Choose the letter of the correct answer. In all cases, NOTA means "none of these answers".
Figures are not drawn to scale.

1) In 1990, the population of Sacramento was about 1,340,000. The population increased to
about 1,630,000 by 2000. If Sacramento's population growth is linear, estimate its population
in the year 2025.
      A) 725,000   B) 1,630,000   C) 2,065,000   D) 2,355,000   E) NOTA

2) One night Chanyang was experimenting with her video camera by videoing herself. She
hooked up the camera to her television to view the video. Chanyang was amused by seeing
herself on the television, though she noted the figure on the television was smaller than real
life. This is an example of which transformation?
      A) dilation   B) reflection   C) rotation   D) translation   E) NOTA

3) Lisa the Lady Bug wants to crawl through a parabola along a straight line through the focus
to grab a bite to eat at the Parabola Café. Ok, she wants to travel along the latus rectum. The
graph of the parabola in question has an equation of $y = \dfrac{-3}{2}x^2 + 3x - 4$. How many units will
Lisa have to crawl in order to traverse the latus rectum of this parabola?
      A) $\dfrac{-3}{2}$ B) $\dfrac{-2}{3}$ C) $\dfrac{2}{3}$ D) $\dfrac{3}{2}$ E) NOTA

4) Yige wants to cover his elliptical shaped pool with a tarp. Using his computer like brain,
Yige determines the equation for the pool is $16x^2 + 25y^2 - 300y + 500 = 0$, where all units are
in feet. What is the area in square feet of the tarp Yige will need if he wants to cover the pool?
      A) 16π   B) 20π   C) 25π   D) 400π   E) NOTA

5) Milton the Mouse is at Point A in a maze trying to get to Point C and eat the cheese that lies
there. In order to go from Point A to Point C, Milton must first go through Point B. There are 3
ways for Milton to go from Point A to Point B and 4 ways to go from Point B to Point C. How
many ways are there for Milton to go from Point A to Point C through point B?
      A) 12   B) 7   C) 4   D) 3   E) NOTA

6) Clara plans to have a "Let's Burn Our High School Books" party after graduation. She hires
Wang's Well Drilling to dig a 100 foot hole for her party. Wang charges $12 for drilling the first
foot of the hole, $12.25 for drilling the second foot, $12.50 for the third foot, and so on. How
much will Clara have to pay for the hole?
      A) $36.75   B) $48.75   C) $2437.50   D) $4875   E) NOTA

7) Which "set-up" below would give you the answer to the question : How many distinguishable
permutations are there for the word **Chickamauga**?
      A) 11!   B) $\dfrac{11!}{2!3!}$ C) $\dfrac{11!}{2!3!6!}$ D) $\dfrac{2!3!}{11!}$ E) NOTA

8) Patrick is hired to work at the Sacramento City College Observatory. He is to study Near Earth Objects and determine whether there is a danger of any of them hitting the Earth. Patrick assumes the shape of the Earth's surface is a circle and knows the equation of the Earth's surface is $x^2 + y^2 = 40$ with the origin as the center of the Earth and x and y in thousands of kilometers. Patrick tracks a meteorite with an orbit along one branch of a hyperbola determined by $4x^2 - y^2 - 80x = -340$ where x and y are in thousands of kilometers. (See sketch.) Could the meteorite hit the Earth? If so, where?
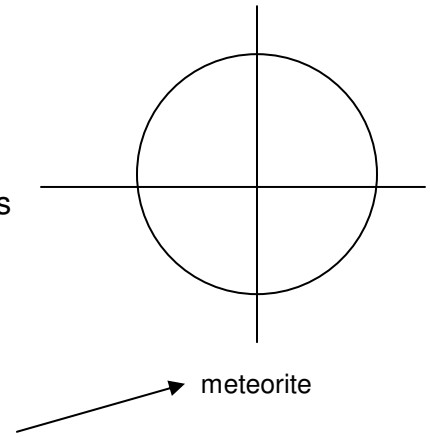
meteorite

    A) The meteorite will not hit the Earth.

    B) The meteorite could hit the Earth at $\left(10, -2\sqrt{15}\right)$

    C) The meteorite could hit the Earth at (-6, 2)
    D) The meteorite could hit the Earth at (6, -2)
    E) NOTA

9) Tom Sawyer was told by his Aunt Polly to whitewash the family fence. Tom can whitewash the entire fence by himself in 5 hours. Fortunately for Tom, after one hour, his friend, Huckleberry Finn, happens to wander by and agrees to help Tom. Huckleberry can whitewash the entire fence by himself in 6 hours. How many hours did it take to complete whitewashing the fence after Huckleberry began helping Tom?

    A) $2\frac{2}{11}$ hours   B) $2\frac{8}{11}$ hours   C) 4 hours   D) $4\frac{2}{5}$ hours   E) NOTA

10) Catherine is out flying her Piper 6X plane from Sacramento to Lawrence, Kansas, a distance of 2000 kilometers. Strong headwinds caused the plane's ground speed to be only 600 km/h for the first half of the trip. What must her ground speed be in km/h for the second half of the trip to average 720 km/h for the entire trip?
    A) 780   B) 840   C) 900   D) 960   E) NOTA

11) Joseph the Germ is crawling from left to right along a graph on a Cartesian Coordinate System determined by the equation $f(x) = \dfrac{x^2 + x - 12}{x^2 + 2x - 8}$. All of a sudden, Joseph finds he must start crawling up, almost straight up until infinity. Joseph has encountered a vertical asymptote. What is the equation for the vertical asymptote for $f(x) = \dfrac{x^2 + x - 12}{x^2 + 2x - 8}$?

    A) y = 2   B) y = -4   C) x = 2   D) x = -4   E) NOTA

12) Janna is reading the book "I ♥ Algebra". Just for fun, Janna counted the number of digits for the page numbers of the book. She counted 1002 digits. If the book begins on page 1 and ends on page x, find x.
    A) 1002   B) 370   C) 271   D) 189   E) NOTA

13) The radius of the planet Mars is about 3400 kilometers. Assuming Mars is shaped like a sphere, find the surface area of the Red Planet in square kilometers.

    A) 13600π   B) 11560000π   C) $15413333\frac{1}{3}$π   D) 46240000π   E) NOTA

14) In 1921, the people of Mitchell, South Dakota built the Corn Palace. Yes, a building made of colored corn. Assume the Corn Palace is in the shape of a right rectangular prism with the base measuring 152 by 196 feet and 40 feet in height, and a bushel of corn can cover 15 square feet. How many bushels of corn will it take to cover the exterior sides of the Corn Palace (NOT the roof)?

    A) $79,445\frac{1}{3}$ B) 27,840   C) 1856

        D) 928   E) NOTA

15) It is said that in Burma a flock of tiny yellow birds flies once each year over the Irawaddy River and drops into the river precious diamonds at the rate of one diamond the first year, two diamonds the second year, four diamonds the third year, eight diamonds the fourth year, and so on. How many years will pass before the birds will have dropped a total of 4095 diamonds into the river?

    A) 10   B) 11   C) 12   D) 13   E) NOTA

16) It's always good to know something about the subject you are studying or are about to study. Which of the following statements is NOT true about the word *Algebra* or the origins of Algebra?

    A) The Greeks were really good at Algebra since they took a liking to irrational numbers.
    B) The word *algebra* is a Latin variant of the Arabic word *al-jabr*
    C) The word *Algebra*   came from the title of a book, *Hidab al-jabr wal-muqubala*, written in Baghdad about 825 A.D. by the Arab mathematician Mohammed ign-Musa al-Khowarizmi.
    D) The Arabs of the 13th century were really good at Algebra since they, too, liked irrational numbers.
    E) NOTA

17) Daniel climbs to the top of the 14,500 foot tall Mount Whitney, the highest point in California. Ever the wise guy, he pulls out a super ball and tosses it off the top of the mountain. The ball bounces back up to 50% of its previous height with each successive bounce. Find the total vertical distance in feet Daniel's ball traveled if it continues bounding in this pattern infinitely.

    A) 7250   B) 14,500   C) 29,000   D) 43,500   E) NOTA

18) At Deerfield Beach High School, *a* students take English, *b* students take Science, *c* students take Math, *d* students take English and Science, *e* students take English and Math, *f* students take Science and Math, *g* students take English, Science, and Math (all 3 courses), and *h* students take none of English, Science, and Math. If all students at Deerfield are accounted for, find the number of students at Deerfield in terms of *a, b, c, d, e, f, g*, and *h*.

    A) a + b + c   B) a + b + c + h   C) a + b + c - d - e - f + g + h
                 D) a + b + c - d - e - g + h   E) NOTA

19) Vicky owns a house with a wall in the shape of a regular pentadecagon. Charlotte the spider, seeing the opportunity, spins a web with each strand a diagonal of the wall. How many strands will Charlotte have to spin in order to complete her web?

    A) 90   B) 120   C) 180   D) 225   E) NOTA

20) So, what is wrong with this proof? Or, does 2 = 1?

                 1) Let $x = 1$
                 2) $x^2 = x$
                 3) $x^2 - 1 = x - 1$
                 4) $(x + 1)(x - 1) = x - 1$
                 5) $x + 1 = 1$
                 6)   2   = 1

A) x can never equal 1
B) There is no property that allows us to go from step 1 to step 2.
C) $x^2 - 1$ does not factor to $(x + 1)(x - 1)$.
D) Holy cow! Two does equal one.
E) NOTA

21) Which fraction below, when simplified, will allow you to determine the length of time it will take you to double your money if you invest it at a rate of 8% compounded annually?

    A) 2PRT   B) $\dfrac{PRT}{2}$ C) $\dfrac{\log 1.08}{\log 2}$ D) $\dfrac{\log 2}{\log 1.08}$ E) NOTA

22) The fourth term of a geometric sequence is 125 and the tenth term is $\dfrac{125}{64}$. Find the 15th term.

    A) 125   B) $\dfrac{125}{2}$ C) $\dfrac{125}{1024}$ D) $\dfrac{125}{2048}$ E) NOTA

23) Steve drives from Tallahassee, Florida to Sacramento, California, a distance of about 2600 miles, averaging 50 miles per hour (mph). He makes the return trip averaging 40 mph. What is Steve's average speed for the entire round trip in mph?

A) 45   B) $44\frac{4}{9}$ C) $44\frac{4}{11}$ D) 44   E) NOTA

24) Linda, a student at Chiles High School wants to take her math, English, and science classes consecutively. Chiles High offers seven class periods each day and Linda will take a class every period. In how many ways can Linda take these three classes consecutively, but not necessarily in that order? Note : periods 6, 7, and 1 and periods 7, 1, and 2 are not considered consecutive and lunch is not to be considered for this problem.

A) 30   B) 15   C) 5   D) 3   E) NOTA

25) Marshall and Erica begin 25 miles apart and ride bicycles directly towards each other, each of them beginning at the same time. Marshall averages pedaling 13 miles per hour (mph) and Erica averages pedaling 12 mph. Unbeknownst to them, a bumble bee is enjoying its day flying from Marshall's bike to Erica's bike and back again at a rate of 10 mph, turning around immediately after reaching one or the other bike. The bee began its journey the moment Marshall and Erica began their journeys. How many miles did the bee travel between the bikes before Marshall and Erica collided with each other, crushing the bee (not every story has a happy ending)?

A) 50   B) 25   C) 10   D) 5   E) NOTA

26) Andy is going off to college and wants to make a budget for the first semester. He comes up with the following figures :

       Tuition - $2250   Food - $750
       Books - $500   Car - $500
       Rent - $1200   Miscellaneous - $800

Since Andy is a Mu Alpha Theta whiz, he constructs a circle (pie) graph to show his budget. Determine the measure of the central angle for the sector labeled Rent.

A) 0.2°   B) 30°   C) 72°   D) 120°   E) NOTA

27) Find the <u>sum</u> for all real values of x for which $(\log_{10}x)^2 = \log_{10}x^4$.

A) 1   B) 4   C) 10,000   D) 10,001   E) NOTA

28) Let x = the units digit of 5^{2008}, y = the units digit of 3^{2008}, and z = the units digit of 2^{2008}, find xyz.

A) 40   B) 30   C) 14   D) 0   E) NOTA

29) If $\begin{bmatrix} -2 & -4 \\ -2 & -8 \end{bmatrix}\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find a + b + c + d.

A) -18   B) $-\dfrac{1}{2}$ C) $\dfrac{1}{2}$ D) 18   E) NOTA

30) Here are your probabilities for rain tomorrow - Sacramento : 50%, Los Angeles : 20%, and San Francisco : 40%. What is the probability that, tomorrow, it will rain in Sacramento and Los Angeles, but not in San Francisco?

A) 0.04   B) 0.06   C) 0.16   D) 0.24   E) NOTA