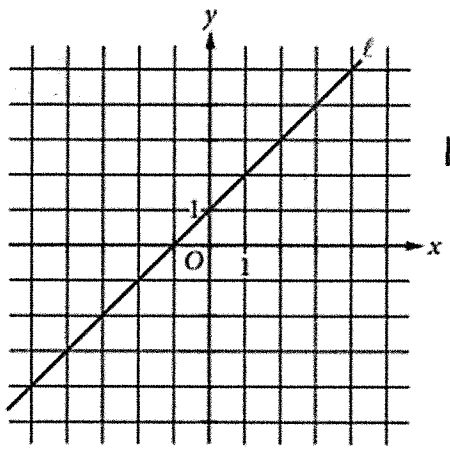


Name: Key

Heart of Algebra SAT prep (NO Calculator)

1



$m=1$
 $b=1$

Which of the following is an equation of line l in the xy -plane above?

- A) $x = 1$
- B) $y = 1$
- C) $y = x$
- D) $y = x + 1$**

5

$$\sqrt{k+2} - x = 0$$

In the equation above, k is a constant. If $x = 9$, what is the value of k ?

- A) 1
- B) 7
- C) 16
- D) 79**

Replace x by 9
 $\sqrt{k+2} - 9 = 0$
 $(\sqrt{k+2})^2 = (9)^2$
 $k+2 = 81$
 $k = 79$

3

What are the solutions of the quadratic equation $4x^2 - 8x - 12 = 0$? $4(x^2 - 2x - 3) = 0$

- A) $x = -1$ and $x = -3$
 - B) $x = -1$ and $x = 3$**
 - C) $x = 1$ and $x = -3$
 - D) $x = 1$ and $x = 3$
- $4(x+1)(x-3) = 0$
- $x = -1$
 $x = 3$

6

Which of the following is equivalent to the sum of the expressions $a^2 - 1$ and $a + 1$?

- A) $a^2 + a$**
 - B) $a^3 - 1$
 - C) $2a^2$
 - D) a^3
- $a^2 - 1 + a + 1$
 $a^2 + a$

Name: _____

12

Which of the following is equivalent to $9^{\frac{3}{4}}$?

A) $\sqrt[3]{9}$

B) $\sqrt[4]{9}$

C) $\sqrt{3}$

D) $3\sqrt{3}$

$$\sqrt[4]{(9)^3}$$

15

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by \$5. Assuming gasoline costs \$4 per gallon, which equation can Alan use to determine how many fewer average miles, m , he should drive each week?

A) $\frac{25}{4}m = 95$

B) $\frac{25}{4}m = 5$

C) $\frac{4}{25}m = 95$

D) $\frac{4}{25}m = 5$

9

$$y = x^2$$

$$2y + 6 = 2(x + 3)$$

If (x, y) is a solution of the system of equations above and $x > 0$, what is the value of xy ?

A) 1

B) 2

C) 3

D) 9

$$2x^2 + 6 = 2x + 6$$

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

$$2x(x - 1) = 0$$

$$x = 0 \Rightarrow y = 0$$

$$x = 1 \Rightarrow y = 1$$

$$xy = 1$$

10

If $a^2 + b^2 = z$ and $ab = y$, which of the following is equivalent to $4z + 8y$?

A) $(a + 2b)^2$

B) $(2a + 2b)^2$

C) $(4a + 4b)^2$

D) $(4a + 8b)^2$

$$4(a^2 + b^2) + 8(ab)$$
$$4a^2 + 4b^2 + 8ab$$

Name: _____

Key

18

$$\frac{1}{2}(2x+y) = \frac{21}{2}$$

$y = 2x$

The system of equations above has solution (x, y) .

What is the value of x ?

$$\frac{1}{2}(y+y) = \frac{21}{2}$$

$$\frac{2y}{2} = \frac{21}{2} \quad y = 10.5$$

$$x = 5.25$$

17

$$2(p+1) + 8(p-1) = 5p$$

What value of p is the solution of the equation above?

$$2p + 2 + 8p - 8 = 5p$$

$$10p - 6 = 5p$$

$$\begin{array}{r} -5p \\ \hline 5p = 6 \end{array}$$

$$\frac{5p}{5} = \frac{6}{5}$$

$$p = \frac{6}{5}$$

19

$$\frac{2x+6}{(x+2)^2} - \frac{2(x+2)}{x+2(x+2)}$$

The expression above is equivalent to $\frac{a}{(x+2)^2}$,

where a is a positive constant and $x \neq -2$.

What is the value of a ?

$$\frac{2x+6}{(x+2)^2} - \frac{2(x+2)}{(x+2)^2}$$

$$\frac{\cancel{2x}+6 - \cancel{2x}-2}{(x+2)^2} = \frac{4}{(x+2)^2}$$

$$a = 4$$

Calculator

Name: _____

2

x	f(x)
1	5
3	13
5	21

Some values of the linear function f are shown in the table above. Which of the following defines f ?

- A) $f(x) = 2x + 3$
- B) $f(x) = 3x + 2$
- C) $f(x) = 4x + 1$**
- D) $f(x) = 5x$

$m = 4$
 $b = 1$

4

If $\frac{3(c+d)}{3} = \frac{5}{3}$, what is the value of $c+d$?

- A) $\frac{3}{5}$
- B) $\frac{5}{3}$**
- C) 3
- D) 5

8

Which of the following is an equivalent form of $(1.5x - 2.4)^2 - (5.2x^2 - 6.4)$?

- A) $-2.2x^2 + 1.6$
- B) $-2.2x^2 + 11.2$
- C) $-2.95x^2 - 7.2x + 12.16$
- D) $-2.95x^2 - 7.2x + 0.64$

$$\begin{aligned} (1.5x - 2.4)^2 &= (1.5x - 2.4)(1.5x - 2.4) \\ 2.25x^2 - 7.2x + 5.76 &- 5.2x^2 + 6.4 \\ &= -2.95x^2 - 7.2x + 12.16 \end{aligned}$$

12

$$\begin{aligned} \frac{1}{2}y &= 4 \\ x - \frac{1}{2}y &= 2 \end{aligned}$$

The system of equations above has solution (x, y) . What is the value of x ?

- A) 3
- B) $\frac{7}{2}$
- C) 4
- D) 6**

$$\begin{array}{r} x - 4 = 2 \\ + 4 \quad + 4 \\ \hline x = 6 \end{array}$$

Name: _____

Questions 16-18 refer to the following information.

Species of tree	Growth factor
Red maple	4.5
River birch	3.5
Cottonwood	2.0
Black walnut	4.5
White birch	5.0
American elm	4.0
Pin oak	3.0
Shagbark hickory	7.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species. The table above gives the growth factors for eight species of trees.

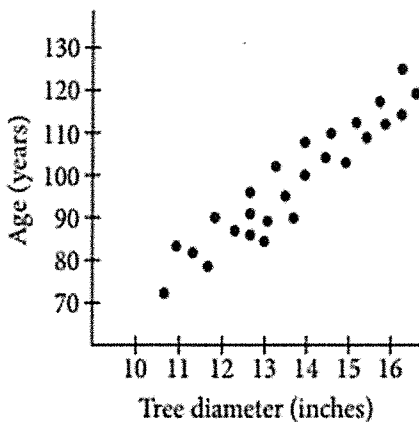
16

According to the information in the table, what is the approximate age of an American elm tree with a diameter of 12 inches?

- A) 24 years
- B) 36 years
- C) 40 years
- D) 48 years

17

Tree Diameter versus Age



The scatterplot above gives the tree diameter plotted against age for 26 trees of a single species. The growth factor of this species is closest to that of which of the following species of tree?

- A) Red maple
- B) Cottonwood
- C) White birch
- D) Shagbark hickory

18

If a white birch tree and a pin oak tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in inches, of their diameters 10 years from now? (1 foot = 12 inches)

- A) 1.0
- B) 1.2
- C) 1.3
- D) 1.4

$$\text{age} = \text{diameter} \cdot \text{growth}$$
$$\text{diameter} = \frac{\text{age}}{\text{growth}}$$

<u>birch</u>	<u>pine</u>
<u>10 yrs</u>	<u>10 yrs</u>
(5)	(3)
= 2	= 3.3
3.3 - 2 = 1.3	

Name: _____

34

In the xy -plane, the point $(2, 5)$ lies on the graph of the function f . If $f(x) = k - x^2$, where k is a constant, what is the value of k ?

$$5 = k - (2)^2$$

$$5 = k - 4$$

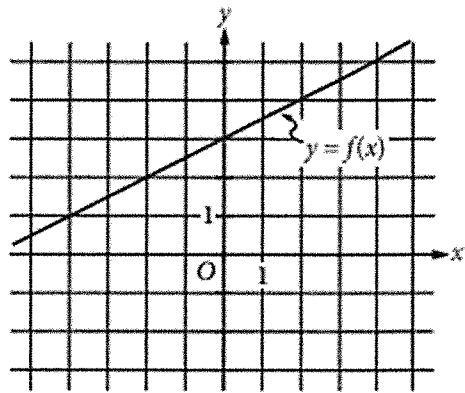
$$k = 9$$

10

The density d of an object is found by dividing the mass m of the object by its volume V . Which of the following equations gives the mass m in terms of d and V ?

- A) $m = dV$
- B) $m = \frac{d}{V}$
- C) $m = \frac{V}{d}$
- D) $m = V + d$

28



The graph of the linear function f is shown in the xy -plane above. The slope of the graph of the linear function g is 4 times the slope of the graph of f . If the graph of g passes through the point $(0, -4)$, what is the value of $g(9)$?

- A) 5
- B) 9
- C) 14
- D) 18

$$\equiv g(x) = 2x - 4$$

$$g(9) = 2(9) - 4$$

$$g(9) = 14$$

$$y \leq 3x + 1$$

$$x - y > 1$$

Which of the following ordered pairs (x, y) satisfies the system of inequalities above?

- A) $(-2, -1)$
- B) $(-1, 3)$
- C) $(1, 5)$
- D) $(2, -1)$

Name: _____

Questions 37 and 38 refer to the following information.

Ms. Simon's Workday Morning Drive

Segment of drive	Distance (miles)	Average driving speed with no traffic delay (mph)
From home to freeway entrance	0.6	25
From freeway entrance to freeway exit	15.4	50
From freeway exit to workplace	1.4	35

Ms. Simon drives her car from her home to her workplace every workday morning. The table above shows the distance, in miles, and her average driving speed, in miles per hour (mph), when there is no traffic delay, for each segment of her drive.

37

One morning, Ms. Simon drove directly from her home to her workplace in 24 minutes. What was her average speed, in miles per hour, during her drive that morning?

$$\begin{aligned} \text{entire way} &= 0.6 + 15.4 + 1.4 \\ &= 17.4 \text{ mi} \\ \text{Speed} &= \frac{\text{distance}}{\text{Time}} = \frac{17.4 \text{ mi}}{24 \text{ min}} \end{aligned}$$

38

If Ms. Simon starts her drive at 6:30 a.m., she can drive at her average driving speed with no traffic delay for each segment of the drive. If she starts her drive at 7:00 a.m., the travel time from the freeway entrance to the freeway exit increases by 33% due to slower traffic, but the travel time for each of the other two segments of her drive does not change. Based on the table, how many more minutes does Ms. Simon take to arrive at her workplace if she starts her drive at 7:00 a.m. than if she starts her drive at 6:30 a.m.? (Round your answer to the nearest minute.)

$$\begin{aligned} \text{Speed} &= \frac{\text{distance}}{\text{Time}} \\ \text{Time} &= \frac{\text{distance}}{\text{Speed}} = \frac{15.4}{50} \\ &= 0.308 \text{ hr} \\ &\text{In minutes} \\ &0.308 \times 60 \text{ min} \\ &= 18.48 \text{ min} \\ \text{Increase} &= 0.33(18.48) = 6 \text{ min} \end{aligned}$$