while under the care of Squire Allworthy.

ANSWER: *The History of* Tom Jones, *a Foundling*

9. This composer’s seventh symphony is his last and is notable for having only one movement. For 10 points each:

[10] Name this Finnish composer of the tone poem *Tapiola* and the symphonic poem *Finlandia*.

ANSWER: Jean Sibelius

[10] This set of pieces by Sibelius imagines such events as “The Siege of Viipuri Castle” and “Karl Knutsson.” It was commissioned for the students at Helsinki University in Vyborg and named for a region of Finland.

ANSWER: Karelia Suite, Op. 11

[10] Sibelius also wrote some incidental music to this play. The text of this play inspired the first of Ralph Vaughan Williams' *Three Shakespeare Songs*, which was entitled "Full Fathom Five."

ANSWER: The Tempest

10. Answer some questions about logistics on the Eastern Front during WWII. For 10 points each:

[10] The primary goal of the Case Blue offensive that led to the battle of Stalingrad was to reach Baku, where this crucial resource was abundant. It was also at the center of the First Gulf War.

ANSWER: oil (or petroleum)

[10] In this gigantic battle fought months after Stalingrad, Georgy Zhukov repulsed a German offensive codenamed Operation Citadel.

ANSWER: Battle of Kursk

[10] Farther north, Leningrad was supplied during prolonged Axis siege by the Road of Life, which traversed this frozen lake, the largest in Europe.

ANSWER: Lake Ladoga

11. In one section of this poem, men standing outside of a tavern shout "you know how little while we have to stay." For 10 points each:

[10] Name this series of quatrains by Omar Khayyam notably translated by Edward Fitzgerald.

ANSWER: Rubaiyat of Omar Khayyam

[10] The *Rubaiyat* states that "all thy Piety nor Wit shall lure [this object] back." This "moving" object is said to "write; and, having writ, move on."

ANSWER: "The Moving Finger"

[10] In one quatrain, the Nightingale cries this word four times to the Rose. A jug of this substance appears with a "loaf of bread" and "thou" in the most famous line of the poem.

ANSWER: wine

12. This group included Calais and Zetes, who saved Phineus from the wrath of the Harpies. For 10 points each:

[10] Name this group led by Jason. They were sent on a quest to retrieve the Golden Fleece.

ANSWER: the Argonauts

[10] This king of Iolcus sent Jason on the quest for the Golden Fleece. This figure was warned to beware of a man with one sandal, and he died his daughters chopped him up into pieces in hopes of restoring his youth.

ANSWER: Pelias

[10] This daughter of Aeëtes convinced the daughters of Pelias that she could make him young again. She killed her children when Jason left her for Glauce. She also killed Talos. She was scary.

ANSWER: Medea

13. ADA and other exploratory HIV treatments target this protein motif, which exists in gag-knuckle and treble clef variations. For 10 points each:

[10] Name this protein motif that uses two cysteine and two histidine residues as ligands to bind DNA and like molecules.

ANSWER: zinc fingers

[10] Histidine and zinc also coordinate in carbonic anhydrase, a key enzyme in this process of maintaining constant pH.

ANSWER: buffering

[10] Zinc fingers were first discovered in *Xenopus*, a model organism from the Anura order of this taxonomic class. After evolving from sarcopterygian fish during the Devonian, this class became the dominant terrestrial vertebrates of the Carboniferous period.

ANSWER: amphibians (anti-prompt on “frogs”)

14. René Iché created a sculpture of this name depicting a skeleton in a dress standing on a rock. For 10 points each:

[10] Give this name of a Pablo Picasso painting that he created after the title Basque town was bombed.

ANSWER: Guernica

[10] To the left of a screaming horse and a bird, one of these animals is visible. A woman holds a dead child under this animal, which has a smoking tail.

ANSWER: a bull (accept cow, steer, cattle, ox, yak or whatever else it could be)

[10] The bomb itself is represented by an eye with a pupil in the shape of one of these objects.

ANSWER: a light bulb (or bombilla, accept electric light or lamp)

15. This case was used as a precedent in *Morse v. Frederick*, which is more well known as the “Bong Hits 4 Jesus” case. For 10 points each:

[10] Name this case that involved school students who wore black armbands to an Iowa high school.

ANSWER: Tinker v. Des Moines Independent Community School District (accept in either order)

[10] The lone dissenter in *Tinker* was Potter Stewart who loved judicial restraint. Black more famously dissented, along with Potter Stewart in this case that declared a ban on contraceptives in a New England state was unconstitutional.

ANSWER: Griswold v. Connecticut (or Connecticut v. Griswold)

[10] The right to privacy that was established in *Griswold* was also used in this 1973 case that established the legal right to get an abortion throughout the United States.

ANSWER: Roe v. Wade (or Wade v. Roe)

16. Name some things about a certain author of the Klondike. For 10 points each:

[10] This author and political writer wrote frequently about the Alaskan frontier and penned the short story *To Build a Fire* and *Call of the Wild*.

ANSWER: Jack London

[10] This other London novel about a titular wolf who goes from being an abused dog-fighter to living comfortable at a California estate with Weedon Scott.

ANSWER: White Fang

[10] This dystopian novel by London describes a tyrannical government in the future United States and highlights his socialist views.

ANSWER: *The* Iron Heel

17. Answer these questions about genetic disorders among ethnic groups. For 10 points each:

[10] This disease is thought to be the most common genetic disorder among Caucasians. It is diagnosed with the sweat test, and characterized by overproduction of mucus.

ANSWER: cystic fibrosis (or mucoviscidosis)

[10] Unlike other lysosomal storage diseases, this ethnically-confined genetic disorder does not exhibit hepatosplenomegaly. It is caused by overaccumulation of gangliosides due to mutation in the HEXA gene.

ANSWER: Tay-Sachs disease

[10] Salla disease, type III Usher disease, and Mulibrey nanism are among the numerous disorders named for this European ethnic group, whose low-diversity Y chromosome may trace back to just two male lineages.

ANSWER: Finnish (accept equivalents)

18. Answer the following about physicalism. For 10 points each:

[10] Physicalism, which states that there is nothing outside the physical, stands in opposition to this ontological stance, which divides the world into two different aspects, such as a mental and a physical one.

ANSWER: **dualism**

[10] This French philosopher described the mind and body as separate entities in his *Passions of the Soul*. He also wrote *Meditations on First Philosophy*.

ANSWER: René **Descartes**

[10] This philosopher briefly held physicalist views, but is more famous for writing *On Denoting* and coming up with a namesake “teapot”.

ANSWER: Bertrand Arthur William **Russell**

19. This man’s government lost prestige when his general Carlos Prats shot at a woman who had insulted him from her car. For 10 points each:

[10] Name this man who committed suicide in La Moneda Palace after being overthrown in a coup led by Augusto Pinochet.

ANSWER: Salvador **Allende**

[10] Allende and Pinochet led this South American country that fought the War of the Pacific with its northern neighbor, Peru.

ANSWER: **Chile**

[10] Allende was almost overthrown in a “putsch” named for these items. A prototype of one of these items was dubbed “Little Willie” and they were used at the Battle of Flers-Courcelette.

ANSWER: **tanks**

20. This set of numbers forms a ring, but not a field because it lacks multiplicative inverses. For 10 points each:

[10] Name these numbers that include the natural numbers, their negatives, and zero. They are denoted with a big **Z**.

ANSWER: **integers**

[10] These types of equations admit only integer solutions. Matiyasevich gave a negative answer to Hilbert’s tenth problem, which was to find an algorithm to determine if these are solvable.

ANSWER: **Diophantine** equations

[10] This mathematician’s cattle problem may be modeled by Pell’s equation, which is x^2 minus n times y^2 equals one. He also calculated the area of a circle by approximating it as a square, then a hexagon, then an octagon, and so on.

ANSWER: **Pell**’s equation