MATHEMATICS TEST

50 Minutes—45 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose, but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

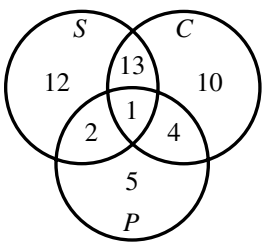
1. Illustrative figures are **not** necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word "line" indicates a straight line.
4. The word "average" indicates arithmetic mean.

DO YOUR FIGURING HERE.

1. Cameron took 4 tests, and his scores were as follows: 100, 60, 80, and 30. Cameron took another test that was scored x. The mean score of the 5 tests he took is 72. What is the value of x?

A. 54
B. 67.5
C. 68.4
D. 90

2. In the Venn diagram below, circles S, C, and P represent farms raising sheep, cows, and pigs, respectively. How many of the 47 farms represented in the diagram do **not** raise cows?



F. 15
G. 17
H. 18
J. 19

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

3. Marco designs a spinner wheel that has exactly 4 sections: red, blue, green, and yellow. He wants the spinner wheel to have a 25% chance of landing on each section. He spins the wheel 500 times. The results of the spins are shown in this table.

Spinner wheel section	Number of times the spinner lands in each section
Red	80
Blue	165
Green	130
Yellow	125

Based on the results in this table, one of the following changes would be the best fix. Which one?

A. He should decrease the area of the red section by increasing the area of the blue section.
B. He should increase the area of the red section by decreasing the area of the blue section.
C. He should increase the area of the red section by decreasing the area of any of the other three sections.
D. He should decrease the area of the blue section, and then it does **not** matter which section's area is increased.

4. In $\triangle ABC$, $\angle A$ and $\angle C$ are congruent, and the measure of $\angle B$ is 143.6°. What is the measure of $\angle A$?

F. 18.2°
G. 36.4°
H. 71.8°
J. 143.6°

5. Which of the following expressions is equivalent to $x^2 - x - 30$?

A. $(x + 3)(x - 10)$
B. $(x + 6)(x - 5)$
C. $(x - 6)(x + 5)$
D. $(x - 15)(x - 15)$

6. Which of the following matrices is equal to $5\begin{bmatrix} -4 & 2 \\ 0 & -5 \end{bmatrix}$?

F. $\begin{bmatrix} -20 & -15 \end{bmatrix}$

G. $\begin{bmatrix} -10 \\ -25 \end{bmatrix}$

H. $\begin{bmatrix} 1 & 7 \\ 5 & 0 \end{bmatrix}$

J. $\begin{bmatrix} -20 & 10 \\ 0 & -25 \end{bmatrix}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

7. Lavonne purchased some tickets and snack vouchers for an upcoming event and gave them to the members of her work group. Each member of her work group received the same number of tickets and the same number of snack vouchers. The total number of tickets she gave to her group was 30, and the total number of snack vouchers was 75. Which of the following could be the number of members in Lavonne's work group?

A. 10
B. 15
C. 25
D. 30

8. The initial speed, in miles per hour, of a certain car that skids to a stop can be estimated by multiplying the length of the skid, in feet, by 35 and then taking the square root of the product. According to this method, what is the estimated initial speed, in miles per hour, of the car when it makes a 108-foot skid?

F. $\sqrt{143}$
G. $7\sqrt{105}$
H. $6\sqrt{105}$
J. $210\sqrt{3}$

9. If $6y = 5x - 1$, then $x = ?$

A. $\frac{6}{5}y - 1$
B. $\frac{6}{5}y + 1$
C. $\frac{6y - 1}{5}$
D. $\frac{6y + 1}{5}$

10. A boat is traveling at a speed of 30 miles per hour. What is the boat's speed in feet per second?

(Note: 1 mile = 5,280 feet)

F. 20
G. 30
H. 44
J. 176

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

11. An object is launched vertically at 30 meters per second from a 55-meter-tall platform. The height, $h(t)$ meters, of the object t seconds after launch is modeled by $h(t) = -4.9t^2 + 30t + 55$. What will be the height, in meters, of the object 3 seconds after launch?

A. 44.1
B. 100.9
C. 145
D. 189.1

12. The whole numbers 1 through 30 were each written on separate pieces of paper. Those 30 pieces of paper were put into a jar. One piece of paper will be randomly drawn from this jar. What is the probability that this piece of paper will have a prime number written on it?

F. $\frac{1}{30}$

G. $\frac{1}{20}$

H. $\frac{1}{10}$

J. $\frac{10}{30}$

13. For an angle with measure α in a right triangle, $\sin\alpha = \frac{5}{13}$ and $\tan\alpha = \frac{5}{12}$. What is the value of $\cos\alpha$?

A. $\frac{12}{13}$

B. $\frac{12}{\sqrt{194}}$

C. $\frac{12}{\sqrt{119}}$

D. $\frac{13}{12}$

14. Which of the following values, if any, is the y-value of the solution set to the system of equations below?

$2x - y = 7$
$-4x + 2y = 2$

F. 2
G. 5
H. 9
J. There is no such value for y.

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

15. Which of the following expressions is equivalent to $(y + 7)^3$?

A. $y^3 + 21y^2 + 147y + 343$
B. $y^3 + 14y + 343$
C. $y^3 + 14y + 49$
D. $y^3 + 343$

16. The sum of 3 positive integers is 180, and the ratio of the integers is 5:3:2. What is the value of the smallest of the integers?

F. 18
G. 36
H. 54
J. 90

17. Which of the following expressions is equivalent to $(x^2 - y^2) - (6x^2 + 4xy - y^2)$?

A. $-5x^2 - 4xy$
B. $-5x^2 + 4xy - 2y^2$
C. $7x^2 + 4xy - 2y^2$
D. $7x^2 + 4xy + 2y^2$

18. Given $i = \sqrt{-1}$, what is $\sqrt{9} + \sqrt{-16}$?

F. $7i$
G. $i\sqrt{7}$
H. $3 - 4i$
J. $3 + 4i$

19. The first 5 terms of an arithmetic sequence are 7, 21, 35, 49, and 63. Let t_n represent the nth term of the sequence. What is the value of t_{25}?

A. 175
B. 343
C. 357
D. 371

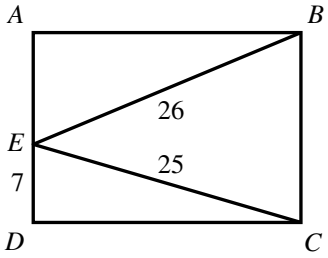
20. At a certain time of day, a flagpole casts a 9.0-foot-long shadow and a nearby 4.0-foot-tall fence post casts a 2.4-foot-long shadow. Given that both the flagpole and the fence post are vertical and on level ground, what is the height, in feet, of the flagpole?

F. 5.4
G. 10.6
H. 15.0
J. 15.4

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

21. In rectangle $ABCD$ shown, segments $\overline{BE}$ and $\overline{CE}$ partition the rectangle into 3 triangles. Given $DE = 7$ centimeters, $BE = 26$ centimeters, and $CE = 25$ centimeters, what is the length, in centimeters, of $\overline{BC}$?



A. 10
B. 15
C. 17
D. 24

22. In a particular cleaning solution, the ratio of concentrated solution to water is 3:40. How many **cups** of concentrated solution should be added to 5 gallons of water to make the cleaning solution in the given ratio?

(Note: 4 cups = 1 quart; 4 quarts = 1 gallon)

F. 12

G. 6

H. $1\frac{1}{2}$

J. $\frac{3}{8}$

23. Let $f(t) = 7e^{3t} + 1$. Which of the following numbers is closest to the value of $f(5)$?

A. -2×10^{-1}
B. 3×10^{2}
C. 2×10^{7}
D. 6×10^{7}

24. Which of the following expresses 40° in radians?

F. $\frac{2}{9\pi}$

G. $\frac{2\pi}{9}$

H. $\frac{9\pi}{2}$

J. $\frac{7{,}200}{\pi}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

25. Let the function f be defined as $f(x) = -9x^2$. In the standard (x,y) coordinate plane, the graph of $y = f(x)$ undergoes a transformation such that the result is the graph of $y = f(x) - 4$. Under this transformation the graph of $y = f(x)$ is:

A. shifted downward 4 coordinate units.
B. shifted left 4 coordinate units.
C. stretched horizontally by a factor of 4.
D. stretched vertically by a factor of 4.

26. For all positive values of a, b, c, and d, when $\frac{1}{2}ab^2 + c = d$, which of the following expressions is equal to b?

F. $\sqrt{\frac{a(d-c)}{2}}$

G. $\sqrt{\frac{2(d-c)}{a}}$

H. $\sqrt{\frac{2d-c}{a}}$

J. $\sqrt{\frac{d-c}{2a}}$

27. On a trip, 2 sisters counted 1,430 vehicles. They divided the vehicles into categories: cars, trucks, and other. They noted the color of each as white, black, red, or other, as shown in the table. What is the probability that a randomly selected truck is black?

	White	Black	Red	Other	Total
Car	118	62	97	197	474
Truck	100	31	116	232	479
Other	86	85	94	212	477
Total	304	178	307	641	1,430

A. $\frac{31}{178}$

B. $\frac{31}{479}$

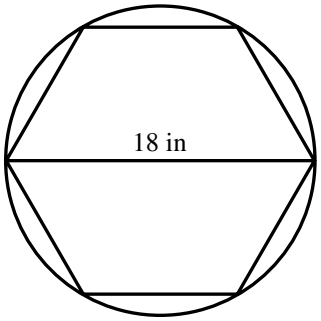
C. $\frac{31}{1{,}430}$

D. $\frac{479}{1{,}430}$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

28. A regular hexagon is inscribed in a circle with diameter 18 inches, as shown. What is the perimeter, in inches, of the hexagon?



F. 54
G. 108
H. $27\sqrt{3}$
J. $54\sqrt{3}$

29. Tanya earns $34,000 in her 1st year at a job. She is given a raise of the same dollar amount each year, resulting in her earning $38,080 in the 4th year at the job. What is the total of Tanya's earnings during her 4 years at the job?

A. $136,000
B. $140,080
C. $144,160
D. $152,320

30. In the standard (x,y) coordinate plane, how many points are both 5 coordinate units from the origin and also 2 coordinate units from the line $y = 0$?

F. 0
G. 1
H. 2
J. 4

31. In $\triangle ABC$, if the measure of $\angle A$ is less than the measure of $\angle B$, and the measure of $\angle B$ is less than the measure of $\angle C$, what is the correct ordering of the side lengths, from least to greatest?

A. $AB < BC < AC$
B. $AB < AC < BC$
C. $BC < AC < AB$
D. $BC < AB < AC$

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

32. Lajuan sells exactly 4 kinds of pies in his bakery: apple, pecan, coconut cream, and peach. Of the pies he sold on Thursday, $\frac{1}{4}$ were apple, $\frac{1}{2}$ were pecan, 24 were coconut cream, and 8 were peach. How many total pies did Lajuan sell on Thursday?

F. 40
G. 42
H. 56
J. 128

33. In a certain quadrilateral, 2 opposite angles each measure $(3x + 5)°$. The other 2 opposite angles each measure $(x + 3)°$. What is the value of x?

A. 1
B. 9
C. 43
D. 88

34. The first 4 terms of a sequence are shown in the table. The sequence is defined by $a_1 = 2$ and $a_n = a_{n-1} + (n-1)^2$ for $n \geq 2$. What is the sixth term, a_6, of this sequence?

a_1	a_2	a_3	a_4
2	3	7	16

F. 68
G. 57
H. 41
J. 32

35. On the real number line, how many integers are between $-\frac{65}{6}$ and $\frac{75}{2}$?

A. 8
B. 28
C. 48
D. 140

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

36. During a particular experiment, 2 events, A and B, can each occur. Events A and B are mutually exclusive during this experiment. Which of the following probabilities is 0?

F. P(A)
G. P(B)
H. P(A or B)
J. P(A and B)

37. The polynomial function defined by $p(x) = x^3 + x^2 - 8x - 12$ has $(x - 3)$ as one of its linear factors. What are all and only the zeros of p?

A. −3 and −2
B. −3 and 2
C. −2 and 3
D. 2 and 3

38. Jonathan rode his bike every day for 18 days. The table shows each of the distances he rode. The table also shows the number of days he rode each of those distances.

Distance (in miles)	Number of days
1	2
3	4
4	3
5	6
7	3

What is the median daily distance, in miles, that Jonathan rode his bike for the 18 days?

F. 3
G. 3.5
H. 4
J. 4.5

39. A tourism organization randomly selected 100 tourists finishing their summer visit to Spain. The organization asked them how many cities they had toured in the country. The table shows the results. Based on these data, for the population of tourists that visited Spain during the summer, what is the best estimate of the mean number of cities toured?

Number of cities	1	2	3
Number of tourists	10	40	50

A. 0.8
B. 2
C. 2.4
D. 3

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

40. Given the equation $\sqrt[4]{x} = y$, where y is a real number, what **must** be true of x? x is:

F. an even real number.
G. a rational number.
H. an integer.
J. a nonnegative real number.

41. Given that $1 \le m \le 4$, $4 \le n \le 6$, and $8 \le p \le 10$, what is the greatest possible value for $\left(\frac{m}{n}\right)\left(\frac{1}{p}\right)$?

A. $\frac{3}{20}$

B. $\frac{1}{15}$

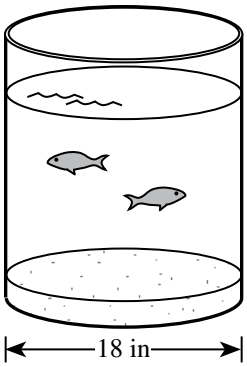
C. $\frac{1}{10}$

D. $\frac{1}{8}$

42. Which of the following datasets has the largest standard deviation?

F. 0, 0, 10, 10
G. 0, 1, 9, 10
H. 2, 3, 5, 7
J. 5, 5, 5, 5

43. Michael has a cylindrical fish tank, shown, that has an inside diameter of 18 inches. When he put colored gravel in his fish tank, the water level of the tank rose 2 inches. What is the volume of the gravel in cubic inches?



A. 18π
B. 36π
C. 162π
D. 648π

GO ON TO THE NEXT PAGE.

DO YOUR FIGURING HERE.

44. The table gives values of $f(x)$, $g(x)$, and $h(x)$ for all positive integers $x \leq 5$. Given $h(f(g(a))) = 1$ where a is a positive integer less than or equal to 5, what is the value of a?

x	$f(x)$	$g(x)$	$h(x)$
1	2	4	3
2	1	5	1
3	4	2	5
4	5	3	4
5	3	1	2

F. 2
G. 3
H. 4
J. 5

45. Each time Coin C is tossed, it lands faceup or facedown. The probability of landing faceup is 3 times the probability of landing facedown. In a certain game, the player wins \$1.00 when Coin C lands faceup and the player wins \$2.00 when Coin C lands facedown. To the nearest cent, what is the expected value of each toss of Coin C in this game?

A. \$1.25
B. \$1.33
C. \$1.50
D. \$1.67

END OF TEST 2

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

DO NOT RETURN TO THE PREVIOUS TEST.

