ALGEBRA I

1. Find the area of the triangle ABC with vertices at A(-3,0), B(23,5) and C(15,0).

   a) 30 b) 50 c) 90 d) 60 e) 45

2. Which property is illustrated by the equation $(a+b)+c=a+(b+c)$?

   a) associative b) commutative c) distributive d) identity e) inverse

3. What is the slope of the line containing the points (-9,2) and (3,14)?

   a) 1 b) -1 c) 2 d) -2 e) 0.5

4. Flying east between 2 cities, a plane's speed is 380 miles per hour. On the return trip it flies at 420 miles per hour. Find the average speed in miles per hour for the round trip.

   a) 400 b) 399 c) 398 d) 401 e) 405

5. How much water in ounces should be added to 20 ounces of a 15% solution of argyrol in water to reduce it to a solution that is 90% water?

   a) 10 b) 12 c) 18 d) 3 e) 14

6. At Treetop High School, there are 16 students in the English Club, 16 students in the Science Club and 20 students in the Math Club. Of these students, there are 5 students in both the English and Science Clubs, 6 students in both the Science and Math Clubs, and 8 in both the English and Math Clubs. If only 2 students are in all three clubs, how many students are in at least one of the clubs?

   a) 52 b) 35 c) 30 d) 20 e) none of these

7. Find the next term in the sequence: 5, 11, 19, 29, 41, …

   a) 60 b) 72 c) 84 d) 55 e) 58

8. The smaller of two numbers is 12 less than the larger. Four times the larger exceeds 3 times the smaller by 90. Find the sum of the two numbers.

   a) 144 b) 172 c) 42 d) 96 e) 54

9. One of the roots of the equation $x^2+3x-40=0$ is 5. What is the other root?

   a) -5 b) -8) c) 8 d) 5 e) 10

10. Suppose *f(x)* is a linear function and *f*(2) = -3 and *f*(5) = 4. If *g(x)* is a linear function whose graph is perpendicular to the graph of *f(x)*, what is the slope of *g(x)* ?

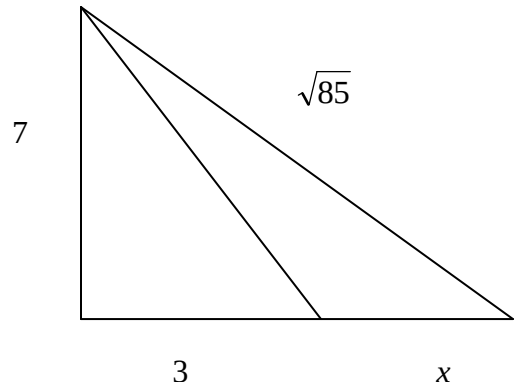
a) $\frac{7}{3}$ b) $\frac{3}{7}$ c) $-\frac{7}{3}$ d) $\frac{1}{7}$ e) $-\frac{3}{7}$

11. The sum of a man's age and his daughter's age is 50 years. Eight years from now, the man will be twice as old as his daughter will be then. Find the present age of each.

a) man 36, daughter 14 b) man 34, daughter 16 c) man 38, daughter 12

d) man 40, daughter 10 e) man 35, daughter 15

12. Find *x* in the right triangle (not drawn to scale):



a) 2 b) 3 c) 4 d) 5 e) 3.5

13. Given the equations $y = x^2 - 4x - 5$ and $y + x = -1$, one point that satisfies both equations is:

a) (-2,1) b) (4,-5) c) (2,9) d) (5,0) e) (2,-3)

14. If $9^{2x} \cdot 27^{x^2} = 3^{-1}$, then the sum of the roots of the equation is:

a) $\frac{4}{3}$ b) $-\frac{4}{3}$ c) $\frac{2}{3}$ d) $-\frac{2}{3}$ e) $\frac{3}{4}$

15. If the diagonal of a square is 5 inches, how many inches are in the perimeter of the square?

a) 12.5 b) $5\sqrt{2}$ c) $\frac{2\sqrt{5}}{5}$ d) $10\sqrt{2}$ e) $20\sqrt{2}$

16. For which value of x is $\frac{x-2}{x^2+3x+2}$ undefined?

a) 1 b) 2 c) 3 d) 4 e) -2

17. An LCD panel is used for a computer monitor. When rounded to the "nearest inch", the length of the monitor is 16 inches and the width is 12 inches. Which of the following cannot be the area of the monitor?

a) 174 sq in b) 186 sq in c) 192 sq in d) 204 sq in e) 190 sq in

18. If the parabola $y = 2x^2 + 8x + 5$ is shifted 2 units up and 3 units left, what are the coordinates of the new vertex?

a) (0,-3) b) (-5,-1) c) (-2,0) d) (-2,-1) e) (-1,-5)

19. In a cup there are 4 quarters, 5 dimes, 6 nickels and 10 pennies. If one coin is selected at random, what is the probability that the coin has a letter "*n*" in its name?

a) $\frac{6}{25}$ b) $\frac{2}{4}$ c) $\frac{9}{16}$ d) $\frac{16}{25}$ e) $\frac{2}{5}$

20. What is the domain of the function $f(x) = \frac{3x+4}{\sqrt{4-3x}}$?

a) $\left(-\infty,-\frac{4}{3}\right)$ b) $\left(-\frac{4}{3},\infty\right)$ c) $\left(-\frac{4}{3},\frac{4}{3}\right)$ d) $\left(-\infty,\frac{4}{3}\right)$ e) $\left(-\infty,\frac{4}{3}\right)\cup\left(\frac{4}{3},\infty\right)$

21. If $f(x) = -x^2 + 4x$ and $g(x) = x^3 - x$, what is the value of $g(f(-2))$?

a) -36 b) 68 c) 1716 d) 1740 e) -1716

22. The length of a rectangular garden is 3 yards more than its width. If the area of the garden is 36 square yards, which equation could be used to find the dimensions of the garden?

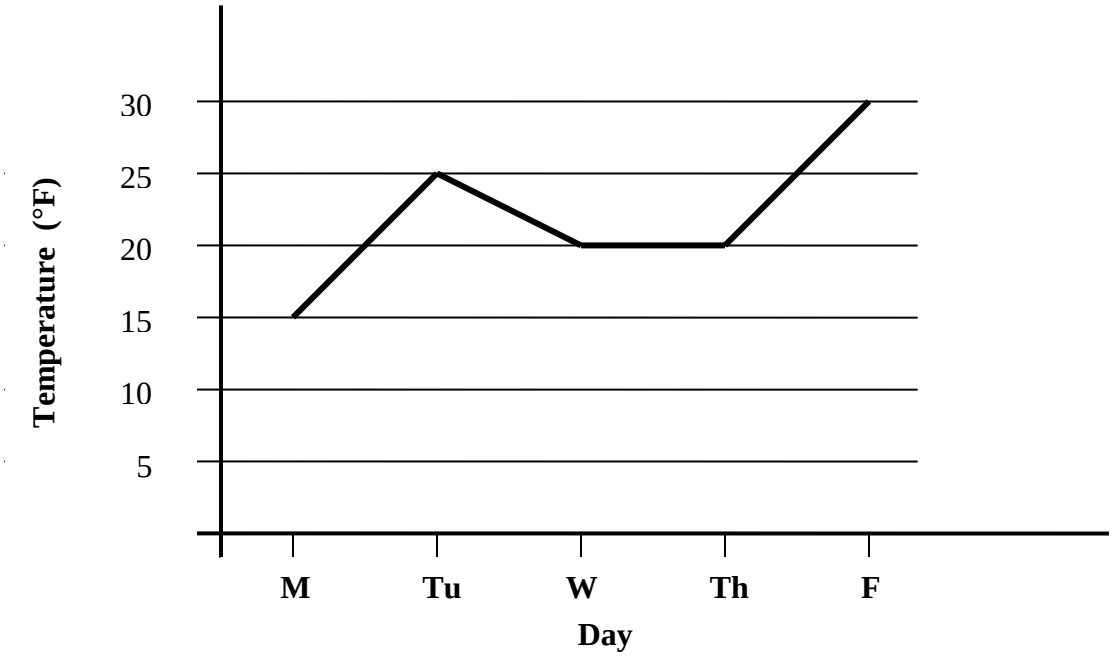
a) $x^2 + 3x + 36 = 0$ b) $x^2 - 3x + 36 = 0$ c) $x^2 - 3x - 36 = 0$

d) $x^2 + 3x - 36 = 0$ e) $x^2 - 36 = 0$

23. The accompanying graph shows the high temperatures in Elmira, New York for a 5 day period in January. Which statement correctly describes the data?

a) median = mode b) mean < mode c) median = mean

d) mean = mode e) mean < median



24. If $f(x) = -x^2 + 3x - 5$, then $f(x+h) - f(x)$ = ?

a) $-x^2 + 2xh + h^2 + 3x + 3h - 5$ b) $-h^2 + 3h$

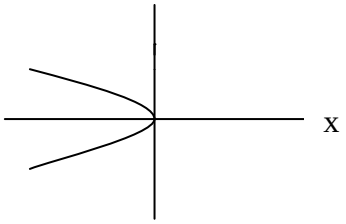
c) $-2xh - h^2 + 3h$ d) $2xh + h^2 - 3h$

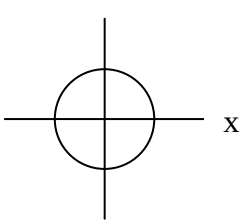
e) $-h^2 + 3h - 5$

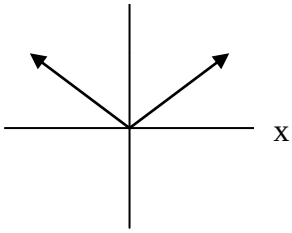
25. The solution to the system of equations $\frac{1}{x} + \frac{1}{y} = 8$ and $\frac{3}{x} - \frac{5}{y} = 0$ is:

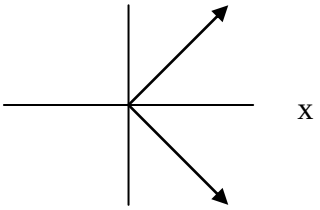
a) (5,3) b) (5,-3) c) $\left(-\frac{1}{5}, \frac{1}{3}\right)$ d) $\left(\frac{1}{5}, \frac{1}{3}\right)$ e) $\left(\frac{1}{3}, \frac{1}{5}\right)$

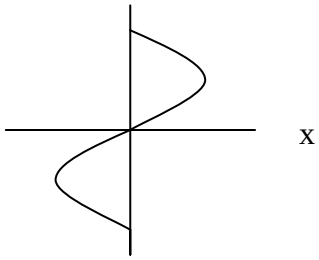
26. Which of the following graphs represents a function?

a) 

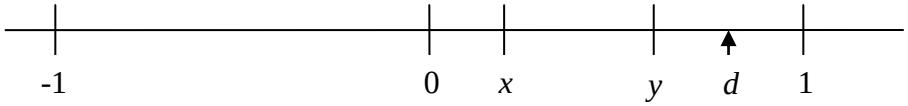
b) 

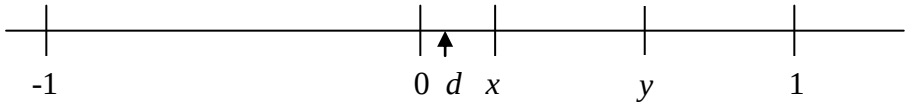
c) 

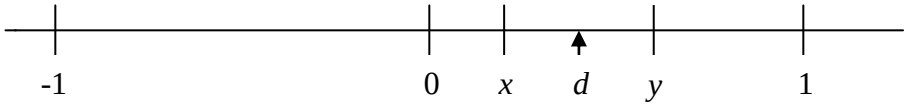
d) 

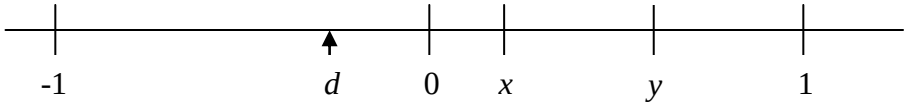
e) 

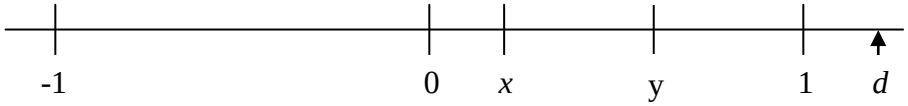
27. Let x and y be numbers such that $0 < x < y < 1$ and let $d = x - y$. Which graph could represent the location of "d" on the number line?

a) 

b) 

c) 

d) 

e) 

28. If the *y*-intercept of a line is twice the *x*-intercept and the line passes through the point (-5,2) then the equation of the line is:

a) $y = 2x - 4$ b) $2x + y = 8$ c) $2x + y = -10$ d) $2x - y = 12$ e) $2x + y = -8$

29. The height, *h*, of a cylinder is 3 units less than 4 times its radius. Which expression represents the radius of the cylinder in terms of its height?

a) $\frac{h+3}{4}$ b) $4h - 3$ c) $\frac{4}{h+3}$ d) $\frac{h-3}{4}$ e) $3h - 4$

30. The least common multiple of $4x^3 - 4x^2 + x$ and $2x^3 - x^2$ is:

a) $x(2x-1)^2$ b) $x^2(2x-1)$ c) $x^2(2x+1)^2$ d) $x^2(2x-1)^2$ e) $x(2x+1)^2$

31. What is the least number of terms that must be added in an arithmetic sequence whose first term is 78 and whose common difference is -4 to obtain a sum of 702?

a) 40 b) 13 c) 27 d) 5 e) 10

32. A sequence is defined recursively as $a_1 = 3$, $a_n = 4 - a_{n-1}$. The 5th term of this sequence is:

a) 3 b) 0 c) -3 d) 1 e) -1

33. The remainder when $f(x) = (3x - 5)^{37} + 5x - 9$ is divided by $x - 2$ is:

a) greater than 10 b) less than 0 c) 0 d) greater than 2 e) 2

34. If $x = -5$ and $y = 3$, then $5x^{-1}y^2$ is:

a) 225 b) -9 c) 9 d) -225 e) 45

35. Simplify $\frac{x^2 - 25}{x^3 - 4x^2 - 5x} \cdot \frac{x^2 + x}{1 - x^2}$

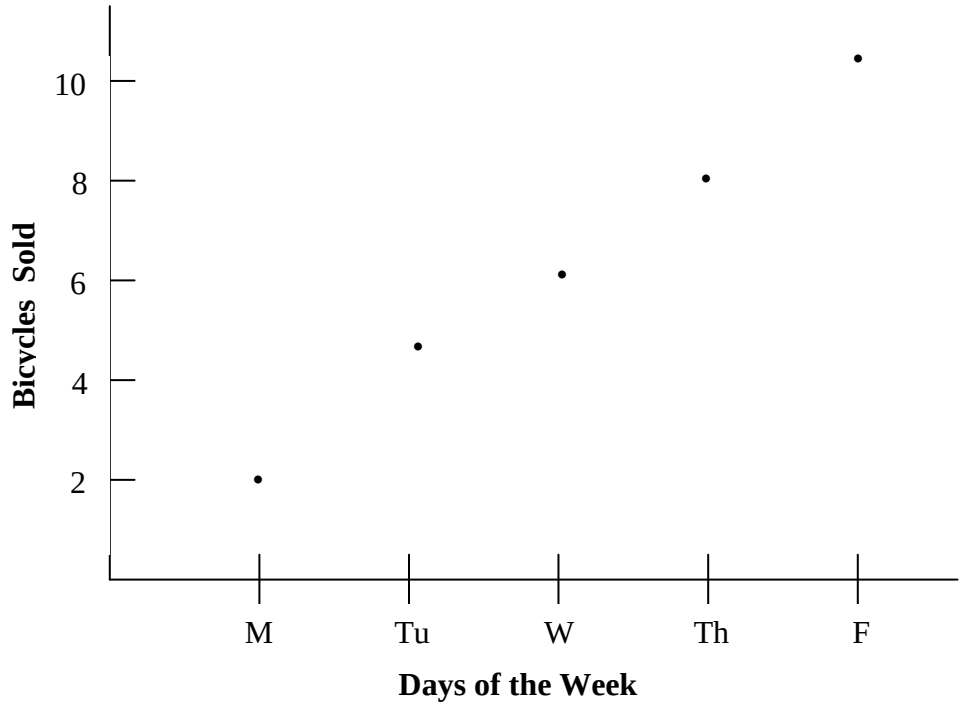
a) $\frac{x-5}{x^2-1}$ b) $\frac{x+5}{x^2-1}$ c) $\frac{x+5}{1-x^2}$ d) $\frac{x+5}{x^2+1}$ e) $\frac{x-5}{-x^2+1}$

36. If *y* is 3 when *x* is 8 and *y* varies inversely as *x*, what is *y* when *x* is 2?

a) 6 b) 48 c) 12 d) 16 e) 4

37. In the scatter plot shown below, which statement best describes the correlation between the days of the week and the number of bicycles sold?

a) There is a high negative correlation between the days of the week and the number of bicycles sold.
b) There is a low negative correlation between the days of the week and the number of bicycles sold.
c) There is a high positive correlation between the days of the week and the number of bicycles sold.
d) There is a low positive correlation between the days of the week and the number of bicycles sold.
e) There is no correlation between the days of the week and the number of bicycles sold.



38. Rationalize the numerator: $\dfrac{\sqrt{16}-\sqrt{5}}{5}$

a) $\dfrac{11}{5\sqrt{16}+5}$ b) $\dfrac{11}{25\sqrt{5}}$ c) $\dfrac{11}{20+5\sqrt{5}}$ d) $\dfrac{11}{20-5\sqrt{5}}$ e) $\dfrac{11}{15\sqrt{5}}$

39. What is the equation of the perpendicular bisector of the line segment joining (2,3) and (4,-5)?

a) $y = \frac{1}{4}x - \frac{7}{4}$ b) $y = \frac{1}{4}x + \frac{1}{4}$ c) $y = -4x + 11$

d) $y = -4x - 11$ e) $y = -\frac{1}{4}x - \frac{1}{4}$

40. Which of the following statements are false?

1. Some rational numbers are integers.
2. All irrational numbers are real numbers.
3. Some natural numbers are not positive.
4. The integers are a proper subset of the real numbers.
5. Every integer has an additive inverse.
6. All rational numbers have multiplicative inverses.

a) 1 and 6 b) 3 and 4 c) 2 and 6 d) 5 and 6 e) 3 and 6