

**MATHEMATICS TEST***60 Minutes—60 Questions*

DIRECTIONS: Solve each of the problems in the time allowed, then fill in the corresponding bubble on your answer sheet. Do not spend too much time on any one problem; skip the more difficult problems and go back to them later. You may

use a calculator on this test. For this test you should assume that figures are NOT necessarily drawn to scale, that all geometric figures lie in a plane, and that the word *line* is used to indicate a straight line.

1. $|9 - 5| - |5 - 9| = ?$

- A. -8
- B. -6
- C. -4
- D. 0
- E. 8

2. An editor charges \$30 for each hour he works on a book project, plus a flat \$25 editing fee. How many hours of work are included in a \$190 bill for a book project?

- F. $3\frac{2}{5}$
- G. 4
- H. $5\frac{1}{2}$
- J. $6\frac{1}{3}$
- K. 7

3. Runner *A* averages 5 miles per hour, and Runner *B* averages 6 miles per hour. At these rates, how much longer does it take Runner *A* than Runner *B* to run 15 miles?

- A. .5 hour
- B. 1 hour
- C. 1.5 hours
- D. 2.5 hours
- E. 3 hours

4. $x^2 + 60x + 54 - 59x - 82x^2$ is equivalent to:

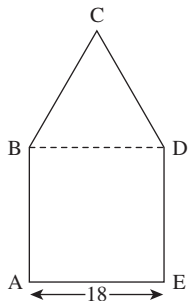
- F. $-26x^2$
- G. $-26x^6$
- H. $-81x^2 + x + 54$
- J. $-81x^2 - x + 54$
- K. $-83x^2 - x - 54$

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.



5. The figure below is composed of square $ABDE$ and equilateral triangle BCD . The length of line segment AE is 18 centimeters. What is the perimeter of $ABCDE$, in centimeters?



- A. 48
 B. 54
 C. 72
 D. 90
 E. 106
6. The expression $(6n - 5)(n + 4)$ is equivalent to:
 F. $6n^2 - 20$
 G. $6n^2 - 19n - 20$
 H. $6n^2 - 29n - 20$
 J. $6n^2 + 19n$
 K. $6n^2 + 19n - 20$
7. Blair expects an increase of 3% in her current annual salary of \$42,000. What would her new annual salary be?
 A. \$42,003
 B. \$42,126
 C. \$43,260
 D. \$45,000
 E. \$54,600
8. The 6 consecutive integers below add up to 513.

$$n - 2$$

$$n - 1$$

$$n$$

$$n + 1$$

$$n + 2$$

$$n + 3$$

What is the value of n ?

- F. 48
 G. 53
 H. 64
 J. 85
 K. 86

DO YOUR FIGURING HERE.

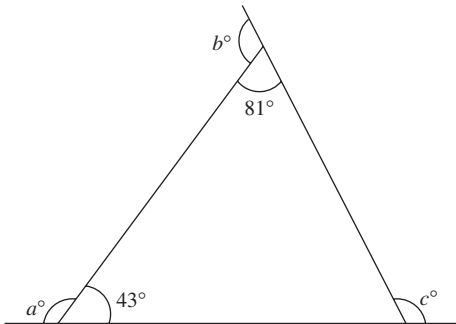
2



2

9. In the standard (x,y) coordinate plane, point B with coordinates $(5,6)$ is the midpoint of AC , and A has coordinates $(6,7)$. What are the coordinates of C ?
- A. $(11,13)$
 B. $(7,8)$
 C. $(4,5)$
 D. $(5.5,6.5)$
 E. $(-4,-8)$
10. Rectangle $PQRS$ lies in the standard (x,y) coordinate plane so that its sides are not parallel to the axes. What is the product of the slopes of all four sides of rectangle $PQRS$?
- F. -2
 G. -1
 H. 0
 J. 1
 K. 2
11. If Tom traveled 45 miles in 12 hours and Jim traveled four times as far in one-third the time, what was Jim's average speed, in miles per hour?
- A. 5
 B. 15
 C. 30
 D. 45
 E. 90

12. Given the triangle shown below with exterior angles that measure a° , b° , and c° as shown, what is the sum of a , b , and c ?



- F. 180
 G. 236
 H. 261
 J. 360
 K. Cannot be determined from the given information

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.

2         **2**

Use the following information to answer Questions 13 – 15.

DO YOUR FIGURING HERE.

A poll of 200 students was taken before Center High School changed the name of its mascot. All 200 students indicated which 1 of the 4 mascot names they would vote for. The results of the poll are given in the table below.

Mascot name	Number of students
Spartans	30
Lions	40
Gophers	80
Knights	50

13. What percent of the students polled chose Spartans in the poll?
- A. 40%
 - B. 30%
 - C. 25%
 - D. 20%
 - E. 15%
14. If the information in the table were converted to a pie chart, then the central angle of the sector for Lions would measure how many degrees?
- F. 144°
 - G. 108°
 - H. 72°
 - J. 54°
 - K. 45°
15. If the poll is indicative of how the 3,000 students at Center High School will actually vote, which of the following is the best estimate of the number of votes Knights will receive?
- A. 50
 - B. 200
 - C. 525
 - D. 750
 - E. 900

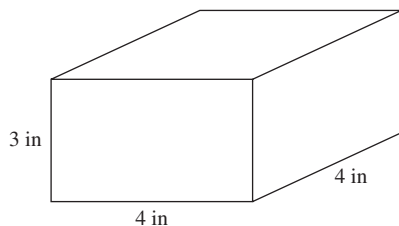
GO ON TO THE NEXT PAGE.

2



2

16. The total surface area of the rectangular solid shown below is the sum of the areas of the 6 sides. What is the solid's total surface area, in square inches?

**DO YOUR FIGURING HERE.**

- F. 18
G. 36
H. 48
J. 80
K. 96
17. Which of the following is the slope of a line parallel to the line $y = \frac{2}{5}x + 7$ in the standard (x, y) coordinate plane?
A. -7
B. $-\frac{5}{2}$
C. $\frac{2}{5}$
D. 2
E. $\frac{5}{2}$
18. A circular lamp base has a radius of 2.5 inches. When placed on a flat table, approximately how much area does the lamp base cover, in square inches?
F. 5.00
G. 6.25
H. 15.70
J. 19.63
K. 25.00
19. What is the largest integer less than $\sqrt{42}$?
A. 3
B. 6
C. 7
D. 9
E. 23

GO ON TO THE NEXT PAGE.



20. Amanda plans to paint the 4 walls of her bedroom with 1 coat of paint. The walls are rectangular, and each wall measures 12 feet by 14 feet. She will not paint either the 3-foot-by-4-foot rectangular window in her bedroom or the 3-foot-by-7-foot rectangular bedroom door. Amanda knows that each gallon of paint covers between 350 and 400 square feet. If only 1-gallon cans of paint are available, which of the following is the minimum number of cans of paint Amanda needs to buy to paint her bedroom walls?

F. 1
G. 2
H. 3
J. 4
K. 5

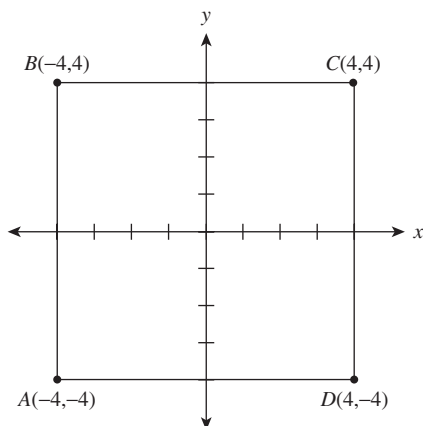
21. For all $x > 0$, the expression $\frac{3x^3}{3x^9}$ equals:

A. x^{-6}
B. x^3
C. x^6
D. x^{12}
E. x^{27}

22. What values of a are solutions for $a^2 + 2a = 8$?

F. 6 and 8
G. 0 and 2
H. -2 and 4
J. -2 and 0
K. -4 and 2

23. In the square graphed below, what is the slope of line segment AC ?



A. 4
B. 2
C. 1
D. -1
E. -4

DO YOUR FIGURING HERE.

2

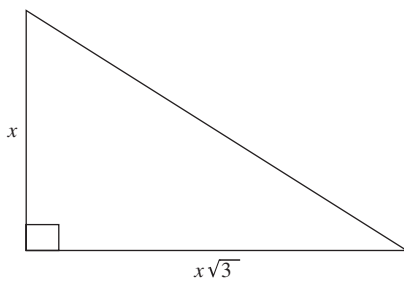


2

24. The fixed costs of printing a certain textbook are \$900.00 per week. The variable costs are \$1.50 per textbook. Which of the following expressions can be used to model the cost of printing t textbooks in 1 week?
- F. $\$901.50t$
 G. $\$150t - \900.00
 H. $\$900.00t + \1.50
 J. $\$900.00 - \$1.50t$
 K. $\$900.00 + \$1.50t$

DO YOUR FIGURING HERE.

25. In the figure shown below, the perimeter of the triangle is $15 + 5\sqrt{3}$. What is the value of x ?



- A. 2
 B. 3
 C. 4
 D. 5
 E. 6
26. If $\frac{4\sqrt{9}}{y\sqrt{11}} = \frac{4\sqrt{9}}{11}$, then $y =$?
- F. 1
 G. $\sqrt{11}$
 H. 11
 J. 22
 K. 36
27. Casey has buckets of 3 different sizes. The total capacity of 12 of the buckets is g gallons, the total capacity of 8 buckets of another size is g gallons, and the total capacity of 4 buckets of the third size is also g gallons. In terms of g when $g > 0$, what is the capacity, in gallons, of each of the smallest-sized buckets?
- A. $\frac{g}{12}$
 B. $\frac{g}{8}$
 C. $\frac{g}{4}$
 D. $12g$
 E. $8g$

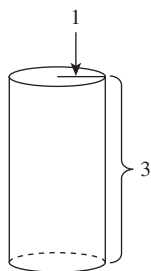
GO ON TO THE NEXT PAGE.



28. What is the area of a circle that has a circumference of $.5\pi$?
- F. 0.0625π
 G. 0.10π
 H. 0.25π
 J. 25π
 K. 625π
29. Cube X has an edge length of 2 inches. Cube Y has an edge length triple that of Cube X . What is the volume, in cubic inches, of Cube Y ?
- A. 6
 B. 12
 C. 36
 D. 72
 E. 216
30. A formula used to compute the current value of an investment account is $A = P(1 + r)^n$, where A is the current value, P is the amount deposited, r is the rate of interest for 1 compounding period, expressed as a decimal, and n is the number of compounding periods. Which of the following is closest to the value of an investment account after 3 years if \$8,000 is deposited at 5% annual interest compounded annually?
- F. \$8,400
 G. \$9,261
 H. \$15,730
 J. \$25,200
 K. \$33,463

DO YOUR FIGURING HERE.

31. A right circular cylinder is shown below, with dimensions given in inches. What is the total surface area of the cylinder, in square inches?
 (Note: The total surface area of a cylinder is given by $2\pi r^2 + 2\pi rh$, where r is the radius and h is the height.)



- A. 3π
 B. 5π
 C. 6π
 D. 8π
 E. 11π
32. Given $f(x) = 3x + 5$ and $g(x) = x^2 - x + 7$, which of the following is an expression for $f(g(x))$?
- F. $3x^2 - 3x + 26$
 G. $3x^2 - 3x + 12$
 H. $x^2 - x + 12$
 J. $9x^2 + 25x + 27$
 K. $3x^2 + 21$

GO ON TO THE NEXT PAGE.

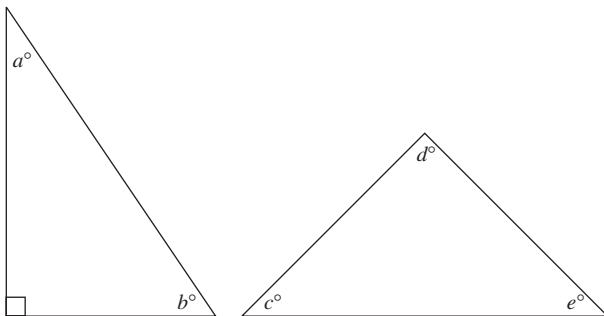
2 △ △ △ △ △ △ △ △ 2

33. The table below shows the total number of touchdowns scored in each of 16 football games during a regular season. What is the average number of touchdowns scored per game, to the nearest tenth?

DO YOUR FIGURING HERE.

Total number of touchdowns in a game	Number of games with this total
0	2
1	3
2	3
3	5
4	2
5	1

- A. 2.6
 B. 2.3
 C. 2.0
 D. 1.5
 E. 0.9
34. In the triangles shown below, what is the average of angles a , b , c , d , and e ?



- F. 30°
 G. 45°
 H. 54°
 J. 60°
 K. 72°
35. $(4x^4)^4$ is equivalent to:
 A. x
 B. $16x^8$
 C. $16x^{16}$
 D. $256x^8$
 E. $256x^{16}$
36. Which of the following is equivalent to the inequality $3x - 6 > 6x + 9$?
 F. $x > -5$
 G. $x < -5$
 H. $x > -2$
 J. $x < 3$
 K. $x > 3$

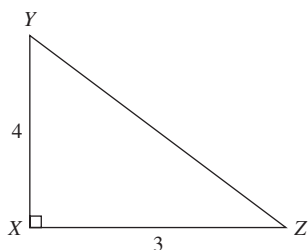
GO ON TO THE NEXT PAGE.



37. In the xy -coordinate system, $(\sqrt{5}, s)$ is one of the points of intersection of the graphs $y = 2x^2 + 6$ and $y = -4x^2 + m$, where m is a constant. What is the value of m ?
- A. 30
B. 33
C. 36
D. 39
E. 42

DO YOUR FIGURING HERE.

38. For right triangle XYZ below, what is $\cos \angle Z$?



- F. $\frac{4}{3}$
G. $\frac{5}{4}$
H. $\frac{3}{4}$
J. $\frac{3}{5}$
K. Cannot be determined from the given information
39. Which of the following statements is NOT true about the arithmetic sequence 16, 11, 6, 1, ...?
- A. The fifth term is -4 .
B. The sum of the first 5 terms is 30.
C. The seventh term is -12 .
D. The common difference of consecutive integers is -5 .
E. The sum of the first 7 terms is 7.
40. If there are 6×10^{14} oxygen molecules in a volume of 3×10^7 cubic meters, what is the average number of oxygen molecules per cubic meter?
- F. 2×10^5
G. 2×10^7
H. 2×10^{21}
J. 18×10^7
K. 18×10^{21}

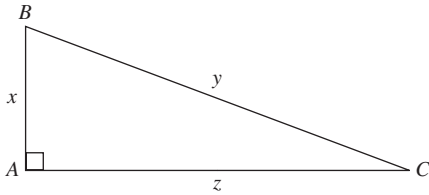
2



2

41. The lengths of the sides of right triangle ABC are shown in the figure below. What is the cotangent of $\angle B$?

DO YOUR FIGURING HERE.



- A. $\frac{x}{y}$
 B. $\frac{x}{z}$
 C. $\frac{y}{z}$
 D. $\frac{z}{x}$
 E. $\frac{z}{y}$
42. What rational number is halfway between $\frac{1}{6}$ and $\frac{1}{2}$?
- F. $\frac{1}{8}$
 G. $\frac{1}{4}$
 H. $\frac{1}{3}$
 J. $\frac{2}{3}$
 K. $\frac{3}{2}$
43. If $|6 - 2x| > 9$, which of the following is a possible value of x ?
- A. -2
 B. -1
 C. 0
 D. 4
 E. 7

GO ON TO THE NEXT PAGE.

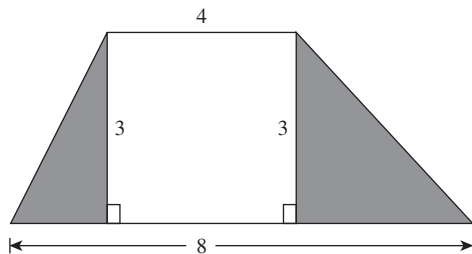
2



2

44. A square and a regular pentagon have equal perimeters. If the pentagon has sides of length 12, what is the area of the square?
- F. 30
G. 48
H. 60
J. 225
K. 244
45. A classroom has 10 tables that will seat up to 4 students each. If 20 students are seated at tables, and NO tables are empty, what is the greatest possible number of tables that could be filled with students?
- A. 5
B. 3
C. 2
D. 1
E. 0
46. If $x < y$, then $|x - y|$ is equivalent to which of the following?
- F. $x + y$
G. $-(x + y)$
H. $\sqrt{x} - y$
J. $x - y$
K. $-(x - y)$
47. The trapezoid below is divided into 2 triangles and 1 rectangle. Lengths are given in centimeters. What is the combined area, in square centimeters, of the 2 shaded triangles?

DO YOUR FIGURING HERE.



- A. 18
B. 12
C. 9
D. 6
E. 4

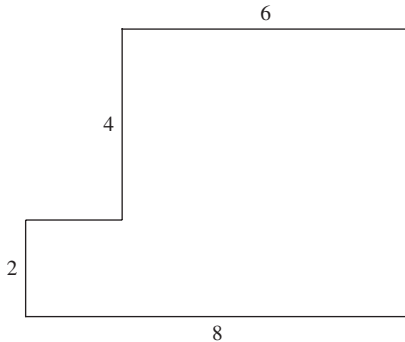
GO ON TO THE NEXT PAGE.

2



2

48. In the figure below, all line segments are either horizontal or vertical, and the dimensions given are in feet. What is the perimeter, in feet, of the figure?



DO YOUR FIGURING HERE.

- F. 20
G. 24
H. 26
J. 28
K. 32
49. If c is directly proportional to s^2 and $c = \frac{7}{16}$ when $s = \frac{1}{4}$, what is the value of s when $c = 175$?
- A. 2
B. 3
C. 4
D. 5
E. 6
50. If the value, to the nearest thousandth, of $\cos \alpha$ is -0.385 , which of the following could be true about α ?
- F. $\frac{2\pi}{3} \leq \alpha \leq \pi$
G. $\frac{\pi}{2} \leq \alpha \leq \frac{2\pi}{3}$
H. $\frac{\pi}{3} \leq \alpha \leq \frac{\pi}{2}$
J. $\frac{\pi}{6} \leq \alpha \leq \frac{\pi}{3}$
K. $0 \leq \alpha \leq \frac{\pi}{6}$
51. An integer from 10 through 99, inclusive, is to be chosen at random. What is the probability that the number chosen will have 0 as at least 1 digit?
- A. $\frac{2}{90}$
B. $\frac{1}{10}$
C. $\frac{9}{89}$
D. $\frac{10}{89}$
E. $\frac{9}{100}$

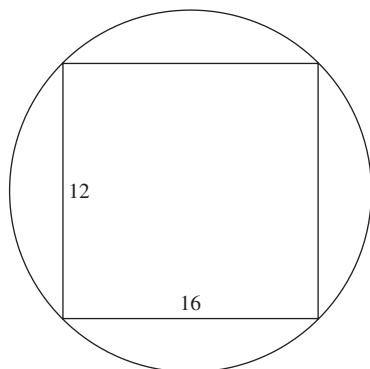
GO ON TO THE NEXT PAGE.

2



2

52. A 12-centimeter-by-16-centimeter rectangle is inscribed in a circle as shown below. What is the area of the circle, in square centimeters?



DO YOUR FIGURING HERE.

- F. 5π
 G. 14π
 H. 25π
 J. 100π
 K. 192π
53. If $\log_a x = n$ and $\log_a y = p$, then $\log_a(xy)^2 = ?$
 A. np
 B. $2np$
 C. $4np$
 D. $n + p$
 E. $2(n + p)$
54. For every positive 2-digit number, a , with units digit x and tens digit y , let b be the 2-digit number formed by reversing the digits of a . Which of the following expressions is equivalent to $a - b$?
 F. 0
 G. $9x - y$
 H. $9y - x$
 J. $9(x - y)$
 K. $9(y - x)$
55. If $f(a) = a^2 - 2$, then $f(a + b) = ?$
 A. $a^2 + b^2$
 B. $a^2 - 2 + b$
 C. $a^2 + b^2 - 2$
 D. $a^2 + 2ab + b^2$
 E. $a^2 + 2ab + b^2 - 2$
56. In the complex numbers, where $i^2 = -1$, $\frac{1}{(1+i)} \times \frac{(1-i)}{(1-i)} = ?$
 F. $i - 1$
 G. $1 + i$
 H. $1 - i$
 J. $\frac{(1-i)}{2}$
 K. $\frac{(1+i)}{2}$

GO ON TO THE NEXT PAGE.



57. Amy's best marathon time decreased by 10% from 2005 to 2006 and by 20% from 2006 to 2007. By what percent did her best marathon time decrease from 2005 to 2007?

A. 28%
B. 30%
C. 50%
D. 72%
E. 10%

DO YOUR FIGURING HERE.

58. The sum of an infinite geometric sequence series with first term x and common ratio $y < 1$ is given by $\frac{x}{(1-y)}$.

The sum of a given infinite geometric series is 200, and the common ratio is 0.15. What is the second term of this series?

F. 199.85
G. 170
H. 169.85
J. 30
K. 25.5

59. How many different integer values of a satisfy the inequality $\frac{1}{11} < \frac{2}{a} < \frac{1}{8}$?

A. 1
B. 2
C. 3
D. 4
E. 5

60. In 3 fair coin tosses, where the 2 outcomes, heads and tails, are equally likely, what is the probability of obtaining exactly 2 heads?

F. $\frac{1}{3}$
G. $\frac{3}{8}$
H. $\frac{1}{2}$
J. $\frac{2}{3}$
K. $\frac{7}{8}$

END OF THE MATHEMATICS TEST.

STOP! IF YOU HAVE TIME LEFT OVER, CHECK YOUR WORK ON THIS SECTION ONLY.

Mathematics Test

1. D	21. A	41. B
2. H	22. K	42. H
3. A	23. C	43. A
4. H	24. K	44. J
5. D	25. D	45. B
6. K	26. G	46. K
7. C	27. A	47. D
8. J	28. F	48. J
9. C	29. E	49. D
10. J	30. G	50. G
11. D	31. D	51. B
12. J	32. F	52. J
13. E	33. B	53. E
14. H	34. H	54. J
15. D	35. E	55. E
16. J	36. G	56. J
17. C	37. C	57. A
18. J	38. J	58. K
19. B	39. C	59. D
20. G	40. G	60. G