



### Tossup 1: Science — Astronomy

<p>The type II kind can be distinguished by hydrogen spectral lines, and occurs when hydrogen runs out, causing the hydrostatic equilibrium to end. All but the "I a" type are caused by some form of core collapse, which instead occurs when a white dwarf reaches the Chandrasekhar limit. Tycho's and Kepler's occurred in 1572 and 1604, the last ones observable by the naked eye. Name this form of star explosion which occurs when a star collapses.</p>	<p><b><u>Supernova</u></b> (<i>do not accept nova</i>)</p>
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### Bonus 1: Social Studies — Other

<p>Given a description, identify the philosopher.</p>		
<p><b>A</b></p>	<p>The writers of the Declaration of Independence drew on this man's ideas, some of which were expounded in his Two Treatises of Government and An Essay Concerning Human Understanding.</p>	<p><b>John <u>Locke</u></b></p>
<p><b>B</b></p>	<p>This Scottish thinker penned An Enquiry Concerning Human Understanding, as well as A Treatise of Human Nature.</p>	<p><b>David <u>Hume</u></b></p>
<p><b>C</b></p>	<p>The man in part B was friends with this French thinker who authored Emile and Confessions, but is best known for his writing of the Social Contract.</p>	<p><b>Jean Jacques <u>Rousseau</u></b></p>
<p><b>D</b></p>	<p>This author of the Persian Letters published his best known work, the Spirit of the Laws, anonymously.</p>	<p><b>Charles de Secondat, Baron de <u>Montesquieu</u></b></p>



## Tossup 2: Literature — Literature

<p>One of his characters, a Northern Civil War soldier named Carter Druse, finds himself unavoidably having to shoot his father, who is fighting for the South. While this occurs in his "A Horseman in the Sky", his more famous story outlines Peyton Farquhar's death by hanging. In 1914, he disappeared mysteriously while observing the movements of Pancho Villa's army in Mexico. Responsible for the short story "An Occurrence at Owl Creek Bridge", identify this author who also penned The Devil's Dictionary.</p>	<p><b>Ambrose Gwinnett <u>Bierce</u></b></p>
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## Bonus 2: Math — Calculus

<p>Answer the following about the function <math>f</math> of <math>x</math> equals <math>x</math> plus the square root of <math>x</math>.</p>		
<b>A</b>	Find the domain of $f$ .	<b><u>non-negative</u> real numbers</b> <i>(accept <math>x</math> greater than or equal to zero)</i>
<b>B</b>	Evaluate the derivative of $f$ at $x$ equals 1.	<b><u>3/2</u></b>
<b>C</b>	Find the area between the curve, the $x$ -axis, and the line $x$ equals 1.	<b><u>7/6</u></b>
<b>D</b>	Find the coordinates of all points of intersection between $f$ and the line $y$ equals $4x$ .	<b><u>(0, 0)</u> and <u>(1/9, 4/9)</u></b> <i>(must have both answers)</i>



### Tossup 3: Miscellaneous — Entertainment

<p>Paul Gleason, who plays Mr. Vernon, portrayed a very similar character in a 2001 movie. Actor Judd Nelson was nearly a full decade older than his character John Bender, who ends up in a relationship at the end of the movie with preppy Claire Standish, played by Molly Ringwald. This was one of two John Hughes directed movies in which Ringwald starred with Anthony Michael Hall, who played nerd Brian Johnson. Name this 1985 movie, also starring Emilio Estevez, in which five kids from five walks of life spend a Saturday together in detention.</p>	<p><b><u>The Breakfast Club</u></b></p>
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### Bonus 3: Science — Physics

Identify these properties of particles.		
<b>A</b>	This is the intrinsic angular momentum of a particle, and distinguishes fermions from bosons.	<b><u>Spin</u></b>
<b>B</b>	This special kind of charge held by quarks and gluons mediates the strong force.	<b><u>Color charge</u></b>
<b>C</b>	This property exists in the strangeness, charm, and bottom varieties, among others.	<b><u>Flavor</u></b>
<b>D</b>	This class of particles only exist in groups, and include the up, down, charm, strange, top, and bottom ones.	<b><u>Quark</u></b>



### Tossup 4: Math — General

<p>The first number proven to have this property was Liouville's constant. Hilbert, in his seventh problem, singled out two of them that were, at the time, unknown to be this, but were proven to be so by Gelfond's theorem. Those two numbers, 2 to the square root of 2 and e to the pi, can both be written as an algebraic number to the power of an irrational number. Name this type of number that cannot be the solution to a polynomial with integer coefficients.</p>	<p><b><u>transcendental number</u></b> <i>(accept <u>nonalgebraic number</u>)</i></p>
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### Bonus 4: Literature — Literature

<p>Given a description, name the Latin American writer.</p>		
<p><b>A</b></p>	<p>Yu Tsun shoots Dr. Albert in "The Garden of Forking Paths" and an infinitely large building divided into hexagonal rooms is the focus of "The Library of Babel", both of which appear in this Argentine's collection, Ficciones.</p>	<p><b>Jorge Luis <u>Borges</u></b></p>
<p><b>B</b></p>	<p>This Chilean Nobel Laureate glorified normal objects in "Hymn to Celery" and "Ode to my Socks" but is better known for Twenty Love Poems and a Song of Despair.</p>	<p><b>Pablo <u>Neruda</u></b></p>
<p><b>C</b></p>	<p>This Columbian wrote about Fermina Daza in Love in the Time of Cholera and the fictional town of Macondo in One Hundred Years of Solitude.</p>	<p><b>Gabriel <u>García Márquez</u></b></p>
<p><b>D</b></p>	<p>This magical realist won the 1967 Nobel Prize in Literature for works like The Banana Trilogy and Men of Maize but famously wrote a political novel about his native Guatemala in El Señor Presidente.</p>	<p><b>Miguel <u>Asturias</u></b></p>



### Tossup 5: Social Studies — World History

<p>In 1967, he gave a speech in Québec, in which he said "Vive le Québec libre!", or "Long live free Québec!", inciting much outrage within Canada. He followed this by somewhat hypocritically denouncing the regionalist movement in Brittany a year later. He resigned from his office in 1969, and was replaced by Alain Poher. Originally elected President in December, 1958, he was the first under the constitution of the new Fifth Republic. Leading a military group opposed to the government of Laval and Petain, identify this French general and statesman, the leader of the Free French Forces during World War II.</p>	<p><b>Général Charles <u>de Gaulle</u></b></p>
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### Bonus 5: Fine Arts — Music

Identify the following works by Beethoven.	
<b>A</b>	This symphony, the first of his middle period was dedicated to Napoleon, and is sometimes considered the transition between the Classical and Romantic musical periods. <b><u>Eroica Symphony</u></b> (accept <i>Symphony No. 3 in E flat major</i> or <i>3rd Symphony</i> )
<b>B</b>	Beethoven called this symphony his "little Symphony in F", distinguishing it from his Sixth, which was also in F. It was one of the few works Beethoven did not dedicate. <b><u>Symphony No. 8 in F Major</u></b> (accept <i>8th Symphony</i> )
<b>C</b>	This work, the only of its kind by Beethoven, follows Leonore as she rescues her husband Florestan from prison. <b><u>Fidelio</u></b>
<b>D</b>	Depicting rural life in the country and simply titled "Recollections of Country Life" at its premier, this work was overshadowed by the work it premiered alongside. <b><u>Pastoral Symphony</u></b> (accept <i>Symphony No. 6 in F major</i> or <i>6th Symphony</i> )



### Tossup 6: Math — Calculus (Computational: 30 Seconds)

Evaluate the definite integral from 0 to 1, of  $x$  over the quantity one plus  $x$  squared,  $dx$ .

**natural log of 2, over 2** (accept *1/2 natural log of 2*)

### Bonus 6: Science — Chemistry

Answer the following about chemical tests.

<b>A</b>	The results of this kind of tests occasionally have to be viewed through cobalt blue gas, usually to filter out any sodium that may be a contaminant.	<b><u>Flame tests</u></b>
<b>B</b>	This test determines whether a metal is gold, and now refers colloquially to any test used to confirm validity.	<b>Nitric <u>acid</u> test</b>
<b>C</b>	Using this reagent, named for an American chemist, can confirm the presence of monosaccharides or other reducing sugars in solution.	<b><u>Benedict's test or solution or reagent</u></b>
<b>D</b>	The emulsion test can be used to test for this class of carbohydrates which are dissolved in ethanol, decanted into water, and then form an emulsion as the ethanol is diluted.	<b><u>Lipids</u></b> (prompt on fats or oils)



### Tossup 7: Social Studies — U.S. History

<p>He once fought a duel in Honduras with a British sea captain who had called him a "damned Yankee". During a march, he met and spoke with Samuel Holden Parsons about a cannon shortage, one that they decided could be remedied by capturing Fort Ticonderoga. Alongside Ethan Allen's Green Mountain Boys, he ended up doing just that, taking Forts Crown Point and George as well. Eventually having command of the fort at West Point, New York, identify this man who unsuccessfully attempted to surrender it to British control, a name which has become synonymous with "traitor."</p>	<p><b>Benedict <u>Arnold</u> V</b></p>
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### Bonus 7: Miscellaneous — Sports

<p>Given an excerpt from a classic press conference, identify the football coach, and the team they were coaching when they gave us words to live by.</p>		
<p><b>A</b></p>	<p>"Playoffs? Don't talk about playoffs. You kiddin' me. Playoffs? I just hope we can win a game."</p>	<p><b>Jim <u>Mora</u> and Indianapolis <u>Colts</u></b></p>
<p><b>B</b></p>	<p>"They are who we thought they were... and we let them off the hook."</p>	<p><b>Dennis "Denny" Greene and Arizona <u>Cardinals</u></b></p>
<p><b>C</b></p>	<p>"Come after me. I'm a man. I'm forty. I'm not a kid."</p>	<p><b>Mike <u>Gundy</u> and <u>Oklahoma State University</u> Cowboys</b></p>
<p><b>D</b></p>	<p>"This is what the greatest thing about sports is: you play to win the game. Hello! You play to win the game. We don't play to just play it."</p>	<p><b>Herman "Herm" <u>Edwards</u> and New York <u>Jets</u></b></p>



### Tossup 8: Literature — Literature

The protagonist of this novel lives in Eatonville, Jacksonville, and the Everglades at various points in the story, and is married at various times to Logan Killicks, Jody Starks, and Vergible Woods. The latter, who goes by the nickname Tea Cake, gets rabies after a hurricane and the protagonist, Janie Crawford, is forced to shoot him. Name this Harlem Renaissance novel by Zora Neale Hurston.

**Their Eyes Were Watching God**

### Bonus 8: Math — Other

Give the number of distinct arrangements of the following objects.

<b>A</b>	Two red beads, two green beads, and one blue bead, in a line.	<b><u>30</u></b>
<b>B</b>	Two red beads, two green beads, and one blue bead, in a circular necklace.	<b><u>6</u></b>
<b>C</b>	Five indistinguishable balls placed in two indistinguishable urns.	<b><u>6</u></b>
<b>D</b>	Four identical books and three identical magazines.	<b><u>35</u></b>



### Tossup 9: Science — Biology

<p>It begins in the third trimester, where primordial germ cells undergo mitosis to create gametogonia. They begin to divide, but are arrested in the dictyotene phase for as long as half a century, until follicle-stimulating hormone allows them to continue meiosis until metaphase II, where those cells stay until they are fertilized, eventually creating three polar bodies and one egg cell. Name this biological process in humans by which eggs are created.</p>	<p><b>Oogenesis</b> (<i>oh-oh-jen-eh-sis</i>; <i>prompt on gametogenesis</i>)</p>
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### Bonus 9: Social Studies — Geography

<p>Answer these questions about Canada.</p>		
<b>A</b>	Located in the Northwest Territories, this longest river of Canada flows out of the Great Slave Lake.	<b><u>MacKenzie River</u></b>
<b>B</b>	This largest lake entirely within Canada is nearly 1500 ft deep, and is located inside the Arctic Circle.	<b><u>Great Bear Lake</u></b>
<b>C</b>	This mountain located within Kluane National Park is the highest point in Canada.	<b><u>Mount Logan</u></b>
<b>D</b>	Iqaluit is the capital of this most recently named Canadian territory, that was once part of the Northwest Territories.	<b><u>Nunavut</u></b>



### Tossup 10: Fine Arts — Visual Art

<p>One of his paintings, displays two apostles conversing with a reborn Christ in his The Supper at Emmaus. Another one of his paintings involves the trampling of the titular character by horse, while yet another uses chiaroscuro to show a bright light shining upon the titular subject sitting at a table. Known for killing a man over a tennis match score, name this painter who painted The Calling of Saint Matthew and The Conversion of Saint Paul in addition to a famous picture of Bacchus and The Cardsharps.</p>	<p><b><u>Michelangelo Merisi da Caravaggio</u></b></p>
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### Bonus 10: Literature — Literature

<p>Identify these works of Sinclair Lewis.</p>		
<p><b>A</b></p>	<p>Lewis's hometown of Sauk Centre was the basis for Gopher Prairie, the setting for this work about Carol Kennicott's struggle to revitalize the town.</p>	<p><b><u>Main Street</u></b></p>
<p><b>B</b></p>	<p>Tinka, Ted, and Verona are the children of this title character, a real estate agent who lives in Zenith.</p>	<p><b><u>Babbitt</u></b></p>
<p><b>C</b></p>	<p>The title character of this 1927 Lewis novel is a college athlete-turned-evangelical preacher, who only uses that position to further his greed.</p>	<p><b><u>Elmer Gantry</u></b></p>
<p><b>D</b></p>	<p>In this work, Fran Voelker is the wife of the title character, a former auto company executive, and the two take a vacation to Europe where the protagonist meets Edith Cortright.</p>	<p><b><u>Dodsworth</u></b></p>



### Tossup 11: Miscellaneous — Entertainment

<p>After Brian Jones died in 1969, Mick Taylor joined this band, but he would be replaced five years later by Ron Wood. Their 1968 effort, <i>Their Satanic Majesties Request</i>, was their take on psychedelic music, and the best known song off that album is <i>2000 Light Years From Home</i>. 1971's <i>Sticky Fingers</i> contained <i>Wild Horses</i> and <i>Brown Sugar</i>, and other well known songs from them include <i>Sympathy for the Devil</i> and <i>Gimme Shelter</i>. Name this British rock group led by Keith Richards and Mick Jagger, probably best known for their song <i>Satisfaction</i>.</p>	<p><u>Rolling Stones</u></p>
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### Bonus 11: Math — Algebra

Fully factor the following polynomials.		
<b>A</b>	$x^3 - 6x^2 + 11x - 6$ .	<i>(Answers in any order)</i> <u><math>(x-3)(x-2)(x-1)</math></u>
<b>B</b>	$x^3 - x^2 + 3x - 3$ .	<u><math>(x^2 + 3)(x - 1)</math></u>
<b>C</b>	$2x^2 + 11x - 21$ .	<u><math>(x + 7)(2x - 3)</math></u>
<b>D</b>	$3x^2 + 8x - 3$ .	<u><math>(3x - 1)(x + 3)</math></u>



### Tossup 12: Literature — Literature

A possible source for this work is S.E. Gross' The Merchant Prince of Corneville, a comparison which won Gross a hefty plagiarism settlement from this work's author. The play opens with the title character chasing Montfleury off the stage and then composing a ballade while dueling Viscount Valvert. Later, Christian de Neuvillette, a handsome, yet slow-witted man uses the title character's infatuation with Roxanne to get him to help woo her in a famous balcony scene. Featuring a protagonist with an oversized schnoz, identify this work by Edmond Rostand.

Cyrano de Bergerac

### Bonus 12: Science — Chemistry

Answer these acid/base chemistry questions.		
<b>A</b>	This type of base is exemplified by ammonia, and is also known as a nucleophile.	<u>Lewis base</u>
<b>B</b>	This procedure finds an unknown concentration of an acid or base using a burette, a neutralization reaction, and an indicator.	<u>titration</u>
<b>C</b>	This adjective describes a substance that can act as either an acid or a base, such as water.	<u>amphoteric</u> (accept <i>amphoprotic</i> )
<b>D</b>	This is the color litmus paper turns in water after bubbling CO <sub>2</sub> through the beaker.	<u>red</u> (accept <i>pink</i> or similar colors)



### Tossup 13: Social Studies — Geography

<p>This Near East city on the Barada River has achieved fame throughout the centuries. In the time of the crusades, it gained fame for its woven cloths and steel daggers, reputed to be on par with Toledo in terms of quality. Only 50 miles from the Mediterranean, in biblical times Saul was on his way there when an angel blinded him, after which he converted to Christianity. Name this city, the current capital of Syria.</p>	<p><b><u>Damascus</u></b></p>
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### Bonus 13: Literature — Literature

<p>Identify these Japanese authors.</p>		
<b>A</b>	<p>This 17th century author of the Narrow Road to Oku is considered the greatest writer of haiku.</p>	<p><b>Matsuo <u>Basho</u></b></p>
<b>B</b>	<p>The Tale of Genji, one of the earliest known novels, was written by this author a millennium ago.</p>	<p><b>Lady <u>Murasaki</u> Shikibu</b></p>
<b>C</b>	<p>Spring Snow and the Temple of Dawn are two of the four works that comprise this author's Sea of Fertility; it was completed shortly before he committed seppuku.</p>	<p><b>Yukio <u>Mishima</u></b> (<i>prompt Kimitake Hiraoka</i>)</p>
<b>D</b>	<p>He came up with the idea for his first novel, Hear the Wind Sing, while watching a baseball game, but he is better known for Norwegian Wood and the Wind-Up Bird Chronicle.</p>	<p><b>Haruki <u>Murakami</u></b></p>



### Tossup 14: Science — Chemistry

<p>It was discovered by Ramsay and Travers in 1898, and its dimer was used in the first excimer laser. Later found as the product of iodine-129's beta decay, it has nine stable isotopes, more than every element except for tin. Platinum hexafluoride was added to it in 1962 to create the first noble gas compound. Glowing blue when excited, and with a density of 5.9 grams per liter, name this noble gas with atomic number 54, between krypton and radon.</p>	<p><u>Xenon</u></p>
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### Bonus 14: Fine Arts — Visual Art

<p>Identify the following works of Marcel Duchamp.</p>		
<p><b>A</b></p>	<p>This painting, which illustrates the titular action, has been described as an explosion in a shingle factory.</p>	<p><u>Nude Descending a Staircase, No. 2</u></p>
<p><b>B</b></p>	<p>This painting, which consists of The Mona Lisa with a Mustache drawn on it, has a title that, when said in French and loosely translated reads "There is heat down below."</p>	<p><u>L.H.O.O.Q.</u></p>
<p><b>C</b></p>	<p>This work is made of two glass panels between which are pressed various materials to make up some complex machinery in the lower panel as well as the titular characters.</p>	<p><u>The Bride Stripped Bare by Her Bachelors, Even</u> (<i>accept The Large Glass</i>)</p>
<p><b>D</b></p>	<p>Both the answers to A and B were considered this type of art, which turns an everyday object into something the artist has declared to be art.</p>	<p><u>Readymades</u></p>



**Tossup 15: Math — Geometry (Computational: 30 Seconds)**

Find the surface area of a sphere whose inscribed cube has an edge length of 4.	<b><u>48 pi</u></b>
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**Bonus 15: Social Studies — World History**

Answer these questions about Canadian Prime Ministers.		
<b>A</b>	In 1867, this man became the first Canadian Prime Minister.	<b>Sir John Alexander <u>Macdonald</u></b>
<b>B</b>	This native of Quebec was first elected to office in 1968, and in 1980 launched the controversial National Energy Program.	<b>Pierre <u>Trudeau</u></b>
<b>C</b>	This Liberal son of a Cabinet member often clashed with his predecessor Jean Chretien, and then gained power from him in 2003.	<b>Paul <u>Martin</u></b>
<b>D</b>	This current leader of Canada was the first ever prime minister from the recently formed Conservative Party, and made news in 2006 when he visited Canadian troops at the front lines.	<b>Stephen <u>Harper</u></b>



### Tossup 16: Math — Algebra (Computational: 30 Seconds)

In degrees, find all theta between 0 and 360 degrees such that the sine of theta is one half.

**30 and 150 degrees** (both answers required)

### Bonus 16: Miscellaneous — Interdisciplinary

The past hundred years have seen revolutions of all sorts. Answer the following questions related to revolutions, political and otherwise.

<b>A</b>	This British rock band penned the song "Revolution" which references Chairman Mao.	<b>The Beatles</b>
<b>B</b>	The Orange Revolution took place in this former Soviet Bloc country from 2004 to 2005 in the wake of a disputed presidential election.	<b>Ukraine</b>
<b>C</b>	Fashion house People's Revolution was heavily featured on the most recent season of this popular reality television program.	<b>The Hills</b>
<b>D</b>	The recent film "Revolution Road" marked the first on screen reunion of the romantic leads from this 1997 blockbuster film.	<b>Titanic</b>



### Tossup 17: Literature — Literature

<p>Another poem by this American first appears in the collection Harmonium and presents a woman who eats “coffee and oranges in a sunny chair” and who wonders whether Christianity or paganism is the right way to go. In addition to “The Necessary Angel”, “The Idea of Order at Key West” and “Sunday Morning”, he wrote a poem about the titular creature that “sat in the cedar limbs” and “flew out of sight”. Also writing a poem about a titular “roller of big cigars” in a poem about a dead prostitute, identify this modernist poet of “Thirteen Ways of Looking at a Blackbird” and “The Emperor of Ice Cream”.</p>	<p><b>Wallace <u>Stevens</u></b></p>
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### Bonus 17: Social Studies — U.S. History

<p>Identify these happenings from the 1890s.</p>		
<p><b>A</b></p>	<p>In the election of 1892, this man became the first president to serve two non-consecutive terms.</p>	<p><b>Grover <u>Cleveland</u></b></p>
<p><b>B</b></p>	<p>Also in the election of 1892, this lowan running on the Populist ticket came in third.</p>	<p><b>James Baird <u>Weaver</u></b></p>
<p><b>C</b></p>	<p>At the 1896 Democratic National Convention, William Jennings Bryan gave this famous speech, promoting the use of bimetallism.</p>	<p><b><u>Cross of Gold</u></b></p>
<p><b>D</b></p>	<p>The 51st congress, which met from 1889-1891, was known as this because of how much it spent.</p>	<p><b><u>Billion Dollar Congress</u></b></p>



### Tossup 18: Fine Arts — Music

<p>This piece was first performed in 1952 during a contemporary piano recital. The performer, David Tudor, signified the first movement by closing the lid on the keys, and then signified the end of the movement by opening the lid. When listening to the piece, the audience should only hear the circulation of their blood and the pounding of air against their eardrums. Inspired by a trip to an anechoic sound chamber at Harvard, name this piece which consists of the titular amount of silence, composed by John Cage.</p>	<p><b>4'33"</b> (<i>four minutes thirty three seconds</i>)</p>
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### Bonus 18: Science — Biology

<p>Answer these questions about the Calvin cycle, the "dark" cycle of photosynthesis.</p>	
<b>A</b>	<p>The Calvin cycle captures carbon dioxide from the atmosphere as organic molecules, a process known broadly as this.</p> <p><b><u>Carbon fixation</u></b></p>
<b>B</b>	<p>This protein used in the Calvin cycle can combine CO<sub>2</sub> and water, or oxygen and water in the absence of CO<sub>2</sub>.</p> <p><b><u>RuBisCO</u></b></p>
<b>C</b>	<p>CO<sub>2</sub> and water produce a three-carbon molecule which is then transformed into this storage sugar.</p> <p><b><u>Glucose</u></b></p>
<b>D</b>	<p>Most plants use the C<sub>3</sub> pathway, though plants in some climates use the C<sub>4</sub> pathway or this pathway found in cacti, pineapples, and orchids.</p> <p><b><u>CAM</u></b> (<i>accept <u>crassulacean acid metabolism</u></i>)</p>



### Tossup 19: Social Studies — Current Events

<p>She earned \$1 a year for her position as the director of the Office of Strategic Partnerships for the New York City Department of Education. A graduate of Radcliffe College, she donated money to the presidential campaigns of both Hillary Clinton and Barack Obama, though she would eventually endorse Obama. One of the creators of the Profiles in Courage Award, in January 2009 she informed New York Governor David Paterson that she was not interested in Clinton's vacant senate seat. Name this daughter of President John F. Kennedy.</p>	<p><u>Caroline Bouvier Kennedy</u></p>
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### Bonus 19: Math — General

<p>Name answer these questions about prime numbers.</p>		
<p><b>A</b></p>	<p>A famous unproven conjecture states that there are an infinite number of these pairs of primes which are two apart, like 3 and 5.</p>	<p><u>twin primes</u></p>
<p><b>B</b></p>	<p>It is unknown whether there are an infinite number of this kind of prime, named after a French mathematician, and of the form <math>2^n - 1</math>.</p>	<p><u>Mersenne primes</u></p>
<p><b>C</b></p>	<p>This Greek letter is often used to represent the prime counting function.</p>	<p><u>pi</u></p>
<p><b>D</b></p>	<p>This is a short set of data that verifies the primality of a number.</p>	<p><u>primality certificate</u></p>



### Tossup 20: Science — Physics

<p>It was completely explained by Einstein in 1905, and can be approximated by the Langevin equation. It is described more exactly as a Wiener process, a continuous-time stochastic random-walk as the mesh approaches zero. Feynman proposed a thought experiment involving a ratchet subject to this phenomenon, first described by Lucretius but named after a Scottish botanist. Name this phenomenon in which small particles suspended in a fluid move randomly.</p>	<p><b><u>Brownian motion</u></b></p>
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### Bonus 20: Literature — Mythology

<p>Identify the following non-Greco-Roman mythological creatures.</p>		
<p><b>A</b></p>	<p>This Slavic character lives in an ambulatory house with chicken feet and flies around in a giant mortar, using the pestle to steer; eating small children.</p>	<p><b><u>Baba Yaga</u></b></p>
<p><b>B</b></p>	<p>These minor water deities from Japanese folklore have water-filled depressions atop their heads, which are the source of their power. If you get one to bow to you, he might spill it all out.</p>	<p><b><u>Kappa</u></b> (accept <u>Kawatarō</u> or <u>Kawako</u>)</p>
<p><b>C</b></p>	<p>Also from Japanese folklore, these demonic creatures are often depicted wearing tiger-skin loincloths and carrying iron clubs.</p>	<p><b><u>Oni</u></b></p>
<p><b>D</b></p>	<p>This creature from Norse myth caused Thor to put his foot through a boat and will kill and be killed by him at Ragnarok.</p>	<p><b><u>Jörmundgandr</u></b> (accept <u>Midgard Serpent</u> or <u>World Serpent</u>)</p>



### Tossup A: Literature — Mythology

<p>She was given the baby Adonis by Aphrodite for safekeeping and became entranced by his unearthly beauty, leading to a quarrel between Aphrodite and this goddess. She was tricked into eating several Pomegranate seeds by Hades, leading to her having to return to the Underworld for some time each year. This came after Hades had spotted her innocently picking some flowers, and came up out of a cleft in the Earth, kidnapping her. Her yearly return to the underworld being the mythic reason behind the Earth's withering during Fall and Winter every year, identify this goddess of the springtime revival and queen of the Underworld.</p>	<p><b><u>Persephone</u></b> (accept <u>Proserpina</u>)</p>
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### Bonus A: Social Studies — U.S. History

Identify these facts related to the Vietnam War.		
<b>A</b>	This man was in charge of the forces there from 1964-1968, and then he was Chief of Staff of the Army until 1972.	<b>Gen. William <u>Westmoreland</u></b>
<b>B</b>	After the USS Maddox was attacked, this resolution was issued by Congress.	<b>Gulf of <u>Tonkin</u> Resolution</b>
<b>C</b>	William Calley was the only soldier who served jail time for his actions at this March 16, 1968 event.	<b><u>My Lai</u> Massacre</b> (prompt on <u>So'n My</u> Massacre)
<b>D</b>	Named after a Vietnamese holiday, this 1968 campaign by the Viet Cong intended to throw South Vietnam into uprising.	<b><u>Tet</u> Offensive</b>



### Tossup B: Science — Physics

<p>This Alabama native's most famous invention eventually had a 4-story tall room built around it at the Boston Science Museum. It was designed to provide high energy electrons for the MIT particle accelerator, and was originally able to generate potential differences of 80,000 volts. Name this inventor who created a namesake generator to replace the Wimshurst machine, which generated electrons by use of a fabric belt while collecting them on a hollow metal sphere.</p>	<p><b>Robert <u>Van de Graaff</u></b></p>
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### Bonus B: Literature — Literature

Identify the following about the mythological King Arthur.		
<b>A</b>	This historical king of Britain is Arthur's father.	<b><u>Uther</u> Pendragon</b>
<b>B</b>	This man is Arthur's illegitimate son by his half-sister who ends up betraying him at the Battle of Camlann.	<b><u>Mordred</u> (accept <u>Modred</u>)</b>
<b>C</b>	The title of this work by T.H. White is taken from the inscription on Arthur's grave.	<b>The <u>Once and Future King</u></b>
<b>D</b>	This cycle of poems in Blank Verse by Tennyson retells the entirety of Arthur's life.	<b><u>Idylls of the King</u></b>



**Tossup C: Math — General (Computational: 30 Seconds)**

Convert the number 3 2 3 from base 4 into base 8.	<u>73</u>
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**Bonus C: Fine Arts — Visual Art**

Identify the following buildings, all of which were designed by Frank Gehry.	
<b>A</b>	This building, created in Prague, consists of the characteristic Gehry metal sheeting which reflects onto the river it sits next to. <b><u>Dancing House</u></b>
<b>B</b>	This building in Seattle was contracted by Paul Allen as a giant write off for his music collection. Supposedly looking like a smashed guitar, the city's monorail runs right through the middle of it. <b><u>Experience Music Project</u></b> <i>(accept <u>EMP</u>)</i>
<b>C</b>	This building is located at 111 South Grand Avenue, in L.A. and houses Pipe Dreams, an organ assembly designed by Gehry himself. <b><u>Walt Disney Concert Hall</u></b>
<b>D</b>	Situated on the MIT campus, MIT eventually sued Gehry, who in turn blamed MIT for the problems with the building, citing their attempts to cut the cost of the project. <b><u>Ray and Maria Stata Center</u></b>