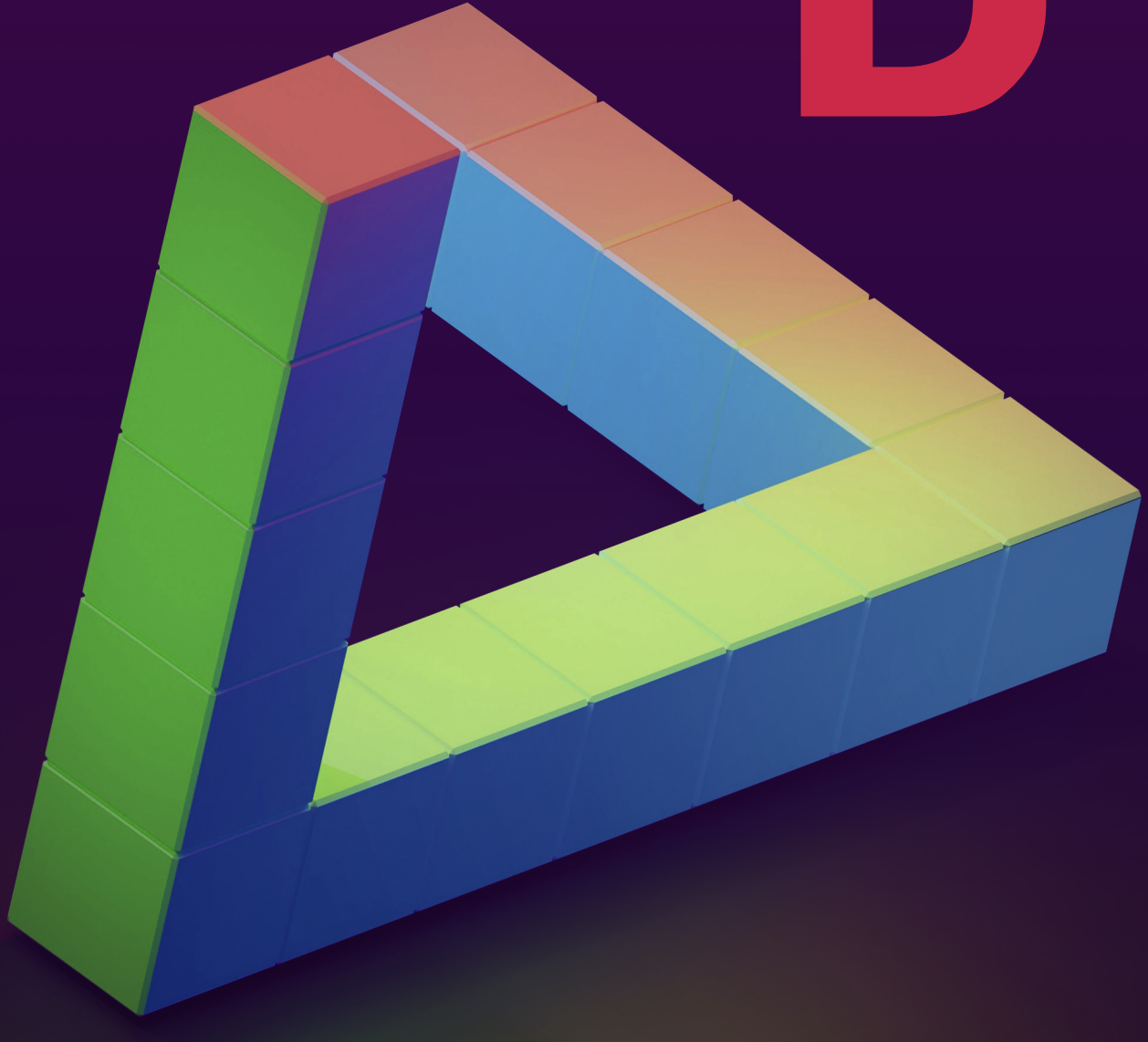
Mathematics

Advanced

ACT PRACTICE BOOK D



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Scale Score	Raw Scores				Scale Score
	Test 1 English	Test 2 Mathematics	Test 3 Reading	Test 4 Science	
36	74-75	59-60	40	39-40	36
35	72-73	57-58	38-39	38	35
34	71	55-56	37	37	34
33	69-70	54	36	—	33
32	68	53	35	36	32
31	67	51-52	34	35	31
30	66	49-50	33	34	30
29	65	47-48	32	33	29
28	63-64	44-46	31	—	28
27	62	41-43	30	31-32	27
26	60-61	39-40	29	30	26
25	58-59	36-38	28	29	25
24	55-57	34-35	27	27-28	24
23	52-54	32-33	25-26	26	23
22	49-51	31	24	24-25	22
21	47-48	29-30	22-23	23	21
20	44-46	28	21	21-22	20
19	42-43	26-27	20	20	19
18	40-41	23-25	18-19	18-19	18
17	38-39	20-22	17	17	17
16	35-37	17-19	16	15-16	16
15	31-34	13-16	14-15	13-14	15
14	28-30	10-12	13	12	14
13	26-27	8-9	12	11	13
12	24-25	6-7	10-11	10	12
11	21-23	5	9	8-9	11
10	18-20	4	7-8	7	10
9	15-17	—	6	6	9
8	13-14	3	5	5	8
7	11-12	—	—	4	7
6	9-10	2	4	3	6
5	7-8	—	3	—	5
4	5-6	1	2	2	4
3	4	—	—	1	3
2	2-3	—	1	—	2
1	0-1	0	0	0	1

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Good Luck

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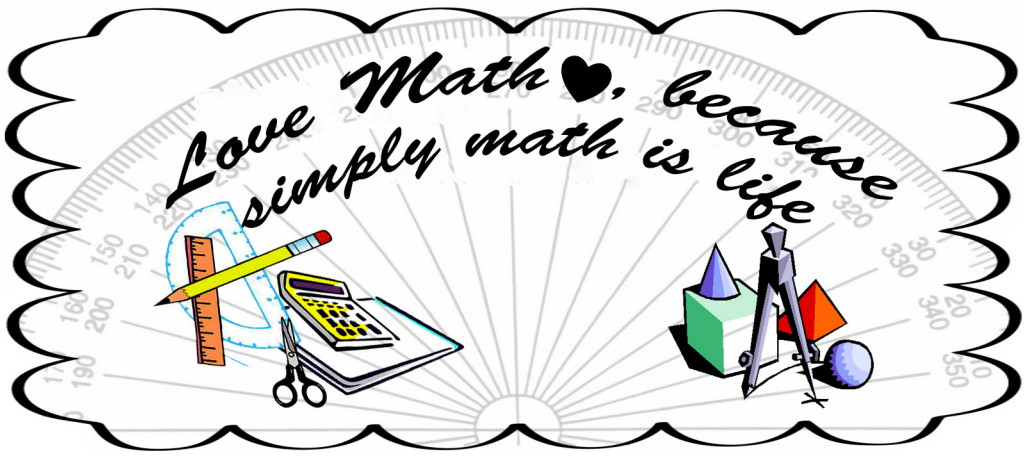

ACT

Test 1

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MATHEMATICAL

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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.

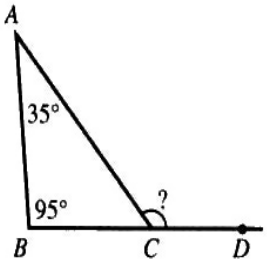
1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

DO YOUR FIGURING HERE.

1. A function, f, is defined by $f(x,y) = 3x^2 - 4y$. What is the value of $f(3,2)$?

   A. 0
   B. 10
   C. 19
   D. 24
   E. 28

2. In the figure below, $\angle BAC$ measures 35°, $\angle ABC$ measures 95°, and points B, C, and D are collinear. What is the measure of $\angle ACD$?



   F. 95°
   G. 125°
   H. 130°
   J. 140°
   K. 145°

3. For all nonzero values of x and y, which of the following expressions is equivalent to $-\frac{36x^4y^3}{4xy}$?

   A. $-40x^3y^2$
   B. $-32x^3y^2$
   C. $-9x^5y^4$
   D. $-9x^4y^3$
   E. $-9x^3y^2$

4. At a certain airline company, the cost to transfer mileage points from one person's account to another person's account is \$0.75 for every 100 mileage points transferred plus a onetime \$20 processing fee. What is the cost to transfer 7,000 mileage points from one account to another at that airline company?

   F. \$25.25
   G. \$67.50
   H. \$72.50
   J. \$75.00
   K. \$95.00

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DO YOUR FIGURING HERE.

5. For $x = -5$, what is the value of $4x^2 - 11x$?

   A. −155
   B. −84
   C. −45
   D. 84
   E. 155

6. Taho earns his regular pay of \$11 per hour for up to 40 hours of work per week. For each hour over 40 hours of work per week, Taho earns $1\frac{1}{2}$ times his regular pay. How much does Taho earn in a week in which he works 50 hours?

   F. \$550
   G. \$605
   H. \$625
   J. \$750
   K. \$825

7. A science class has 8 juniors and 4 seniors. The teacher will randomly select 2 students, one at a time, to represent the class in a committee at the school. Given that the first student selected is a junior, what is the probability that the second student selected will be a senior?

   A. $\frac{1}{11}$
   B. $\frac{1}{4}$
   C. $\frac{3}{11}$
   D. $\frac{1}{3}$
   E. $\frac{4}{11}$

8. When Tyrone fell asleep one night, the temperature was 24°F. When Tyrone awoke the next morning, the temperature was −12°F. Letting + denote a rise in temperature and − denote a drop in temperature, what was the change in temperature from the time Tyrone fell asleep until the time he awoke?

   F. −36°F
   G. −12°F
   H. +6°F
   J. +12°F
   K. +36°F

9. The total cost of renting a car is \$35.00 for each day the car is rented plus 42.5¢ for each mile the car is driven. What is the total cost of renting the car for 6 days and driving 350 miles?

   (Note: No sales tax is involved.)

   A. \$ 154.75
   B. \$ 224.88
   C. \$ 358.75
   D. \$ 420.00
   E. \$1,697.50

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DO YOUR FIGURING HERE.

10. In the standard (x,y) coordinate plane, what is the slope of the line through $(-6,4)$ and $(1,3)$?

F. $-\frac{7}{5}$

G. $-\frac{1}{5}$

H. $-\frac{1}{7}$

J. $\frac{1}{7}$

K. $\frac{1}{5}$

11. One morning at a coffee shop, each customer ordered either decaf or regular coffee, and each ordered it either with milk or without milk. The number of customers who ordered each type of coffee with or without milk is listed in the table below.

Order	Decaf	Regular	Total
With milk	12	8	20
Without milk	6	10	16
Total	18	18	36

A customer will be randomly selected from all 36 customers for a prize. What is the probability that the selected customer will have ordered a regular coffee without milk?

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

B. $\frac{5}{18}$

C. $\frac{5}{13}$

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

E. $\frac{5}{8}$

12. Which of the following inequalities describes the solution set for $3x - 5 < 2x + 1$?

F. $x < -4$

G. $x > -\frac{4}{5}$

H. $x < \frac{6}{5}$

J. $x < 6$

K. $x > 6$

13. Which of the following expressions is equivalent to $4(x+2) + 3(2x-1)$?

A. $3x+8$
B. $5(2x+1)$
C. $10(x+1)$
D. $10x+11$
E. $15x$

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DO YOUR FIGURING HERE.

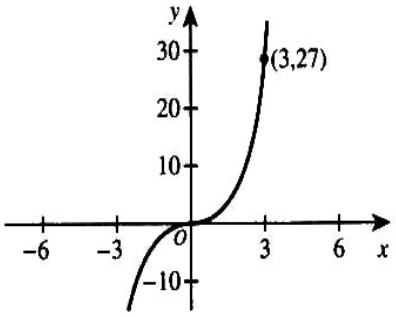
14. What is 4% of 1.36×10^4 ?

F. 340
G. 544
H. 3,400
J. 5,440
K. 54,400

15. What is the least common denominator of the fractions $\frac{4}{35}$, $\frac{1}{77}$, and $\frac{3}{22}$?

A. 110
B. 770
C. 2,695
D. 8,470
E. 59,290

16. The point (3,27) is labeled on the graph of $f(x) = x^3$ in the standard (x,y) coordinate plane below. The graph of $f(x)$ will be translated 3 coordinate units to the left. Which of the following points will be on the image of the graph after the translation?



F. (0,27)
G. (3,24)
H. (3,27)
J. (3,30)
K. (6,27)

17. In the standard (x,y) coordinate plane, what is the midpoint of the line segment that has endpoints (−6,9) and (2,5) ?

A. (−4,−4)

B. (−2, 7)

C. $\left(\frac{3}{2}, \frac{7}{2}\right)$

D. (4,−2)

E. (8,−4)

18. What value of x satisfies the equation $\frac{x^2+2x}{x+2} = 2$?

F. −4
G. −3
H. −2
J. 1
K. 2

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DO YOUR FIGURING HERE.

Use the following information to answer questions 19–21.

A large theater complex surveyed 5,000 adults. The results of the survey are shown in the tables below.

Age groups	Number
21–30	2,750
31–40	1,225
41–50	625
51 or older	400

Moviegoer category	Number
Very often	830
Often	1,650
Sometimes	2,320
Rarely	200

Tickets are $9.50 for all regular showings and $7.00 for matinees.

19. Based on the survey results, what was the average number of moviegoers for each of the 4 categories?

A. 610
B. 1,060
C. 1,240
D. 1,250
E. 1,985

20. Suppose all the adults surveyed happened to attend 1 movie each in one particular week. The total amount spent on tickets by those surveyed in that week was $44,000.00. How many adults attended matinees that week?

F. 500
G. 1,400
H. 2,500
J. 3,600
K. 4,500

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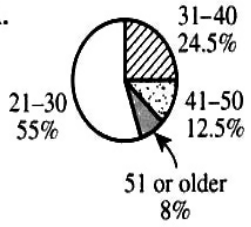
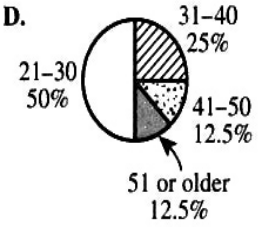
DO YOUR FIGURING HERE.

21. One of the following circle graphs represents the proportion by age group of the adults surveyed. Which one?

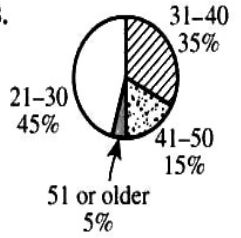
A.



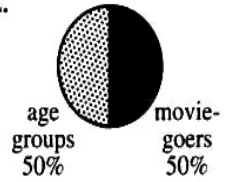
D.



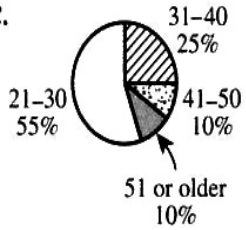
B.



E.



C.



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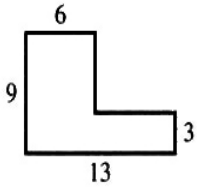
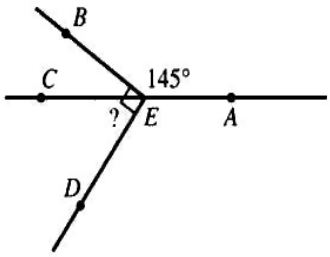
22. In the figure shown below, all angles are right angles, and the side lengths given are in centimeters. What is the area, in square centimeters, of the figure?

F. 42
G. 75
H. 93
J. 99
K. 117



23. In the figure below, E is on $\overline{CA}$, and the measures of $\angle BED$ and $\angle AEB$ are 90° and 145°, respectively. If it can be determined, what is the measure of $\angle CED$?



A. 35°
B. 45°
C. 55°
D. 80°
E. Cannot be determined from the given information

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DO YOUR FIGURING HERE.

24. In the standard (x,y) coordinate plane, the graph of the function $y = 5\sin(x) - 7$ undergoes a single translation such that the equation of its image is $y = 5\sin(x) - 14$. Which of the following describes this translation?

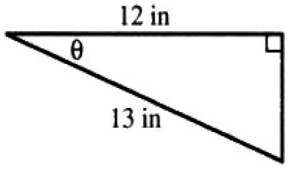
F. Up 7 coordinate units
G. Down 7 coordinate units
H. Left 7 coordinate units
J. Right 7 coordinate units
K. Right 14 coordinate units

25. What is the value of $\left(9^{\frac{1}{2}} + 16^{\frac{1}{2}}\right)^2$?

A. 7
B. 25
C. 49
D. 337
E. 625

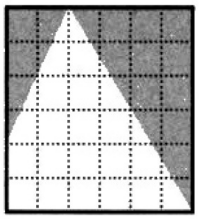
26. A right triangle is shown in the figure below. What is the value of $\sin\theta$?

F. $\frac{5}{13}$
G. $\frac{5}{12}$
H. $\frac{12}{13}$
J. $\frac{13}{12}$
K. $\frac{13}{5}$



27. A 6-inch-by-6-inch square grid shown below is divided into 36 squares, each with a side length of 1 inch. Each vertex of the 2 shaded triangles lies at an intersection of 2 grid lines. What fractional part of the 6-inch-by-6-inch square is shaded?

A. $\frac{2}{3}$
B. $\frac{4}{5}$
C. $\frac{4}{9}$
D. $\frac{5}{9}$
E. $\frac{8}{9}$



28. All the values in the equation below are exact. What value of c makes the equation true?

$$(4.25 \times 10^{2c+4})(6 \times 10^{7}) = 255$$

F. −7
G. −6.5
H. −5
J. −4.5
K. −4

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DO YOUR FIGURING HERE.

29. Which of the following inequalities is true for all positive integers m ?

A. $m \leq \frac{1}{m}$

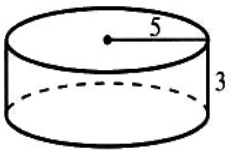
B. $m \leq \sqrt{m}$

C. $m \geq m^2$

D. $m \leq m + 1$

E. $m \geq \sqrt{m+1}$

30. A formula for the volume, V, of a right circular cylinder is $V = \pi r^2 h$, where r is the radius and h is the height. The cylindrical tank shown below has radius 5 meters and height 3 meters and is filled with water.

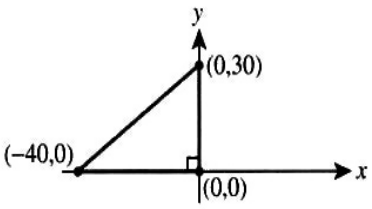


Given that the weight of 1 cubic meter of water is approximately 2,205 pounds, the weight, in pounds, of the water in the tank is:

F. less than 200,000.
G. between 200,000 and 300,000.
H. between 300,000 and 500,000.
J. between 500,000 and 1,000,000.
K. more than 1,000,000.

31. Graphed in the standard (x,y) coordinate plane below is a right triangle with vertices (0,0), (−40,0), and (0,30). What is the length, in coordinate units, of the hypotenuse of the triangle?

A. 30
B. 35
C. 40
D. 50
E. 70



32. Every graph in one of the following categories has a vertical line of symmetry regardless of how it is oriented in the standard (x,y) coordinate plane. Which one?

F. Circles
G. Squares
H. Ellipses
J. Triangles
K. Rectangles

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33. In the standard (x,y) coordinate plane, the graph of $y = 30(x + 17)^2 - 42$ is a parabola. What are the coordinates of the vertex of the parabola?

A. (−30,−42)
B. (−17,−42)
C. (17,−42)
D. (17, 42)
E. (30, 42)

34. One side of square *ABCD* has a length of 15 meters. A certain rectangle whose area is equal to the area of *ABCD* has a width of 10 meters. What is the length, in meters, of the rectangle?

F. 15
G. 20
H. 22.5
J. 25
K. 37.5

35. The average weight of 10 boys is 77.0 pounds. If the youngest boy is excluded, the average weight of the 9 remaining boys is 78.0 pounds. What is the weight, in pounds, of the youngest boy?

A. 62
B. 68
C. 70
D. 78
E. 87

36. The total amount of a certain substance present in a laboratory experiment is given by the formula $A = A_0\left(2^{\frac{h}{5}}\right)$, where A is the total amount of the substance h hours after an initial amount (A_0) of the substance began accumulating. Which of the following expressions gives the number of hours it will take an initial amount of 10 grams of this substance to accumulate to 100 grams?

F. 5
G. 25
H. $\log_2(50)$
J. $5 \log_2(10)$
K. $5 \log_{20}(100)$

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37. For all values of x greater than 3, which of the following expressions is equivalent to $\frac{x^2-x-6}{x^2-9}$?

A. $\frac{-x-6}{-9}$

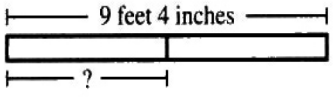
B. $\frac{x-2}{x-3}$

C. $\frac{x-2}{x+3}$

D. $\frac{x+2}{x-3}$

E. $\frac{x+2}{x+3}$

38. Shown below, a board 9 feet 4 inches long is cut into 2 equal parts. What is the length, to the nearest inch, of each part?



F. 4 feet 5 inches
G. 4 feet 7 inches
H. 4 feet 8 inches
J. 5 feet 4 inches
K. 5 feet 5 inches

39. If the positive integers x and y are relatively prime (their greatest common factor is 1) and $\frac{1}{2}+\frac{1}{3}\cdot\frac{1}{4}\div\frac{1}{5}=\frac{x}{y}$, then $x+y=$?

A. 23
B. 25
C. 49
D. 91
E. 132

40. What is the 358th digit after the decimal point in the repeating decimal $0.\overline{3178}$?

F. 0
G. 3
H. 1
J. 7
K. 8

41. To promote a new brand of shoes, a shoe store will run a promotion using a jar containing 3 red balls marked "10% off," 2 white balls marked "30% off," and 1 green ball marked "60% off." Each customer will randomly select 1 ball from the jar to determine the discount that the customer will receive on any single pair of the new brand of shoes. Given that the new brand of shoes regularly costs \$60 per pair, what is the average discount amount, in dollars, that the store can expect to give each customer due to this promotion?

A. \$ 6
B. \$10
C. \$15
D. \$20
E. \$25

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Use the following information to answer questions 42–44.

A 500-square-mile national park in Kenya has large and small protected animals. The number of *large* protected animals at the beginning of 2014 is given in the table below.

Large animal	Number
Elephant	600
Rhinoceros	100
Lion	200
Leopard	300
Zebra	400
Giraffe	800
Total	2,400

At the beginning of 2014, the number of *all* protected animals in the park was 10,000. Zoologists predict that for each year from 2015 to 2019, the total number of protected animals in the park at the beginning of the year will be 2% more than the number of protected animals in the park at the beginning of the previous year.

42. At the beginning of 2014, the number of lions in the park was p percent of the total number of *large* animals. Which of the following is closest to the value of p?

F. 2
G. 8
H. 9
J. 11
K. 12

43. In this park, the average number of gallons of water consumed per day by each elephant, lion, and giraffe is 50, 5, and 10, respectively. Which of the following matrix products yields the average total number of gallons of water consumed per day by all the elephants, lions, and giraffes in the park?

A. $[600\ 200\ 800]\begin{bmatrix}50\\5\\10\end{bmatrix}$

B. $[600\ 800\ 200]\begin{bmatrix}50\\5\\10\end{bmatrix}$

C. $\begin{bmatrix}600\\200\\800\end{bmatrix}[50\ 5\ 10]$

D. $\begin{bmatrix}600\\800\\200\end{bmatrix}[50\ 5\ 10]$

E. $\begin{bmatrix}600\\800\\200\end{bmatrix}\begin{bmatrix}50\\5\\10\end{bmatrix}$

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44. Let t be a positive integer less than 6. Based on the zoologists' prediction, which of the following expressions represents the number of protected animals in the park t years after the beginning of 2014 ?

F. $10{,}000 + 0.02t$
G. $10{,}000 + 0.2t$
H. $10{,}000(1 + 0.02^t)$
J. $10{,}000(1 + 0.02)^t$
K. $10{,}000(1 + 0.2)^t$

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45. Anela and Jacob plan to attend a concert in Brady. Anela will drive 375 km to Brady at a constant speed of 75 km/hr, stopping one time for a 30-minute break. Jacob will start 600 km from Brady and will drive at a constant speed of 90 km/hr for 2 hours. He will take a 1-hour break and then drive to Brady at a constant speed of 70 km/hr. To the nearest 0.1 hour, Jacob must leave how much earlier than Anela in order for them to arrive in Brady at the same time?

A. 2.2
B. 2.5
C. 3.1
D. 3.5
E. 4.0

46. Which of the following is equal to $\frac{3x+5}{2x} - \frac{7x-3}{2x}$, for all $x \neq 0$?

F. $-4x + 8$
G. $-4x + 2$
H. $-2x + 1$
J. $\frac{-2x+4}{x}$
K. 2

47. A rectangular stage is 90 feet long and 30 feet wide. What is the area, in square *yards*, of this stage?

A. $30\sqrt{3}$
B. 300
C. 675
D. 900
E. 2,700

NOTES

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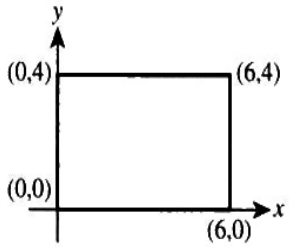
48. A rectangle, with its vertex coordinates labeled, is graphed in the standard (x,y) coordinate plane below. A *lattice point* is a point with coordinates that are both integers. A lattice point inside but NOT on the rectangle will be chosen at random. What is the probability that the sum of the x-coordinate and the y-coordinate of the chosen lattice point will be odd?



F. $\frac{1}{5}$

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

H. $\frac{7}{15}$

J. $\frac{17}{35}$

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

49. The nth term of an arithmetic progression is given by the formula $a_n = a_1 + (n-1)d$, where d is the common difference and a_1 is the first term. If the third term of an arithmetic progression is $\frac{5}{2}$ and the sixth term is $\frac{1}{4}$, what is the seventh term?

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

B. 0

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

D. $\frac{3}{4}$

E. 1

50. The probability of Jamie being chosen to bat first in the lineup for his baseball team is $\frac{1}{9}$. What are the odds in favor of Jamie being chosen to bat first?

(Note: The *odds* in favor of an event are defined as the ratio of the probability that the event will happen to the probability that the event will NOT happen.)

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

G. $\frac{1}{9}$

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

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

K. $\frac{9}{1}$

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51. A 120-liter solution that is 5% salt is mixed with an 80-liter solution that is 15% salt. The combined solution is what percent salt?

A. 8%
B. 9%
C. 10%
D. 11%
E. 12%

52. A 50-foot-long rectangular swimming pool with vertical sides is 3 feet deep at the shallow end and 10 feet deep at the deep end. The bottom of the pool slopes downward at a constant angle from horizontal along the length of the pool. Which of the following expressions gives this constant angle?

(Note: For $-\frac{\pi}{2} < x < \frac{\pi}{2}$, $y = \tan x$ if and only if $x = \tan^{-1} y$.)

F. $\tan^{-1}\left(\frac{7}{50}\right)$

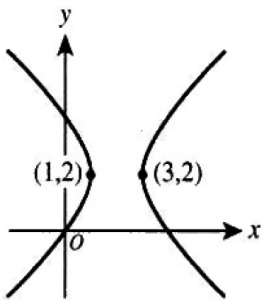
G. $\tan^{-1}\left(\frac{13}{50}\right)$

H. $\tan^{-1}\left(\frac{7}{10}\right)$

J. $\tan^{-1}\left(\frac{50}{13}\right)$

K. $\tan^{-1}\left(\frac{50}{7}\right)$

53. A hyperbola that has vertices (1,2) and (3,2) and that passes through the origin is shown below in the standard (x,y) coordinate plane. The hyperbola has which of the following equations?



A. $\frac{(x-2)^2}{1} - \frac{3(y-2)^2}{4} = 1$

B. $\frac{(x-2)^2}{1} - \frac{4(y-2)^2}{3} = 1$

C. $\frac{(x+2)^2}{1} - \frac{3(y+2)^2}{4} = 1$

D. $\frac{(x-2)^2}{1} + \frac{3(y-2)^2}{4} = 1$

E. $\frac{(x+2)^2}{1} + \frac{4(y+2)^2}{3} = 1$

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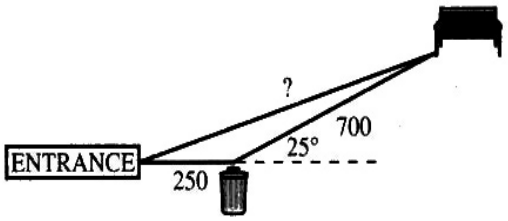
54. As shown below, Alli walked her dog 250 feet due east from the entrance of a dog park to a trash can and then walked 700 feet in a straight line 25° north of east to a bench. Which of the following expressions is equal to the distance, in feet, between the entrance and the bench?



F. $\frac{950}{\cos 25°}$

G. $\frac{250}{\cos 25°} + 700$

H. $\frac{250}{\sin 155°} + 700$

J. $\sqrt{700^2 + 250^2 - 2(700)(250)\cos 25°}$

K. $\sqrt{700^2 + 250^2 - 2(700)(250)\cos 155°}$

55. For real numbers a, b, and c such that $a > b > c$ and $b > 0$, which of the statements below is(are) *always* true?

I. $|a| > |b|$
II. $|a| > |c|$
III. $|b| > |c|$

A. I only
B. II only
C. I and II only
D. II and III only
E. I, II, and III

56. Kenji and Mary are members of a school committee that will be meeting this afternoon. The 6 members of the committee will be seated randomly around a circular table. What is the probability that Kenji and Mary will NOT sit next to each other at the meeting?

F. $\frac{1}{5}$

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

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

J. $\frac{3}{5}$

K. $\frac{4}{5}$

57. The digit in the ones place of 2^{88} is 6. What is the digit in the ones place of 2^{90}?

A. 0
B. 2
C. 4
D. 6
E. 8

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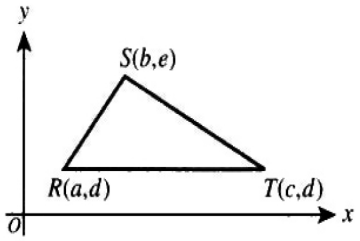
58. Which of the following expressions represents the area, in square coordinate units, of $\triangle RST$ shown in the standard (x,y) coordinate plane below?



F. $\frac{1}{2}(c-a)(e-d)$

G. $\frac{1}{2}c(e-b)$

H. $\frac{1}{2}e(c-a)$

J. $\frac{1}{2}\left[(e-d)^2+(b-a)^2\right]\left[(e-d)^2+(b-c)^2\right]$

K. $\frac{1}{2}\left(\sqrt{(e-d)^2+(b-a)^2}\right)\left(\sqrt{(e-d)^2+(b-c)^2}\right)$

59. In the complex numbers, where $i^2=-1$, what complex number x is a solution to the equation $x(2+3i)=1$?

A. $\frac{2}{13}-\frac{3}{13}i$

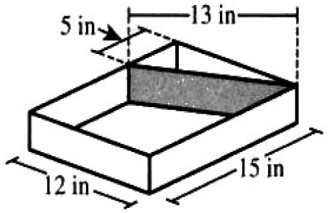
B. $\frac{2}{5}+\frac{3}{5}i$

C. 1

D. -1

E. $-\frac{i}{13}$

60. The rectangular container shown below has a small compartment for water created by a rectangular dividing wall of negligible width. One face of the dividing wall, shown shaded, has an area of 39 square inches. What is the volume, in cubic inches, of the larger compartment?



F. 180
G. 195
H. 390
J. 450
K. 540

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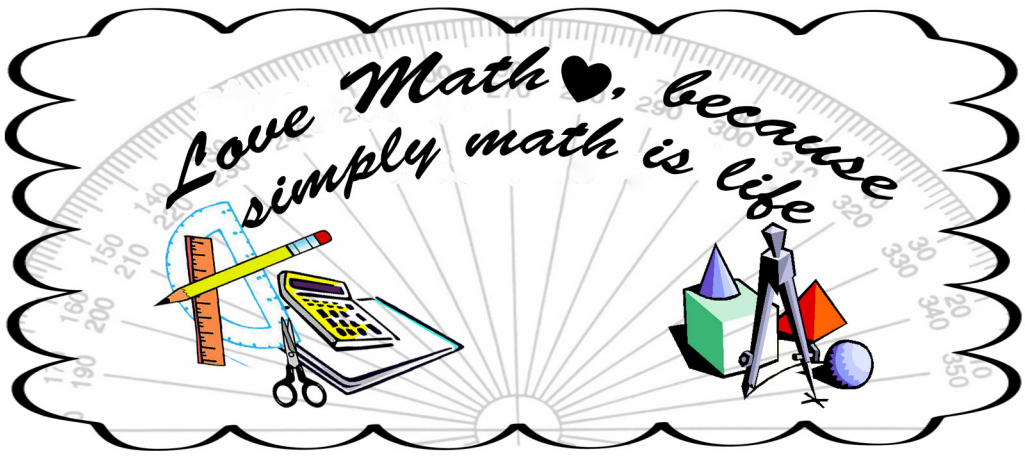

ACT

Test 2

MOHAMED EISSA
MATHEMATICAL

Mr. Mohamed Eissa

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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.

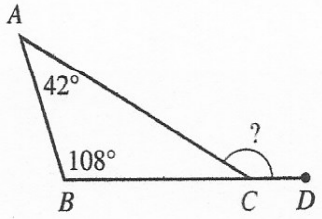
1. A calculator has a regular price of $59.95 before taxes. It goes on sale at 20% below the regular price. Before taxes are added, what is the sale price of the calculator?

   A. $11.99
   B. $29.98
   C. $39.95
   D. $47.96
   E. $54.95

2. Given $r = 6$, $b = 4$, and $g = -9$, $(r + b - g)(b + g) = ?$

   F. −95
   G. −5
   H. 5
   J. 13
   K. 14

3. In the figure below, C is on $\overline{BD}$, $\angle BAC$ measures 42°, and $\angle ABC$ measures 108°. What is the measure of $\angle ACD$?



   A. 108°
   B. 120°
   C. 132°
   D. 138°
   E. 150°

4. If $\frac{3}{5}x + 10 = 17$, then $x = ?$

   F. $-\frac{35}{3}$
   G. $\frac{5}{3}$
   H. $\frac{35}{3}$
   J. $\frac{21}{5}$
   K. 45

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5. What is the length, in inches, of the hypotenuse of a right triangle with a leg that is 9 inches long and a leg that is 2 inches long?

A. $\sqrt{22}$
B. $\sqrt{77}$
C. $\sqrt{85}$
D. 5.5
E. 11

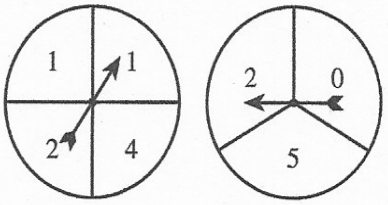
6. A bag contains exactly 18 solid-colored buttons: 3 red, 5 blue, and 10 white. What is the probability of randomly selecting 1 button that is NOT white?

F. $\frac{1}{18}$
G. $\frac{1}{8}$
H. $\frac{4}{9}$
J. $\frac{2}{3}$
K. $\frac{4}{5}$

7. What is the sum of 3 consecutive odd integers whose mean is 27 ?

A. 39
B. 75
C. 81
D. 87
E. 93

8. Two dials are shown below. When the arrow on each dial is spun, it is equally likely to point at any of the numbered sectors on its dial after it has stopped spinning. After the arrows are next spun, the numbers in the sectors the arrows point at after they stop spinning will be added together. Which of the following values is NOT a possible sum of those 2 numbers?



F. 1
G. 4
H. 6
J. 7
K. 8

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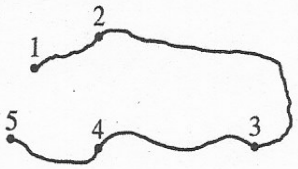
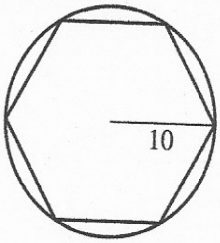
9. On a bike trail there are 5 checkpoints numbered in order, Checkpoint 1 through Checkpoint 5, as shown in the figure below. Some distances along the trail between 2 checkpoints are given: 6.6 miles between 1 and 3; 4.5 miles between 2 and 3; and 9.7 miles between 2 and 5. Which of the following values is closest to the distance, in miles, along the trail between Checkpoint 1 and Checkpoint 5 ?

A. 11.1
B. 11.8
C. 14.2
D. 16.3
E. 20.8



10. In the figure below, a circle with a radius of 10 meters circumscribes a regular hexagon. What is the perimeter, in meters, of the hexagon?

F. 30
G. $30\sqrt{3}$
H. 60
J. $60\sqrt{2}$
K. $60\sqrt{3}$



11. To produce aluminum softball bats, it costs the Recreation Equipment Supply Company $3,500 for overhead, plus $2 per softball bat produced. What is the maximum number of bats that can be produced by the company for $15,000 ?

A. 1,750
B. 3,502
C. 5,000
D. 5,750
E. 7,500

12. Given that $3x + 2 = 4$ and $2y + 6 = 5$, what is $x + y$?

F. $-\frac{1}{2}$
G. $\frac{1}{6}$
H. $\frac{2}{3}$
J. $\frac{7}{6}$
K. $\frac{15}{2}$

13. For all x such that $x \neq 0$, which of the following expressions is equivalent to $\frac{15x^2 + 25x}{5x}$?

A. $8x$
B. $28x$
C. $3x + 5$
D. $3x^2 + 5$
E. $15x^2 + 5$

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14. What is the value of the expression $\frac{|-3-2|^2+(-1)^3}{16\div 4\times 2-5}$?

DO YOUR FIGURING HERE.

F. -8

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

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

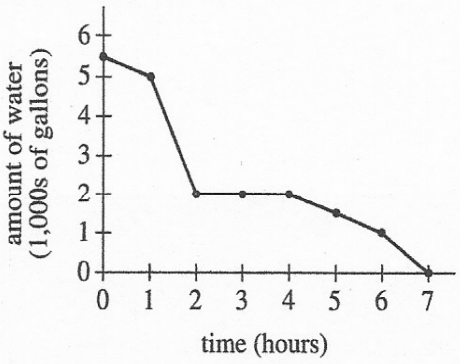
J. $\frac{26}{3}$

K. 8

15. Karen invested \$2,000 in a special savings account. The balance of this special savings account will double every 5 years. Assuming that Karen makes no other deposits and no withdrawals, what will be the balance of Karen's investment at the end of 40 years?

A. \$ 80,000
B. \$ 256,000
C. \$ 400,000
D. \$ 512,000
E. \$1,024,000

16. The graph below shows the amount of water in a pond over a period of 7 hours. One of the following values is the number of hours the amount of water in the pond remained constant. Which one?



F. 2
G. 3
H. 3.5
J. 4
K. 7

17. If it rains in Franklin City on a particular day, the probability that it will rain there the following day is 0.70. If it does not rain in Franklin City on a particular day, the probability that it will rain there the following day is 0.10. Given that it rained in Franklin City on Monday, what is the probability that it will NOT rain in Franklin City on Tuesday of the same week?

A. 0.10
B. 0.30
C. 0.60
D. 0.70
E. 0.90

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18. In the standard (x,y) coordinate plane, what is the slope of the line given by the equation $5x = 9y + 18$?

F. $-\frac{5}{9}$

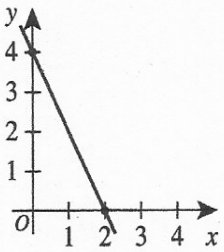
G. $\frac{5}{9}$

H. $\frac{9}{5}$

J. 5

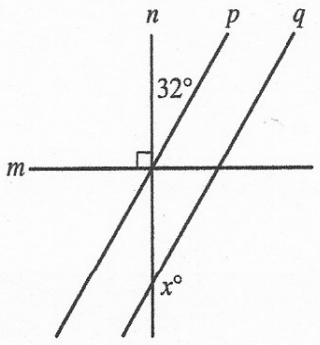
K. 9

19. One of the following equations represents the line graphed in the standard (x,y) coordinate plane below. Which one?



A. $y = -2x + 2$
B. $y = -2x + 4$
C. $y = 2x + 4$
D. $y = 4x - 2$
E. $y = 4x + 2$

20. In the figure below, line m is perpendicular to line n, and line p is parallel to line q. Lines m, n, and p intersect at a single point. Some angle measures are given. What is the value of x ?



F. 32
G. 58
H. 122
J. 148
K. 158

21. A bag contains 10 solid-colored marbles of the same size: 3 red, 2 green, 1 yellow, and 4 blue. Which of the following expressions gives the probability of drawing, at random and without replacement, a blue marble on the 1st draw, a green marble on the 2nd draw, and a blue marble on the 3rd draw?

A. $\left(\frac{4}{10}\right)\left(\frac{2}{10}\right)\left(\frac{3}{10}\right)$

B. $\left(\frac{4}{10}\right)\left(\frac{2}{10}\right)\left(\frac{4}{10}\right)$

C. $\left(\frac{4}{10}\right)\left(\frac{2}{9}\right)\left(\frac{4}{8}\right)$

D. $\left(\frac{4}{10}\right)\left(\frac{2}{9}\right)\left(\frac{3}{8}\right)$

E. $\left(\frac{4}{10}\right)\left(\frac{3}{9}\right)\left(\frac{3}{8}\right)$

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22. A physical education teacher recorded the distances, in inches, that her students jumped during a long jump lesson. The distances of 1 jump by each of the students are represented in the stem-and-leaf plot below.

Stem	Leaf
3	7 8
4	3 5 6 7
5	2 4 5 8 9
6	0 1 2 3 6
7	0 1 2

Key: 5 | 2 = 52 inches

What is the probability that a student chosen at random from the class will have jumped *at least* 60 inches?

F. $\frac{5}{24}$

G. $\frac{8}{24}$

H. $\frac{5}{19}$

J. $\frac{7}{19}$

K. $\frac{8}{19}$

23. Given that the function f defined as $f(x) = 5 - 3x$ has domain $\{-1, 0, 2\}$, what is the range of f?

A. $\{-2, 0, 4\}$

B. $\{-1, 2, 8\}$

C. $\{-1, 5, 8\}$

D. $\{2, 5, 8\}$

E. $\{2, 5, 11\}$

24. To the nearest 1 foot, what is the height of a rectangular prism with a base length of 15 feet, a base width of $1\frac{1}{3}$ feet, and a volume of 100 cubic feet?

F. 5
G. 7
H. 9
J. 20
K. 75

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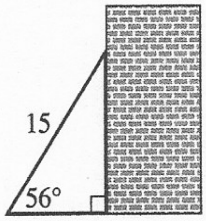
25. Tables of values for the 2 functions f and g are shown below. What is the value of $g(f(5))$?

x	$f(x)$
−7	9
−3	−7
1	5
5	3

x	$g(x)$
−3	5
1	−1
3	−5
5	−7

A. −21
B. −7
C. −5
D. 3
E. 9

26. In the figure shown below, a ladder 15 feet long forms an angle of 56° with the level ground as it leans against the vertical side of a building. The distance along the building, in feet, between the ground and the top of the ladder is equal to which of the following expressions?



F. $\frac{15}{2}$

G. $\frac{15\sqrt{3}}{2}$

H. 15 sin 56°

J. 15 cos 56°

K. 15 tan 56°

27. The isotope iodine-131 has a half-life of 8 days, which means that the amount of iodine-131 remaining after t days is $N\left(\frac{1}{2}\right)^{\frac{t}{8}}$, where N is the number of grams of iodine-131 at $t = 0$. How many grams of iodine-131 will remain after 16 days if there were 32 grams of iodine-131 at $t = 0$?

A. 0
B. 2
C. 8
D. 16
E. 128

28. Which of the following expressions is equivalent to $\sqrt[4]{256x^{16}}$?

F. $4x^4$
G. $4x^{12}$
H. $16x^4$
J. $64x^{12}$
K. $128x^8$

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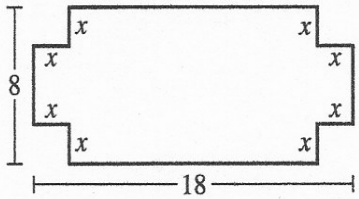
29. Two concentric circles have radii of 5 centimeters and 6 centimeters, respectively. How many centimeters longer is the circumference of the larger circle than that of the smaller circle?

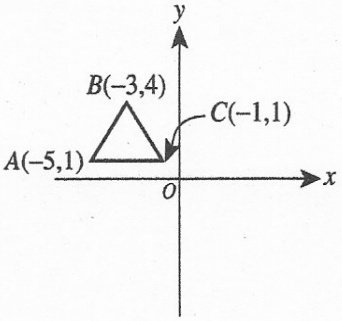
A. 1
B. π
C. 2π
D. 11π
E. 22π

30. Squares with sides of length x cm have been removed from each corner of a rectangle measuring 8 cm by 18 cm, resulting in the figure shown below. In terms of x, what is the area, in square centimeters, of the figure?



F. $52 - 4x^2$
G. $144 - 4x^2$
H. $144 + 4x^2$
J. $144 - 8x$
K. $144 - 52x + 4x^2$

31. In the standard (x,y) coordinate plane below, $\triangle ABC$ will be translated 10 units down and then the resulting image will be reflected over the y-axis. What will be the coordinates of the final image of A resulting from both transformations?



A. (−5, 9)
B. (−1, 9)
C. (1, −9)
D. (5,−10)
E. (5, −9)

32. Olivia, Ashton, and Jane are standing on a soccer field such that Olivia is 20 meters due west of Ashton and Jane is 40 meters due north of Ashton. Their positions are at the vertices of a triangle. Which of the following expressions gives the degree measure of the angle of the triangle at the vertex where Olivia is standing?

F. $\cos^{-1}\left(\frac{40}{20}\right)$
G. $\sin^{-1}\left(\frac{40}{20}\right)$
H. $\sin^{-1}\left(\frac{20}{40}\right)$
J. $\tan^{-1}\left(\frac{40}{20}\right)$
K. $\tan^{-1}\left(\frac{20}{40}\right)$

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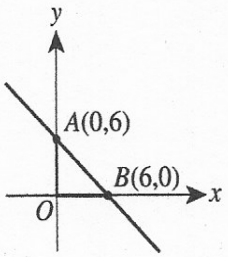
DO YOUR FIGURING HERE.

Use the following information to answer questions 33–35.

In the standard (x,y) coordinate plane below, $\triangle AOB$ is formed by $\overleftrightarrow{AB}$, the x-axis, and the y-axis.



33. What is the area of $\triangle AOB$ in square coordinate units?

A. 6
B. $6\sqrt{2}$
C. 12
D. 18
E. 36

34. What is the length of $\overline{AB}$ in coordinate units?

F. $2\sqrt{6}$
G. $6\sqrt{2}$
H. $6\sqrt{3}$
J. 6
K. 12

35. Which of the following is an equation of $\overleftrightarrow{AB}$?

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

---

36. Which of the following arranges the numbers $\frac{9}{5}$, $1.\overline{8}$, 1.08, and $1.\overline{08}$ into ascending order? (Note: The overbar notation shows that the digits under the bar will repeat. For example, $1.\overline{73} = 1.737373\ldots$)

F. $\frac{9}{5} < 1.\overline{08} < 1.08 < 1.\overline{8}$
G. $\frac{9}{5} < 1.08 < 1.\overline{08} < 1.\overline{8}$
H. $1.\overline{08} < 1.08 < \frac{9}{5} < 1.\overline{8}$
J. $1.08 < 1.\overline{08} < 1.\overline{8} < \frac{9}{5}$
K. $1.08 < 1.\overline{08} < \frac{9}{5} < 1.\overline{8}$

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37. Andre's Floral Shop asked each of 20 customers to give a rating of the shop's service. The table below summarizes the 20 customer ratings.

Rating	Number of customers
3	6
2	8
1	2
0	4

Which of the following values is closest to the mean of the 20 customer ratings?

A. 1.8
B. 2.0
C. 2.3
D. 2.7
E. 3.3

38. Which of the following operations will produce the largest result when substituted for the blank in the expression $14 \_\_\_\_ \left(-\frac{1}{40}\right)$?

F. Plus
G. Minus
H. Divided by
J. Multiplied by
K. Averaged with

39. A local bowling league established its handicap for bowlers who have an average of 200 or less as 75% of the difference between 200 and the bowler's average score. If H represents the handicap of such a bowler and A represents his or her average score, which of the following equations gives H in terms of A ?

A. $H = 150 - A$

B. $H = A - 150$

C. $H = 200 - \frac{A}{0.75}$

D. $H = 200 - 0.75A$

E. $H = 0.75(200 - A)$

40. The equation $t = -0.0066a + 15$ models the noon temperature, t degrees Celsius, a meters above sea level, on a certain day on Laurel Mountain. According to this equation, what would be the noon temperature for that certain day on Laurel Mountain at sea level?

F. 0°C
G. 0.0066°C
H. 14.9934°C
J. 15°C
K. 15.0066°C

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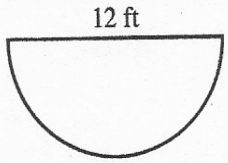
41. The semicircular top surface of Ron's patio is shown below. Which of the following values is closest to the area, in square feet, of the top surface of the patio?



A. 18
B. 36
C. 54
D. 108
E. 186

42. Which of the following equations is that of a circle that is in the standard (x,y) coordinate plane, has center $(1,-4)$, and has a radius of 5 coordinate units?

F. $(x-1)+(y+4)=5$
G. $(x+1)+(y-4)=5$
H. $(x-1)^2+(y+4)^2=\sqrt{5}$
J. $(x-1)^2+(y+4)^2=25$
K. $(x+1)^2+(y-4)^2=25$

43. What is the smallest positive integer having exactly 5 different positive integer divisors?

A. 5
B. 6
C. 12
D. 16
E. 18

44. If $49^a=7$ and $3^{a+b}=81$, then $b=?$

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

45. Florencia has 60 feet of fencing and a 4-foot-wide gate to use to enclose a dog pen. Among the following, a dog pen of which shape and dimensions will have the largest area if only the fencing and the gate are used to enclose it?

A. A square with a side length of 16 feet
B. A square with a side length of 17 feet
C. A rectangle with a length of 14 feet and a width of 16 feet
D. A rectangle with a length of 15 feet and a width of 17 feet
E. A rectangle with a length of 15 feet and a width of 18 feet

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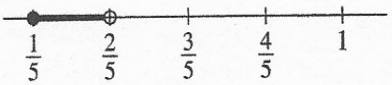
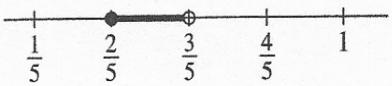
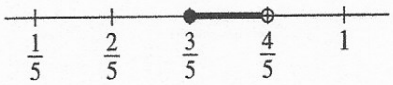
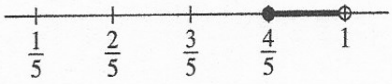
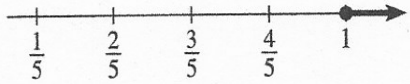
46. The difference $\frac{3}{5} - \frac{-1}{3}$ lies in which of the following intervals graphed on the real number line?

F.


G.


H.


J.


K.


47. The recursive formula for a sequence is given below, where a_n is the value of the nth term.

$$a_1 = 10$$
$$a_n = a_{n-1} + 5$$

Which of the following equations is an explicit formula for this sequence?

A. $a_n = -5n + 10$
B. $a_n = 5n + 5$
C. $a_n = 5n + 10$
D. $a_n = 10n - 5$
E. $a_n = 10n + 5$

48. The probabilities that each of 2 independent events will occur are given in the table below.

Event	Probability
A	0.20
B	0.40

What is the probability that both Events A and B will occur—that is, P(A and B) ?

F. 0.08
G. 0.20
H. 0.30
J. 0.50
K. 0.60

49. What is the solution set of the equation $x^4 + 21x^2 - 100 = 0$?

A. $\{-25, 4\}$
B. $\{-25, -2, 2\}$
C. $\{-5, -4, 5\}$
D. $\{-5, 5, -2i, 2i\}$
E. $\{-2, 2, -5i, 5i\}$

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Use the following information to answer questions 50–52.

Skyline Tours is offering hot-air-balloon tours. The tables below give information about the balloon, the equipment, and the tours offered.

Hot-air-balloon information	
Volume of balloon	80,000 cubic feet
Maximum capacity of basket	8 people
Weight of balloon	200 pounds
Weight of basket	150 pounds
Weight of burner	50 pounds

Tour information			
Tour	Ticket price	Duration, in minutes	Maximum altitude, in feet
A	$100	45	500
B	$125	60	600
C	$200	90	1,000

50. Jarrod is looking up at a hot-air balloon. The balloon is currently at the maximum altitude during Tour C. The angle of elevation from the horizon is 37°, as shown in the figure below. Which of the following expressions is closest to the distance, d feet, from Jarrod to the basket?

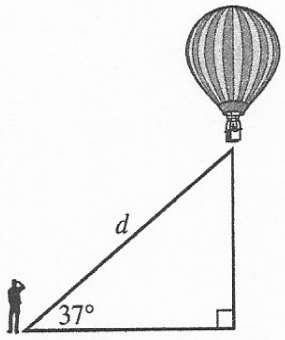
F. $\frac{1{,}000}{\sin 37°}$

G. $\frac{1{,}000}{\cos 37°}$

H. $1{,}000 \sin 37°$

J. $1{,}000 \cos 37°$

K. $1{,}000 \tan 37°$



51. Skyline Tours made $5,000 in 1 day by selling a total of 30 tickets for Tours A, B, and C. They sold twice as many tickets for Tour B as for Tour A. How many tickets were sold for Tour C ?

A. 4
B. 8
C. 12
D. 16
E. 18

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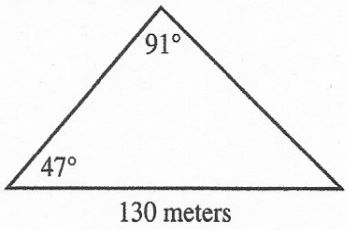
52. Jarrod went on Tour A, and his trip covered a distance of 6 miles. Bhumi went on Tour C, and her trip covered a distance of 9 miles. Which of the following values is the difference, in miles per hour, of the average speeds of their balloons during their tours?

F. 0
G. 2
H. 3
J. 8
K. 9

---

53. A forest fire is contained within a triangular region, which is shown below. The supervising firefighter plans to fight the fire by positioning a firefighter about every 4 meters along the perimeter of the triangle. Among the following, which expression best estimates the planned number of firefighters along the perimeter?

(Note: The law of sines states that in every triangle, the 3 ratios of length of a side to the sine of the angle opposite that side are equal.)



A. $\dfrac{130 + \left(\dfrac{130 \sin 42°}{\sin 91°}\right) + \left(\dfrac{130 \sin 47°}{\sin 91°}\right)}{4}$

B. $\dfrac{130 + \left(\dfrac{130 \sin 91°}{\sin 42°}\right) + \left(\dfrac{130 \sin 91°}{\sin 47°}\right)}{4}$

C. $130 + \dfrac{130 \sin 42°}{\sin 91°} + \dfrac{130 \sin 47°}{\sin 91°}$

D. $\dfrac{\frac{1}{2}\left(\dfrac{130 \sin 47°}{\sin 91°}\right)}{4}$

E. $\dfrac{\frac{1}{2}(130)}{4}$

54. How many integers between, but not including, 20 and 30 have a prime factorization with exactly 3 factors that are NOT necessarily unique?

(Note: 1 is NOT a prime number.)

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

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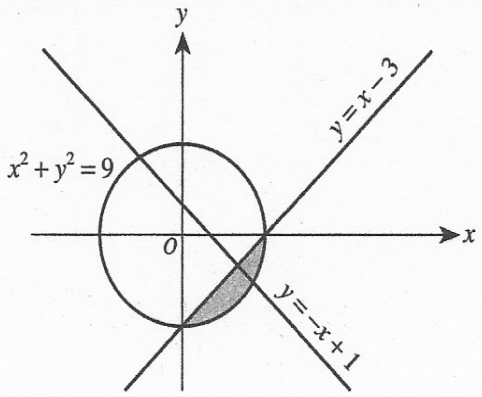
55. The graphs of $y = -x + 1$, $y = x - 3$, and $x^2 + y^2 = 9$ are shown in the standard (x,y) coordinate plane below. The shaded region is the solution set to one of the following systems of inequalities. Which system is it?



A. $y \leq x - 3$
$x^2 + y^2 \leq 9$

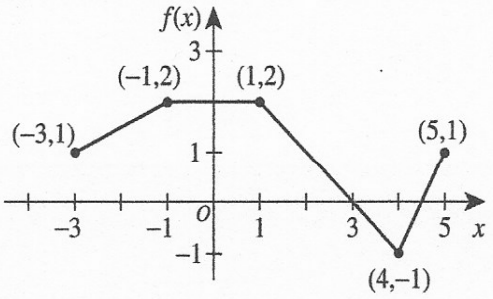
B. $y \leq x - 3$
$x^2 + y^2 \geq 9$

C. $y \leq -x + 1$
$x^2 + y^2 \leq 9$

D. $y \geq x - 3$
$x^2 + y^2 \leq 9$

E. $y \geq -x + 1$
$x^2 + y^2 \geq 9$

56. The function $f(x)$ is shown below with several points labeled. Another function, $g(x)$, is defined such that $g(x) = -[f(x) - 3]$. What is $g(4)$?



F. −4
G. −1
H. 1
J. 4
K. 7

57. The ratio of a to b is 6 to 1, and the ratio of b to c is 12 to 1. What is the value of $\frac{2a+3b}{4b+3c}$?

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

B. $\frac{5}{17}$

C. $\frac{16}{17}$

D. $\frac{60}{17}$

E. $\frac{48}{7}$

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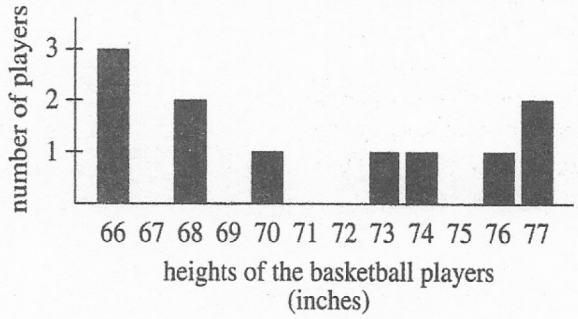
58. The frequency histogram below shows the distribution of the heights, in inches, of 11 basketball players.



Using the data from the frequency histogram, what is the sum of the mean and the median of this distribution?

F. 141
G. 142
H. 143
J. 144
K. 145

59. In the standard (x,y) coordinate plane, what is the y-intercept of the graph of the function $y = f(x)$ defined below?

$$f(x) = \begin{cases} x^2 - 1 & \text{for } x < -3 \\ 2x - 5 & \text{for } -3 \le x \le 2 \\ |x - 3| & \text{for } x > 2 \end{cases}$$

A. −5
B. −3
C. −1
D. 2.5
E. 3

60. What is the matrix product $\begin{bmatrix} 2 & 4 \\ 6 & 5 \end{bmatrix}\begin{bmatrix} a & b \\ c & d \end{bmatrix}$?

F. $\begin{bmatrix} 2a & 4b \\ 6c & 5d \end{bmatrix}$

G. $\begin{bmatrix} (2a+4b) \\ (6c+5d) \end{bmatrix}$

H. $[(2a+6c)\ (4b+5d)]$

J. $\begin{bmatrix} (2a+6b) & (4a+5b) \\ (2c+6d) & (4c+5d) \end{bmatrix}$

K. $\begin{bmatrix} (2a+4c) & (2b+4d) \\ (6a+5c) & (6b+5d) \end{bmatrix}$

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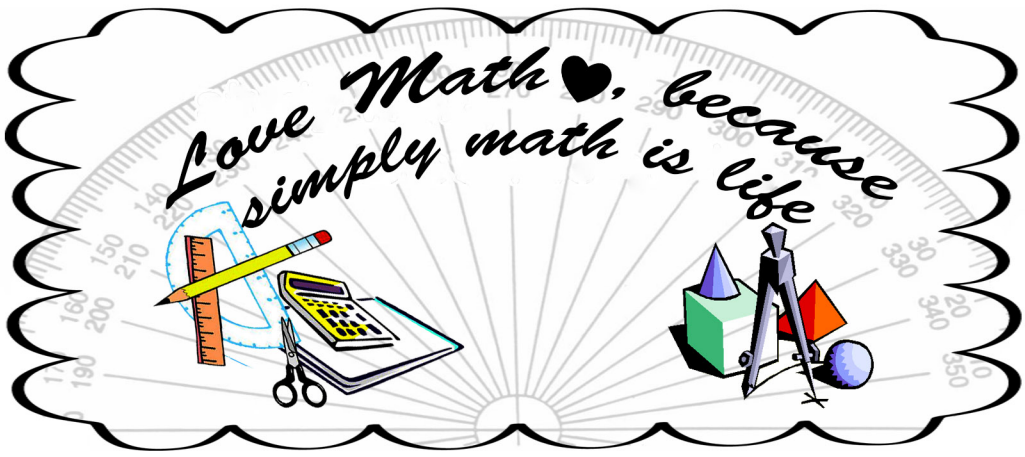

ACT

Test 3

MOHAMED EISSA
MATHEMATICAL

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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.

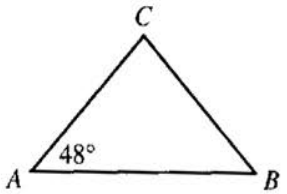
1. Given $r = 4$, $b = 2$, and $g = -5$, $(r + b - g)(b + g) = ?$

   A. -33
   B. -3
   C. 3
   D. 7
   E. 8

2. Jeralyn purchases 1 box of granola bars and 6 boxes of chocolate bars for a total price of \$22.00. The price of each box of granola bars is \$2.50, and the price of each box of chocolate bars is n dollars. Which of the following equations models Jeralyn's purchase?

   F. $2.50 + 22.00 = 6n$
   G. $2.50n + 22.00 = 6n$
   H. $2.50(6n) = 22.00$
   J. $2.50 + 6n = 22.00$
   K. $2.50n + 6n = 22.00$

3. In $\triangle ABC$ shown below, $\overline{AC} \cong \overline{BC}$ and the measure of $\angle A$ is 48°. What is the measure of $\angle C$?



   A. 48°
   B. 84°
   C. 90°
   D. 96°
   E. 132°

4. A square has a perimeter of 20 feet. What is the area, in square feet, of the square?

   F. 5
   G. 10
   H. 25
   J. 40
   K. 80

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5. A bag contains exactly 21 solid-colored buttons: 3 red, 6 blue, and 12 white. What is the probability of randomly selecting 1 button that is NOT white?

   A. $\frac{1}{21}$
   B. $\frac{1}{9}$
   C. $\frac{3}{7}$
   D. $\frac{2}{3}$
   E. $\frac{3}{4}$

6. What is the value of $|-7| - |7 - 29|$?

   F. −29
   G. −15
   H. 15
   J. 29
   K. 43

7. A store's revenue is the amount of money received for goods sold. A store's cost is the amount of money the store pays for the goods plus all the store's operating costs like rent, utilities, wages, etc. A store's net profit is the difference between revenue and cost. During 1 month, a grocery store paid $30,000 for goods that were sold for $39,500. With operating costs as shown below, what was the store's net profit for that month?

Operating costs	Amount
Rent, utilities, and telephone	$2,500
Taxes and insurance	$ 370
Interest on business loan	$ 400
Grocer's own wages	$4,500
Wages for part-time help	$ 630
Miscellaneous	$ 400

   A. $ 700
   B. $ 800
   C. $ 900
   D. $1,000
   E. $1,100

8. When Jorge began a driving trip, his car's odometer read 42 miles. After Jorge drove for 3 hours, the odometer read 165 miles. Which of the following values is closest to Jorge's average driving speed, in miles per hour, during those 3 hours?

   F. 36
   G. 41
   H. 54
   J. 55
   K. 62

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9. Melinda and Jericho are painting a room in the city recreation center. They started with 5 gallons of paint. On the first day, Melinda used $\frac{3}{4}$ gallon of paint and Jericho used $2\frac{1}{2}$ gallons of paint. How many gallons of paint were left after the first day?

A. $1\frac{3}{4}$

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

C. $2\frac{3}{4}$

D. $3\frac{1}{4}$

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

10. What value of x makes the equation below true?

$$\frac{25^x}{5^2} = 5^4$$

F. 3
G. 6
H. 8
J. 25
K. 625

11. For functions $f(x) = 5 \cdot 2^x$ and $g(x) = 10x$, the value of $f(3) - g(3)$ is:

A. 0
B. 10
C. 70
D. 970
E. 1,030

12. Tanisha, a manager at a state park, counted the money in the cash register at the end of her shift, and then she deposited the money in the bank. When she went back to her office, she accidentally shredded the deposit slip. She remembered that there were only \$5 and \$10 bills. She also recalled that there were 27 bills totaling \$205. How many \$5 bills were in Tanisha's cash register at the end of her shift?

F. 13
G. 14
H. 16
J. 23
K. 32

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13. In the standard (x,y) coordinate plane, a line intersects the y-axis at $(0,2)$ and contains the point $(8,3)$. What is the slope of the line?

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

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

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

D. 2

E. 8

14. For an angle with measure α in a right triangle, $\sin \alpha = \frac{15}{17}$ and $\tan \alpha = \frac{15}{8}$. What is the value of $\cos \alpha$?

F. $\frac{17}{8}$

G. $\frac{8}{15}$

H. $\frac{8}{17}$

J. $\frac{8}{\sqrt{161}}$

K. $\frac{8}{\sqrt{514}}$

15. The expression $\frac{6\sqrt{28}}{3\sqrt{7}}$ is equal to:

A. 4

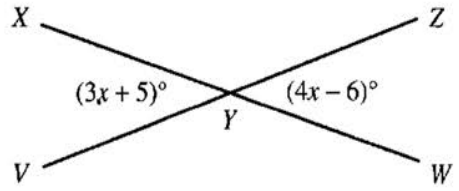
B. 6

C. 8

D. 12

E. $3\sqrt{21}$

16. In the figure below, $\overline{XW}$ intersects $\overline{VZ}$ at Y, the measure of $\angle XYV$ is $(3x + 5)°$, and the measure of $\angle ZYW$ is $(4x - 6)°$. What is the measure of $\angle XYZ$?



F. 83°
G. 97°
H. 104°
J. 142°
K. 169°

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17. The table below shows the letter grades 60 students earned on the final exam in American Literature. The highest possible grade is A; the lowest possible grade is F.

Final exam grade	Number of students
A	10
B	26
C	18
D	4
F	2

A student from this group will be chosen at random. What is the probability that the student's final exam grade is C or higher?

A. 0.3
B. 0.4
C. 0.6
D. 0.7
E. 0.9

18. For what value of n does the quadratic equation $x^2 - 2x + n = 0$ have solutions of $x = 4$ and $x = -2$?

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

19. The circumference of a circle is 12π inches. What is the area of the circle, in square inches?

A. 4π
B. 9π
C. 12π
D. 16π
E. 36π

20. The application for a license plate states that the license plate number has 3 letters followed by a 3-digit number, for example, AEE123. The letters O and I and the digit 0 cannot be part of the license plate number. Any of the other letters and digits may be used up to 3 times. Which of the following expressions represents how many different license plate numbers are possible?

F. 24(23)(22)(9)(8)(7)
G. 24(23)(22)(10)(10)(10)
H. 24(24)(24)(9)(9)(9)
J. 26(25)(24)(10)(9)(8)
K. 26(26)(26)(10)(10)(10)

21. Which of the following expressions is equivalent to $3(a + b) - 2(a - 5b)$?

A. $a - 9b$
B. $a - 7b$
C. $a - 4b$
D. $a + 8b$
E. $a + 13b$

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22. In the figure below, all of the small squares are equal in area, and the area of rectangle $ABCD$ is 1 square unit. Which of the following expressions represents the area, in square units, of the shaded region?

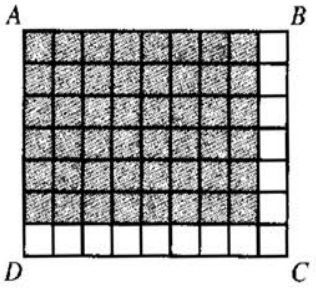
F. $\frac{1}{9} \cdot \frac{1}{7}$

G. $\frac{1}{9} \cdot \frac{6}{7}$

H. $\frac{1}{9} \cdot \frac{8}{9}$

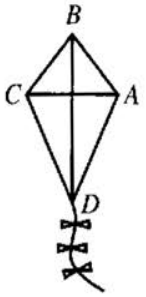
J. $\frac{8}{9} \cdot \frac{1}{7}$

K. $\frac{8}{9} \cdot \frac{6}{7}$



23. Marie is building a kite. In a drawing of her kite, shown below, $AB = BC$, $AD = DC$, the measure of $\angle ABC$ is 80°, and the measure of $\angle ADC$ is 50°. What is the measure of $\angle BAD$?

A. 50°
B. 65°
C. 90°
D. 115°
E. 130°



24. The triangles below are similar ($\triangle ABC \sim \triangle DEF$). Which of the following is an expression for the area of $\triangle ABC$, in square inches?

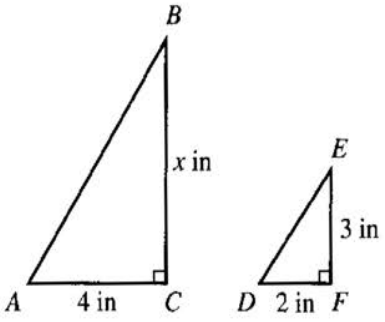
F. $\frac{1}{2}(2+4)(3+x)$

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

H. $\frac{1}{2}(2)(3)(2)$

J. $\frac{1}{2}\left(\frac{x}{3}\right)(2)$

K. $\frac{1}{2}(4)(6)$



25. The interior of a rectangular shipping crate has dimensions 2 ft by 3 ft by 6 ft. The crate will be filled with cube-shaped boxes whose exteriors have dimensions 12 in by 12 in by 12 in. Given that no box can extend beyond the dimensions of the crate's interior, what is the maximum number of boxes the crate can hold?

A. 3
B. 12
C. 36
D. 48
E. 72

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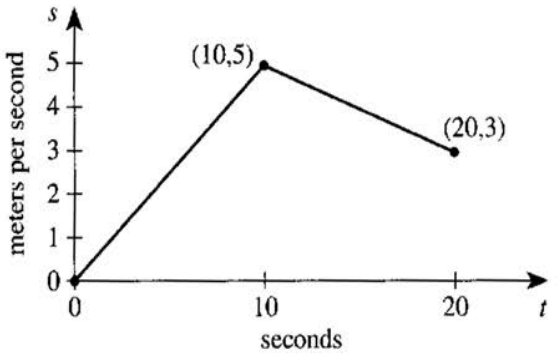
Use the following information to answer questions 26–29.

Shasta is participating in a bike ride for charity. The graph of speed (s) versus time (t) for the first 20 seconds of her bike ride is shown in the coordinate plane below. The graph is composed of 2 line segments for which the endpoints are at (0,0), (10,5), and (20,3). Shasta traveled 25 meters in the first 10 seconds.



Beginning at $t = 20$ seconds, Shasta slows down as she approaches a familiar group of riders ahead of her and then travels at a constant speed with the group after joining them.

26. What is Shasta's speed, in meters per second, at $t = 3$ seconds?

F. 1.5
G. 2.0
H. 2.5
J. 3.0
K. 6.0

27. Shasta's acceleration, a, over the interval from $t = 10$ seconds to $t = 20$ seconds, is equal to the slope of the graph over that interval, measured in meters per second per second. What is the value of a ?

A. -5

B. $-\frac{1}{5}$

C. $\frac{1}{5}$

D. 2

E. 5

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28. Calen started his bike ride earlier than Shasta. During the first 15 seconds of Shasta's ride, Calen was traveling at a constant speed equal to $\frac{1}{2}$ of Shasta's maximum speed during that same time period. How far, in meters, did Calen travel during the first 15 seconds of Shasta's ride?

F. $22\frac{1}{2}$

G. 25

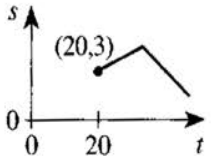
H. $37\frac{1}{2}$

J. 45

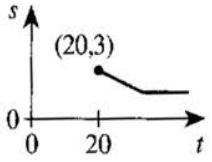
K. 75

29. Which of the following graphs best represents the portion of Shasta's ride beginning at $t = 20$ seconds?

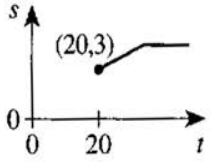
A.



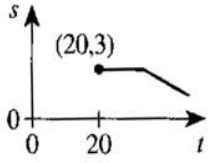
D.



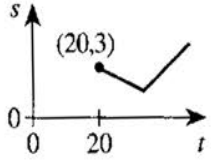
B.



E.



C.



30. $\frac{2}{3} - \frac{5}{6}\left(\frac{2}{5} + \frac{1}{10}\right) = ?$

F. $-\frac{1}{3}$

G. $-\frac{1}{9}$

H. $-\frac{1}{12}$

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

K. $\frac{13}{30}$

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31. The lengths of 2 adjacent sides of a rectangle are represented by $x + 2$ feet and $2x + 7$ feet. In terms of x, what is the area, in square feet, of the rectangle?

A. $6x + 18$
B. $2x^2 + 14$
C. $2x^2 + 9x + 14$
D. $2x^2 + 11x + 9$
E. $2x^2 + 11x + 14$

32. Which one of the following inequalities is true?

F. $2 < \sqrt{3} < 4$
G. $\frac{1}{2} < \sqrt{\frac{1}{3}} < \frac{1}{4}$
H. $4 < 2(\sqrt{5}) < 5$
J. $\sqrt{3} < 4 < \sqrt{5}$
K. $\sqrt{2} < 2(\sqrt{2}) < \sqrt{3}$

33. Two fair coins are repeatedly tossed simultaneously. What is the probability that both coins land heads up on the 36th toss?

A. $\frac{1}{144}$
B. $\frac{1}{108}$
C. $\frac{1}{36}$
D. $\frac{1}{9}$
E. $\frac{1}{4}$

34. Suppose a student's course grade is determined solely by that student's scores on 8 tests, which are worth 100 points each. If Bane has an average of exactly 88 points on the first 6 tests, how many points must he average on the last 2 tests to earn exactly a 90-point course grade?

F. 99
G. 96
H. 95
J. 94
K. 92

35. Which of the following operations will produce the largest result when substituted for the blank in the expression $62 \_\_\_\_ \left(-\frac{1}{65}\right)$?

A. Averaged with
B. Divided by
C. Minus
D. Plus
E. Multiplied by

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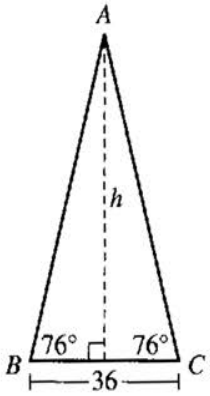
36. Given the sets $A = \{0, 1, 2, 3\}$ and $B = \{1, 3, 5, 7\}$, which of the following defines a function f from A onto B?

F. $f(x) = 2x + 1$
G. $f(x) = 2x - 1$
H. $f(x) = 3x - 1$
J. $f(x) = 3x - 2$
K. $f(x) = x + 1$

37. If $x = \frac{3}{4} + \frac{4}{3}$, $y = \frac{2}{3} + \frac{3}{2}$, and $z = 1 + 1$, which of the following orders x, y, and z from least to greatest?

A. $x < y < z$
B. $y < x < z$
C. $y < z < x$
D. $z < x < y$
E. $z < y < x$

38. Isosceles triangle $\triangle ABC$ has an altitude of h inches, a base of 36 inches, and 2 base angles measuring 76° each, as shown in the figure below. What is the value of h?



F. 18 sin 76°
G. 18 tan 76°
H. 36 cot 76°
J. 36 sin 76°
K. 36 tan 76°

39. The least common multiple (LCM) of 2 numbers is 216. The larger of the 2 numbers is 108. What is the greatest value the other number can have?

A. 2
B. 6
C. 36
D. 54
E. 72

40. In the standard (x,y) coordinate plane, given Parabola A with equation $y = 3x^2$, Parabola B is the image of Parabola A after a shift of 7 coordinate units to the left and 4 coordinate units down. Parabola B has which of the following equations?

F. $y = 3(x - 4)^2 - 7$
G. $y = 3(x - 7)^2 - 4$
H. $y = 3(x - 7)^2 + 4$
J. $y = 3(x + 7)^2 - 4$
K. $y = 3(x + 7)^2 + 4$

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Use the following information to answer questions 41–43.

In 2012, pollsters for the Gallup Organization asked a random sample of 1,014 adults, "On the average, about how much does your family spend on food each week?" The table below lists the percent of the sample that gave each response. For example, approximately 21% of adults in the sample responded that, on average, they spend no less than $200 but no more than $299 on food each week.

Average amount spent	Percent of sample
Less than $50	8%
$50 to $99	17%
$100 to $124	22%
$125 to $149	4%
$150 to $199	15%
$200 to $299	21%
$300 or more	10%
Did not give an amount	3%

41. Which of the following expressions is equal to the approximate number of adults from the sample that said they spend an average of less than $100 each week on food?

A. 1,014(22)
B. 1,014(25)
C. 1,014(47)
D. 1,014(0.22)
E. 1,014(0.25)

42. What percent of adults in the sample responded that they spend, on average, at least $150 each week on food?

F. 15%
G. 46%
H. 49%
J. 51%
K. 66%

43. A pollster will create a circle graph using the information in the table. One sector of the circle graph will represent the percent of adults in the sample who said they spend an average of $300 or more on food each week. What will be the measure of the central angle for that sector?

A. 10°
B. 13°
C. 36°
D. 45°
E. 47°

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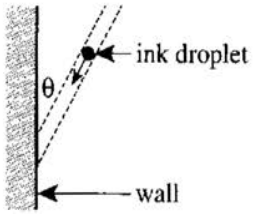
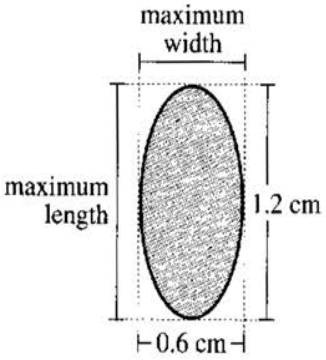
44. A spherical droplet of ink strikes a vertical wall, as modeled in the figure below. The angle of impact is indicated by θ in the figure.

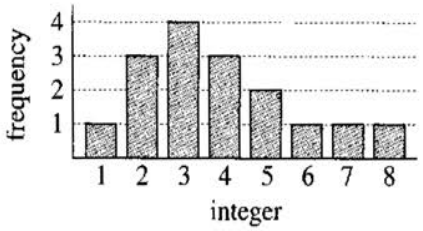


The stain the droplet leaves on the wall is oval-shaped. Scientists can measure the maximum length and maximum width of the stain to determine the angle of impact according to the formula $\sin\theta = \frac{\text{maximum width}}{\text{maximum length}}$. The figure below models such a stain. What was the impact angle of the droplet that left this stain?



F. 30°
G. 45°
H. 60°
J. 90°
K. 120°

45. The graph below shows the distribution of a data set consisting of 16 positive integers. Which of the following statements about the mean, median, and mode of the data set is true?



A. The mode is less than the median, and the median is less than the mean.
B. The mode is less than the mean, and the mean is equal to the median.
C. The mode is equal to the mean, and the mean is less than the median.
D. The mean is less than the median, and the median is less than the mode.
E. The mean is equal to the median, and the median is equal to the mode.

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46. Yolanda collects trading cards, and she has started her younger brothers, Xavier and Zach, collecting cards as well. As of today, Zach owns 5 more cards than Xavier, and Yolanda owns twice as many cards as Xavier and Zach combined. Which of the following equations expresses the relationship between y, the number of cards Yolanda owns, and x, the number of cards Xavier owns?

F. $y = x - 5$
G. $y = x + 5$
H. $y = 2x$
J. $y = 4x - 10$
K. $y = 4x + 10$

47. What is the distance, in coordinate units, between the points $(-2,1)$ and $(1,10)$ in the standard (x,y) coordinate plane?

A. $\sqrt{72}$
B. $\sqrt{80}$
C. $\sqrt{82}$
D. $\sqrt{90}$
E. 12

48. A rectangular solid has a volume of 100 cubic units. If the length, width, and height of the solid are each doubled, what will the volume, in cubic units, of the new solid be?

F. 200
G. 400
H. 600
J. 800
K. 2,700

49. The set of all values of x that satisfies $|x - 2| < 7$ is the same as the set of all values of x that satisfies:

A. $0 < x < 5$
B. $0 < x < 9$
C. $-5 < x < 5$
D. $-5 < x < 9$
E. $-9 < x < 9$

50. The fifth power of a number is 380,204,032. The number is between:

F. 1 and 10.
G. 10 and 100.
H. 100 and 1,000.
J. 1,000 and 100,000.
K. 100,000 and 100,000,000.

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51. Given $A = \begin{bmatrix} 2 & 0 & 3 \\ -1 & 5 & -2 \end{bmatrix}$, $B = \begin{bmatrix} -3 & 1 \\ 4 & 1 \\ 1 & 2 \end{bmatrix}$, and $C = \begin{bmatrix} 0 & -2 \\ 1 & -4 \end{bmatrix}$, if it is possible to calculate $C + AB$, which of the following matrices is the result?

A. $\begin{bmatrix} -6 & -3 \\ 1 & 1 \end{bmatrix}$

B. $\begin{bmatrix} -3 & 6 \\ 22 & -4 \end{bmatrix}$

C. $\begin{bmatrix} 11 & 6 \\ 2 & -3 \end{bmatrix}$

D. $\begin{bmatrix} -6 & 0 \\ -8 & 1 \\ 3 & -4 \end{bmatrix}$

E. It is not possible to calculate $C + AB$.

52. Given $0 \le x \le 8$ and $y \ge 18$, what is the greatest value of $\frac{x+y}{y}$, if it can be determined?

F. 0

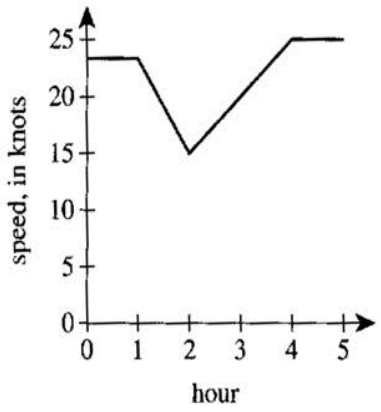
G. 1

H. $\frac{13}{9}$

J. $\frac{13}{4}$

K. Cannot be determined from the given information

53. The graph below gives the speed, in *knots* (nautical miles per hour), of a cruise ship during a 5-hour period. Which of the following values is closest to the rate of change, in knots per hour, of the speed of the ship between hours 2 and 4 ?



A. 2
B. 3
C. 5
D. 10
E. 25

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54. A fair spinner with 4 equally sized regions and an arrow has regions numbered 1, 2, 3, and 4, respectively, and a second fair spinner with 5 equally sized regions and an arrow has regions numbered 1, 2, 3, 4, and 5, respectively. The arrows are both spun at the same time, and the numbers the 2 arrows land on are multiplied together. What is the probability that this product is an odd number?

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

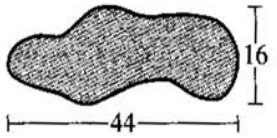
G. $\frac{4}{5}$

H. $\frac{4}{9}$

J. $\frac{5}{9}$

K. $\frac{3}{10}$

55. The bottom of a swimming pool, shown below, has an area of 630 square feet and a perimeter of 114 ft. The swimming pool has a uniform depth of 5 ft of water, and the given lengths are in feet. If it can be determined, what is the volume of water, in cubic feet, that the pool contains?



A. 3,150
B. 3,335
C. 3,520
D. 3,720
E. Cannot be determined from the given information

56. For all positive integers a and b, the expression $(a!)^b$ is equivalent to one of the following expressions. Which one?

F. $(a^b)!$

G. $(ab)!$

H. $b(a!)$

J. $a^b(-1 + -2 + -3 + \cdots)$

K. $[a(a-1)(a-2)\cdots(1)]^b$

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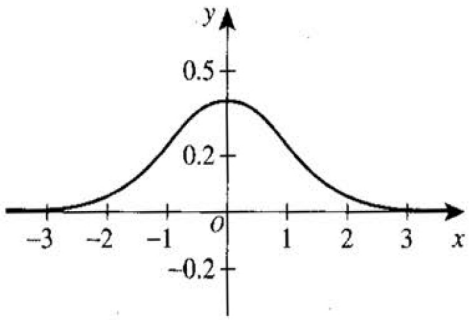
57. The standard normal probability distribution function ($\mu = 0$ and $\sigma = 1$) is graphed in the standard (x,y) coordinate plane below. Which of the following percentages is closest to the percent of the data points that are within 2 standard deviations of the mean in any normal distribution?



A. 50%
B. 68%
C. 90%
D. 95%
E. 99%

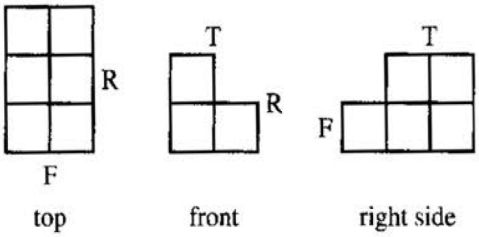
58. For what value of b will the determinant of the matrix $\begin{bmatrix} 4 & b \\ 2 & 3 \end{bmatrix}$ have a value of 18 ?

F. $-\frac{10}{3}$
G. -3
H. 3
J. 6
K. 15

59. What are the solutions to $x^2 - 2x + 17 = 0$?

A. -3 and 5
B. $1 \pm (3\sqrt{2})i$
C. $1 \pm 4i$
D. $1 \pm 8i$
E. $2 \pm 8i$

60. Shown below are the top, front, and right side views of a stack of 1-centimeter cubes. The labels T, F, and R specify where the top, front, and right sides are located with respect to the view. What is the volume, in cubic centimeters, of the stack of cubes?



top front right side

F. 6
G. 8
H. 9
J. 12
K. 14

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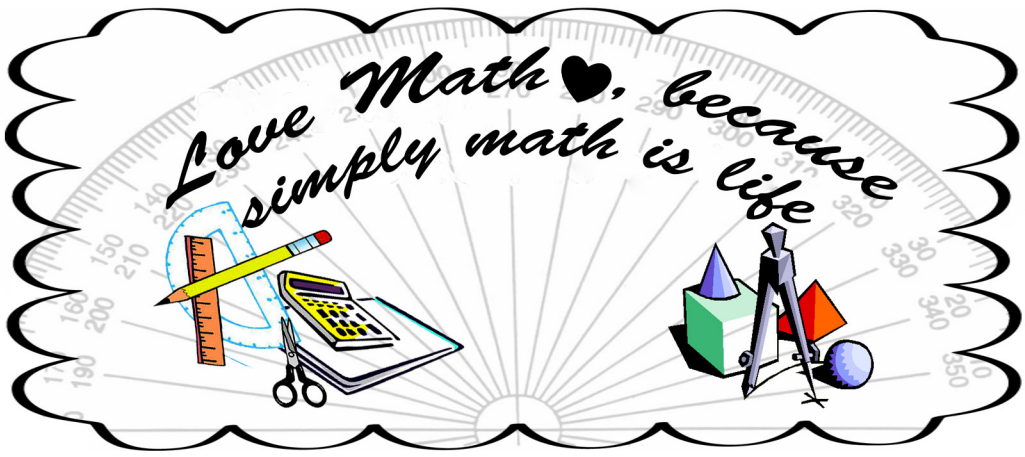

ACT
Home work
Test 1

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2 △ △ △ △ △ △ △ △ △ 2

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.

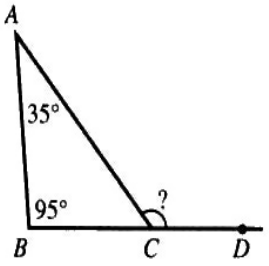
1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

DO YOUR FIGURING HERE.

1. A function, f, is defined by $f(x,y) = 3x^2 - 4y$. What is the value of $f(3,2)$?

   A. 0
   B. 10
   C. 19
   D. 24
   E. 28

2. In the figure below, $\angle BAC$ measures 35°, $\angle ABC$ measures 95°, and points B, C, and D are collinear. What is the measure of $\angle ACD$?



   F. 95°
   G. 125°
   H. 130°
   J. 140°
   K. 145°

3. For all nonzero values of x and y, which of the following expressions is equivalent to $-\frac{36x^4y^3}{4xy}$?

   A. $-40x^3y^2$
   B. $-32x^3y^2$
   C. $-9x^5y^4$
   D. $-9x^4y^3$
   E. $-9x^3y^2$

4. At a certain airline company, the cost to transfer mileage points from one person's account to another person's account is \$0.75 for every 100 mileage points transferred plus a onetime \$20 processing fee. What is the cost to transfer 7,000 mileage points from one account to another at that airline company?

   F. \$25.25
   G. \$67.50
   H. \$72.50
   J. \$75.00
   K. \$95.00

DO YOUR FIGURING HERE.

5. For $x = -5$, what is the value of $4x^2 - 11x$?

   A. −155
   B. −84
   C. −45
   D. 84
   E. 155

6. Taho earns his regular pay of \$11 per hour for up to 40 hours of work per week. For each hour over 40 hours of work per week, Taho earns $1\frac{1}{2}$ times his regular pay. How much does Taho earn in a week in which he works 50 hours?

   F. \$550
   G. \$605
   H. \$625
   J. \$750
   K. \$825

7. A science class has 8 juniors and 4 seniors. The teacher will randomly select 2 students, one at a time, to represent the class in a committee at the school. Given that the first student selected is a junior, what is the probability that the second student selected will be a senior?

   A. $\frac{1}{11}$
   B. $\frac{1}{4}$
   C. $\frac{3}{11}$
   D. $\frac{1}{3}$
   E. $\frac{4}{11}$

8. When Tyrone fell asleep one night, the temperature was 24°F. When Tyrone awoke the next morning, the temperature was −12°F. Letting + denote a rise in temperature and − denote a drop in temperature, what was the change in temperature from the time Tyrone fell asleep until the time he awoke?

   F. −36°F
   G. −12°F
   H. +6°F
   J. +12°F
   K. +36°F

9. The total cost of renting a car is \$35.00 for each day the car is rented plus 42.5¢ for each mile the car is driven. What is the total cost of renting the car for 6 days and driving 350 miles?

   (Note: No sales tax is involved.)

   A. \$ 154.75
   B. \$ 224.88
   C. \$ 358.75
   D. \$ 420.00
   E. \$1,697.50

DO YOUR FIGURING HERE.

10. In the standard (x,y) coordinate plane, what is the slope of the line through $(-6,4)$ and $(1,3)$?

F. $-\frac{7}{5}$

G. $-\frac{1}{5}$

H. $-\frac{1}{7}$

J. $\frac{1}{7}$

K. $\frac{1}{5}$

11. One morning at a coffee shop, each customer ordered either decaf or regular coffee, and each ordered it either with milk or without milk. The number of customers who ordered each type of coffee with or without milk is listed in the table below.

Order	Decaf	Regular	Total
With milk	12	8	20
Without milk	6	10	16
Total	18	18	36

A customer will be randomly selected from all 36 customers for a prize. What is the probability that the selected customer will have ordered a regular coffee without milk?

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

B. $\frac{5}{18}$

C. $\frac{5}{13}$

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

E. $\frac{5}{8}$

12. Which of the following inequalities describes the solution set for $3x - 5 < 2x + 1$?

F. $x < -4$

G. $x > -\frac{4}{5}$

H. $x < \frac{6}{5}$

J. $x < 6$

K. $x > 6$

13. Which of the following expressions is equivalent to $4(x+2) + 3(2x-1)$?

A. $3x + 8$
B. $5(2x + 1)$
C. $10(x + 1)$
D. $10x + 11$
E. $15x$

DO YOUR FIGURING HERE.

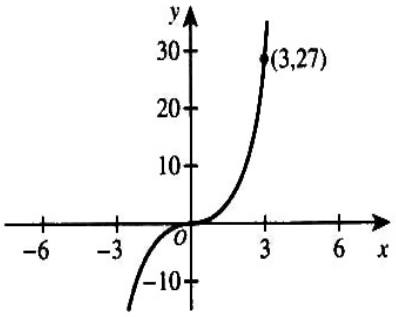
14. What is 4% of 1.36×10^4 ?

F. 340
G. 544
H. 3,400
J. 5,440
K. 54,400

15. What is the least common denominator of the fractions $\frac{4}{35}$, $\frac{1}{77}$, and $\frac{3}{22}$?

A. 110
B. 770
C. 2,695
D. 8,470
E. 59,290

16. The point (3,27) is labeled on the graph of $f(x) = x^3$ in the standard (x,y) coordinate plane below. The graph of $f(x)$ will be translated 3 coordinate units to the left. Which of the following points will be on the image of the graph after the translation?



F. (0,27)
G. (3,24)
H. (3,27)
J. (3,30)
K. (6,27)

17. In the standard (x,y) coordinate plane, what is the midpoint of the line segment that has endpoints (−6,9) and (2,5) ?

A. (−4,−4)

B. (−2, 7)

C. $\left(\frac{3}{2}, \frac{7}{2}\right)$

D. (4,−2)

E. (8,−4)

18. What value of x satisfies the equation $\frac{x^2+2x}{x+2} = 2$?

F. −4
G. −3
H. −2
J. 1
K. 2

DO YOUR FIGURING HERE.

Use the following information to answer questions 19–21.

A large theater complex surveyed 5,000 adults. The results of the survey are shown in the tables below.

Age groups	Number
21–30	2,750
31–40	1,225
41–50	625
51 or older	400

Moviegoer category	Number
Very often	830
Often	1,650
Sometimes	2,320
Rarely	200

Tickets are $9.50 for all regular showings and $7.00 for matinees.

19. Based on the survey results, what was the average number of moviegoers for each of the 4 categories?

A. 610
B. 1,060
C. 1,240
D. 1,250
E. 1,985

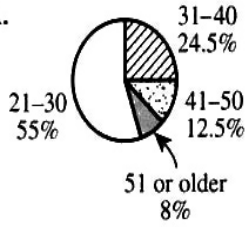
20. Suppose all the adults surveyed happened to attend 1 movie each in one particular week. The total amount spent on tickets by those surveyed in that week was $44,000.00. How many adults attended matinees that week?

F. 500
G. 1,400
H. 2,500
J. 3,600
K. 4,500

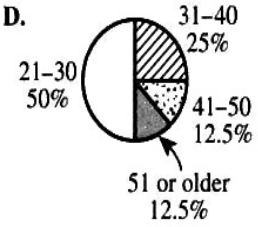
DO YOUR FIGURING HERE.

21. One of the following circle graphs represents the proportion by age group of the adults surveyed. Which one?

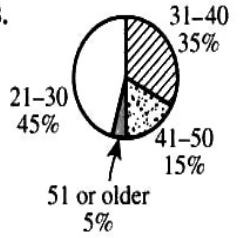
A.



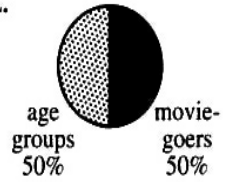
D.



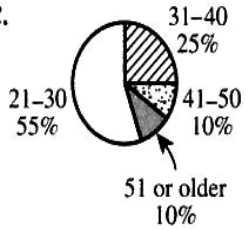
B.



E.



C.



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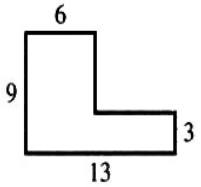
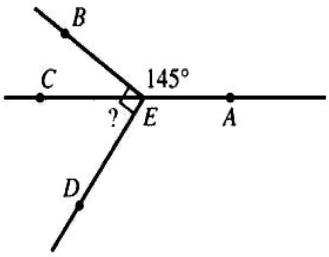
22. In the figure shown below, all angles are right angles, and the side lengths given are in centimeters. What is the area, in square centimeters, of the figure?

F. 42
G. 75
H. 93
J. 99
K. 117



23. In the figure below, E is on $\overline{CA}$, and the measures of $\angle BED$ and $\angle AEB$ are 90° and 145°, respectively. If it can be determined, what is the measure of $\angle CED$?



A. 35°
B. 45°
C. 55°
D. 80°
E. Cannot be determined from the given information

DO YOUR FIGURING HERE.

24. In the standard (x,y) coordinate plane, the graph of the function $y = 5\sin(x) - 7$ undergoes a single translation such that the equation of its image is $y = 5\sin(x) - 14$. Which of the following describes this translation?

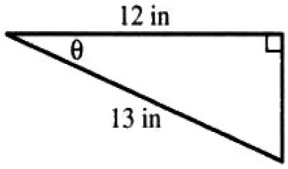
F. Up 7 coordinate units
G. Down 7 coordinate units
H. Left 7 coordinate units
J. Right 7 coordinate units
K. Right 14 coordinate units

25. What is the value of $\left(9^{\frac{1}{2}} + 16^{\frac{1}{2}}\right)^2$?

A. 7
B. 25
C. 49
D. 337
E. 625

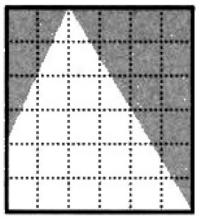
26. A right triangle is shown in the figure below. What is the value of $\sin\theta$?

F. $\frac{5}{13}$
G. $\frac{5}{12}$
H. $\frac{12}{13}$
J. $\frac{13}{12}$
K. $\frac{13}{5}$



27. A 6-inch-by-6-inch square grid shown below is divided into 36 squares, each with a side length of 1 inch. Each vertex of the 2 shaded triangles lies at an intersection of 2 grid lines. What fractional part of the 6-inch-by-6-inch square is shaded?

A. $\frac{2}{3}$
B. $\frac{4}{5}$
C. $\frac{4}{9}$
D. $\frac{5}{9}$
E. $\frac{8}{9}$



28. All the values in the equation below are exact. What value of c makes the equation true?

$$(4.25 \times 10^{2c+4})(6 \times 10^{7}) = 255$$

F. −7
G. −6.5
H. −5
J. −4.5
K. −4

DO YOUR FIGURING HERE.

29. Which of the following inequalities is true for all positive integers m ?

A. $m \leq \frac{1}{m}$

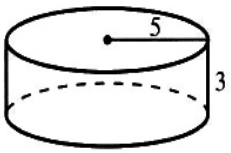
B. $m \leq \sqrt{m}$

C. $m \geq m^2$

D. $m \leq m + 1$

E. $m \geq \sqrt{m+1}$

30. A formula for the volume, V, of a right circular cylinder is $V = \pi r^2 h$, where r is the radius and h is the height. The cylindrical tank shown below has radius 5 meters and height 3 meters and is filled with water.

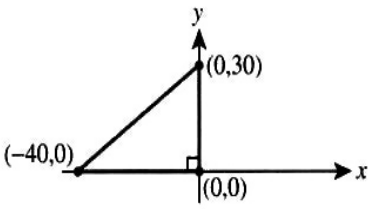


Given that the weight of 1 cubic meter of water is approximately 2,205 pounds, the weight, in pounds, of the water in the tank is:

F. less than 200,000.
G. between 200,000 and 300,000.
H. between 300,000 and 500,000.
J. between 500,000 and 1,000,000.
K. more than 1,000,000.

31. Graphed in the standard (x,y) coordinate plane below is a right triangle with vertices (0,0), (−40,0), and (0,30). What is the length, in coordinate units, of the hypotenuse of the triangle?

A. 30
B. 35
C. 40
D. 50
E. 70



32. Every graph in one of the following categories has a vertical line of symmetry regardless of how it is oriented in the standard (x,y) coordinate plane. Which one?

F. Circles
G. Squares
H. Ellipses
J. Triangles
K. Rectangles

DO YOUR FIGURING HERE.

33. In the standard (x,y) coordinate plane, the graph of $y = 30(x + 17)^2 - 42$ is a parabola. What are the coordinates of the vertex of the parabola?

A. (−30,−42)
B. (−17,−42)
C. (17,−42)
D. (17, 42)
E. (30, 42)

34. One side of square *ABCD* has a length of 15 meters. A certain rectangle whose area is equal to the area of *ABCD* has a width of 10 meters. What is the length, in meters, of the rectangle?

F. 15
G. 20
H. 22.5
J. 25
K. 37.5

35. The average weight of 10 boys is 77.0 pounds. If the youngest boy is excluded, the average weight of the 9 remaining boys is 78.0 pounds. What is the weight, in pounds, of the youngest boy?

A. 62
B. 68
C. 70
D. 78
E. 87

36. The total amount of a certain substance present in a laboratory experiment is given by the formula $A = A_0\left(2^{\frac{h}{5}}\right)$, where A is the total amount of the substance h hours after an initial amount (A_0) of the substance began accumulating. Which of the following expressions gives the number of hours it will take an initial amount of 10 grams of this substance to accumulate to 100 grams?

F. 5
G. 25
H. $\log_2(50)$
J. $5 \log_2(10)$
K. $5 \log_{20}(100)$

DO YOUR FIGURING HERE.

37. For all values of x greater than 3, which of the following expressions is equivalent to $\frac{x^2-x-6}{x^2-9}$?

A. $\frac{-x-6}{-9}$

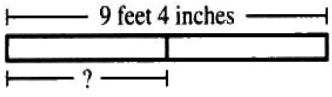
B. $\frac{x-2}{x-3}$

C. $\frac{x-2}{x+3}$

D. $\frac{x+2}{x-3}$

E. $\frac{x+2}{x+3}$

38. Shown below, a board 9 feet 4 inches long is cut into 2 equal parts. What is the length, to the nearest inch, of each part?



F. 4 feet 5 inches
G. 4 feet 7 inches
H. 4 feet 8 inches
J. 5 feet 4 inches
K. 5 feet 5 inches

39. If the positive integers x and y are relatively prime (their greatest common factor is 1) and $\frac{1}{2}+\frac{1}{3}\cdot\frac{1}{4}\div\frac{1}{5}=\frac{x}{y}$, then $x+y=$?

A. 23
B. 25
C. 49
D. 91
E. 132

40. What is the 358th digit after the decimal point in the repeating decimal $0.\overline{3178}$?

F. 0
G. 3
H. 1
J. 7
K. 8

41. To promote a new brand of shoes, a shoe store will run a promotion using a jar containing 3 red balls marked "10% off," 2 white balls marked "30% off," and 1 green ball marked "60% off." Each customer will randomly select 1 ball from the jar to determine the discount that the customer will receive on any single pair of the new brand of shoes. Given that the new brand of shoes regularly costs \$60 per pair, what is the average discount amount, in dollars, that the store can expect to give each customer due to this promotion?

A. \$ 6
B. \$10
C. \$15
D. \$20
E. \$25

DO YOUR FIGURING HERE.

Use the following information to answer questions 42–44.

A 500-square-mile national park in Kenya has large and small protected animals. The number of *large* protected animals at the beginning of 2014 is given in the table below.

Large animal	Number
Elephant	600
Rhinoceros	100
Lion	200
Leopard	300
Zebra	400
Giraffe	800
Total	2,400

At the beginning of 2014, the number of *all* protected animals in the park was 10,000. Zoologists predict that for each year from 2015 to 2019, the total number of protected animals in the park at the beginning of the year will be 2% more than the number of protected animals in the park at the beginning of the previous year.

42. At the beginning of 2014, the number of lions in the park was p percent of the total number of *large* animals. Which of the following is closest to the value of p?

F. 2
G. 8
H. 9
J. 11
K. 12

43. In this park, the average number of gallons of water consumed per day by each elephant, lion, and giraffe is 50, 5, and 10, respectively. Which of the following matrix products yields the average total number of gallons of water consumed per day by all the elephants, lions, and giraffes in the park?

A. $[600\ 200\ 800]\begin{bmatrix}50\\5\\10\end{bmatrix}$

B. $[600\ 800\ 200]\begin{bmatrix}50\\5\\10\end{bmatrix}$

C. $\begin{bmatrix}600\\200\\800\end{bmatrix}[50\ 5\ 10]$

D. $\begin{bmatrix}600\\800\\200\end{bmatrix}[50\ 5\ 10]$

E. $\begin{bmatrix}600\\800\\200\end{bmatrix}\begin{bmatrix}50\\5\\10\end{bmatrix}$

DO YOUR FIGURING HERE.

44. Let t be a positive integer less than 6. Based on the zoologists' prediction, which of the following expressions represents the number of protected animals in the park t years after the beginning of 2014 ?

F. $10{,}000 + 0.02t$
G. $10{,}000 + 0.2t$
H. $10{,}000(1 + 0.02^t)$
J. $10{,}000(1 + 0.02)^t$
K. $10{,}000(1 + 0.2)^t$

---

45. Anela and Jacob plan to attend a concert in Brady. Anela will drive 375 km to Brady at a constant speed of 75 km/hr, stopping one time for a 30-minute break. Jacob will start 600 km from Brady and will drive at a constant speed of 90 km/hr for 2 hours. He will take a 1-hour break and then drive to Brady at a constant speed of 70 km/hr. To the nearest 0.1 hour, Jacob must leave how much earlier than Anela in order for them to arrive in Brady at the same time?

A. 2.2
B. 2.5
C. 3.1
D. 3.5
E. 4.0

46. Which of the following is equal to $\frac{3x+5}{2x} - \frac{7x-3}{2x}$, for all $x \neq 0$?

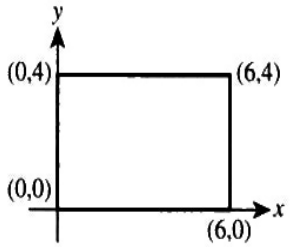
F. $-4x + 8$
G. $-4x + 2$
H. $-2x + 1$
J. $\frac{-2x+4}{x}$
K. 2

47. A rectangular stage is 90 feet long and 30 feet wide. What is the area, in square *yards*, of this stage?

A. $30\sqrt{3}$
B. 300
C. 675
D. 900
E. 2,700

DO YOUR FIGURING HERE.

48. A rectangle, with its vertex coordinates labeled, is graphed in the standard (x,y) coordinate plane below. A *lattice point* is a point with coordinates that are both integers. A lattice point inside but NOT on the rectangle will be chosen at random. What is the probability that the sum of the x-coordinate and the y-coordinate of the chosen lattice point will be odd?



F. $\frac{1}{5}$

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

H. $\frac{7}{15}$

J. $\frac{17}{35}$

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

49. The nth term of an arithmetic progression is given by the formula $a_n = a_1 + (n-1)d$, where d is the common difference and a_1 is the first term. If the third term of an arithmetic progression is $\frac{5}{2}$ and the sixth term is $\frac{1}{4}$, what is the seventh term?

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

B. 0

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

D. $\frac{3}{4}$

E. 1

50. The probability of Jamie being chosen to bat first in the lineup for his baseball team is $\frac{1}{9}$. What are the odds in favor of Jamie being chosen to bat first?

(Note: The *odds* in favor of an event are defined as the ratio of the probability that the event will happen to the probability that the event will NOT happen.)

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

G. $\frac{1}{9}$

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

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

K. $\frac{9}{1}$

DO YOUR FIGURING HERE.

51. A 120-liter solution that is 5% salt is mixed with an 80-liter solution that is 15% salt. The combined solution is what percent salt?

A. 8%
B. 9%
C. 10%
D. 11%
E. 12%

52. A 50-foot-long rectangular swimming pool with vertical sides is 3 feet deep at the shallow end and 10 feet deep at the deep end. The bottom of the pool slopes downward at a constant angle from horizontal along the length of the pool. Which of the following expressions gives this constant angle?

(Note: For $-\frac{\pi}{2} < x < \frac{\pi}{2}$, $y = \tan x$ if and only if $x = \tan^{-1} y$.)

F. $\tan^{-1}\left(\frac{7}{50}\right)$

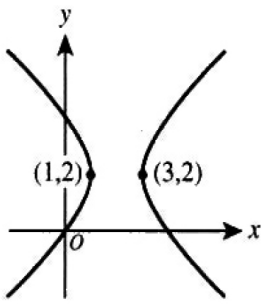
G. $\tan^{-1}\left(\frac{13}{50}\right)$

H. $\tan^{-1}\left(\frac{7}{10}\right)$

J. $\tan^{-1}\left(\frac{50}{13}\right)$

K. $\tan^{-1}\left(\frac{50}{7}\right)$

53. A hyperbola that has vertices (1,2) and (3,2) and that passes through the origin is shown below in the standard (x,y) coordinate plane. The hyperbola has which of the following equations?



A. $\frac{(x-2)^2}{1} - \frac{3(y-2)^2}{4} = 1$

B. $\frac{(x-2)^2}{1} - \frac{4(y-2)^2}{3} = 1$

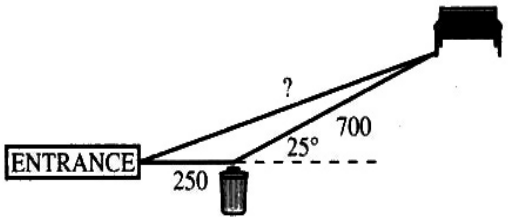
C. $\frac{(x+2)^2}{1} - \frac{3(y+2)^2}{4} = 1$

D. $\frac{(x-2)^2}{1} + \frac{3(y-2)^2}{4} = 1$

E. $\frac{(x+2)^2}{1} + \frac{4(y+2)^2}{3} = 1$

DO YOUR FIGURING HERE.

54. As shown below, Alli walked her dog 250 feet due east from the entrance of a dog park to a trash can and then walked 700 feet in a straight line 25° north of east to a bench. Which of the following expressions is equal to the distance, in feet, between the entrance and the bench?



F. $\frac{950}{\cos 25°}$

G. $\frac{250}{\cos 25°} + 700$

H. $\frac{250}{\sin 155°} + 700$

J. $\sqrt{700^2 + 250^2 - 2(700)(250)\cos 25°}$

K. $\sqrt{700^2 + 250^2 - 2(700)(250)\cos 155°}$

55. For real numbers a, b, and c such that $a > b > c$ and $b > 0$, which of the statements below is(are) *always* true?

I. $|a| > |b|$
II. $|a| > |c|$
III. $|b| > |c|$

A. I only
B. II only
C. I and II only
D. II and III only
E. I, II, and III

56. Kenji and Mary are members of a school committee that will be meeting this afternoon. The 6 members of the committee will be seated randomly around a circular table. What is the probability that Kenji and Mary will NOT sit next to each other at the meeting?

F. $\frac{1}{5}$

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

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

J. $\frac{3}{5}$

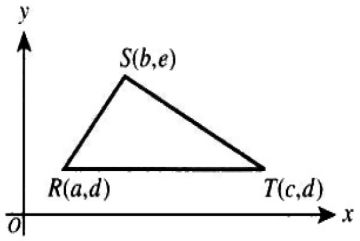
K. $\frac{4}{5}$

57. The digit in the ones place of 2^{88} is 6. What is the digit in the ones place of 2^{90}?

A. 0
B. 2
C. 4
D. 6
E. 8

DO YOUR FIGURING HERE.

58. Which of the following expressions represents the area, in square coordinate units, of $\triangle RST$ shown in the standard (x,y) coordinate plane below?



F. $\frac{1}{2}(c-a)(e-d)$

G. $\frac{1}{2}c(e-b)$

H. $\frac{1}{2}e(c-a)$

J. $\frac{1}{2}\left[(e-d)^2+(b-a)^2\right]\left[(e-d)^2+(b-c)^2\right]$

K. $\frac{1}{2}\left(\sqrt{(e-d)^2+(b-a)^2}\right)\left(\sqrt{(e-d)^2+(b-c)^2}\right)$

59. In the complex numbers, where $i^2=-1$, what complex number x is a solution to the equation $x(2+3i)=1$?

A. $\frac{2}{13}-\frac{3}{13}i$

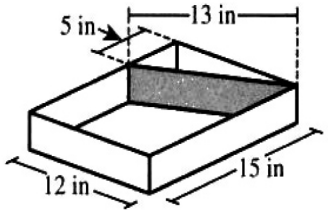
B. $\frac{2}{5}+\frac{3}{5}i$

C. 1

D. -1

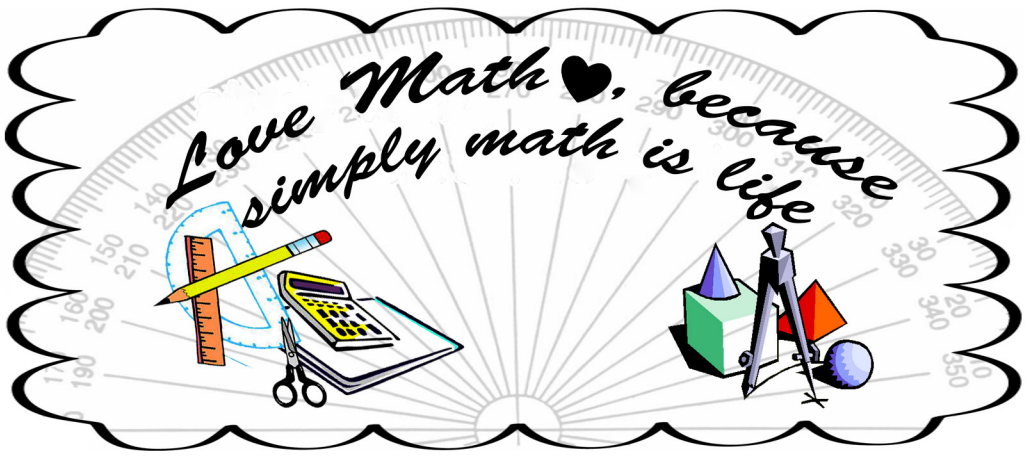
E. $-\frac{i}{13}$

60. The rectangular container shown below has a small compartment for water created by a rectangular dividing wall of negligible width. One face of the dividing wall, shown shaded, has an area of 39 square inches. What is the volume, in cubic inches, of the larger compartment?



F. 180
G. 195
H. 390
J. 450
K. 540

Good Luck From Mr. Mohamed Eissa



ACT
Home work
Test 2

MOHAMED EISSA
MATHEMATICAL

Mr. Mohamed Eissa

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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.

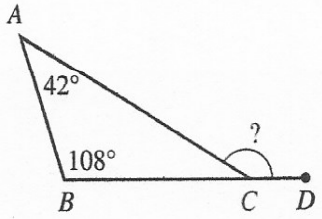
1. A calculator has a regular price of $59.95 before taxes. It goes on sale at 20% below the regular price. Before taxes are added, what is the sale price of the calculator?

   A. $11.99
   B. $29.98
   C. $39.95
   D. $47.96
   E. $54.95

2. Given $r = 6$, $b = 4$, and $g = -9$, $(r + b - g)(b + g) = ?$

   F. −95
   G. −5
   H. 5
   J. 13
   K. 14

3. In the figure below, C is on $\overline{BD}$, $\angle BAC$ measures 42°, and $\angle ABC$ measures 108°. What is the measure of $\angle ACD$?



   A. 108°
   B. 120°
   C. 132°
   D. 138°
   E. 150°

4. If $\frac{3}{5}x + 10 = 17$, then $x = ?$

   F. $-\frac{35}{3}$
   G. $\frac{5}{3}$
   H. $\frac{35}{3}$
   J. $\frac{21}{5}$
   K. 45

DO YOUR FIGURING HERE.

5. What is the length, in inches, of the hypotenuse of a right triangle with a leg that is 9 inches long and a leg that is 2 inches long?

   A. $\sqrt{22}$
   B. $\sqrt{77}$
   C. $\sqrt{85}$
   D. 5.5
   E. 11

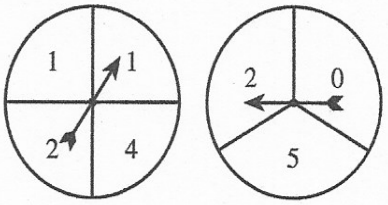
6. A bag contains exactly 18 solid-colored buttons: 3 red, 5 blue, and 10 white. What is the probability of randomly selecting 1 button that is NOT white?

   F. $\frac{1}{18}$
   G. $\frac{1}{8}$
   H. $\frac{4}{9}$
   J. $\frac{2}{3}$
   K. $\frac{4}{5}$

7. What is the sum of 3 consecutive odd integers whose mean is 27 ?

   A. 39
   B. 75
   C. 81
   D. 87
   E. 93

8. Two dials are shown below. When the arrow on each dial is spun, it is equally likely to point at any of the numbered sectors on its dial after it has stopped spinning. After the arrows are next spun, the numbers in the sectors the arrows point at after they stop spinning will be added together. Which of the following values is NOT a possible sum of those 2 numbers?

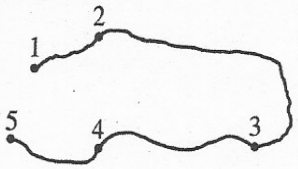


   F. 1
   G. 4
   H. 6
   J. 7
   K. 8

DO YOUR FIGURING HERE.

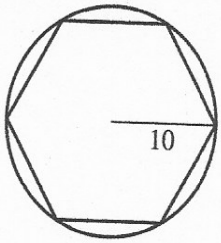
9. On a bike trail there are 5 checkpoints numbered in order, Checkpoint 1 through Checkpoint 5, as shown in the figure below. Some distances along the trail between 2 checkpoints are given: 6.6 miles between 1 and 3; 4.5 miles between 2 and 3; and 9.7 miles between 2 and 5. Which of the following values is closest to the distance, in miles, along the trail between Checkpoint 1 and Checkpoint 5 ?

A. 11.1
B. 11.8
C. 14.2
D. 16.3
E. 20.8



10. In the figure below, a circle with a radius of 10 meters circumscribes a regular hexagon. What is the perimeter, in meters, of the hexagon?

F. 30
G. $30\sqrt{3}$
H. 60
J. $60\sqrt{2}$
K. $60\sqrt{3}$



11. To produce aluminum softball bats, it costs the Recreation Equipment Supply Company $3,500 for overhead, plus $2 per softball bat produced. What is the maximum number of bats that can be produced by the company for $15,000 ?

A. 1,750
B. 3,502
C. 5,000
D. 5,750
E. 7,500

12. Given that $3x + 2 = 4$ and $2y + 6 = 5$, what is $x + y$?

F. $-\frac{1}{2}$
G. $\frac{1}{6}$
H. $\frac{2}{3}$
J. $\frac{7}{6}$
K. $\frac{15}{2}$

13. For all x such that $x \neq 0$, which of the following expressions is equivalent to $\frac{15x^2 + 25x}{5x}$?

A. $8x$
B. $28x$
C. $3x + 5$
D. $3x^2 + 5$
E. $15x^2 + 5$

14. What is the value of the expression $\frac{|-3-2|^2+(-1)^3}{16\div 4\times 2-5}$?

DO YOUR FIGURING HERE.

F. -8

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

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

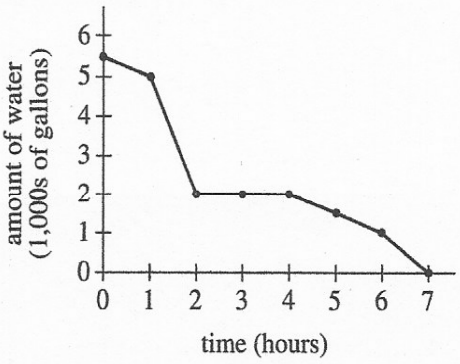
J. $\frac{26}{3}$

K. 8

15. Karen invested \$2,000 in a special savings account. The balance of this special savings account will double every 5 years. Assuming that Karen makes no other deposits and no withdrawals, what will be the balance of Karen's investment at the end of 40 years?

A. \$ 80,000
B. \$ 256,000
C. \$ 400,000
D. \$ 512,000
E. \$1,024,000

16. The graph below shows the amount of water in a pond over a period of 7 hours. One of the following values is the number of hours the amount of water in the pond remained constant. Which one?



F. 2
G. 3
H. 3.5
J. 4
K. 7

17. If it rains in Franklin City on a particular day, the probability that it will rain there the following day is 0.70. If it does not rain in Franklin City on a particular day, the probability that it will rain there the following day is 0.10. Given that it rained in Franklin City on Monday, what is the probability that it will NOT rain in Franklin City on Tuesday of the same week?

A. 0.10
B. 0.30
C. 0.60
D. 0.70
E. 0.90

DO YOUR FIGURING HERE.

18. In the standard (x,y) coordinate plane, what is the slope of the line given by the equation $5x = 9y + 18$?

F. $-\frac{5}{9}$

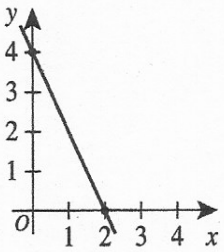
G. $\frac{5}{9}$

H. $\frac{9}{5}$

J. 5

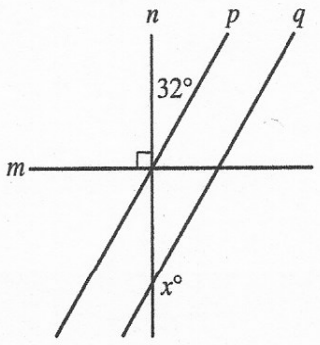
K. 9

19. One of the following equations represents the line graphed in the standard (x,y) coordinate plane below. Which one?



A. $y = -2x + 2$
B. $y = -2x + 4$
C. $y = 2x + 4$
D. $y = 4x - 2$
E. $y = 4x + 2$

20. In the figure below, line m is perpendicular to line n, and line p is parallel to line q. Lines m, n, and p intersect at a single point. Some angle measures are given. What is the value of x ?



F. 32
G. 58
H. 122
J. 148
K. 158

21. A bag contains 10 solid-colored marbles of the same size: 3 red, 2 green, 1 yellow, and 4 blue. Which of the following expressions gives the probability of drawing, at random and without replacement, a blue marble on the 1st draw, a green marble on the 2nd draw, and a blue marble on the 3rd draw?

A. $\left(\frac{4}{10}\right)\left(\frac{2}{10}\right)\left(\frac{3}{10}\right)$

B. $\left(\frac{4}{10}\right)\left(\frac{2}{10}\right)\left(\frac{4}{10}\right)$

C. $\left(\frac{4}{10}\right)\left(\frac{2}{9}\right)\left(\frac{4}{8}\right)$

D. $\left(\frac{4}{10}\right)\left(\frac{2}{9}\right)\left(\frac{3}{8}\right)$

E. $\left(\frac{4}{10}\right)\left(\frac{3}{9}\right)\left(\frac{3}{8}\right)$

DO YOUR FIGURING HERE.

22. A physical education teacher recorded the distances, in inches, that her students jumped during a long jump lesson. The distances of 1 jump by each of the students are represented in the stem-and-leaf plot below.

Stem	Leaf
3	7 8
4	3 5 6 7
5	2 4 5 8 9
6	0 1 2 3 6
7	0 1 2

Key: 5 | 2 = 52 inches

What is the probability that a student chosen at random from the class will have jumped *at least* 60 inches?

F. $\frac{5}{24}$

G. $\frac{8}{24}$

H. $\frac{5}{19}$

J. $\frac{7}{19}$

K. $\frac{8}{19}$

23. Given that the function f defined as $f(x) = 5 - 3x$ has domain $\{-1, 0, 2\}$, what is the range of f?

A. $\{-2, 0, 4\}$

B. $\{-1, 2, 8\}$

C. $\{-1, 5, 8\}$

D. $\{2, 5, 8\}$

E. $\{2, 5, 11\}$

24. To the nearest 1 foot, what is the height of a rectangular prism with a base length of 15 feet, a base width of $1\frac{1}{3}$ feet, and a volume of 100 cubic feet?

F. 5
G. 7
H. 9
J. 20
K. 75

DO YOUR FIGURING HERE.

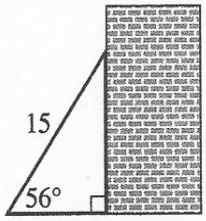
25. Tables of values for the 2 functions f and g are shown below. What is the value of $g(f(5))$?

x	$f(x)$
−7	9
−3	−7
1	5
5	3

x	$g(x)$
−3	5
1	−1
3	−5
5	−7

A. −21
B. −7
C. −5
D. 3
E. 9

26. In the figure shown below, a ladder 15 feet long forms an angle of 56° with the level ground as it leans against the vertical side of a building. The distance along the building, in feet, between the ground and the top of the ladder is equal to which of the following expressions?



F. $\frac{15}{2}$

G. $\frac{15\sqrt{3}}{2}$

H. 15 sin 56°

J. 15 cos 56°

K. 15 tan 56°

27. The isotope iodine-131 has a half-life of 8 days, which means that the amount of iodine-131 remaining after t days is $N\left(\frac{1}{2}\right)^{\frac{t}{8}}$, where N is the number of grams of iodine-131 at $t = 0$. How many grams of iodine-131 will remain after 16 days if there were 32 grams of iodine-131 at $t = 0$?

A. 0
B. 2
C. 8
D. 16
E. 128

28. Which of the following expressions is equivalent to $\sqrt[4]{256x^{16}}$?

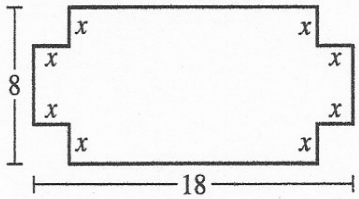
F. $4x^4$
G. $4x^{12}$
H. $16x^4$
J. $64x^{12}$
K. $128x^8$

DO YOUR FIGURING HERE.

29. Two concentric circles have radii of 5 centimeters and 6 centimeters, respectively. How many centimeters longer is the circumference of the larger circle than that of the smaller circle?

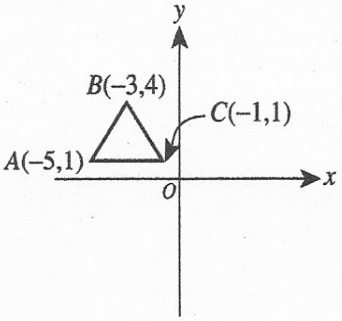
A. 1
B. π
C. 2π
D. 11π
E. 22π

30. Squares with sides of length x cm have been removed from each corner of a rectangle measuring 8 cm by 18 cm, resulting in the figure shown below. In terms of x, what is the area, in square centimeters, of the figure?



F. $52 - 4x^2$
G. $144 - 4x^2$
H. $144 + 4x^2$
J. $144 - 8x$
K. $144 - 52x + 4x^2$

31. In the standard (x,y) coordinate plane below, $\triangle ABC$ will be translated 10 units down and then the resulting image will be reflected over the y-axis. What will be the coordinates of the final image of A resulting from both transformations?



A. (−5, 9)
B. (−1, 9)
C. (1, −9)
D. (5,−10)
E. (5, −9)

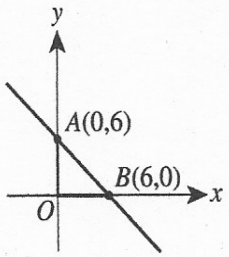
32. Olivia, Ashton, and Jane are standing on a soccer field such that Olivia is 20 meters due west of Ashton and Jane is 40 meters due north of Ashton. Their positions are at the vertices of a triangle. Which of the following expressions gives the degree measure of the angle of the triangle at the vertex where Olivia is standing?

F. $\cos^{-1}\left(\frac{40}{20}\right)$
G. $\sin^{-1}\left(\frac{40}{20}\right)$
H. $\sin^{-1}\left(\frac{20}{40}\right)$
J. $\tan^{-1}\left(\frac{40}{20}\right)$
K. $\tan^{-1}\left(\frac{20}{40}\right)$

DO YOUR FIGURING HERE.

Use the following information to answer questions 33–35.

In the standard (x,y) coordinate plane below, $\triangle AOB$ is formed by $\overleftrightarrow{AB}$, the x-axis, and the y-axis.



33. What is the area of $\triangle AOB$ in square coordinate units?

A. 6
B. $6\sqrt{2}$
C. 12
D. 18
E. 36

34. What is the length of $\overline{AB}$ in coordinate units?

F. $2\sqrt{6}$
G. $6\sqrt{2}$
H. $6\sqrt{3}$
J. 6
K. 12

35. Which of the following is an equation of $\overleftrightarrow{AB}$?

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

---

36. Which of the following arranges the numbers $\frac{9}{5}$, $1.\overline{8}$, 1.08, and $1.\overline{08}$ into ascending order? (Note: The overbar notation shows that the digits under the bar will repeat. For example, $1.\overline{73} = 1.737373\ldots$)

F. $\frac{9}{5} < 1.\overline{08} < 1.08 < 1.\overline{8}$
G. $\frac{9}{5} < 1.08 < 1.\overline{08} < 1.\overline{8}$
H. $1.\overline{08} < 1.08 < \frac{9}{5} < 1.\overline{8}$
J. $1.08 < 1.\overline{08} < 1.\overline{8} < \frac{9}{5}$
K. $1.08 < 1.\overline{08} < \frac{9}{5} < 1.\overline{8}$

DO YOUR FIGURING HERE.

37. Andre's Floral Shop asked each of 20 customers to give a rating of the shop's service. The table below summarizes the 20 customer ratings.

Rating	Number of customers
3	6
2	8
1	2
0	4

Which of the following values is closest to the mean of the 20 customer ratings?

A. 1.8
B. 2.0
C. 2.3
D. 2.7
E. 3.3

38. Which of the following operations will produce the largest result when substituted for the blank in the expression $14 \_\_\_\_ \left(-\frac{1}{40}\right)$?

F. Plus
G. Minus
H. Divided by
J. Multiplied by
K. Averaged with

39. A local bowling league established its handicap for bowlers who have an average of 200 or less as 75% of the difference between 200 and the bowler's average score. If H represents the handicap of such a bowler and A represents his or her average score, which of the following equations gives H in terms of A ?

A. $H = 150 - A$

B. $H = A - 150$

C. $H = 200 - \frac{A}{0.75}$

D. $H = 200 - 0.75A$

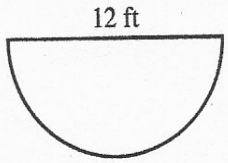
E. $H = 0.75(200 - A)$

40. The equation $t = -0.0066a + 15$ models the noon temperature, t degrees Celsius, a meters above sea level, on a certain day on Laurel Mountain. According to this equation, what would be the noon temperature for that certain day on Laurel Mountain at sea level?

F. 0°C
G. 0.0066°C
H. 14.9934°C
J. 15°C
K. 15.0066°C

DO YOUR FIGURING HERE.

41. The semicircular top surface of Ron's patio is shown below. Which of the following values is closest to the area, in square feet, of the top surface of the patio?



A. 18
B. 36
C. 54
D. 108
E. 186

42. Which of the following equations is that of a circle that is in the standard (x,y) coordinate plane, has center $(1,-4)$, and has a radius of 5 coordinate units?

F. $(x-1)+(y+4)=5$
G. $(x+1)+(y-4)=5$
H. $(x-1)^2+(y+4)^2=\sqrt{5}$
J. $(x-1)^2+(y+4)^2=25$
K. $(x+1)^2+(y-4)^2=25$

43. What is the smallest positive integer having exactly 5 different positive integer divisors?

A. 5
B. 6
C. 12
D. 16
E. 18

44. If $49^a=7$ and $3^{a+b}=81$, then $b=?$

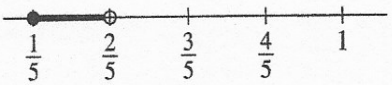
F. $\frac{1}{2}$
G. $\frac{3}{2}$
H. $\frac{5}{2}$
J. 3
K. $\frac{7}{2}$

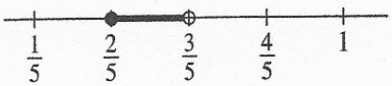
45. Florencia has 60 feet of fencing and a 4-foot-wide gate to use to enclose a dog pen. Among the following, a dog pen of which shape and dimensions will have the largest area if only the fencing and the gate are used to enclose it?

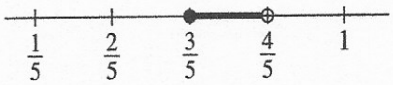
A. A square with a side length of 16 feet
B. A square with a side length of 17 feet
C. A rectangle with a length of 14 feet and a width of 16 feet
D. A rectangle with a length of 15 feet and a width of 17 feet
E. A rectangle with a length of 15 feet and a width of 18 feet

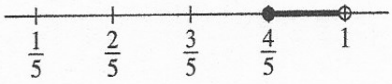
DO YOUR FIGURING HERE.

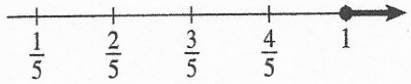
46. The difference $\frac{3}{5} - \frac{-1}{3}$ lies in which of the following intervals graphed on the real number line?

F.


G.


H.


J.


K.


47. The recursive formula for a sequence is given below, where a_n is the value of the nth term.

$$a_1 = 10$$
$$a_n = a_{n-1} + 5$$

Which of the following equations is an explicit formula for this sequence?

A. $a_n = -5n + 10$
B. $a_n = 5n + 5$
C. $a_n = 5n + 10$
D. $a_n = 10n - 5$
E. $a_n = 10n + 5$

48. The probabilities that each of 2 independent events will occur are given in the table below.

Event	Probability
A	0.20
B	0.40

What is the probability that both Events A and B will occur—that is, P(A and B) ?

F. 0.08
G. 0.20
H. 0.30
J. 0.50
K. 0.60

49. What is the solution set of the equation $x^4 + 21x^2 - 100 = 0$?

A. $\{-25, 4\}$
B. $\{-25, -2, 2\}$
C. $\{-5, -4, 5\}$
D. $\{-5, 5, -2i, 2i\}$
E. $\{-2, 2, -5i, 5i\}$

DO YOUR FIGURING HERE.

Use the following information to answer questions 50–52.

Skyline Tours is offering hot-air-balloon tours. The tables below give information about the balloon, the equipment, and the tours offered.

Hot-air-balloon information	
Volume of balloon	80,000 cubic feet
Maximum capacity of basket	8 people
Weight of balloon	200 pounds
Weight of basket	150 pounds
Weight of burner	50 pounds

Tour information			
Tour	Ticket price	Duration, in minutes	Maximum altitude, in feet
A	$100	45	500
B	$125	60	600
C	$200	90	1,000

50. Jarrod is looking up at a hot-air balloon. The balloon is currently at the maximum altitude during Tour C. The angle of elevation from the horizon is 37°, as shown in the figure below. Which of the following expressions is closest to the distance, d feet, from Jarrod to the basket?

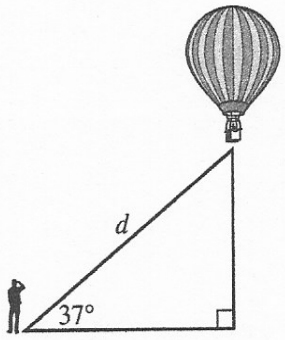
F. $\frac{1{,}000}{\sin 37°}$

G. $\frac{1{,}000}{\cos 37°}$

H. $1{,}000 \sin 37°$

J. $1{,}000 \cos 37°$

K. $1{,}000 \tan 37°$



51. Skyline Tours made $5,000 in 1 day by selling a total of 30 tickets for Tours A, B, and C. They sold twice as many tickets for Tour B as for Tour A. How many tickets were sold for Tour C ?

A. 4
B. 8
C. 12
D. 16
E. 18

DO YOUR FIGURING HERE.

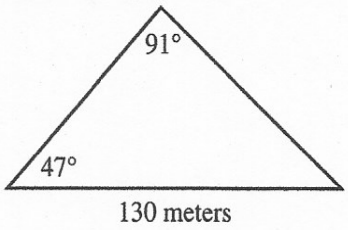
52. Jarrod went on Tour A, and his trip covered a distance of 6 miles. Bhumi went on Tour C, and her trip covered a distance of 9 miles. Which of the following values is the difference, in miles per hour, of the average speeds of their balloons during their tours?

F. 0
G. 2
H. 3
J. 8
K. 9

---

53. A forest fire is contained within a triangular region, which is shown below. The supervising firefighter plans to fight the fire by positioning a firefighter about every 4 meters along the perimeter of the triangle. Among the following, which expression best estimates the planned number of firefighters along the perimeter?

(Note: The law of sines states that in every triangle, the 3 ratios of length of a side to the sine of the angle opposite that side are equal.)



A. $\dfrac{130 + \left(\dfrac{130 \sin 42°}{\sin 91°}\right) + \left(\dfrac{130 \sin 47°}{\sin 91°}\right)}{4}$

B. $\dfrac{130 + \left(\dfrac{130 \sin 91°}{\sin 42°}\right) + \left(\dfrac{130 \sin 91°}{\sin 47°}\right)}{4}$

C. $130 + \dfrac{130 \sin 42°}{\sin 91°} + \dfrac{130 \sin 47°}{\sin 91°}$

D. $\dfrac{\frac{1}{2}\left(\dfrac{130 \sin 47°}{\sin 91°}\right)}{4}$

E. $\dfrac{\frac{1}{2}(130)}{4}$

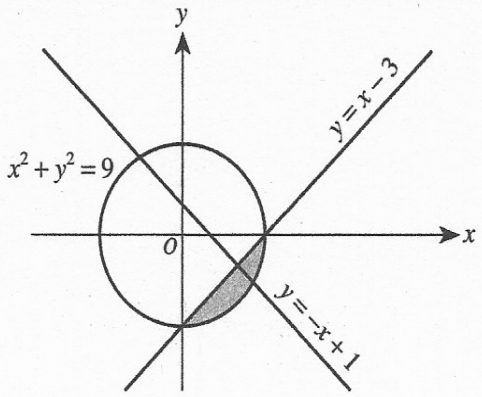
54. How many integers between, but not including, 20 and 30 have a prime factorization with exactly 3 factors that are NOT necessarily unique?

(Note: 1 is NOT a prime number.)

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

DO YOUR FIGURING HERE.

55. The graphs of $y = -x + 1$, $y = x - 3$, and $x^2 + y^2 = 9$ are shown in the standard (x,y) coordinate plane below. The shaded region is the solution set to one of the following systems of inequalities. Which system is it?



A. $y \leq x - 3$
$x^2 + y^2 \leq 9$

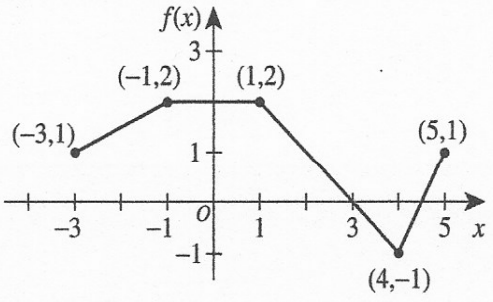
B. $y \leq x - 3$
$x^2 + y^2 \geq 9$

C. $y \leq -x + 1$
$x^2 + y^2 \leq 9$

D. $y \geq x - 3$
$x^2 + y^2 \leq 9$

E. $y \geq -x + 1$
$x^2 + y^2 \geq 9$

56. The function $f(x)$ is shown below with several points labeled. Another function, $g(x)$, is defined such that $g(x) = -[f(x) - 3]$. What is $g(4)$?



F. −4
G. −1
H. 1
J. 4
K. 7

57. The ratio of a to b is 6 to 1, and the ratio of b to c is 12 to 1. What is the value of $\frac{2a + 3b}{4b + 3c}$?

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

B. $\frac{5}{17}$

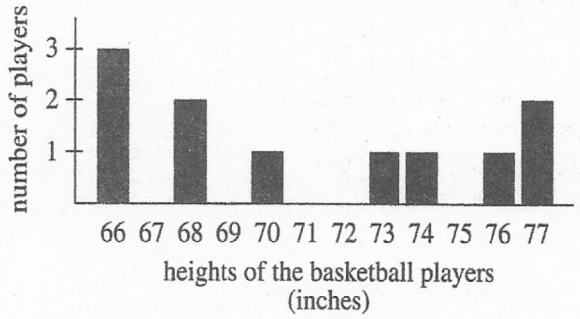
C. $\frac{16}{17}$

D. $\frac{60}{17}$

E. $\frac{48}{7}$

DO YOUR FIGURING HERE.

58. The frequency histogram below shows the distribution of the heights, in inches, of 11 basketball players.



Using the data from the frequency histogram, what is the sum of the mean and the median of this distribution?

F. 141
G. 142
H. 143
J. 144
K. 145

59. In the standard (x,y) coordinate plane, what is the y-intercept of the graph of the function $y = f(x)$ defined below?

$$f(x) = \begin{cases} x^2 - 1 & \text{for } x < -3 \\ 2x - 5 & \text{for } -3 \le x \le 2 \\ |x - 3| & \text{for } x > 2 \end{cases}$$

A. -5
B. -3
C. -1
D. 2.5
E. 3

60. What is the matrix product $\begin{bmatrix} 2 & 4 \\ 6 & 5 \end{bmatrix}\begin{bmatrix} a & b \\ c & d \end{bmatrix}$?

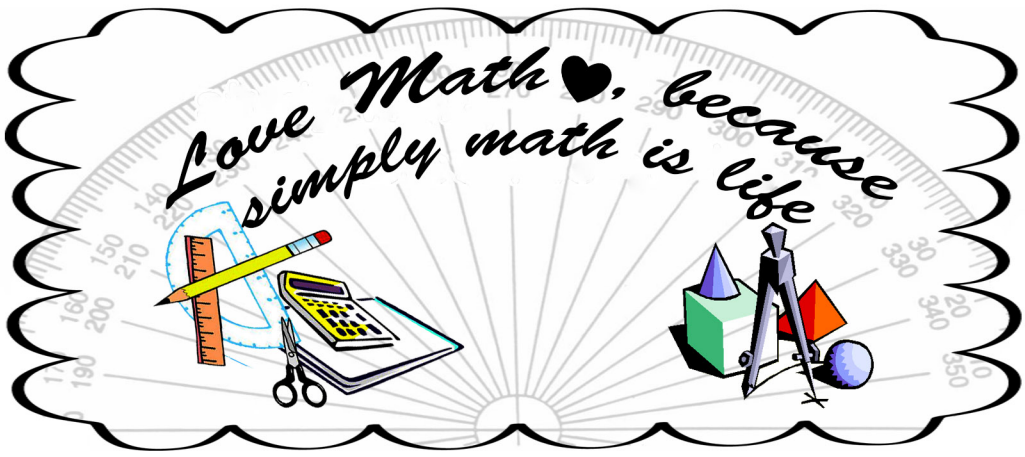
F. $\begin{bmatrix} 2a & 4b \\ 6c & 5d \end{bmatrix}$

G. $\begin{bmatrix} (2a+4b) \\ (6c+5d) \end{bmatrix}$

H. $[(2a+6c)\ (4b+5d)]$

J. $\begin{bmatrix} (2a+6b) & (4a+5b) \\ (2c+6d) & (4c+5d) \end{bmatrix}$

K. $\begin{bmatrix} (2a+4c) & (2b+4d) \\ (6a+5c) & (6b+5d) \end{bmatrix}$



ACT
Home work
Test 3

MOHAMED EISSA
MATHEMATICAL

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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.

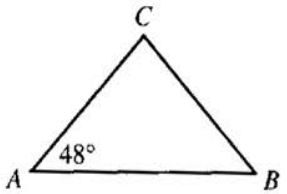
1. Given $r = 4$, $b = 2$, and $g = -5$, $(r + b - g)(b + g) = ?$

   A. -33
   B. -3
   C. 3
   D. 7
   E. 8

2. Jeralyn purchases 1 box of granola bars and 6 boxes of chocolate bars for a total price of \$22.00. The price of each box of granola bars is \$2.50, and the price of each box of chocolate bars is n dollars. Which of the following equations models Jeralyn's purchase?

   F. $2.50 + 22.00 = 6n$
   G. $2.50n + 22.00 = 6n$
   H. $2.50(6n) = 22.00$
   J. $2.50 + 6n = 22.00$
   K. $2.50n + 6n = 22.00$

3. In $\triangle ABC$ shown below, $\overline{AC} \cong \overline{BC}$ and the measure of $\angle A$ is 48°. What is the measure of $\angle C$?



   A. 48°
   B. 84°
   C. 90°
   D. 96°
   E. 132°

4. A square has a perimeter of 20 feet. What is the area, in square feet, of the square?

   F. 5
   G. 10
   H. 25
   J. 40
   K. 80

DO YOUR FIGURING HERE.

5. A bag contains exactly 21 solid-colored buttons: 3 red, 6 blue, and 12 white. What is the probability of randomly selecting 1 button that is NOT white?

A. $\frac{1}{21}$

B. $\frac{1}{9}$

C. $\frac{3}{7}$

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

E. $\frac{3}{4}$

6. What is the value of $|-7| - |7 - 29|$?

F. −29
G. −15
H. 15
J. 29
K. 43

7. A store's revenue is the amount of money received for goods sold. A store's cost is the amount of money the store pays for the goods plus all the store's operating costs like rent, utilities, wages, etc. A store's net profit is the difference between revenue and cost. During 1 month, a grocery store paid $30,000 for goods that were sold for $39,500. With operating costs as shown below, what was the store's net profit for that month?

Operating costs	Amount
Rent, utilities, and telephone	$2,500
Taxes and insurance	$ 370
Interest on business loan	$ 400
Grocer's own wages	$4,500
Wages for part-time help	$ 630
Miscellaneous	$ 400

A. $ 700
B. $ 800
C. $ 900
D. $1,000
E. $1,100

8. When Jorge began a driving trip, his car's odometer read 42 miles. After Jorge drove for 3 hours, the odometer read 165 miles. Which of the following values is closest to Jorge's average driving speed, in miles per hour, during those 3 hours?

F. 36
G. 41
H. 54
J. 55
K. 62

DO YOUR FIGURING HERE.

9. Melinda and Jericho are painting a room in the city recreation center. They started with 5 gallons of paint. On the first day, Melinda used $\frac{3}{4}$ gallon of paint and Jericho used $2\frac{1}{2}$ gallons of paint. How many gallons of paint were left after the first day?

A. $1\frac{3}{4}$

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

C. $2\frac{3}{4}$

D. $3\frac{1}{4}$

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

10. What value of x makes the equation below true?

$$\frac{25^x}{5^2} = 5^4$$

F. 3
G. 6
H. 8
J. 25
K. 625

11. For functions $f(x) = 5 \cdot 2^x$ and $g(x) = 10x$, the value of $f(3) - g(3)$ is:

A. 0
B. 10
C. 70
D. 970
E. 1,030

12. Tanisha, a manager at a state park, counted the money in the cash register at the end of her shift, and then she deposited the money in the bank. When she went back to her office, she accidentally shredded the deposit slip. She remembered that there were only $5 and $10 bills. She also recalled that there were 27 bills totaling $205. How many $5 bills were in Tanisha's cash register at the end of her shift?

F. 13
G. 14
H. 16
J. 23
K. 32

DO YOUR FIGURING HERE.

13. In the standard (x,y) coordinate plane, a line intersects the y-axis at $(0,2)$ and contains the point $(8,3)$. What is the slope of the line?

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

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

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

D. 2

E. 8

14. For an angle with measure α in a right triangle, $\sin \alpha = \frac{15}{17}$ and $\tan \alpha = \frac{15}{8}$. What is the value of $\cos \alpha$?

F. $\frac{17}{8}$

G. $\frac{8}{15}$

H. $\frac{8}{17}$

J. $\frac{8}{\sqrt{161}}$

K. $\frac{8}{\sqrt{514}}$

15. The expression $\frac{6\sqrt{28}}{3\sqrt{7}}$ is equal to:

A. 4

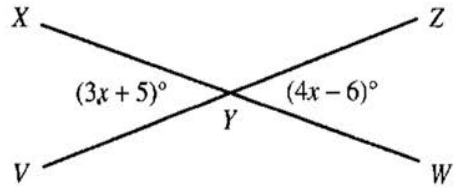
B. 6

C. 8

D. 12

E. $3\sqrt{21}$

16. In the figure below, $\overline{XW}$ intersects $\overline{VZ}$ at Y, the measure of $\angle XYV$ is $(3x + 5)°$, and the measure of $\angle ZYW$ is $(4x - 6)°$. What is the measure of $\angle XYZ$?



F. 83°
G. 97°
H. 104°
J. 142°
K. 169°

DO YOUR FIGURING HERE.

17. The table below shows the letter grades 60 students earned on the final exam in American Literature. The highest possible grade is A; the lowest possible grade is F.

Final exam grade	Number of students
A	10
B	26
C	18
D	4
F	2

A student from this group will be chosen at random. What is the probability that the student's final exam grade is C or higher?

A. 0.3
B. 0.4
C. 0.6
D. 0.7
E. 0.9

18. For what value of n does the quadratic equation $x^2 - 2x + n = 0$ have solutions of $x = 4$ and $x = -2$?

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

19. The circumference of a circle is 12π inches. What is the area of the circle, in square inches?

A. 4π
B. 9π
C. 12π
D. 16π
E. 36π

20. The application for a license plate states that the license plate number has 3 letters followed by a 3-digit number, for example, AEE123. The letters O and I and the digit 0 cannot be part of the license plate number. Any of the other letters and digits may be used up to 3 times. Which of the following expressions represents how many different license plate numbers are possible?

F. 24(23)(22)(9)(8)(7)
G. 24(23)(22)(10)(10)(10)
H. 24(24)(24)(9)(9)(9)
J. 26(25)(24)(10)(9)(8)
K. 26(26)(26)(10)(10)(10)

21. Which of the following expressions is equivalent to $3(a + b) - 2(a - 5b)$?

A. $a - 9b$
B. $a - 7b$
C. $a - 4b$
D. $a + 8b$
E. $a + 13b$

DO YOUR FIGURING HERE.

22. In the figure below, all of the small squares are equal in area, and the area of rectangle $ABCD$ is 1 square unit. Which of the following expressions represents the area, in square units, of the shaded region?

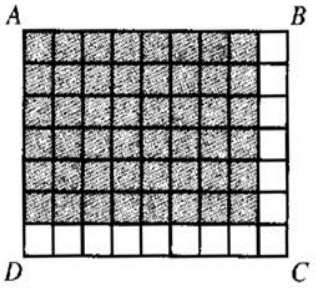
F. $\frac{1}{9} \cdot \frac{1}{7}$

G. $\frac{1}{9} \cdot \frac{6}{7}$

H. $\frac{1}{9} \cdot \frac{8}{9}$

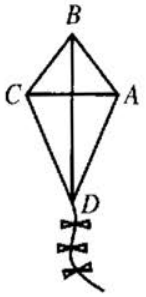
J. $\frac{8}{9} \cdot \frac{1}{7}$

K. $\frac{8}{9} \cdot \frac{6}{7}$



23. Marie is building a kite. In a drawing of her kite, shown below, $AB = BC$, $AD = DC$, the measure of $\angle ABC$ is 80°, and the measure of $\angle ADC$ is 50°. What is the measure of $\angle BAD$?

A. 50°
B. 65°
C. 90°
D. 115°
E. 130°



24. The triangles below are similar ($\triangle ABC \sim \triangle DEF$). Which of the following is an expression for the area of $\triangle ABC$, in square inches?

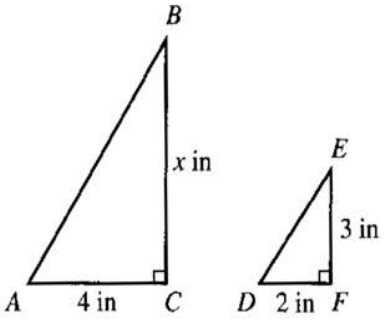
F. $\frac{1}{2}(2+4)(3+x)$

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

H. $\frac{1}{2}(2)(3)(2)$

J. $\frac{1}{2}\left(\frac{x}{3}\right)(2)$

K. $\frac{1}{2}(4)(6)$



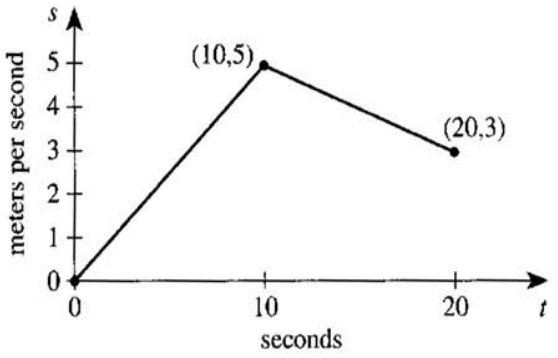
25. The interior of a rectangular shipping crate has dimensions 2 ft by 3 ft by 6 ft. The crate will be filled with cube-shaped boxes whose exteriors have dimensions 12 in by 12 in by 12 in. Given that no box can extend beyond the dimensions of the crate's interior, what is the maximum number of boxes the crate can hold?

A. 3
B. 12
C. 36
D. 48
E. 72

DO YOUR FIGURING HERE.

Use the following information to answer questions 26–29.

Shasta is participating in a bike ride for charity. The graph of speed (s) versus time (t) for the first 20 seconds of her bike ride is shown in the coordinate plane below. The graph is composed of 2 line segments for which the endpoints are at (0,0), (10,5), and (20,3). Shasta traveled 25 meters in the first 10 seconds.



Beginning at $t = 20$ seconds, Shasta slows down as she approaches a familiar group of riders ahead of her and then travels at a constant speed with the group after joining them.

26. What is Shasta's speed, in meters per second, at $t = 3$ seconds?

F. 1.5
G. 2.0
H. 2.5
J. 3.0
K. 6.0

27. Shasta's acceleration, a, over the interval from $t = 10$ seconds to $t = 20$ seconds, is equal to the slope of the graph over that interval, measured in meters per second per second. What is the value of a ?

A. -5

B. $-\frac{1}{5}$

C. $\frac{1}{5}$

D. 2

E. 5

DO YOUR FIGURING HERE.

28. Calen started his bike ride earlier than Shasta. During the first 15 seconds of Shasta's ride, Calen was traveling at a constant speed equal to $\frac{1}{2}$ of Shasta's maximum speed during that same time period. How far, in meters, did Calen travel during the first 15 seconds of Shasta's ride?

F. $22\frac{1}{2}$

G. 25

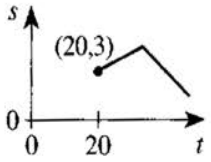
H. $37\frac{1}{2}$

J. 45

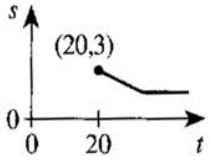
K. 75

29. Which of the following graphs best represents the portion of Shasta's ride beginning at $t = 20$ seconds?

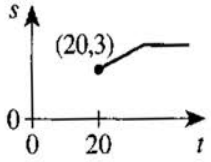
A.



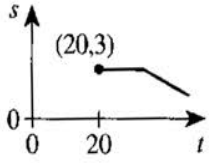
D.



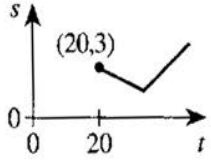
B.



E.



C.



30. $\frac{2}{3} - \frac{5}{6}\left(\frac{2}{5} + \frac{1}{10}\right) = ?$

F. $-\frac{1}{3}$

G. $-\frac{1}{9}$

H. $-\frac{1}{12}$

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

K. $\frac{13}{30}$

DO YOUR FIGURING HERE.

31. The lengths of 2 adjacent sides of a rectangle are represented by $x + 2$ feet and $2x + 7$ feet. In terms of x, what is the area, in square feet, of the rectangle?

A. $6x + 18$
B. $2x^2 + 14$
C. $2x^2 + 9x + 14$
D. $2x^2 + 11x + 9$
E. $2x^2 + 11x + 14$

32. Which one of the following inequalities is true?

F. $2 < \sqrt{3} < 4$
G. $\frac{1}{2} < \sqrt{\frac{1}{3}} < \frac{1}{4}$
H. $4 < 2(\sqrt{5}) < 5$
J. $\sqrt{3} < 4 < \sqrt{5}$
K. $\sqrt{2} < 2(\sqrt{2}) < \sqrt{3}$

33. Two fair coins are repeatedly tossed simultaneously. What is the probability that both coins land heads up on the 36th toss?

A. $\frac{1}{144}$
B. $\frac{1}{108}$
C. $\frac{1}{36}$
D. $\frac{1}{9}$
E. $\frac{1}{4}$

34. Suppose a student's course grade is determined solely by that student's scores on 8 tests, which are worth 100 points each. If Bane has an average of exactly 88 points on the first 6 tests, how many points must he average on the last 2 tests to earn exactly a 90-point course grade?

F. 99
G. 96
H. 95
J. 94
K. 92

35. Which of the following operations will produce the largest result when substituted for the blank in the expression $62 \_\_\_\_ \left(-\frac{1}{65}\right)$?

A. Averaged with
B. Divided by
C. Minus
D. Plus
E. Multiplied by

DO YOUR FIGURING HERE.

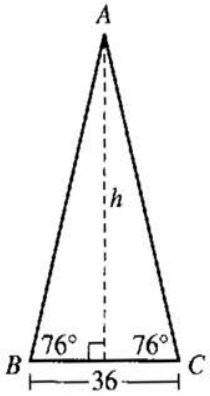
36. Given the sets $A = \{0, 1, 2, 3\}$ and $B = \{1, 3, 5, 7\}$, which of the following defines a function f from A onto B ?

F. $f(x) = 2x + 1$
G. $f(x) = 2x - 1$
H. $f(x) = 3x - 1$
J. $f(x) = 3x - 2$
K. $f(x) = x + 1$

37. If $x = \frac{3}{4} + \frac{4}{3}$, $y = \frac{2}{3} + \frac{3}{2}$, and $z = 1 + 1$, which of the following orders x, y, and z from least to greatest?

A. $x < y < z$
B. $y < x < z$
C. $y < z < x$
D. $z < x < y$
E. $z < y < x$

38. Isosceles triangle $\triangle ABC$ has an altitude of h inches, a base of 36 inches, and 2 base angles measuring 76° each, as shown in the figure below. What is the value of h ?



F. 18 sin 76°
G. 18 tan 76°
H. 36 cot 76°
J. 36 sin 76°
K. 36 tan 76°

39. The least common multiple (LCM) of 2 numbers is 216. The larger of the 2 numbers is 108. What is the greatest value the other number can have?

A. 2
B. 6
C. 36
D. 54
E. 72

40. In the standard (x,y) coordinate plane, given Parabola A with equation $y = 3x^2$, Parabola B is the image of Parabola A after a shift of 7 coordinate units to the left and 4 coordinate units down. Parabola B has which of the following equations?

F. $y = 3(x - 4)^2 - 7$
G. $y = 3(x - 7)^2 - 4$
H. $y = 3(x - 7)^2 + 4$
J. $y = 3(x + 7)^2 - 4$
K. $y = 3(x + 7)^2 + 4$

DO YOUR FIGURING HERE.

Use the following information to answer questions 41–43.

In 2012, pollsters for the Gallup Organization asked a random sample of 1,014 adults, "On the average, about how much does your family spend on food each week?" The table below lists the percent of the sample that gave each response. For example, approximately 21% of adults in the sample responded that, on average, they spend no less than $200 but no more than $299 on food each week.

Average amount spent	Percent of sample
Less than $50	8%
$50 to $99	17%
$100 to $124	22%
$125 to $149	4%
$150 to $199	15%
$200 to $299	21%
$300 or more	10%
Did not give an amount	3%

41. Which of the following expressions is equal to the approximate number of adults from the sample that said they spend an average of less than $100 each week on food?

A. 1,014(22)
B. 1,014(25)
C. 1,014(47)
D. 1,014(0.22)
E. 1,014(0.25)

42. What percent of adults in the sample responded that they spend, on average, at least $150 each week on food?

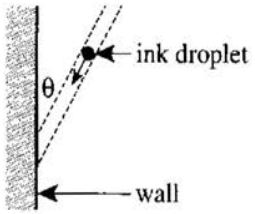
F. 15%
G. 46%
H. 49%
J. 51%
K. 66%

43. A pollster will create a circle graph using the information in the table. One sector of the circle graph will represent the percent of adults in the sample who said they spend an average of $300 or more on food each week. What will be the measure of the central angle for that sector?

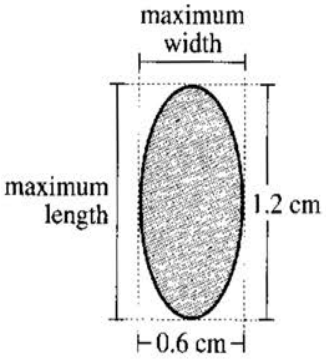
A. 10°
B. 13°
C. 36°
D. 45°
E. 47°

DO YOUR FIGURING HERE.

44. A spherical droplet of ink strikes a vertical wall, as modeled in the figure below. The angle of impact is indicated by θ in the figure.

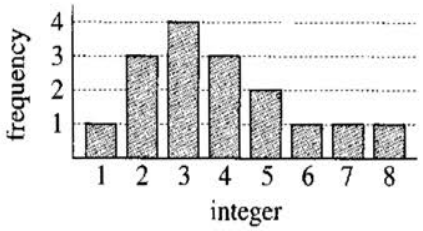


The stain the droplet leaves on the wall is oval-shaped. Scientists can measure the maximum length and maximum width of the stain to determine the angle of impact according to the formula $\sin\theta = \frac{\text{maximum width}}{\text{maximum length}}$. The figure below models such a stain. What was the impact angle of the droplet that left this stain?



F. 30°
G. 45°
H. 60°
J. 90°
K. 120°

45. The graph below shows the distribution of a data set consisting of 16 positive integers. Which of the following statements about the mean, median, and mode of the data set is true?



A. The mode is less than the median, and the median is less than the mean.
B. The mode is less than the mean, and the mean is equal to the median.
C. The mode is equal to the mean, and the mean is less than the median.
D. The mean is less than the median, and the median is less than the mode.
E. The mean is equal to the median, and the median is equal to the mode.

DO YOUR FIGURING HERE.

46. Yolanda collects trading cards, and she has started her younger brothers, Xavier and Zach, collecting cards as well. As of today, Zach owns 5 more cards than Xavier, and Yolanda owns twice as many cards as Xavier and Zach combined. Which of the following equations expresses the relationship between y, the number of cards Yolanda owns, and x, the number of cards Xavier owns?

F. $y = x - 5$
G. $y = x + 5$
H. $y = 2x$
J. $y = 4x - 10$
K. $y = 4x + 10$

47. What is the distance, in coordinate units, between the points $(-2,1)$ and $(1,10)$ in the standard (x,y) coordinate plane?

A. $\sqrt{72}$
B. $\sqrt{80}$
C. $\sqrt{82}$
D. $\sqrt{90}$
E. 12

48. A rectangular solid has a volume of 100 cubic units. If the length, width, and height of the solid are each doubled, what will the volume, in cubic units, of the new solid be?

F. 200
G. 400
H. 600
J. 800
K. 2,700

49. The set of all values of x that satisfies $|x - 2| < 7$ is the same as the set of all values of x that satisfies:

A. $0 < x < 5$
B. $0 < x < 9$
C. $-5 < x < 5$
D. $-5 < x < 9$
E. $-9 < x < 9$

50. The fifth power of a number is 380,204,032. The number is between:

F. 1 and 10.
G. 10 and 100.
H. 100 and 1,000.
J. 1,000 and 100,000.
K. 100,000 and 100,000,000.

DO YOUR FIGURING HERE.

51. Given $A = \begin{bmatrix} 2 & 0 & 3 \\ -1 & 5 & -2 \end{bmatrix}$, $B = \begin{bmatrix} -3 & 1 \\ 4 & 1 \\ 1 & 2 \end{bmatrix}$, and $C = \begin{bmatrix} 0 & -2 \\ 1 & -4 \end{bmatrix}$, if it is possible to calculate $C + AB$, which of the following matrices is the result?

A. $\begin{bmatrix} -6 & -3 \\ 1 & 1 \end{bmatrix}$

B. $\begin{bmatrix} -3 & 6 \\ 22 & -4 \end{bmatrix}$

C. $\begin{bmatrix} 11 & 6 \\ 2 & -3 \end{bmatrix}$

D. $\begin{bmatrix} -6 & 0 \\ -8 & 1 \\ 3 & -4 \end{bmatrix}$

E. It is not possible to calculate $C + AB$.

52. Given $0 \le x \le 8$ and $y \ge 18$, what is the greatest value of $\frac{x+y}{y}$, if it can be determined?

F. 0

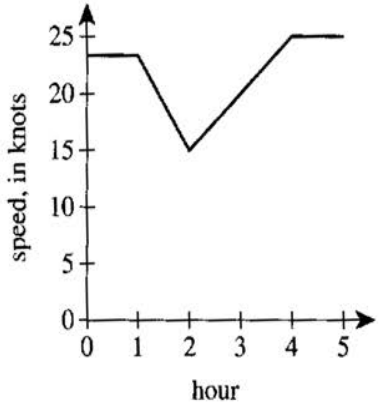
G. 1

H. $\frac{13}{9}$

J. $\frac{13}{4}$

K. Cannot be determined from the given information

53. The graph below gives the speed, in *knots* (nautical miles per hour), of a cruise ship during a 5-hour period. Which of the following values is closest to the rate of change, in knots per hour, of the speed of the ship between hours 2 and 4 ?



A. 2
B. 3
C. 5
D. 10
E. 25

DO YOUR FIGURING HERE.

54. A fair spinner with 4 equally sized regions and an arrow has regions numbered 1, 2, 3, and 4, respectively, and a second fair spinner with 5 equally sized regions and an arrow has regions numbered 1, 2, 3, 4, and 5, respectively. The arrows are both spun at the same time, and the numbers the 2 arrows land on are multiplied together. What is the probability that this product is an odd number?

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

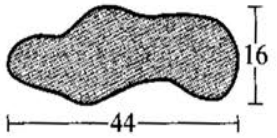
G. $\frac{4}{5}$

H. $\frac{4}{9}$

J. $\frac{5}{9}$

K. $\frac{3}{10}$

55. The bottom of a swimming pool, shown below, has an area of 630 square feet and a perimeter of 114 ft. The swimming pool has a uniform depth of 5 ft of water, and the given lengths are in feet. If it can be determined, what is the volume of water, in cubic feet, that the pool contains?



A. 3,150
B. 3,335
C. 3,520
D. 3,720
E. Cannot be determined from the given information

56. For all positive integers a and b, the expression $(a!)^b$ is equivalent to one of the following expressions. Which one?

F. $(a^b)!$

G. $(ab)!$

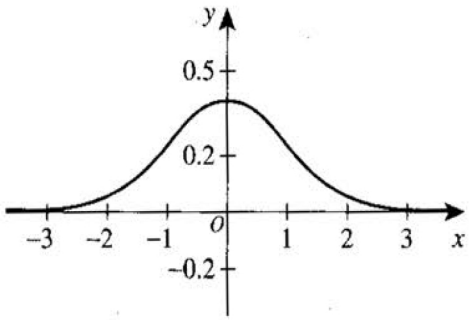
H. $b(a!)$

J. $a^b(-1 + -2 + -3 + \cdots)$

K. $[a(a-1)(a-2)\cdots(1)]^b$

DO YOUR FIGURING HERE.

57. The standard normal probability distribution function ($\mu = 0$ and $\sigma = 1$) is graphed in the standard (x,y) coordinate plane below. Which of the following percentages is closest to the percent of the data points that are within 2 standard deviations of the mean in any normal distribution?



A. 50%
B. 68%
C. 90%
D. 95%
E. 99%

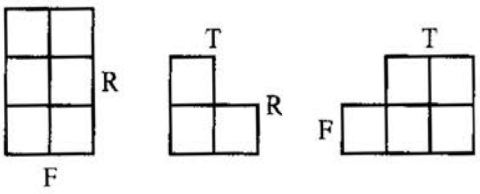
58. For what value of b will the determinant of the matrix $\begin{bmatrix} 4 & b \\ 2 & 3 \end{bmatrix}$ have a value of 18 ?

F. $-\frac{10}{3}$
G. -3
H. 3
J. 6
K. 15

59. What are the solutions to $x^2 - 2x + 17 = 0$?

A. -3 and 5
B. $1 \pm (3\sqrt{2})i$
C. $1 \pm 4i$
D. $1 \pm 8i$
E. $2 \pm 8i$

60. Shown below are the top, front, and right side views of a stack of 1-centimeter cubes. The labels T, F, and R specify where the top, front, and right sides are located with respect to the view. What is the volume, in cubic centimeters, of the stack of cubes?



top front right side

F. 6
G. 8
H. 9
J. 12
K. 14

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ACT

Mathematics

Mr. Mohamed Eissa is an enthusiastic Math tutor and consultant who has a wide experience qualifying American diploma students for their admission college exams.
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An outstanding international education practitioner possessing conciderable Math teaching experience along with ability to motivate and inspire students across the age and ability range. Possessing excllent teaching, learning, and behavior management strategies to help students fullfill their potential.

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