

Math: Routing Module

Mark your answers either on the pages that follow or on a separate sheet of paper. You will be scoring this Routing Module before going on to the final Math Module.

DIRECTIONS

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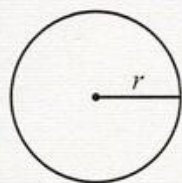
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Examples

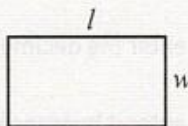
ANSWER	ACCEPTABLE WAY TO ANSWER	UNACCEPTABLE: WILL NOT RECEIVE CREDIT
3.5	3.5 3.50 $7/2$	$31/2$ $3\ 1/2$
$\frac{2}{3}$	$2/3$.6666 .6667 0.666 0.667	0.66 .66 0.67 .67
$-\frac{1}{3}$	$-1/3$ -.3333 -0.333	-.33 -0.33

Reference:

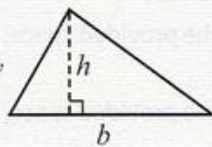


$$A = \pi r^2$$

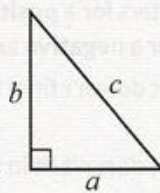
$$C = 2\pi r$$



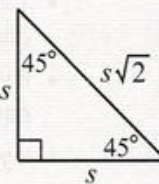
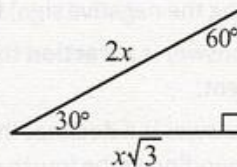
$$A = lw$$



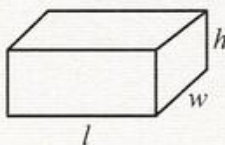
$$A = \frac{1}{2}bh$$



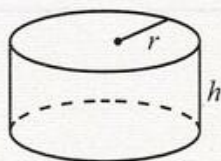
$$c^2 = a^2 + b^2$$



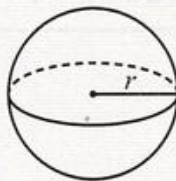
Special Right Triangles



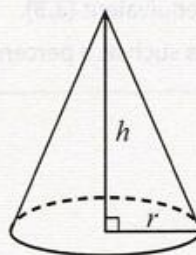
$$V = lwh$$



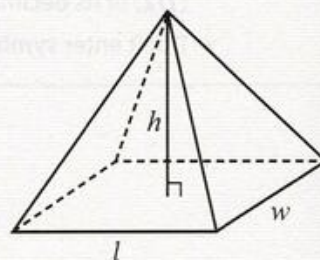
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}lwh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

1

$$\frac{1}{4}(x - 7) = 3$$

What value of x satisfies the equation?

- (A) 3
- (B) 7
- (C) 19
- (D) 28

2

If $f(x) = 5x - 2$, what is $f(x + 3)$?

- (A) $5x + 1$
- (B) $5x + 13$
- (C) $5x + 15$
- (D) $5x + 17$

3

If $4b - 3 > 7$, what is the greatest possible integer value of $-2b + 4$?

- (A) -2
- (B) -1
- (C) 0
- (D) 1

4

Which of the following is equivalent

to $\frac{x^2 + 6x + 9}{x^2 + 7x + 12}$?

- (A) $\frac{6x + 9}{7x + 12}$
- (B) $\frac{x + 4}{x + 3}$
- (C) $\frac{x + 3}{x + 4}$
- (D) $x + 3$

5

$$\frac{x^4 y^3}{(x^2)^2 y^m} = 1$$

What is the value of m ?

6

A certain type of floor tile covers an area of 7.75 square feet for every three tiles. How many tiles of this type are needed to cover an area of 186 square feet?

- (A) 24
- (B) 72
- (C) 186
- (D) 558

7

A square has a diagonal length of $12\sqrt{2}$ inches.
What is the area of the square in square inches?

(A) 12

(B) 24

(C) 72

(D) 144

8

$$\frac{2y - (2y + 1)}{3y + 5} = \frac{4y + (3 - 4y)}{y}$$

What is the value of y ?

9

$$\begin{cases} 2y + x = 9 \\ 27 - 3x = 6y \end{cases}$$

The system of equations shown has how many solutions?

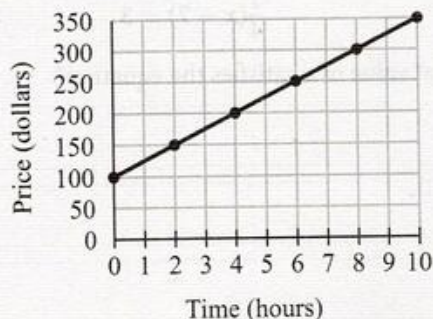
(A) 0

(B) 1

(C) 2

(D) Infinitely many

10



An electrician charges a service call fee, plus an additional fee for every hour on the job. The graph shows the relationship between the hours worked and the total price of the job. Based on the graph, how much would the electrician charge for a job that takes 20 hours?

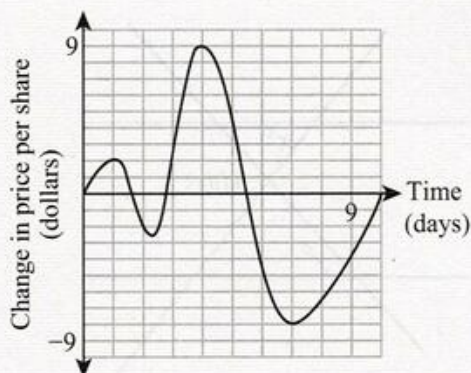
(A) \$600

(B) \$700

(C) \$1200

(D) \$1500

11



The graph represents the change in price per share (in dollars) of a certain stock during two business weeks. If the coordinates of the maximum are (a, b) and the coordinates of the minimum are (c, d) , what is the value of $\frac{d-b}{c-a}$?

Ⓐ -17

Ⓑ $-\frac{19}{3}$ Ⓒ $-\frac{17}{3}$

Ⓓ 3

12

Kush currently scores 400 on the SAT math section. He sets a goal to improve this score by 1% each day. At this rate, approximately how many days will it take him to score an 800?

Ⓐ 40

Ⓑ 50

Ⓒ 60

Ⓓ 70

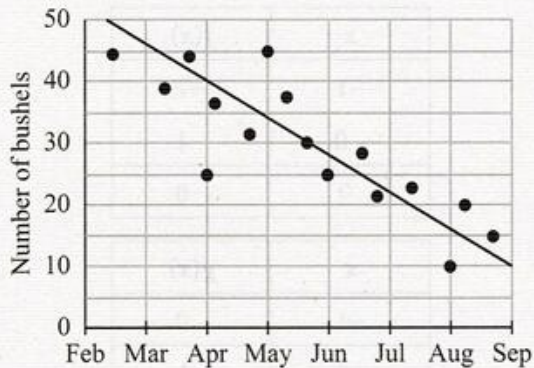
13

x	$f(x)$
-1	-1
0	1
1	0

x	$g(x)$
-1	0
0	-1
1	1

For what value of x is the function $h(x) = \frac{f(x)}{g(x)}$ undefined?

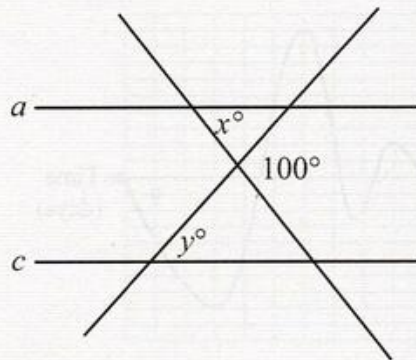
14



The scatterplot relates the time when a farmer planted a crop to the yield of that crop. Which of the following is the approximate difference, in bushels, between the yield predicted by the line of best fit and the actual yield of the greatest outlier from the predicted value?

- (A) 10
(B) 15
(C) 20
(D) 25

15



Line a is parallel to line c . Which of the following statements is true?

- (A) $x^\circ + y^\circ = 80^\circ$
(B) $x^\circ + y^\circ = 100^\circ$
(C) $x^\circ = y^\circ$
(D) $x^\circ + y^\circ = 180^\circ$

16

$$\begin{aligned} 8x &\leq 24y + 40 \\ 3x &\leq 6y + 12 \end{aligned}$$

What is the greatest possible value of x in the system of inequalities?

- (A) 2
(B) 1
(C) 0
(D) -1

17

At a certain store, 4 knives, 5 spoons, and 6 forks cost \$7.90. To purchase 2 knives, 2 spoons, and 5 forks would cost \$5.80. How much do 2 knives, 3 spoons, and 1 fork cost?

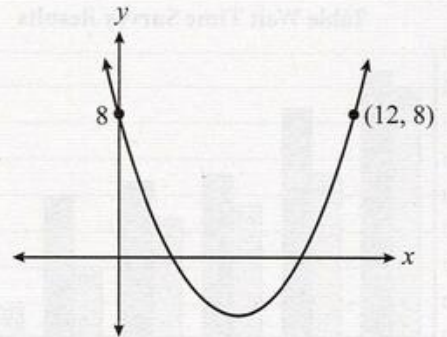
- (A) \$2.10
(B) \$3.30
(C) \$4.70
(D) \$5.80

18

If $x \neq 3$, $y \neq -5$, and $xy = 15$, which of the following is equivalent to $\frac{1}{\frac{1}{x-3} + \frac{1}{y+5}}$?

- (A) $\frac{5x-3y}{x+y+2}$
(B) $\frac{x+y+2}{(x-3)(y+5)}$
(C) $\frac{(x+3)(y-5)}{x+y+2}$
(D) $\frac{5-3}{2}$

19



The range of the parabola shown in the graph above is $y \geq -4$. If the equation $y = ax^2 + bx + c$ is used to represent the graph, what is the value of a ?

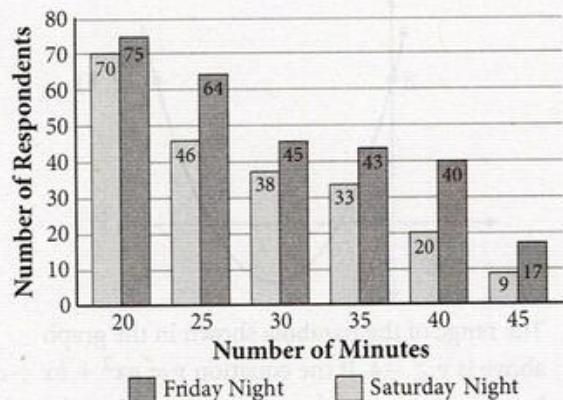
- (A) $\frac{1}{3}$
(B) $\frac{2}{3}$
(C) $\frac{3}{2}$
(D) 3

20

A thrift store prices a piece of used furniture at \$100. The price is marked down an additional p percent every month until it is sold. If the piece of furniture is sold for \$64 after two months, what is the value of p ?

21

Table Wait Time Survey Results

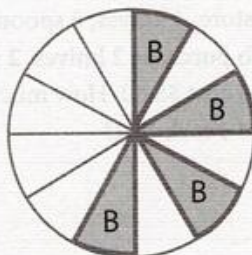


A restaurant randomly surveyed customers to determine how long customers are willing to wait for a table on a Friday night versus a Saturday night. On average, approximately how many minutes longer are customers willing to wait for a table on a Saturday night than on a Friday night?

- (A) 1.3
- (B) 11.3
- (C) 34
- (D) 68

Practice Test

22



The figure shows a rodeo arena divided into 12 equal sections, 4 of which contain bulls. If $64 + \frac{16\pi}{3}$ yards are needed to reinforce all the edges of the 4 bull sections, what is the radius, in yards, of the arena?

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ON TEST DAY, YOU WON'T BE ABLE TO MOVE ON TO THE NEXT MODULE UNTIL TIME EXPIRES.

STOP

Math: Module A

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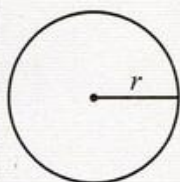
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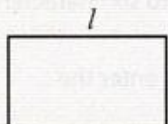
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$\frac{2}{3}$	2/3 .6666 .6667 0.666 0.667	0.66 .66 0.67 .67
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Reference:

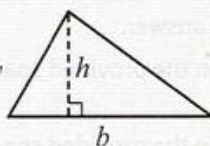


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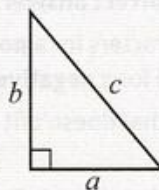
$$C = 2\pi r$$



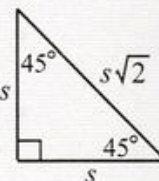
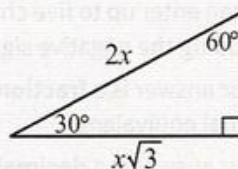
$$A = lw$$



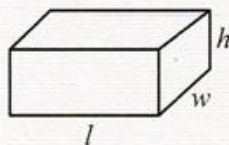
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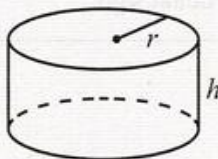
$$c^2 = a^2 + b^2$$



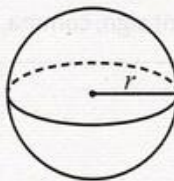
Special Right Triangles



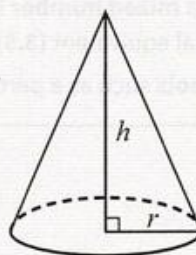
$$V = lwh$$



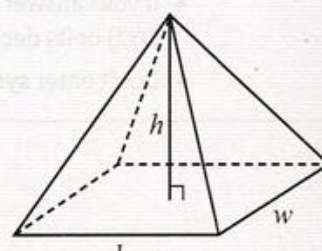
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}lwh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

1

A “pick your own” strawberry farm charges each customer a \$10 entry fee, plus \$3 per pound of strawberries picked. Which of the following functions describes a customer’s total cost in dollars, c , as a function of the number of pounds of strawberries picked, p ?

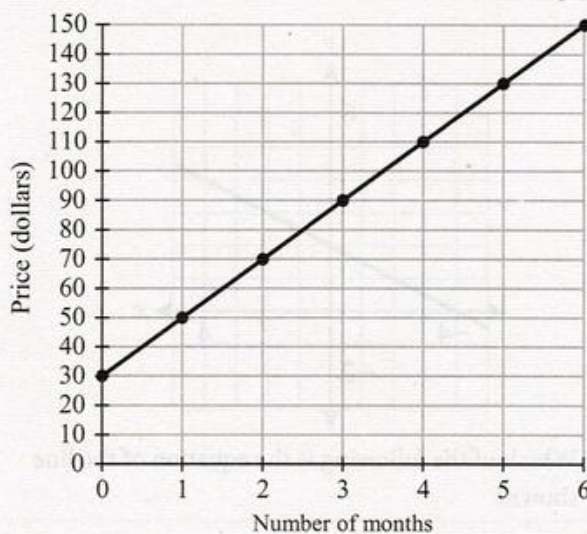
- (A) $c(p) = 3p$
- (B) $c(p) = 3p + 10$
- (C) $c(p) = 10p + 3$
- (D) $c(p) = 10p$

2

If $11x - 22 = 4(x - 2)$, what is the value of $2x$?

- (A) 2
- (B) $\frac{20}{7}$
- (C) 4
- (D) $\frac{40}{7}$

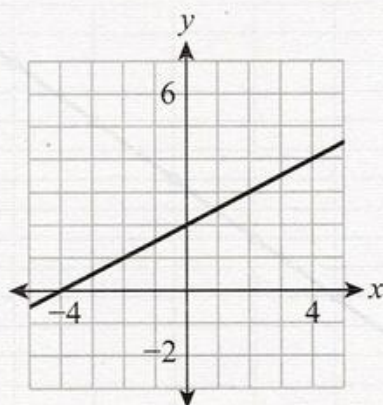
3



An Internet service charges an initial membership fee plus a fixed monthly cost, as shown in the graph. What is the fixed cost per month, in dollars?

- (A) 10
- (B) 20
- (C) 30
- (D) 50

4



Which of the following is the equation of the line shown?

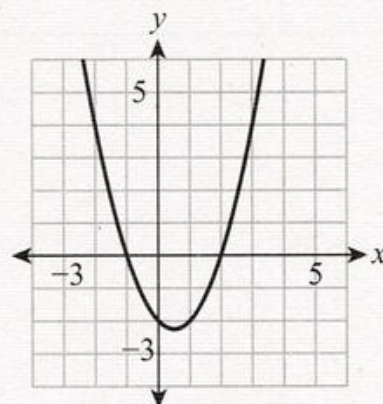
(A) $y = x + 2$

(B) $y = \frac{1}{2}x$

(C) $y = \frac{1}{2}x + 2$

(D) $y = 2x + 2$

5



The graph of the function $y = x^2 - x - 2$ is shown. What is the sum of the roots of this function?

6

If $x - y = 6$, what is the value of $x^2 - 2xy + y^2$?

(A) 0

(B) 6

(C) 24

(D) 36

7

If $\sqrt[3]{x} = 8$, what is the value of x ?

(A) 2

(B) $\frac{8}{3}$

(C) 24

(D) 512

8

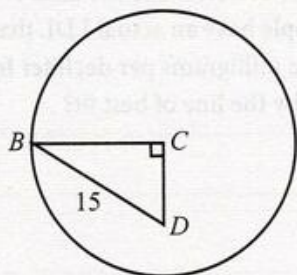
A delivery van travels at an average speed of 30 miles per hour. If the van travels for 8 hours each day, how many miles will it travel in 6 days?

9

A puppy's weight increases 35 percent each month. If the puppy's initial weight is 10 pounds, approximately how many pounds will the puppy weigh after 4 months?

- (A) 13.5
(B) 24
(C) 33
(D) 150

10



In the figure, point C is the center of the circle, and the measure of angle B is 37° . Which of the following expresses the length of the radius?

- (A) $15 \sin 37^\circ$
(B) $15 \tan 37^\circ$
(C) $15 \cos 37^\circ$
(D) $15 \tan 53^\circ$

11

A rectangle has a width of $2a$. If the length of the rectangle is 3.5 times its width, what is the perimeter of the rectangle, in terms of a ?

- (A) $5.5a$
(B) $9a$
(C) $11a$
(D) $18a$

12

If $\sqrt{xy} = 3$, $y = z^2$, and $z = 6$, what is the value of x ?

- (A) $\frac{1}{4}$
(B) $\frac{1}{2}$
(C) 2
(D) 4

13

If $-4x + 46 \leq x - 4$, what is the minimum value of x ?

14

Suppose the larva of a certain insect species has an initial mass of 10 grams and grows linearly from $t = 0$ to $t = 48$ hours. If the mass of the larva is 14 grams after 48 hours, what was its mass, in grams, at $t = 6$ hours?

- (A) 10.5
(B) 12.5
(C) 13
(D) 14

15

$$|3x - 6| = 2x$$

What is the product of the solutions to the equation shown?

- (A) 6
(B) $\frac{36}{5}$
(C) $\frac{42}{5}$
(D) 36

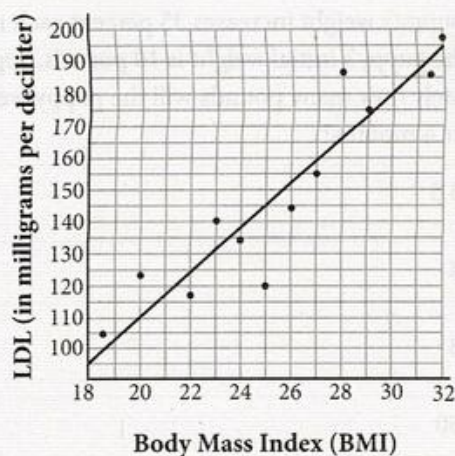
16

$$2x^2 + 16x + 2 = 0$$

What is the value of x ?

- (A) $\pm 5\sqrt{3} - 15$
(B) $\sqrt{15} - 8$
(C) $3\sqrt{5} - 8$
(D) $\pm\sqrt{15} - 4$

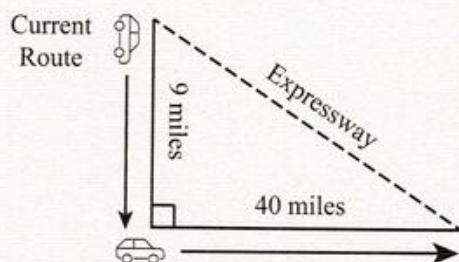
17



The scatterplot shows the relationship between body mass index, low-density lipoprotein (LDL), and the line of best fit for the data. How many of the 12 people have an actual LDL that differs by 10 or more milligrams per deciliter from the LDL predicted by the line of best fit?

- (A) 1
(B) 2
(C) 3
(D) 4

18



Note: Figure not drawn to scale.

The figure shows the route that Max currently takes to work and back home every day. The city is planning to build an expressway that would cross through the city. Assuming an average gas consumption of 20 miles per gallon, how many gallons of gas will Max save each day by taking the expressway to and from work?

19

Which of the following is equivalent to $\frac{3x^2 + 5x - 7}{x + 1}$?

(A) $3x + 5$

(B) $3x + 7$

(C) $3x + 1 + \frac{2}{x + 1}$

(D) $3x + 2 - \frac{9}{x + 1}$

20

$$2x^2 - x - 15 = 0$$

Which of the following is a possible value of x ?

(A) 3

(B) $\frac{5}{2}$

(C) $-\frac{2}{5}$

(D) -3

21

x	$f(x)$
0	-1
1	1
2	7
3	17

Which of the following functions correctly models the data in the table?

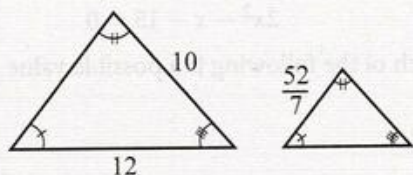
(A) $f(x) = 2x^2 - 1$

(B) $f(x) = 2x^3 - 1$

(C) $f(x) = 2^{2x} - 1$

(D) $f(x) = 2^x - 1$

22



The ratio of the perimeters of the two triangles in the figure is 7:4. What is the perimeter of the smaller triangle?

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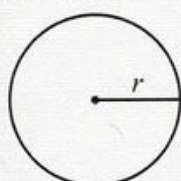
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- If your answer is a **decimal** that doesn't fit in the provided space, enter it by truncating or rounding at the fourth digit.
- If your answer is a **mixed number** (such as $3\frac{1}{2}$), enter it as an improper fraction ($\frac{7}{2}$) or its decimal equivalent (**3.5**).
- Don't enter **symbols** such as a percent sign, comma, or dollar sign.

Examples

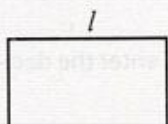
ANSWER	ACCEPTABLE WAY TO ANSWER	UNACCEPTABLE: WILL NOT RECEIVE CREDIT
3.5	3.5 3.50 7/2	3 1/2 3 1/2
$\frac{2}{3}$	$\frac{2}{3}$.6666 .6667 0.666 0.667	0.66 .66 0.67 .67
$-\frac{1}{3}$	$-\frac{1}{3}$ -.3333 -0.333	-.33 -0.33

Reference:

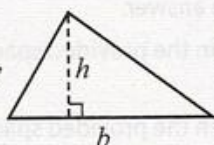


$$A = \pi r^2$$

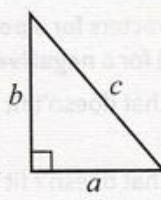
$$C = 2\pi r$$



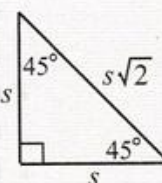
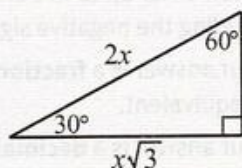
$$A = lw$$



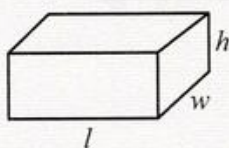
$$A = \frac{1}{2}bh$$



$$c^2 = a^2 + b^2$$



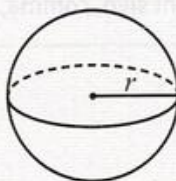
Special Right Triangles



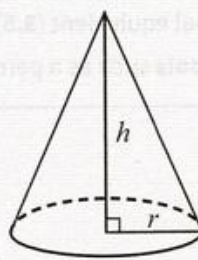
$$V = lwh$$



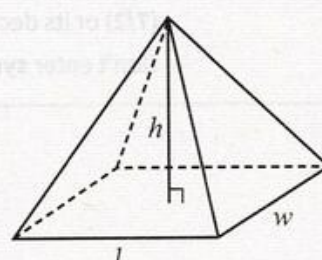
$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}lwh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.

1

The function $f(x)$ is defined as $f(x) = 2g(x)$, where $g(x) = x + 5$. What is the value of $f(3)$?

2

$$\frac{24x^4 + 36x^3 - 12x^2}{12x^2}$$

Which of the following expressions is equivalent to the expression shown?

(A) $2x^2 + 3x$

(B) $24x^4 + 36x^3$

(C) $2x^2 + 3x - 1$

(D) $24x^4 + 36x^3 - 1$

3

A group of 150 first-year students was randomly selected for a survey that asked whether they were excited to continue their foreign language studies in the next school year. Of this group, 93 said yes, 37 said no, and 20 were not sure. If 1,195 first-year students are currently enrolled in foreign language studies, which of the following is most likely a valid conclusion?

(A) About 740 first-year students are excited to continue foreign language studies next year.

(B) About 440 first-year students are not excited to continue foreign language studies next year.

(C) About 240 first-year students are not excited to continue foreign language studies next year.

(D) About 130 first-year students do not know yet whether they are excited to continue foreign language studies next year.

4

A trucking firm needs to hire at least 8 employees. These employees will be made up of drivers, each paid \$1,120 per week, and mechanics, each paid \$900 per week. The budget for paying these employees is no more than \$8,300 per week. Which of the following inequalities represents this situation, where x is the number of drivers and y is the number of mechanics?

(A) $2020(x + y) \leq 8,300$
 $x + y \geq 8$

(B) $1120x + 900y \geq 8,300$
 $x + y \geq 8$

(C) $1120x + 900y \leq 8,300$
 $x + y \leq 8$

(D) $1120x + 900y \leq 8,300$
 $x + y \geq 8$

5

$$y = 3x^2 + 7x - 4$$

$$y - x = -7$$

How many solutions are there to the system of equations shown?

6

A land conservation trust has an initial area of 720 acres. The growth plan will add 84 acres of land to the trust each year. If a function is written in the form $f(x) = ax + b$, where $f(x)$ represents the number of acres of land in the trust and x represents the number of months that have passed, what is the value of x when $f(x) = 1,126$?

(A) 4.83

(B) 13.4

(C) 58

(D) 406

7

$$g(x) = 3x^2 + 12x + 3$$

What is the minimum value of $g(x) + 3$?

(A) -9

(B) -6

(C) -2

(D) 6

8

Which of the following are the roots of the equation $2x^2 + 4x - 3 = 0$?

(A) $\frac{-2 \pm \sqrt{10}}{2}$

(B) $-2 \pm \sqrt{5}$

(C) $-1 \pm \sqrt{10}$

(D) $-1 \pm 2\sqrt{10}$

9

The number of algae cells in a test tube increases at a rate of 50 percent per day. After 3 days, the number of algae cells is 6,750. What was the initial number of algae cells in the test tube?

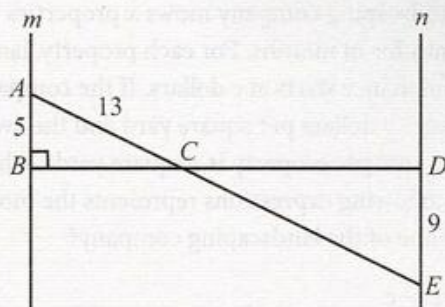
- (A) 2,000
- (B) 3,000
- (C) 4,500
- (D) 6,600

10

Over 5 quizzes, a student's average score is 80. If the lowest score is removed, the average score of the remaining quizzes rises to 83. What is the lowest score of the 5 quizzes?

- (A) 28
- (B) 35
- (C) 68
- (D) 77

11



In the figure shown, lines m and n are parallel. If AB is 5, AC is 13, and DE is 9, what is the length of BD ?

- (A) 12
- (B) 21.6
- (C) 23.4
- (D) 33.6

12

A wholesale food vendor charges \$33 for each gallon of maple syrup and \$14 for each gallon of pancake syrup. If a restaurant buys 8 gallons of syrup, of which x gallons are pancake syrup and the rest are maple syrup, which of the following equations represents the total cost in dollars, c ?

- (A) $c = -19x + 264$
- (B) $c = -14x + 33$
- (C) $c = 14x$
- (D) $c = 19x + 112$

13

A landscaping company mows x properties per month for m months. For each property, landscape maintenance starts at c dollars. If the company charges y dollars per square yard and the average lawn area per property is z square yards, which of the following expressions represents the monthly revenue of the landscaping company?

- (A) $xyz + c$
- (B) $(yz + c)x$
- (C) $(yz + c)mx$
- (D) $(xyz + c)m$

14

$$\begin{cases} 2x + 8y = 9 \\ 3x + 5y = 10 \end{cases}$$

If (x, y) is a solution to the system of equations shown, what is the value of $\frac{x}{y}$?

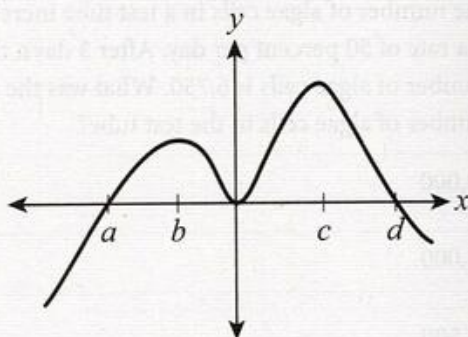
15

$$\left| \frac{4 + 2x}{x + 2} \right| = x$$

What is the solution set for the equation shown?

- (A) No solution
- (B) $\{-2\}$
- (C) $\{2\}$
- (D) $\{-2, 2\}$

16



Which of the following equations could be for the graph of the polynomial shown?

- (A) $f(x) = -x^2(x + a)(x - d)$
- (B) $f(x) = -x^2(x - a)(x - d)$
- (C) $f(x) = -x^2(x - b)(x - c)$
- (D) $f(x) = -x^2(x + b)(x + c)$

17

$$y = ax^2 - \frac{b^2}{4}$$

Which of the following is equivalent to the equation shown?

- (A) $y = \left(\sqrt{ax} + \frac{b}{2} \right) \left(\sqrt{ax} - \frac{b}{2} \right)$
- (B) $y = \left(\sqrt{a}x + \frac{b}{2} \right) \left(\sqrt{a}x - \frac{b}{2} \right)$
- (C) $y = \left(\sqrt{ax} - \frac{b}{2} \right)^2$
- (D) $y = \left(\sqrt{a}x - \frac{b}{2} \right)^2$

18

$$y - 2x^2 = 4x + 5$$

$$y - 8 = 5x$$

In the xy -plane, the equations shown intersect at the points $(\frac{3}{2}, 15.5)$ and (c, d) . What is the value of d ?

(A) -1

(B) 1

(C) $\frac{3}{2}$

(D) 3

19

Disks		
Metal	Small	Large
Zinc		
Copper		
Total	100	170

A machine shop has a box of metal disks as shown in the table. There are 3 small zinc disks for every 5 large zinc disks and 4 small copper disks for every 7 large copper disks. If a small disk is chosen at random, what is the probability that it will be copper?

20

$$x^2 + y^2 + 12x + 14y = -4$$

What is the radius of the circle given by the equation?

(A) -4

(B) -1

(C) 9

(D) 16

21

Cylinder A and cylinder B are right cylinders. Cylinder A's volume is $\frac{5}{4}$ of cylinder B's volume, and cylinder B's diameter is $\frac{4}{5}$ of cylinder A's diameter. What is the ratio of cylinder B's height to cylinder A's height?

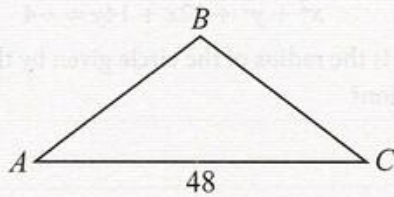
(A) 4:5

(B) 1:1

(C) 5:4

(D) 25:16

22



In triangle ABC , angle A and angle C are equal, and AC is 48 inches long. If $\tan \angle A$ is 0.75, what is the area of the triangle, in square inches?

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS MODULE ONLY.

STOP