1. If $\frac{3}{5} = \frac{M}{45} = \frac{60}{N}$, what is $M + N$?

A) 105
B) 29
C) 45
D) 127
E)none of the above

2. In 2007 Tammy invested $100 for two years. During the first year her investment suffered a 15% loss, but during the second year the remaining investment showed a 20% gain. Over the two-year period, what was the change in Tammy's investment?
A) 5% loss
B) 2% loss
C) 2% gain
D) 5% gain
E) none of the above

3. Mr. Harman needs to know the combined weight in pounds of three boxes he wants to mail. However, the only available scale is not accurate for weights less than 100 pounds or more than 150 pounds. So the boxes are weighed in pairs in every possible way. The results are 122, 125 and 127 pounds. What is the combined weight in pounds of the three boxes?

A) 170
B) 190
C) 195
D) 354
E) none of the above

4. For how many positive integer values of n are both $\frac{n}{3}$ and $3n$ three-digit whole numbers?

A) 12
B) 21
C) 27
D) 33
E) none of the above

5. In two years, Jack will be twice as old as Jen. The sum of Jack's age and three times Jen's age is 67. How old is Jack?
A) 13
B) 26
C) 28
D) 14
E) none of the above

6. The average of the numbers 5, 9, 10, 13, and a equals 11. Find the value of a.
A) 16
B) 17
C) 19
D) 20
E) none of the above

7. A shirt is on sale for $34.40, which is 20% off the original price. Find the original price of the shirt.
A) $36.40
B) $41.28
C) $43.00
D) $54.40
E) none of the above

8. Find the value of *k* that completes the square for $x^2 + 10x + k$.
A) 5
B) 10
C) 25
D) 100
E) none of the above

9. Solve the inequality $7 < 4x + 3 \leq 21$, and express the solution as an interval.
A) (1, 4.5]
B) [1.75, 7)
C) $(\frac{7}{3}, 17)$
D) [4.5, 5.25]
E) none of the above

10. Find the solutions to the equation: $|2x - 14| = 6$.
A) $x = -4,10$
B) $x = 4,10$
C) $x = 11,17$
D) $x = 12,14$
E) none of the above

11. Solve $3(x + 5) = 2x + 35$.
Step 1: $3x + 15 = 2x + 35$
Step 2: $5x + 15 = 35$
Step 3: $5x = 20$
Step 4: $x = 4$
Which is the first incorrect step in the solution shown above?
A) Step 1
B) Step 2
C) Step 3
D) Step 4
E) none of the above

12. A 120 foot long rope is cut into 3 pieces. The first piece of rope is twice as long as the second piece of rope. The third piece of rope is three times as long as the second piece of rope. What is the length of the longest piece of rope?
A) 20 feet
B) 40 feet
C) 60 feet
D) 80 feet
E) none of the above

13. Andy's average driving speed for a 4-hour trip was 45 miles per hour. During the first 3 hours he drove 40 miles per hour. What was his average speed for the last hour of the trip?
A) 50 miles per hour
B) 60 miles per hour
C) 65 miles per hour
D) 70 miles per hour
E) none of the above

14. If k is divisible by 2, 3, and 15, which of the following is also divisible by these numbers?
A) $k+5$
B) $k+15$
C) $k+20$
D) $k+30$
E) none of the above

15. The sum of two roots of a quadratic equation is 5 and their product is -6. Which of the following could be the equation?

A) $x^2 - 5x - 6$

B) $x^2 + 5x - 6$

C) $x^2 - 5x + 6$

D) $x^2 + 5x + 6$

E) none of the above

16. Before 1990, telephone area codes in the United States were three-digit numbers of the form *xyz*, where *x*, *y* and *z* were chosen, respectively, from the sets *X*, *Y* and *Z* shown below.

$X = \{2,3,4,5,6,7,8,9\}$

$Y = \{0,1\}$

$Z = \{0,1,2,3,4,5,6,7,8,9\}$

How many possible area codes were there?

A) 919

B) 160

C) 144

D) 126

E) none of the above

17. The lengths of the sides of a triangle are y, $y+1$ and 7 centimeters. If the perimeter is 56 centimeters, what is the value of y?

A) 24
B) 25
C) 31
D) 32
E) none of the above

18. The equation of the line l is $6x + 5y = 2$, and the equation of the line q is $5x - 6y = 0$. Which statement about the two lines is true?

A) The two lines have the same *y*-intercept.
B) The two lines are parallel.
C) The two lines have the same *x*-intercept.
D) The two lines are perpendicular.
E) none of the above

19. Marcy has a total of 100 dimes and quarters. If the total value of the coins is $14.05, how many quarters does she have?

A) 27
B) 40
C) 56
D) 73
E) none of the above

20. What quantity should be added to both sides of the equation $2x^2 - 8x = 5$ in order to complete the square?

A) 8
B) -8
C) 4
D) -4
E) none of the above

21. Find the sum of the roots of the polynomial $x^2 + 16x = -18$.
A) -18
B) -16
C) 34
D) 16
E) none of the above

22. Find the product of the roots of the polynomial $x^2 - 8x = 120$.
A) -120
B) 960
C) 80
D) 120
E) none of the above

23. Find the sum of the reciprocals of the roots of the polynomial $x^2 - 4x - 8 = 0$.

A) $-\frac{1}{2}$

B) -2

C) 2

D) $\frac{1}{2}$

E) none of the above

24. If $f(x+1) - f(x) = 2$ and $f(1) = 5$ what is $f(6)$?

A) 10

B) 11

C) 15

D) 17

E) none of the above

25. If $f(x+1) = 2f(x)$ and $f(1) = 2$ what is $f(10)$?
A) 1024
B) 512
C) 20
D) 40
E) none of the above

26. The average (arithmetic mean) of *x* and *y* is 5 and the average of *x*, *y*, and *z* is 8. What is the value of *z*?
A) 3
B) 11
C) 13
D) 14
E) none of the above

27. During a game, the blue team scored one-sixth of its points in the first quarter, one-fourth of its points in the second quarter, one-third of its points in the third quarter, and the remaining points in the fourth quarter. If its total score was 36, how many points did the blue team score in the fourth quarter?

A) 6
B) 9
C) 12
D) 8
E) none of the above

28. If $(x+y)^{1/2} = (x-y)^{-1/2}$ which of the following must be true?

A) $y = 0$
B) $x + y = 1$
C) $x - y = 1$
D) $x^2 - y^2 = 1$
E) none of the above

29. If $2x < y < 0$ which of the following is the greatest?
A) $-2x$
B) $-(2x + y)$
C) $2x$
D) $-y$
E) none of the above

30. If $x^2 + y^2 = 73$ and $xy = 24$ what is the value of $(x + y)^2$?
A) 97
B) 100
C) 121
D) 144
E) none of the above

31. Set *X* has *x* members and set *Y* has *y* members. Set *Z* consists of all members that are in either set *X* or set *Y* with the exception of the *k* common members ($k > 0$). Which of the following represents the number of members in set *Z* ?

A) $x + y - k$
B) $x + y - 2k$
C) $x + y + k$
D) $2x + 2y - 2k$
E) none of the above

32. If 30 percent of 40 percent of a positive number is equal to 20 percent of *w* percent of the same number, what is the value of *w* ?

A) 80
B) 50
C) 60
D) 10
E) none of the above

33. Which of the following are rational numbers?

$$-\sqrt{64}, \sqrt{63}, \sqrt{-9}, \sqrt{\frac{36}{49}}$$

A) $-\sqrt{64}, \sqrt{63}$
B) $-\sqrt{64}, \sqrt{63}, \sqrt{-9}$
C) $-\sqrt{64}, \sqrt{\frac{36}{49}}$
D) $-\sqrt{64}, \sqrt{\frac{36}{49}}, \sqrt{-9}$
E) All of the above

34. Find the diagonal of a rectangle with a length of 20 feet and a width of 15 ft.
A) 35 ft
B) 25 ft
C) 5 ft
D) $\sqrt{20}$ ft
E) none of the above

35. The base of an isosceles triangle is $\frac{1}{3}$ the sum of the two equal sides. What is the length of the base if the perimeter of the triangle is 32 inches?
A) 12 inches
B) $\frac{4}{3}$ inches
C) 24 inches
D) 13 inches
E) none of the above

36. The sum of twice a first number and a second number is 37. Three times the second number minus the first number is 34. Find the two numbers.
A) 18 and 19
B) 11 and 15
C) 17 and 20
D) 16 and 18
E) none of the above

37. Dixon Company has 37 more than 3 times the number of employees than the Astor Company. If the two companies have a total number of 989 employees, how many are employed at each company?

A) Dixon=751 and Astor= 238
B) Dixon=238 and Astor= 751
C) Dixon=513 and Astor= 476
D) Dixon=476 and Astor= 513
E) none of the above

38. Solve $3x - (2x + 7) = 6x - (1 - x)$.

A) $x = \frac{3}{2}$
B) $x = 2$
C) $x = \frac{3}{4}$
D) $x = -1$
E) none of the above

39. If 4 long distance runners cover 68 miles, how many runners would be needed to cover 119 miles?
A) 13
B) 10
C) 38
D) 4
E) none of the above

40. A sample of uranium ore weighs 90 kilograms. How much of it is uranium if 2.5% of the ore is uranium?
A) 2.25 kg
B) 87.75 kg
C) 45.2kg
D) 36.0 kg
E) none of the above