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. Danica is trying to encourage her classmates to donate books for the fund-raiser and book-drive for the local library. Danica will donate $35.00, plus $0.07 for each book donated by her classmates. Which of the following equations gives Danica's donation, d dollars, if b books are donated by her classmates?

A. $d = 35 + 0.07b$
B. $d = 35 + 0.7b$
C. $d = 35 + 7b$
D. $d = 35.07b$
E. $d = 42b$

2. If $\frac{z}{-4} = -16$, then $z = ?$

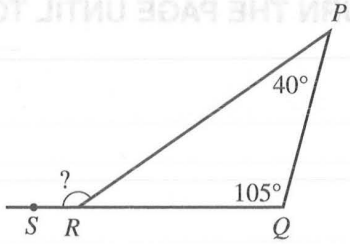
F. -64
G. -12
H. -4
J. 4
K. 64

3. $4b^8 \cdot 5b^3$ is equivalent to:

A. $9b^5$
B. $9b^{11}$
C. $9b^{24}$
D. $20b^{11}$
E. $20b^{24}$

4. In the figure below, $\angle QPR$ measures 40°, $\angle PQR$ measures 105°, and points Q, R, and S are collinear. What is the measure of $\angle PRS$?

F. 105°
G. 125°
H. 130°
J. 140°
K. 145°



DO YOUR FIGURING HERE.

5. The sum of 2 numbers is 90. The smaller number is 50 less than the larger number. What is the larger number?

A. 20
B. 40
C. 45
D. 70
E. 80

6. $|7 - 5| - |1 - 8| = ?$

F. −9
G. −5
H. 5
J. 9
K. 21

7. What is the value of $x^2 + 2 + y^2 - 3$ when $x = 3$ and $y = -3$?

A. −5
B. −1
C. 1
D. 11
E. 17

8. What is the sum of the 4 binomials listed below?

$$x^2 + 2x,\ 3x + 5,\ x^2 + 1,\ 6x - 4$$

F. $x^2 + 11x + 2$
G. $2x^2 + 11x + 2$
H. $2x^2 + 11x + 10$
J. $x^4 + 11x^3 + 2$
K. $2x^4 + 11x^3 + 10$

9. Bert's Building Supply receives shipments of only 2 kinds of lawn mowers: Tough Cuts and Easy Pushes. Today's shipment contains 96 lawn mowers with twice as many Tough Cuts as Easy Pushes. How many of these 96 are Tough Cuts?

A. 16
B. 32
C. 47
D. 48
E. 64

DO YOUR FIGURING HERE.

10. Adina plays in a bowling league. Her bowling scores for last week are listed below. What is the median of Adina's bowling scores for last week?

142, 186, 201, 191, 116, 201, 175

F. $158\frac{1}{2}$

G. $180\frac{1}{2}$

H. 186

J. 191

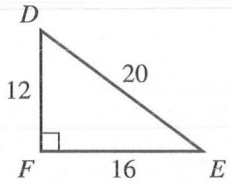
K. 201

11. The table below shows Shannon's height, in inches, on her birthday from the day she was born (birth) to age 5. What was the average rate of change in Shannon's height, in inches per year, from birth to age 5 ?

Age (years)	Height (inches)
Birth	20
1	27
2	32
3	38
4	43
5	50

A. 2
B. 5
C. 6
D. 7
E. 14

12. The side lengths, in centimeters, of right triangle $\triangle DEF$ are given in the figure below. What is the area, in square centimeters, of $\triangle DEF$?



F. 48
G. 96
H. 120
J. 160
K. 192

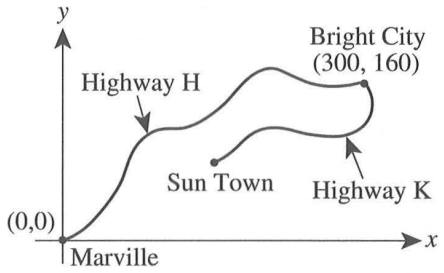
13. Christopher bought 4 cans of soup for a total of \$3.36, which included sales tax of \$0.16. At the same per-can cost, what is the cost before the sales tax is added for 6 cans of the same soup?

A. \$0.80
B. \$0.84
C. \$4.80
D. \$5.04
E. \$6.40

DO YOUR FIGURING HERE.

Use the following information to answer questions 14–16.

A map of the locations of Marville, Sun Town, and Bright City is shown in the standard (x,y) coordinate plane below, where coordinates for x and y are given in miles. The coordinates of Marville and Bright City are given, and Sun Town is located along a straight line exactly halfway between Marville and Bright City. Highway H from Marville to Bright City is 390 miles long. Highway K from Sun Town to Bright City is 200 miles long.



14. What are the coordinates of Sun Town?

F. (80, 150)
G. (140, 140)
H. (150, 80)
J. (195, 100)
K. (230, 70)

15. The straight-line distance, in miles, from Marville to Bright City *must* be:

A. less than 140.
B. between 140 and 300.
C. between 300 and 390.
D. between 390 and 460.
E. more than 460.

16. Chelsea's car travels an average of 32 miles per gallon of gas used, and she pays an average of \$2.25 per gallon of gas. Chelsea will drive her car along Highway H from Marville to Bright City. To the nearest \$1, what will be the total cost of gas that her car uses for the drive?

F. \$ 5.00
G. \$13.00
H. \$14.00
J. \$27.00
K. \$32.00

DO YOUR FIGURING HERE.

17. Let $0 < a < b < c < d$ be true for integers a, b, c, and d. Which of the following expressions has the greatest value?

A. $\frac{d}{a}$

B. $\frac{c}{b}$

C. $\frac{a}{b}$

D. $\frac{d}{c}$

E. $\frac{a}{d}$

18. Maurice earns \$12.50 per hour for the first 40 hours he works each week. For each hour beyond 40 that he works in 1 week, Maurice earns \$18.75 per hour. Last week Maurice earned \$931.25. How many hours did Maurice work last week?

F. 23
G. 30
H. 55
J. 63
K. 76

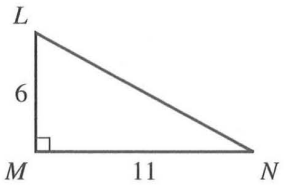
19. An apartment building is 3 stories tall. Each story has 4 identical apartments. Each apartment's living space consists of 4 rectangular rooms: a bathroom 8 feet by 10 feet, a kitchen 10 feet by 12 feet, a bedroom 12 feet by 12 feet, and a living room 12 feet by 14 feet. What is the area, to the nearest 1,000 square feet, of living space in the 3-story apartment building?

A. 8,000
B. 6,000
C. 5,000
D. 4,000
E. 3,000

20. The perimeter of a parallelogram is 80 inches, and the length of 1 side is 18 inches. If it can be determined, what are the lengths, in inches, of the other 3 sides?

F. 18, 13, 13
G. 18, 18, 26
H. 18, 22, 22
J. 18, 31, 31
K. Cannot be determined from the given information

21. The side lengths of right triangle $\triangle LMN$ are given in centimeters in the figure below. What is tan N ?



A. $\frac{6}{11}$

B. $\frac{6}{\sqrt{157}}$

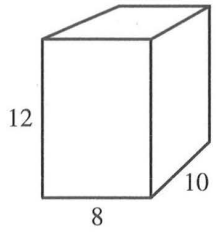
C. $\frac{11}{6}$

D. $\frac{11}{\sqrt{157}}$

E. $\frac{\sqrt{157}}{11}$

DO YOUR FIGURING HERE.

22. The empty container shown below is a right rectangular prism with dimensions given in inches. How many cubic inches of liquid are needed to fill the container to 75% of its capacity?



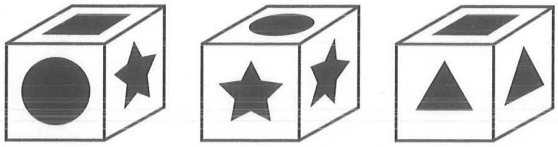
F. 148
G. 240
H. 444
J. 720
K. 960

23. The length of a rectangle is 4 inches longer than the width. The perimeter of the rectangle is 28 inches. What is the width of the rectangle, in inches?

A. 5
B. 7
C. 10
D. 12
E. 14

DO YOUR FIGURING HERE.

24. The figure below shows 3 different views of the same fair cube. Each face of the cube has 1 design drawn on it. The cube will be rolled once. What is the probability that a face showing a star (★) will be on top?



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

G. $\frac{1}{3}$

H. $\frac{2}{3}$

J. $\frac{1}{4}$

K. $\frac{1}{6}$

25. For functions f and g defined by $f(x) = 2x^2 + x$ and $g(x) = 3x - 1$, what is the value of $f(g(3))$?

A. 29
B. 62
C. 136
D. 162
E. 168

26. What is the value of $\sqrt{a^2 + b^2}$ when $a = \sqrt{5}$ and $b = \sqrt{10}$?

F. $\sqrt{15}$
G. $5\sqrt{2}$
H. $5\sqrt{5}$
J. 15
K. 125

27. All of the following statements concern triangles that are similar, congruent, or both. Which statement is FALSE ?

A. Triangles that are congruent to each other are always similar to each other.
B. Lengths of corresponding sides of similar triangles are always equal.
C. Lengths of corresponding sides of congruent triangles are always equal.
D. Measures of corresponding angles of similar triangles are always equal.
E. Measures of corresponding angles of congruent triangles are always equal.

DO YOUR FIGURING HERE.

28. Distinct lines l and m intersect, forming 4 pairs of adjacent angles. Which of the following statements *must* be true about these 4 pairs of angles?

F. The difference of the angle measures in each pair is less than 45°.
G. The difference of the angle measures in each pair is 90°.
H. The measure of each angle in each pair is 45°.
J. The sum of the angle measures in each pair is 90°.
K. The sum of the angle measures in each pair is 180°.

29. In the standard (x,y) coordinate plane, what is the slope of the line through (3,7) and (−2,4) ?

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

30. Which of the following expressions is equivalent to $(2x - 3)(-x - 7)$?

F. $(2x + 3)(x + 7)$
G. $(2x - 3)(x - 7)$
H. $(2x - 3)(x + 7)$
J. $(-2x + 3)(-x - 7)$
K. $(-2x + 3)(x + 7)$

31. Tomas plans to construct a circular fishpond with a diameter of 9 ft. Which of the following is closest to the length, in feet, of the decorative fencing that Tomas needs to enclose the fishpond along its perimeter?

A. 15
B. 19
C. 29
D. 64
E. 255

DO YOUR FIGURING HERE.

32. Ursula will order boxes of red pens and boxes of blue pens for her company. The table below gives the number of pens in each box and the price per box.

Color	Number in each box	Price per box
Red	15	\$5
Blue	20	\$6

Ursula will order a total of 50 boxes of pens for a total price of \$280. Which of the following systems of equations gives a true relationship between the r boxes of red pens and b boxes of blue pens that Ursula will order?

F. $\begin{aligned} r + b &= 50 \\ 5r + 6b &= 280 \end{aligned}$

G. $\begin{aligned} r + b &= 50 \\ 15r + 20b &= 280 \end{aligned}$

H. $\begin{aligned} r + b &= 280 \\ 15r + 20b &= 50 \end{aligned}$

J. $\begin{aligned} 5r + 6b &= 50 \\ 15r + 20b &= 280 \end{aligned}$

K. $\begin{aligned} 5r + 6b &= 280 \\ 15r + 20b &= 50 \end{aligned}$

33. Which of the following inequalities is an equivalent algebraic expression for the statement below?

5 less than the product of 4 and a number n is greater than 28

A. $5 - 4n > 28$
B. $23 > 4n$
C. $28 - 4n > 5$
D. $4n > 23$
E. $4n - 5 > 28$

34. The quadratic formula gives the 2 roots $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ for the equation $ax^2 + bx + c = 0$.

What are the 2 roots of the equation $3x^2 - x = 10$?

F. $\dfrac{1 \pm 2\sqrt{-30}}{6}$

G. $\dfrac{1 \pm 2\sqrt{30}}{6}$

H. -2 and $\dfrac{5}{3}$

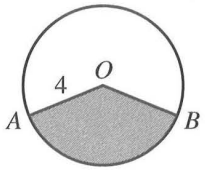
J. 2 and $-\dfrac{5}{3}$

K. 6 and -5

DO YOUR FIGURING HERE.

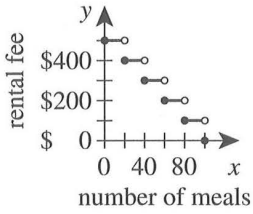
35. The shaded sector of the circle shown below is bounded by radius $\overline{AO}$, radius $\overline{BO}$, and minor arc $\overset{\frown}{AB}$. The length of $\overline{AO}$ is 4 meters, and the area of the shaded sector is 6π square meters. What is the measure of $\angle AOB$?

A. 105°
B. 120°
C. 135°
D. 160°
E. 175°

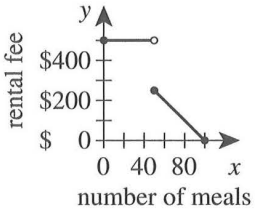


36. The rental fee for the use of a reception hall is \$500. To encourage use of the hall's catering service, the hall's rental fee is reduced by \$100 for each group of 20 meals ordered through the hall's catering service. All 20 meals in a group must be ordered for each reduction in the rental fee. One of the following graphs shows the hall's rental fee when 0 to 100 meals are ordered. Which graph is it?

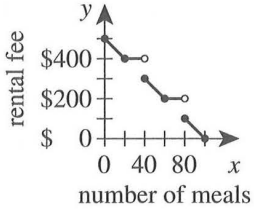
F.



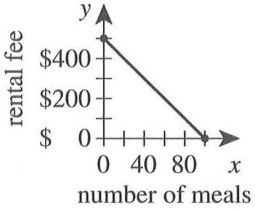
J.



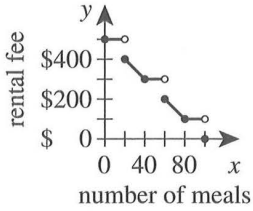
G.



K.



H.

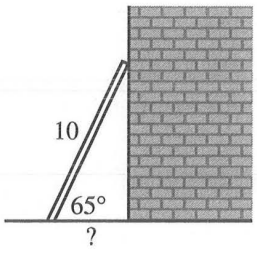


37. A line in the standard (x,y) coordinate plane is parallel to the x-axis and 6 coordinate units above it. Which of the following is an equation of this line?

A. $y = 6$
B. $x = 6$
C. $y = 6x$
D. $y = x + 6$
E. $x = y + 6$

DO YOUR FIGURING HERE.

38. The figure below shows a 10-foot ladder leaning against a vertical wall. The base of the ladder makes a 65° angle with the level ground. Which of the following expressions gives the distance, in feet, between the base of the ladder and the wall?



F. $10 \sin 65°$

G. $10 \cos 65°$

H. $10 \tan 65°$

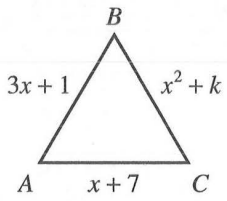
J. $\frac{10}{\sin 65°}$

K. $\frac{10}{\cos 65°}$

39. The only factor that is common to 200 and an integer n is 1. When $\frac{n}{200}$ is written as a decimal number, what is the minimum number of digits to the right of the decimal point?

A. 1
B. 2
C. 3
D. 5
E. 6

40. Equilateral triangle $\triangle ABC$ is shown below with each side length given in meters. What is the value of k ?



F. −6
G. 1
H. 4
J. 6
K. 8

41. If $\frac{3x-y}{x+y} = \frac{2}{5}$, then $\frac{x}{y} = ?$

A. $\frac{2}{5}$

B. $\frac{2}{13}$

C. $\frac{7}{4}$

D. $\frac{7}{13}$

E. 7

DO YOUR FIGURING HERE.

Use the following information to answer questions 42–45.

Jin's Office Supply sells different styles of notebooks. The sale price and number of sheets per notebook for 3 styles of notebooks are given in the table below. The sale price is the amount a customer pays for that notebook.

Style of notebook	Number of sheets per notebook	Sale price per notebook
A	50	$1.00
B	125	$1.50
C	200	$2.00

42. Which of the following amounts is closest to the average sale price per sheet for a Style B notebook?

F. $0.01
G. $0.02
H. $0.03
J. $0.12
K. $0.83

43. A bin contains 100 Style A notebooks, 100 Style B notebooks, and 100 Style C notebooks. Antoine will select 3 notebooks from the bin. How many different selections of 3 notebook styles are possible?

(Note: The order in which the notebooks are selected does not matter.)

A. 3
B. 6
C. 10
D. 14
E. 27

44. Last week, customers bought 5 times as many Style A notebooks as Style C notebooks, and customers bought 2 times as many Style B notebooks as Style C notebooks. Last week, customers bought 392 notebooks. What total amount did customers pay for the 392 notebooks?

F. $490.00
G. $560.00
H. $588.00
J. $686.00
K. $784.00

45. The notebook supplier is offering Jin's a Style D notebook that has 60% more sheets than the Style C notebook has. How many sheets does the Style D notebook have?

A. 200
B. 260
C. 275
D. 320
E. 350

DO YOUR FIGURING HERE.

46. Given that $3x + 5y = 17$ and $2x + 3y = 11$, what is the value of $x + y$?

F. 3

G. $3\frac{1}{2}$

H. 4

J. 5

K. 6

47. The least common multiple (LCM) of 2 numbers is 108. The greater of the 2 numbers is 54. What is the maximum value of the other number?

A. 2
B. 6
C. 18
D. 27
E. 36

48. In the standard (x,y) coordinate plane, what is the slope of a line that is perpendicular to $2x - 3y = 9$?

F. -3

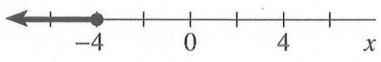
G. $-\frac{3}{2}$

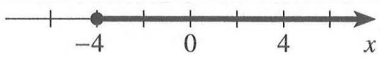
H. $-\frac{2}{3}$

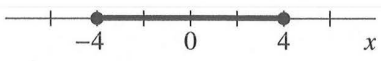
J. $\frac{2}{3}$

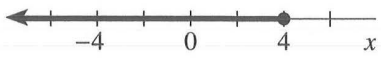
K. $\frac{3}{2}$

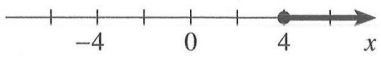
49. Which of the following number line graphs is that of the solution set to the inequality $-2x + 12 \geq 20$?

A.


B.


C.


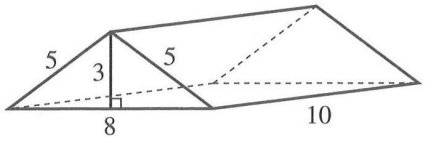
D.


E.


DO YOUR FIGURING HERE.

50. A right prism with triangular bases and with dimensions given in inches is shown below. What is the prism's total surface area, in square inches?

F. 120
G. 204
H. 228
J. 240
K. 264

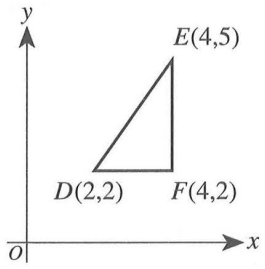


51. If # represents the operation defined by $a \# b = a + b^a$, then $(1 \# 2) \# 3 = ?$

A. 6
B. 12
C. 30
D. 32
E. 216

52. In the standard (x,y) coordinate plane below, $\triangle DEF$ will be translated 12 coordinate units down and 2 coordinate units right. What will be the coordinates of E after the translation?

F. (7,–8)
G. (6,–7)
H. (3,–7)
J. (–7, 6)
K. (–8, 7)



53. The product of 2 numbers is 25. If 1 of the numbers is the complex number $4 + 3i$, what is the other number?

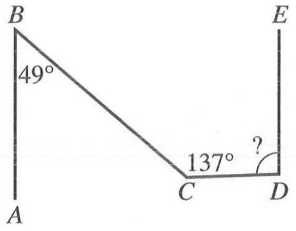
A. $21 - 3i$
B. $\frac{4}{25} + \frac{3}{25}i$
C. $4 - 3i$
D. $100 + 75i$
E. $\frac{100}{7} - \frac{75}{7}i$

54. Experimental data is represented in the standard (x,y) coordinate plane by a scatterplot consisting of 6 points: (1, 1.4), (2, 2.9), (3, 3.4), (4, 3.1), (5, 1.9), and (6, 0.2). When all possible real values for a, b, and c are considered, which of the following functions best fits the experimental data?

F. $y = a$
G. $y = ax + b$
H. $y = a + b(c^x)$
J. $y = a + b \log_c x$
K. $y = ax^2 + bx + c$

55. In the figure below, $\overline{AB}$ is parallel to $\overline{DE}$, the measure of $\angle ABC$ is 49°, and the measure of $\angle BCD$ is 137°. What is the measure of $\angle CDE$?

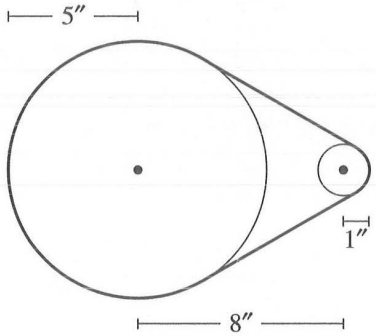
A. 78°
B. 88°
C. 90°
D. 92°
E. 96°



DO YOUR FIGURING HERE.

56. As shown below, 2 circular pulleys with centers 8 inches apart are connected with a tight belt. The belt wraps $\frac{2}{3}$ of the way around the larger pulley, which has a radius of 5 inches, and $\frac{1}{3}$ of the way around the smaller pulley, which has a radius of 1 inch. What is the exact length of the belt, in inches?

F. $\frac{22\pi}{3} + 8$
G. $\frac{22\pi}{3} + 8\sqrt{3}$
H. $17\pi + 8$
J. $17\pi + 8\sqrt{2}$
K. $17\pi + 8\sqrt{3}$



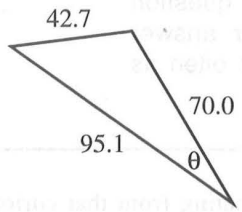
57. Given that $\sin A = \frac{5}{13}$ and $0° \leq A < 360°$, what are all possible values of $\cos A$?

A. $-\frac{5}{13}$ only
B. $-\frac{5}{13}$ and $\frac{5}{13}$
C. $\frac{12}{13}$ only
D. $-\frac{12}{13}$ only
E. $-\frac{12}{13}$ and $\frac{12}{13}$

DO YOUR FIGURING HERE.

58. The lengths of the sides of the triangle shown below are given in meters. Which of the following equations gives the degree measure θ ?

(Note: For any triangle, $c^2 = a^2 + b^2 - 2ab \cos C$, where a, b, and c are the lengths of the sides opposite angles with measures A, B, and C, respectively.)



F. $42.7^2 = 95.1^2 + 70.0^2 - 2(95.1)(70.0) \cos \theta$

G. $70.0^2 = 95.1^2 + 42.7^2 - 2(95.1)(42.7) \cos \theta$

H. $95.1^2 = 70.0^2 + 42.7^2 - 2(70.0)(42.7) \cos \theta$

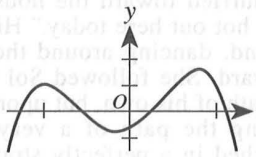
J. $\sin \theta = \frac{42.7}{95.1}$

K. $\cos \theta = \frac{70.0}{95.1}$

59. The sum of the first 30 positive integers is 465. Which of the following is the sum of the first 60 positive integers?

A. 465^2
B. 930
C. 1,395
D. 1,830
E. 12,865

60. What is the minimum degree possible for the polynomial function whose graph is shown in the standard (x,y) coordinate plane below?



F. 0
G. 1
H. 2
J. 3
K. 4

END OF TEST 2

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

DO NOT RETURN TO THE PREVIOUS TEST.