**MATHEMATICS TEST**

60 MINUTES—60 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.

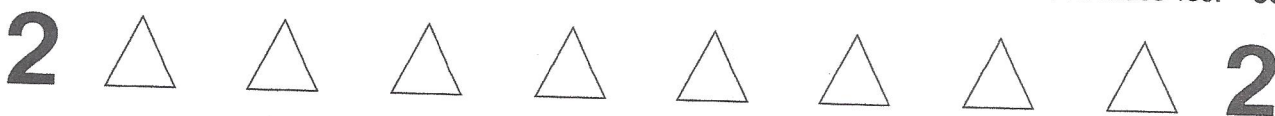
1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

DO YOUR FIGURING HERE.

1. If $x = 3$, then $x^2 + 2x - 12 = ?$
 - A. -3
 - B. 0
 - C. 3
 - D. 6
 - E. 21

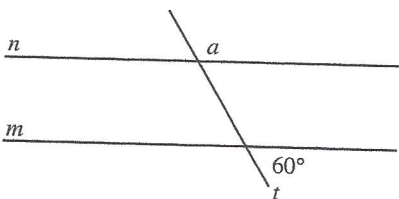
2. If $3(2x - 1) = 11x + 27$, then $x = ?$
 - F. -6
 - G. -2
 - H. 2
 - J. 6
 - K. 7

3. To make space for new merchandise, a clothing store offered a 15% discount on all current stock. What is the sale price of a jacket that regularly sells for \$42?
 - A. \$6.30
 - B. \$8.40
 - C. \$35.70
 - D. \$37.80
 - E. \$41.85



DO YOUR FIGURING HERE.

4. In the figure below, line m is parallel to line n . One angle formed with transversal line t measures 60° , as shown. What is the degree measure of $\angle a$?



- F. 30°
 G. 60°
 H. 90°
 J. 120°
 K. Cannot be determined
5. If $x = 3$, $y = 5$, and $w = 4$, what is the value of $xw^3 + \frac{3w}{2} - x^2y$?
- A. 9.0
 B. 12.0
 C. 79.5
 D. 153.0
 E. 1,689.0
6. For all x , $(3x - 5)(4x + 3) = ?$
- F. $12x^2 - 15$
 G. $12x^2 + 11x - 15$
 H. $12x^2 - 11x - 15$
 J. $12x^2 + 29x - 15$
 K. $12x^2 - 29x - 15$
7. $|5 - 8| - |9 - 3| = ?$
- A. -9
 B. -3
 C. 1
 D. 3
 E. 9
8. $(5\sqrt{3})^2 = ?$
- F. 15
 G. $10\sqrt{6}$
 H. 45
 J. $34 + 10\sqrt{3}$
 K. 75

**DO YOUR FIGURING HERE.**

9. A carpet company uses the following formula for estimating the number of square feet, A , of carpeting needed for a room x feet by y feet, containing a stairway w feet by z feet, with n stairs:

$$A = xy + w[z(2n - 1) + 2n]$$

What is the company's estimate for the number of square feet of carpeting needed for a room that is 15 feet by 18 feet, containing a stairway that is 6 feet by 6 feet with 8 stairs?

- A. 826
B. 894
C. 906
D. 1,086
E. 1,636
10. An urn contains 7 blue balls, 5 white balls, and 3 red balls. What is the probability that the first ball drawn at random from the urn will NOT be red?
- F. $\frac{7}{45}$
G. $\frac{1}{5}$
H. $\frac{1}{3}$
J. $\frac{7}{15}$
K. $\frac{4}{5}$
11. A certain watch costs \$100, and a certain pearl necklace costs \$300. If the cost of the watch increases by 5% and the cost of the pearl necklace decreases by 10%, what will be the sum of their new costs?
- A. \$375
B. \$385
C. \$395
D. \$405
E. \$415

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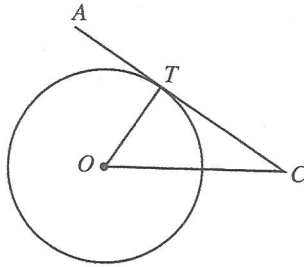


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DO YOUR FIGURING HERE.

12. In the figure below, \overline{CA} is tangent to circle O at point T . If $\overline{AT} = 6$ units, $\overline{CT} = 8$ units, and $\overline{CO} = 10$ units, how many units long is the radius of the circle?

- F. 2
G. 5
H. 6
J. 8
K. 10



13. If $A = BC$, $B = x$, and $C = yz$, then $AB = ?$
- A. $xyzx$
B. $yzxy$
C. $zxyz$
D. $xyyz$
E. xyz
14. Which of the following inequalities specifies precisely the real values of x that are solutions to the inequality $-5 < -3x - 7$?
- F. $x < 4$
G. $x < -\frac{2}{3}$
H. $x > -\frac{2}{3}$
J. $x < \frac{2}{3}$
K. $x > 4$
15. What is the slope of the line determined by the equation $y - \frac{1}{3}x + \frac{3}{5} = 0$?
- A. 3
B. 1
C. $\frac{1}{3}$
D. $-\frac{3}{5}$
E. -3

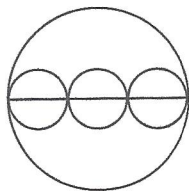
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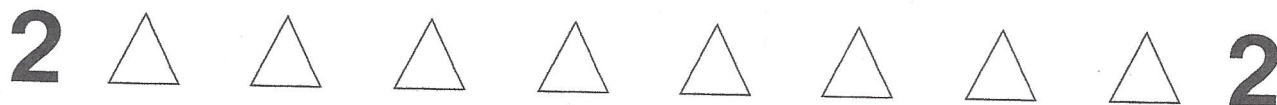
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DO YOUR FIGURING HERE.

16. Which of the following expresses the equation $4x - 2y = 12$ in slope-intercept form for the standard (x, y) coordinate plane?
- F. $x = \frac{1}{2}y + 3$
- G. $x = -\frac{1}{2}y + 3$
- H. $y = 2x - 6$
- J. $y = -2x + 6$
- K. $y = -2x - 6$
17. Which of the following values for a in the equation $3x + 3a - 5 = 5x - a$ causes the solution for x to be 6?
- A. -8.5
- B. -4.25
- C. 4.25
- D. 8.5
- E. 13.25
18. The centers of 3 identically sized circles lie on the diameter of a larger circle, as shown in the figure below. Each of the 4 circles is tangent to 2 other circles, as shown. If the circumference of each small circle is 8π inches, what is the circumference of the largest circle, in inches?
- F. 16π
- G. 24π
- H. 48π
- J. 64π
- K. 144π

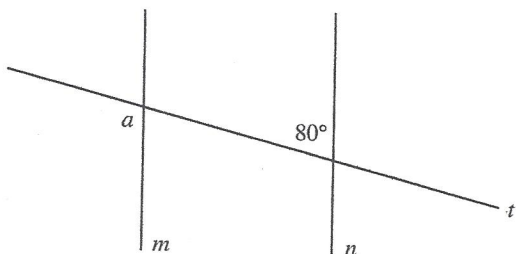


19. A recipe calls for cooking a turkey 1 hour for every 3 pounds it weighs. How long should a 19-pound turkey cook?
- A. 6 hours and 15 minutes
- B. 6 hours and 20 minutes
- C. 6 hours and 30 minutes
- D. 6 hours and $33\frac{1}{3}$ minutes
- E. 6 hours and 40 minutes

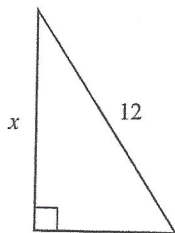
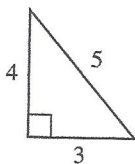


DO YOUR FIGURING HERE.

20. Line t intersects parallel lines m and n . Angle measures are as shown in the figure below. What is the degree measure of $\angle a$?



- F. 10°
 G. 80°
 H. 90°
 J. 100°
 K. 110°
21. A photocopy machine enlarges a small triangle to produce a larger, similar triangle, as shown below. If the lengths of the sides, in inches, are as marked on the figure, and the triangles are similarly oriented, what is the value of x in inches?



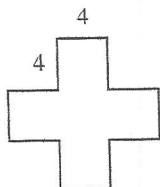
- A. $7\frac{1}{5}$
 B. 9
 C. $9\frac{1}{2}$
 D. $9\frac{3}{5}$
 E. 11
22. If the lengths of adjacent sides of a rectangular playground have measures of $4x - 3$ and $2x^2 + 7$ units, respectively, then which of the following expressions represents the area, in square units, of the playground?
- F. $2x^2 + 4x + 4$
 G. $4x^2 + 8x + 8$
 H. $8x^3 - 21$
 J. $8x^3 - 6x^2 + 28x - 21$
 K. $8x^3 + 6x^2 + 28x + 21$

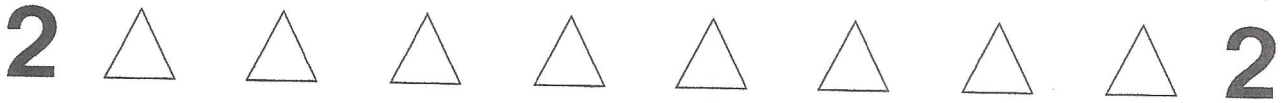
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DO YOUR FIGURING HERE.

23. Which of the following is a prime factorization of 2,100?
- A. $2 \cdot 3 \cdot 5 \cdot 7$
 B. $2^2 \cdot 3 \cdot 5^2 \cdot 7$
 C. $2^2 \cdot 3 \cdot 5 \cdot 35$
 D. $2^2 \cdot 5^2 \cdot 21$
 E. $2^2 \cdot 550$
24. After Jean spent 90% of her vacation money, \$100 remained. How much vacation money did she originally have?
- F. \$111
 G. \$191
 H. \$900
 J. \$1,000
 K. \$1,111
25. Which of the following is a simplified version of $\frac{2x+1}{x} - \frac{x-3}{5x}$ whenever $x \neq 0$?
- A. $9x + 2$
 B. $9x^2 + 2x$
 C. $\frac{-(x-4)}{4x}$
 D. $\frac{9x+8}{5x}$
 E. $\frac{9x^2+8x}{5x^2}$
26. If $2x^2 - x - 15 = 0$, what are the 2 possible values for x ?
- F. -5 and $\frac{3}{2}$
 G. -3 and $\frac{2}{5}$
 H. -3 and $\frac{5}{2}$
 J. 3 and $-\frac{5}{2}$
 K. 5 and $-\frac{3}{2}$
27. All angles in the figure shown below are right angles. If each side has a length of 4 centimeters, what is the area of the figure in square centimeters?
- A. 32
 B. 40
 C. 44
 D. 48
 E. 80



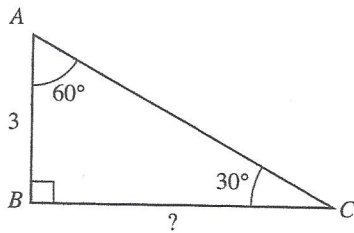


DO YOUR FIGURING HERE.

28. If M , located at $(-1, 2)$, is the midpoint of \overline{AB} , and the coordinates of A are $(2, 9)$, what are the coordinates of B ?

- F. $(-5, 16)$
- G. $(-4, -5)$
- H. $(0.5, 5.5)$
- J. $(4, -5)$
- K. $(5, 16)$

29. In the figure below, lengths in units and angle measures in degrees are as marked. How many units long is \overline{BC} ?



- A. 3
 - B. $3\sqrt{2}$
 - C. $3\sqrt{3}$
 - D. 6
 - E. $3\sqrt{5}$
30. To increase the mean of 5 numbers by 3, by how much would the sum of the 5 numbers need to increase?
- F. 3
 - G. 6
 - H. 9
 - J. 15
 - K. 18
31. Josh pounded a stake into the ground. When he attached a leash to both the stake and his dog's collar, the dog could walk 12 feet from the stake in any direction. Using 3.14 for π , what is the approximate area of the lawn, in square feet, that the dog could roam while tied to the stake?
- A. 38
 - B. 75
 - C. 151
 - D. 377
 - E. 452

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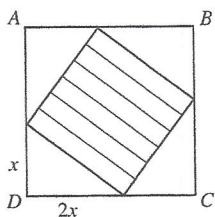
32. Television screen sizes are determined by the diagonal length of the rectangular screen. Chad recently changed from watching a television with a 19-inch screen to a television with a similarly shaped 32-inch screen. If a car on the 19-inch screen appeared 12 inches long, how long, to the nearest inch, would the same car appear on the 32-inch screen?

F. 16
 G. 18
 H. 20
 J. 22
 K. 24

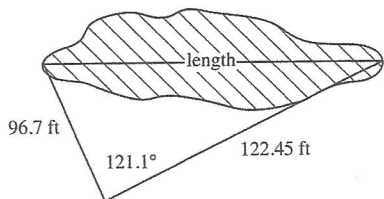
DO YOUR FIGURING HERE.

33. In the figure below, $ABCD$ is a square. Points are connected on each pair of adjacent sides of $ABCD$ to form 4 congruent right triangles, as shown below. Each of these triangles has one leg that is twice as long as the other leg. If the area of the shaded region is 25 square feet, what is the area of square $ABCD$ in square feet?

A. 225
 B. 112.5
 C. 56.25
 D. 45
 E. 27



34. A surveyor took and recorded the measurements shown in the figure below. If the surveyor wants to use these 3 measurements to calculate the length of the pond, which of the following would he find to be the most useful?



- F. The Pythagorean Theorem
 G. The ratios for the side lengths of 30° - 60° - 90° triangles
 H. The ratios for the side lengths of 45° - 45° - 90° triangles
 J. The law of cosines, which states that for any $\triangle ABC$, where a is the length of the side opposite $\angle A$, b is the length of the side opposite $\angle B$, and c is the length of the side opposite $\angle C$, $a^2 = b^2 + c^2 - 2bc[\cos(\angle A)]$
 K. The law of sines, which states that the ratio between the length of the side opposite an angle and the sine of that angle is the same for all of the interior angles in the same triangle.

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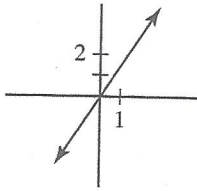
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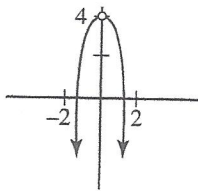
35. Which of the following is the graph of the equation

$$y = \frac{4x - 2x^2}{x} \text{ in the standard } (x, y) \text{ coordinate plane?}$$

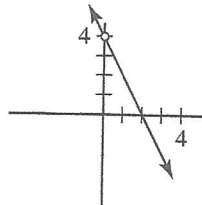
A.



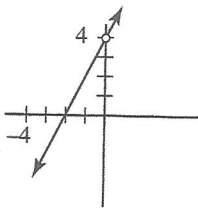
B.



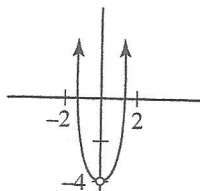
C.



D.



E.



36. A line in a plane separates the plane into how many sets of points that do not contain the line?

- F. 0
- G. 1
- H. 2
- J. 3
- K. Cannot be determined

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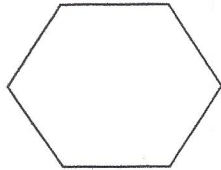


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DO YOUR FIGURING HERE.

37. What is the maximum number of distinct diagonals that can be drawn in the hexagon shown below?

- A. 12
B. 9
C. 6
D. 5
E. 4



38. In the standard (x, y) coordinate plane, the center of a circle lies in quadrant III. If the circle is tangent to the x -axis and the y -axis, which of the following is an equation for the circle?

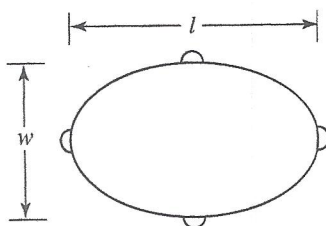
- F. $(x + 4)^2 + (y + 4)^2 = 4$
G. $(x - 4)^2 + (y - 4)^2 = 4$
H. $x^2 + (y - 4)^2 = 16$
J. $(x + 4)^2 + (y + 4)^2 = 16$
K. $(x + 4)^2 + (y - 4)^2 = 16$

39. How must $-\frac{3}{5}$, $-\frac{4}{7}$, $-\frac{5}{6}$, and $-\frac{8}{9}$ be arranged so that they are listed in increasing order?

- A. $-\frac{8}{9} < -\frac{5}{6} < -\frac{3}{5} < -\frac{4}{7}$
B. $-\frac{8}{9} < -\frac{5}{6} < -\frac{4}{7} < -\frac{3}{5}$
C. $-\frac{4}{7} < -\frac{3}{5} < -\frac{5}{6} < -\frac{8}{9}$
D. $-\frac{3}{5} < -\frac{4}{7} < -\frac{5}{6} < -\frac{8}{9}$
E. $-\frac{5}{6} < -\frac{8}{9} < -\frac{3}{5} < -\frac{4}{7}$

40. The perimeter of an elliptical billiard table is to be covered with red velvet. The perimeter of an ellipse is given by the formula $p = \frac{\pi}{2}\sqrt{2(l^2 + w^2)}$, where l is the length and w is the width, as shown in the diagram below. If the length is 4 feet and the width is 3 feet, what is the outside perimeter of the ellipse in feet?

- F. $\frac{5}{2}\pi\sqrt{2}$
G. $\frac{\pi}{2}(4\sqrt{2} + 3)$
H. $\frac{7}{2}\pi\sqrt{2}$
J. $(4\pi + 3)\sqrt{2}$
K. $5\pi\sqrt{2}$



2



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DO YOUR FIGURING HERE.

41. If $\frac{A}{28} + \frac{B}{126} = \frac{9A + 2B}{x}$, and A , B , and x are integers greater than 1, what must x equal?

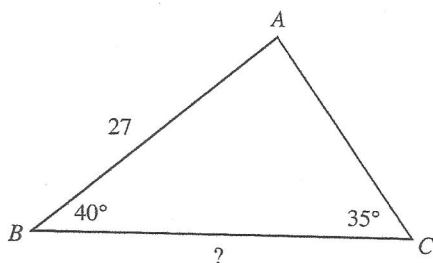
- A. 11
- B. 154
- C. 252
- D. 1,134
- E. 3,528

42. Which one of the following expresses the number of meters that a contestant must travel in a 5-lap race around a circular track with a radius of R meters?

- F. $5R$
- G. $5\pi R$
- H. $5\pi R^2$
- J. $6R$
- K. $10\pi R$

43. In $\triangle ABC$, shown below, the measure of $\angle B$ is 40° , the measure of $\angle C$ is 35° , and \overline{AB} is 27 units long. Which one of the following is an expression of the length, in units, of \overline{BC} ?

(Note: The law of sines states that for any triangle, the ratio between the sine of an angle and the length of the side opposite that angle is the same for all of the interior angles in the triangle.)



- A. $\frac{27(\sin 105^\circ)}{\sin 40^\circ}$
- B. $\frac{27(\sin 105^\circ)}{\sin 35^\circ}$
- C. $\frac{27(\sin 75^\circ)}{\sin 40^\circ}$
- D. $\frac{27(\sin 40^\circ)}{\sin 105^\circ}$
- E. $\frac{27(\sin 35^\circ)}{\sin 75^\circ}$

2



2

DO YOUR FIGURING HERE.

Use the following information to answer questions 44–45.

Kaylee is planning to purchase a car. She will need to borrow some of the money and has a chart, shown below, that will help her to approximate her monthly payment. The chart gives the approximate monthly payment per \$1,000 borrowed.

Monthly payment per \$1,000 borrowed for various annual rates and various numbers of payments.			
Annual Interest Rate	Number of Monthly Payments		
	36	48	60
5%	\$29.97	\$23.03	\$18.87
6%	\$30.42	\$23.49	\$19.33
8%	\$31.34	\$24.41	\$20.28
10%	\$32.27	\$25.36	\$21.24
12%	\$33.22	\$26.34	\$22.24

44. Kaylee found a used car that she is thinking about purchasing. The list price is \$8,785. She calculates that she will need to borrow \$6,500. Approximately what would her monthly payment be if she borrowed the money for 36 months at an annual interest rate of 10%?
- F. \$164.84
 G. \$171.21
 H. \$209.76
 J. \$234.72
 K. \$283.81
45. A local dealership is having an end-of-the-model-year clearance sale and is offering 5% annual interest on new-car loans for 36, 48, or 60 months. The maximum amount that Kaylee can budget for her monthly car payment is \$300. Of the following loan amounts, which one represents the maximum amount that Kaylee can borrow at 5% annual interest while staying within her budget?
- A. \$10,000
 B. \$13,000
 C. \$14,000
 D. \$15,000
 E. \$20,000

2



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46. For $i^2 = -1$, $(5 - i)^2 = ?$

- F. 24
- G. 26
- H. $24 - 5i$
- J. $24 - 10i$
- K. $26 + 10i$

47. If x and y are integers such that $y > 12$ and $2x + y = 19$, which of the following is the solution set for x ?

- A. $x \geq 4$
- B. $x \geq 3$
- C. $x \leq 4$
- D. $x \leq 3$
- E. $x \leq 0$

48. If $pq^3t^4 > 0$, which of the following products must be positive?

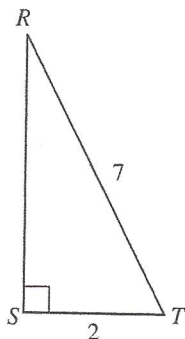
- F. pq
- G. pt
- H. qt
- J. pqt
- K. pq^2

49. If $\log_3 81 = x + 1$, then $x = ?$

- A. 3
- B. 4
- C. 5
- D. 6
- E. 243

50. In $\triangle RST$ below, $\angle S$ is a right angle, $\overline{RT} = 7$ units, and $\overline{TS} = 2$ units. What does $\csc \angle T$ equal?

- F. $\frac{2\sqrt{5}}{15}$
- G. $\frac{3\sqrt{5}}{7}$
- H. $\frac{7\sqrt{5}}{15}$
- J. $\frac{3\sqrt{5}}{2}$
- K. $\frac{7}{2}$



DO YOUR FIGURING HERE.

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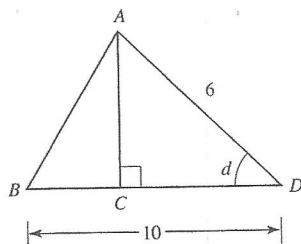
51. A flight instructor charges \$75 per lesson, plus an additional fee for the use of his plane. The charge for the use of his plane varies directly with the cube root of the time the plane is used. If a lesson plus 27 minutes of plane usage costs \$120, what is the total amount charged for a lesson involving 64 minutes of plane usage?

- A. \$195
- B. \$180
- C. \$157
- D. \$135
- E. \$60

DO YOUR FIGURING HERE.

52. In $\triangle ABD$ shown below, C is on \overline{BD} , $\overline{AC} \perp \overline{BD}$, the length of \overline{AD} is 6 inches, the length of \overline{BD} is 10 inches, and $\sin d = 0.8$. What is the area of $\triangle ABD$ in square inches?

- F. 6
- G. 12
- H. 24
- J. 30
- K. 60

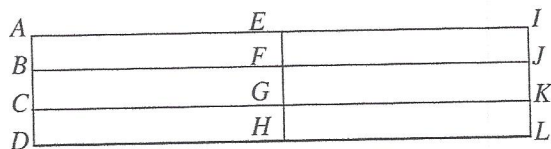


53. For real numbers x and y , when is the equation $|2x + 3y| = |2x - 3y|$ true?

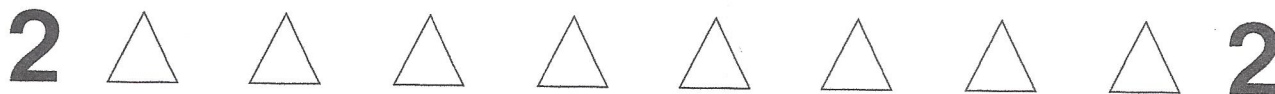
- A. Never
- B. Always
- C. Only when $2x = 3y$
- D. Only when $x = 0$ and $y = 0$
- E. Only when $x = 0$ or $y = 0$

54. In the figure below, all line segments that intersect are perpendicular. Using only the segments and vertices in the figure, how many distinct rectangles are there with areas less than the area of $ADLI$?

(Note: If 2 rectangles have all four vertices in common, then they are not distinct.)



- F. 7
- G. 8
- H. 17
- J. 18
- K. 19

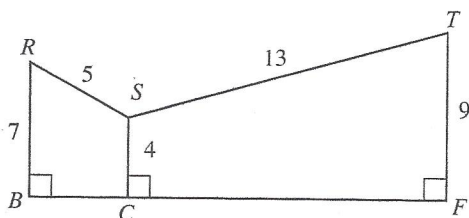


DO YOUR FIGURING HERE.

55. For some real number A , the graph of $y = (A + 3)x + 5$ in the standard (x, y) coordinate plane passes through the point $(3, 11)$. What is the slope of this line?

- A. -5
 B. -2
 C. -1
 D. 2
 E. $5\frac{1}{3}$

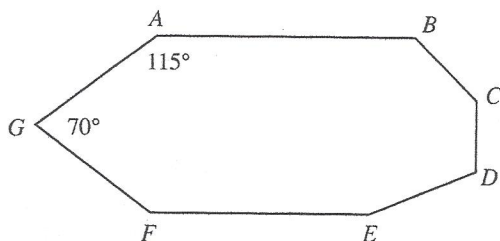
56. In the figure below, \overline{BCF} is a line segment and all distances are given in inches. What is the ratio of the area of quadrilateral $RBCS$ to the area of quadrilateral $SCFT$?



- F. $9:7$
 G. $7:9$
 H. $11:13$
 J. $11:39$
 K. $11:50$
57. When graphed in the standard (x, y) coordinate plane, the graphs of $y = x^2 - 5$ and $y = x + 1$ intersect at which of the following points?

- A. $(-3, 2)$ and $(2, 3)$
 B. $(-3, 4)$ and $(2, -1)$
 C. $(3, -4)$ and $(-2, 1)$
 D. $(3, 4)$ and $(-2, -1)$
 E. The graphs do not intersect.

58. In septagon $ABCDEFGG$ shown below, $\angle A = 115^\circ$ and $\angle G = 70^\circ$. What is the sum of the measures of the other 5 interior angles?



- F. 585°
 G. 595°
 H. 655°
 J. 690°
 K. 715°

GO ON TO THE NEXT PAGE.

2



2

59. For all real numbers x and y such that the product of y and 4 is x , which of the following expressions represents the sum of y and 4 in terms of x ?

- A. $x + 4$
 B. $4x + 4$
 C. $4(x + 4)$
 D. $\frac{x+4}{4}$
 E. $\frac{x+16}{4}$

60. What is $\cos \frac{7\pi}{12}$ given that $\frac{7\pi}{12} = \frac{\pi}{3} + \frac{\pi}{4}$ and that $\cos(A+B) = \cos A \cos B - \sin A \sin B$?
 (Note: You may use the following table of values.)

θ	$\sin \theta$	$\cos \theta$
$\frac{\pi}{6}$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$

- F. $\frac{\sqrt{2} - \sqrt{6}}{4}$
 G. $-\frac{1}{4}$
 H. $\frac{\sqrt{2} - \sqrt{3}}{4}$
 J. 0.999
 K. $\frac{1 + \sqrt{2}}{2}$

DO YOUR FIGURING HERE.



If there is still time remaining, check your answers to this section.

Answer Key

PRACTICE TEST 1

English Test

1. B	16. F	31. B	46. H	61. D
2. J	17. A	32. J	47. A	62. G
3. A	18. F	33. D	48. H	63. D
4. J	19. B	34. F	49. B	64. F
5. D	20. F	35. A	50. H	65. C
6. H	21. C	36. G	51. D	66. F
7. C	22. G	37. C	52. F	67. D
8. F	23. D	38. J	53. B	68. H
9. D	24. H	39. A	54. H	69. A
10. J	25. A	40. H	55. C	70. G
11. B	26. F	41. B	56. F	71. D
12. H	27. B	42. J	57. B	72. H
13. A	28. J	43. B	58. H	73. B
14. G	29. C	44. J	59. A	74. J
15. A	30. J	45. C	60. H	75. C

Math Test

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

Score Conversion Table

Section	Raw Score	Scaled Score
English	(out of 75)	___ / 36
Math	(out of 60)	___ / 36
Reading	(out of 40)	___ / 36
Science	(out of 40)	___ / 36
		Add and divide by 4
Overall Composite =		___ / 36

Score Conversion Chart

ACT Score*	Number Correct				ACT Score*
	English Section	Mathematics Section	Reading Section	Science Section	
36	75	60	40	40	36
35	74	59	39	—	35
34	73	58	38	39	34
33	72	57	37	—	33
32	71	56	36	38	32
31	70	54–55	35	—	31
30	69	53	34	37	30
29	67–68	51–52	33	36	29
28	65–66	49–50	32	35	28
27	64	46–48	31	33–34	27
26	62–63	44–45	30	31–32	26
25	60–61	41–43	29	30	25
24	58–59	39–40	27–28	28–29	24
23	55–57	37–38	25–26	27	23
22	53–54	35–36	23–24	25–26	22
21	50–52	33–34	22	23–24	21
20	47–49	31–32	21	21–22	20
19	44–46	28–30	19–20	19–20	19
18	42–43	25–27	18	17–18	18
17	40–41	22–24	17	15–16	17

Continued