

Notes : For all answers E. "NOTA" means none of the above answers is correct.  
All answers must be exact unless otherwise stated.  
NO figures are drawn to scale.

1) Elizabeth is really hoping to make an "A" in Algebra II for the grading period. Her entire period grade is based on five tests, the first four of which have been 85, 92, 95, and 88. What is the minimum grade Elizabeth must make on the fifth test in order to make at least a 90 average for the grading period? Keep in mind Elizabeth's math teacher, Mr. Goldstein, is a mean old coot and does not round averages up.

- A) 84                      B) 86                      C) 88                      D) 90                      E) NOTA

2) Laura can paint the walls of her apartment in 8 hours, working alone. After she has worked 3 hours, Justin joins her and they finish the job in 2 hours more. How many hours would it take Justin to paint the apartment, working alone?

- A) 3                      B)  $3\frac{1}{5}$                       C)  $5\frac{1}{3}$                       D) 6                      E) NOTA

3) The sum of the altitude and the base of a set of triangular scaffolding in a construction area is 187 feet while the area enclosed by this scaffolding is 3551 square feet. Find the length of the altitude,  $h$ , and the length of the base,  $b$ , then answer  $b - h$ . Assume the base is longer than the altitude.

- A) -81                      B) 53                      C) 81                      D) 134                      E) NOTA

4) The area,  $S$ , of the first triangle drawn on the surface of a rubber beach ball is given by  $S = \frac{E}{180} \pi r^2$ , where  $r$  is the radius of the ball. If the diameter of the beach ball is

doubled and the area of a second triangle drawn on the ball is 3 times the area of the first triangle, how does the second value of  $E$  compare with the first value of  $E$ ?

- A) 1                      B)  $\frac{3}{4}$                       C)  $\frac{2}{3}$                       D)  $\frac{2}{9}$                       E) NOTA

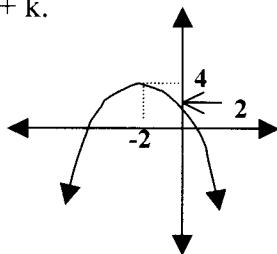
5) A certain number of sophomores attend Badlands High School. All sophomores are accounted for in the following description. Find the number of sophomores who attend Badlands High School.

Fifty-six students play football, 36 students play golf, and 31 students play soccer. Eleven of the students play both football and golf, 8 students play both football and soccer, 7 students play both golf and soccer, and 3 students play all three sports. Ten students don't play any of these sports.

- A) 162                      B) 110                      C) 100                      D) 94                      E) NOTA

- 6) The path of a punted football was modeled by the equation  $y = -0.035x^2 + 1.4x + 1$ , where  $x$  and  $y$  are measured in yards. What was the maximum height of the ball?  
 A) 15 yds.    B) 20 yds.    C) 42 yds.    D) 43 yds.    E) NOTA
- 7) In 1990, the population of Florida was 12,938,000 and the population of New York was 17,990,000. By 2000, the population of Florida had risen to 15,982,000 and New York had 18,976,000 people. Assuming that the population increases of both states was linear in nature, predict the year that the population of Florida will surpass the population of New York.  
 A) 2002    B) 2015    C) 2040    D) 2196    E) NOTA
- 8) Cupid has two love potions to work with. Love Potion Number 7 is 75% pure while Love Potion Number 8 is 35% pure. He wants to mix these potions to make Love Potion Number 9, which will be 50% pure. How many kilograms of Love Potion Number 8 must be mixed with 62 kilograms of Love Potion Number 7 to make his new love potion?  
 A) 31    B)  $37 \frac{1}{5}$     C)  $103 \frac{1}{3}$     D)  $454 \frac{2}{3}$     E) NOTA
- 9) Naomi took a hike in the Argand Diagram Forest. She began her journey from the Origin Café, hiked due east 8 miles, then proceeded with the imaginary part of her hike, walking due south 6i miles. For the return hike, Naomi hiked directly back to the Origin Café. How far was Naomi's return journey?  
 A) 14i miles    B) 14 miles    C) 10i miles    D) 10 miles    E) NOTA
- 10) Charlotte the spider is spinning a web along a regular dodecagon shaped wall. Each strand of her web is a diagonal of the dodecagon. How many strands will Charlotte have to spin in order for her to complete the job?  
 A) 30    B) 54    C) 60    D) 108    E) NOTA
- 11) Eight first-graders, 4 girls and 4 boys get on an eight seat merry-go-round. In how many ways can the first-graders sit on the merry-go-round if they must alternate boy-girl-boy-girl etc.?  
 A) 144    B) 576    C) 5040    D) 40,320    E) NOTA
- 12) Pete the Painter is going to paint a Delta rocket. The rocket is composed of a right cylinder whose height is 20 meters and radius is 4 meters and a capsule, on top, that is shaped like a right circular cone whose radius is 4 meters and height is 3 meters. One can of paint will cover  $7\pi$  square meters. How many cans of paint will Pete need to do his job? Note : The exhaust nozzles on the bottom of the rocket and any fins on the rocket are not to be considered in this problem.  
 A) 28    B)  $30 \frac{2}{7}$     C)  $32 \frac{4}{7}$     D) 196    E) NOTA

- 13) The equation of the graph shown below is  $y - k = a(x - h)^2$ . Find the values of  $a$ ,  $h$ , and  $k$ , then answer  $a + h + k$ .



- A) -1.5      B) -0.25      C) 0.25      D) 1.5      E) NOTA
- 14) A menu from the 1960's listed pizza prices as follows :  
 Small 8" for \$0.85  
 Medium 10" for \$1.15  
 Large 13" for \$1.75  
 If this restaurant offered a 25" Colossal pizza, how much would you expect it to cost? Round your answer to the nearest penny. Assume there is a quadratic relationship between the diameter of the pizza and its corresponding price.  
 A) \$3.40      B) \$3.91      C) \$5.95      D) \$7.45      E) NOTA
- 15) Robert just received a \$1000 birthday present from his dear Aunt Nicole. He has decided to save his money, but he must figure out where to place his money. Robert could put his money in the Hookem and Crookem Bank which pays 5.25% simple interest. Or, he could place his money in the Idunnoh Bank which pays 5% interest compounded quarterly. If Robert left all of his money in the bank which will give him the best deal for three years, how much more would he have in his account, in all, than in the other bank? Round your answer to the nearest penny.  
 A) \$119.53      B) \$108.25      C) \$14.53      D) \$4.33      E) NOTA
- 16) Laenja is the first woman on Mars. Always the "wise guy", she climbs to the top of Olympus Mons, an 80,000 foot tall volcano. (Ok, just use your imagination.) While at the top of the volcano, she pulls out a super ball and heaves it. In the low gravity of Mars, the ball goes way out and bounces at the base of Olympus Mons and continues to bounce, reaching 80% of its previous height with each successive bounce. How many feet will Laenja's super ball travel before coming to rest?  
 A) 720,000      B) 640,000      C) 400,000      D) 320,000      E) NOTA
- 17) So, how many distinguishable permutations are there for the name of the capital city of Florida?  
 A) 48      B) 831,600      C) 3,628,800      D) 39,916,800      E) NOTA

18) Shaquille O'Neal, fresh off his second consecutive NBA championship, decides to build a new pool at his home. The pool can be defined by the equation :

$$25x^2 + 4y^2 - 150x + 32y + 189 = 0$$

Find the area of the bottom of the pool.

- A)  $4\pi$       B)  $9\pi$       C)  $10\pi$       D)  $25\pi$       E) NOTA

19) The planet Mars moves around the sun along an orbit that passes through the points  $(a, 0)$ ,  $(-a, 0)$ ,  $(0, b)$ , and  $(0, -b)$  where  $a$  is slightly larger than  $b$  as Mars follows the path  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ . The sun is located at  $(c, 0)$  where  $c$  is less than  $a$ . Find the area of

$$\frac{a^2}{a^2} \quad \frac{b^2}{b^2}$$

the triangle formed by Mars and the sun when Mars is located at  $(0, b)$  and  $(0, -b)$ .

- A)  $ac$       B)  $bc$       C)  $2ac$       D)  $2bc$       E) NOTA

20) Patrick, a world famous astronomer, peers through his telescope and determines the newly discovered Grischy Comet is headed towards Earth. Patrick uses his computer like mind and quickly figures out the path of the comet is  $x = -2y^2 - 8y - 6$  and that the Earth is the focus of this parabolic course. Find the coordinates of the Earth with respect to this model. (One side note : Patrick determined the Grischy Comet would go around the Earth on Christmas Day. Thank goodness the comet would not hit the Earth. Otherwise, it would be known as the Grischy Who Stole Christmas.)

- A)  $(\frac{15}{8}, -2)$       B)  $(\frac{17}{8}, -2)$       C)  $(2, -2)$

- D)  $(2, \frac{-17}{8})$       E) NOTA

21) Bryan the Bug is crawling along the left side of the graph  $f(x) = \frac{x^2 - x - 6}{x^2 + 3x + 2}$

Suddenly, Bryan's peaceful walk is interrupted as he falls through a hole in the graph. Find the coordinates of the hole.

- A)  $(-1, 0)$       B)  $(-1, 1)$       C)  $(-2, 0)$       D)  $(-2, 5)$       E) NOTA

22) Jack has magic beans which he intends to plant and grow. Jack plants a bean and it starts to grow...rapidly. In fact, by Tuesday the bean stalk was 10 meters tall. By Thursday, the bean stalk was 30 meters tall. Eric of Randell's Random Numbers told Jack that the height of the bean stalk varied exponentially with the number of days since Jack planted the bean. Jack knows the cloud on which the goose that lays the golden eggs lives is 1000 meters high. In how many days, after Tuesday, will Jack be able to climb the bean stalk and steal the goose? Round your answer to one decimal place.

- A) 99.0      B) 10.0      C) 8.4      D) 1.7      E) NOTA

23) The Richter Scale is used to measure the magnitude of an earthquake. The magnitude,  $R$ , of an earthquake of intensity,  $I$ , is given by  $R = \log_{10} I$ , where the intensity is a measure of the wave energy of an earthquake per unit of area. The Great San Francisco Earthquake of 1906 had a magnitude of 8.3. The San Francisco Bay Earthquake of 1989 had a magnitude of 7.1. How many more times intense was the 1906 earthquake than the 1989 earthquake? Round your answer to one decimal place.

- A) 186936977.4      B) 120.0      C) 15.8      D) 1.2      E) NOTA

24) Zach makes \$16 an hour greasing pigs at the rodeo. If he works more than 40 hours per week, Zach makes time-and-a-half for overtime. How many hours would he have to work in order to earn \$808?

- A) 7      B) 21      C) 47      D) 50.5      E) NOTA

25) The radius of the earth at the equator is 6378 miles. Assuming the earth is a sphere, find the surface area of our home planet in miles.

- A)  $12756\pi$       B)  $40678884\pi$       C)  $54238512\pi$   
D)  $162715536\pi$       E) NOTA

26) Steve travels from Glacier National Park in northern Montana to Boise, Idaho, a distance of 600 miles at 50 mph. He makes the return trip at 40 mph. What is Steve's average speed for the trip?

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

27) The Florida Senate is composed of 25 Republicans and 15 Democrats. How many 8-person committees can be formed with 5 Republicans and 3 Democrats?

- A) 53,585      B) 1,081,575      C) 24,174,150  
D) 76,904,685      E) NOTA

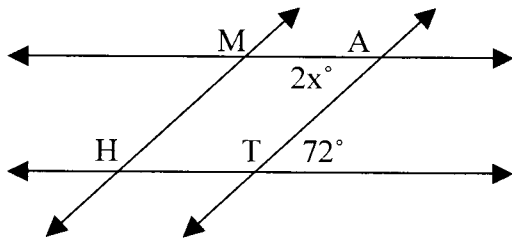
28) Your Uncle Stanley has been visiting your home. Five minutes after he leaves to drive to his home, you discover he has left his false teeth. Realizing Uncle Stanley drives very slowly, you jump into your car and drive to catch up with him. Your average speed is 10 miles per hour faster than his speed and you catch up in 25 minutes. How fast did you drive in miles per hour?

- A) 60      B) 50      C) 35      D) 25      E) NOTA

29) Red Rocks Park is an open air amphitheater carved out of rock near Denver, Colorado. The amphitheater has 69 rows of seats. Rows 46 through 69, inclusive, have seating for 3318 people. The number of seats in the first 45 rows can be modeled by the arithmetic sequence whose  $n$ th term is  $87.5 + 1.5n$ . Jason is organizing a Christina Aguilera concert at Red Rocks Park. How much should Jason charge per ticket to receive \$200,000 in ticket sales for a sell out performance? Round your answer to the nearest quarter.

- A) \$22.75    B) \$23    C) \$36.50    D) \$60.25    E) NOTA

30) Given the figure below and the following information, find  $x$ .



$$\overrightarrow{MA} \parallel \overrightarrow{HT}$$

and

$$\overrightarrow{MH} \parallel \overrightarrow{AT}$$

- A) 36    B) 72    C) 59    D) 118    E) NOTA