19

The function h is defined by $h(x) = 4x + 28$. The graph of $y = h(x)$ in the xy-plane has an x-intercept at $(a, 0)$ and a y-intercept at $(0, b)$, where a and b are constants. What is the value of $a + b$?

A) 21
B) 28
C) 32
D) 35

20

One of the factors of $2x^3 + 42x^2 + 208x$ is $x + b$, where b is a positive constant. What is the smallest possible value of b ?

Mode 5 3

$0, -8, -13$

$(x - 0)(x + 8)(x + 13)$

8

21

$$y = -1.5$$
$$y = x^2 + 8x + a$$

In the given system of equations, a is a positive constant. The system has exactly one distinct real solution. What is the value of a ?

D

14.5

22

$$f(x) = (x + 6)(x + 5)(x - 4)$$

The function f is given. Which table of values represents $y = f(x) - 3$?

A)

x	y
-6	-9
-5	-8
4	1

B)

x	y
-6	-3
-5	-3
4	-3

C)

x	y
-6	-3
-5	-2
4	7

D)

x	y
-6	3
-5	3
4	3

23

For the function q, the value of $q(x)$ decreases by 45% for every increase in the value of x by 1. If $q(0) = 14$, which equation defines q ?
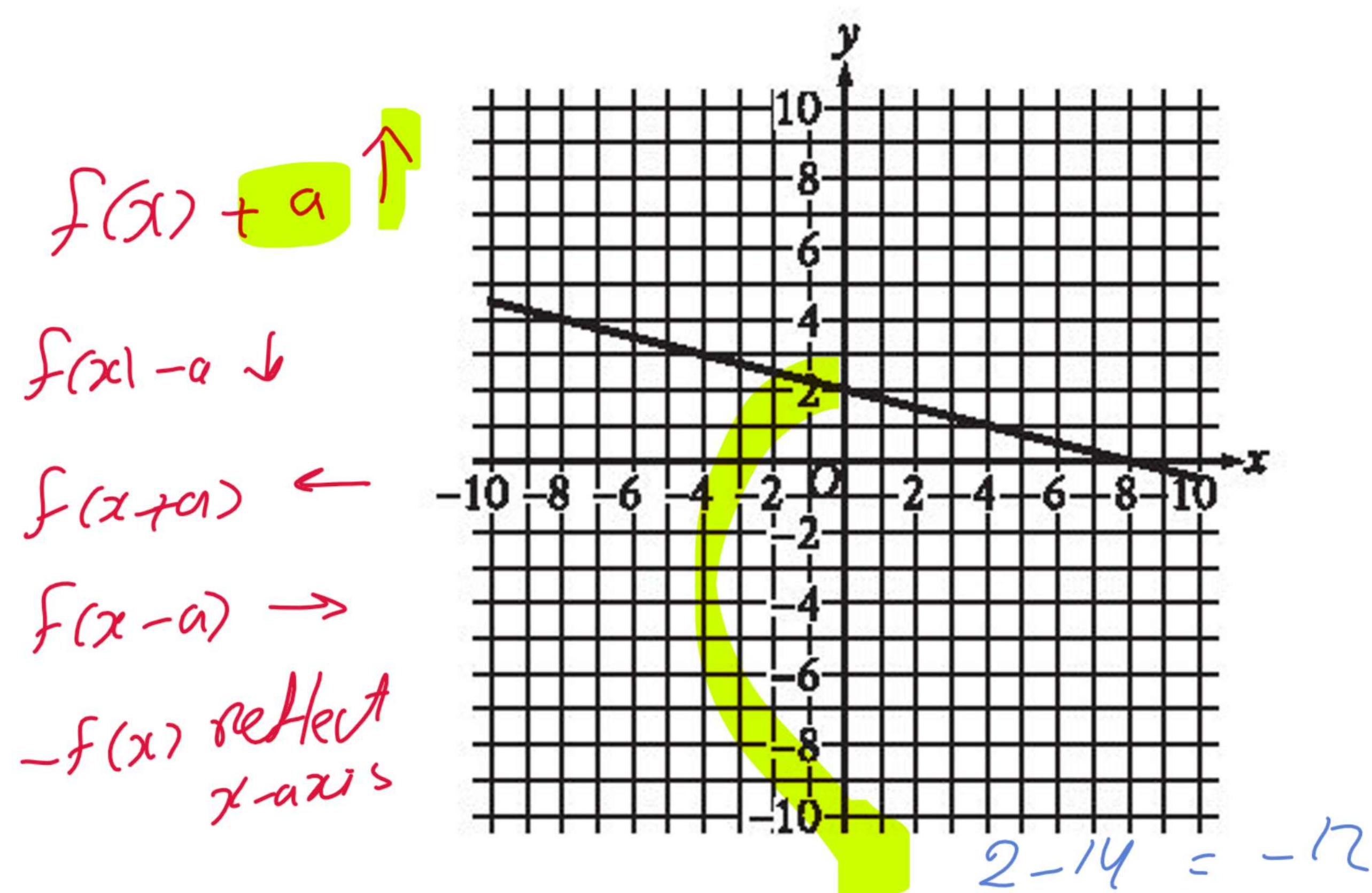
interval

A) $q(x) = 0.55(14)^x$
B) $q(x) = 1.45(14)^x$
C) $q(x) = 14(0.55)^x$
D) $q(x) = 14(1.45)^x$

$A = P(1 \pm 6)^t$

final initial

24

Handwritten notes:
$f(x) + a$ ↑
$f(x) - a$ ↓
$f(x+a)$ ←
$f(x-a)$ →
$-f(x)$ reflect x-axis

$2 - 14 = -12$

The graph of $y = f(x) + 14$ is shown. Which equation defines function f?

A) $f(x) = -\dfrac{1}{4}x - 12$

B) $f(x) = -\dfrac{1}{4}x + 16$

C) $f(x) = -\dfrac{1}{4}x + 2$
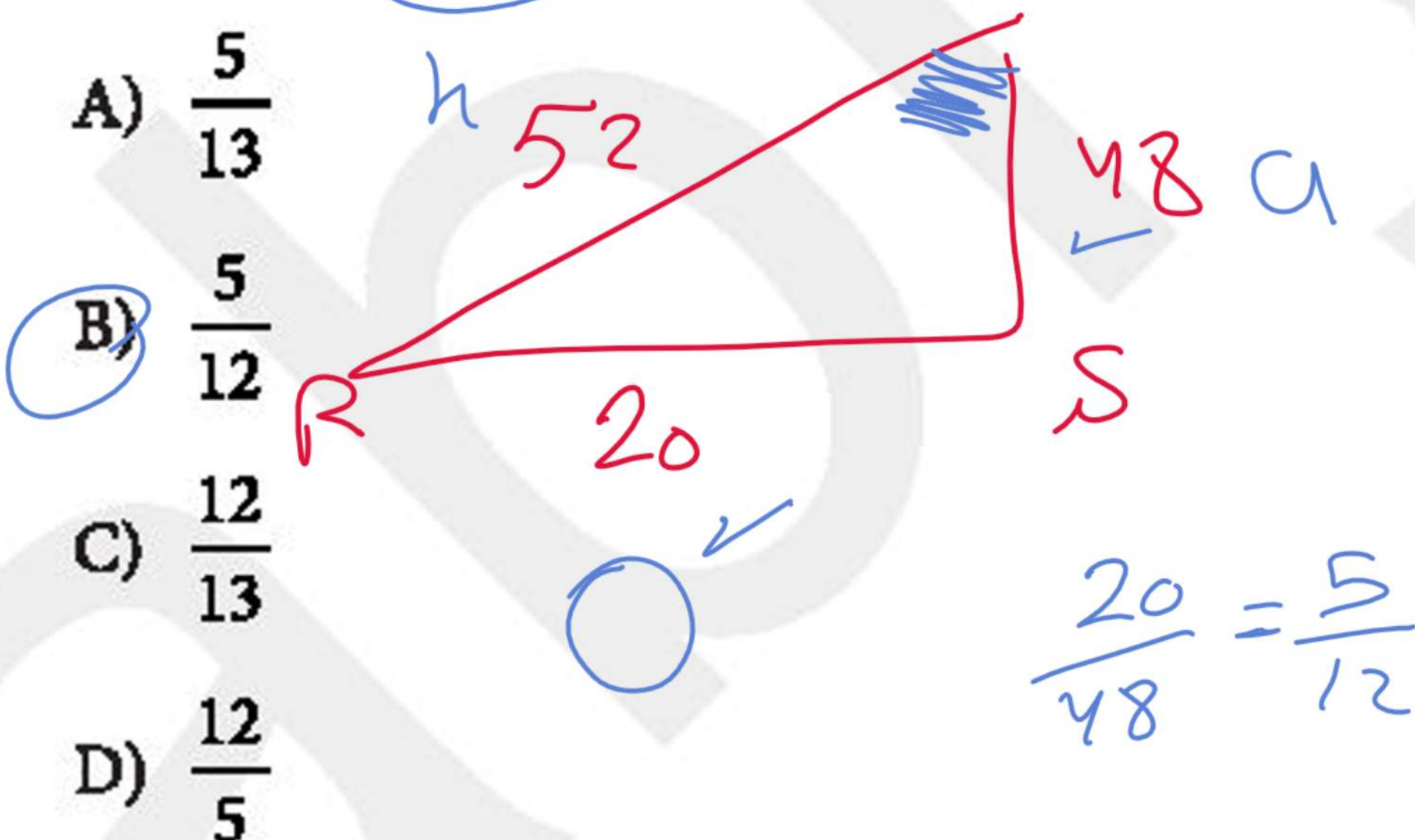
D) $f(x) = -\dfrac{1}{4}x - 14$

25

Handwritten notes:
Soh
Cah
Toa

$RS = 20$
$ST = 48$
$TR = 52$

The side lengths of right triangle RST are given. Triangle RST is similar to triangle UVW, where S corresponds to V and T corresponds to W. What is the value of $\tan W$?

A) $\dfrac{5}{13}$

B) $\dfrac{5}{12}$

C) $\dfrac{12}{13}$

D) $\dfrac{12}{5}$

Handwritten: $\dfrac{20}{48} = \dfrac{5}{12}$

26

One gallon of paint will cover 220 square feet of a surface. A room has a total wall area of w square feet. Which equation represents the total amount of paint P, in gallons, needed to paint the walls of the room twice?

A) $P = \dfrac{w}{110}$

B) $P = 440w$

C) $P = \dfrac{w}{220}$

D) $P = 220w$

$$\begin{array}{cc} g & ft^2 \\ 1 & 220 \\ \boxed{P} & 2w \end{array}$$

$$\dfrac{1 \times 2w}{220}$$

$$\dfrac{1\ w}{110}$$

27

The number a is 110% greater than the number b. The number b is 90% less than 47. What is the value of a ?

$$a = 2.10\ b$$

$$b = 0.10\,(47)$$

$$a = 2.10\,(0.6 \times 47)$$

$$= 9.87$$

STOP

If you finish before time is called, you may check your work on this module only.
Do not turn to any other module in the test.

1

There are 55 students in Spanish club. A sample of the Spanish club students was selected at random and asked whether they intend to enroll in a new study program. Of those surveyed, 20% responded that they intend to enroll in the study program. Based on this survey, which of the following is the best estimate of the total number of Spanish club students who intend to enroll in the study program?
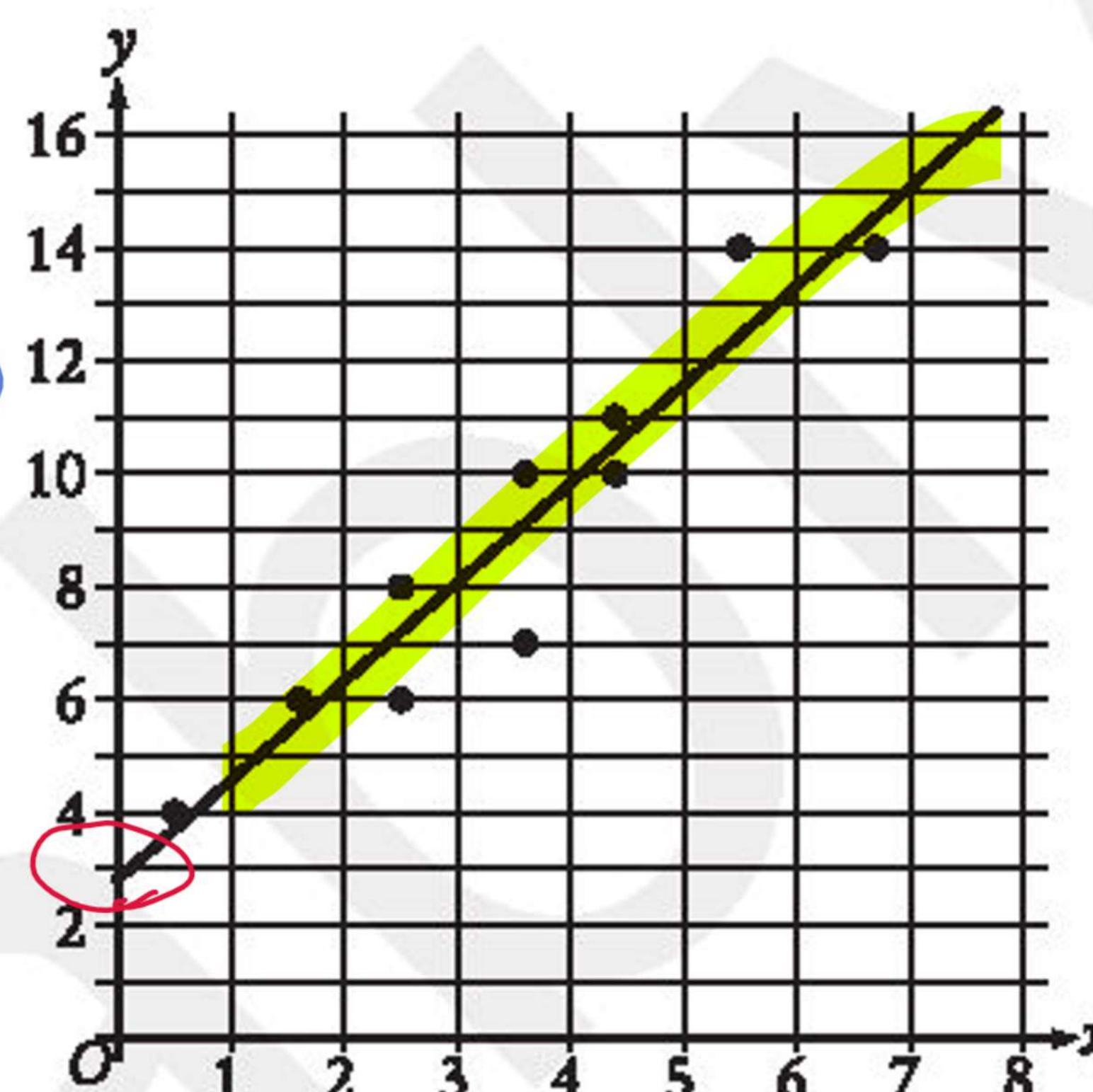
A) 11

B) 20

C) 44

D) 55

$0.20 \times 55 = 11$

2

Jay walks at a speed of 3 miles per hour and runs at a speed of 5 miles per hour. He walks for w hours and runs for r hours for a combined total of 14 miles. Which equation represents this situation?

A) $3w + 5r = 14$

B) $\frac{1}{3}w + \frac{1}{5}r = 14$

C) $\frac{1}{3}w + \frac{1}{5}r = 112$

D) $3w + 5r = 112$

$3w$

3

The scatterplot shows the relationship between two variables, x and y. A line of best fit is also shown.
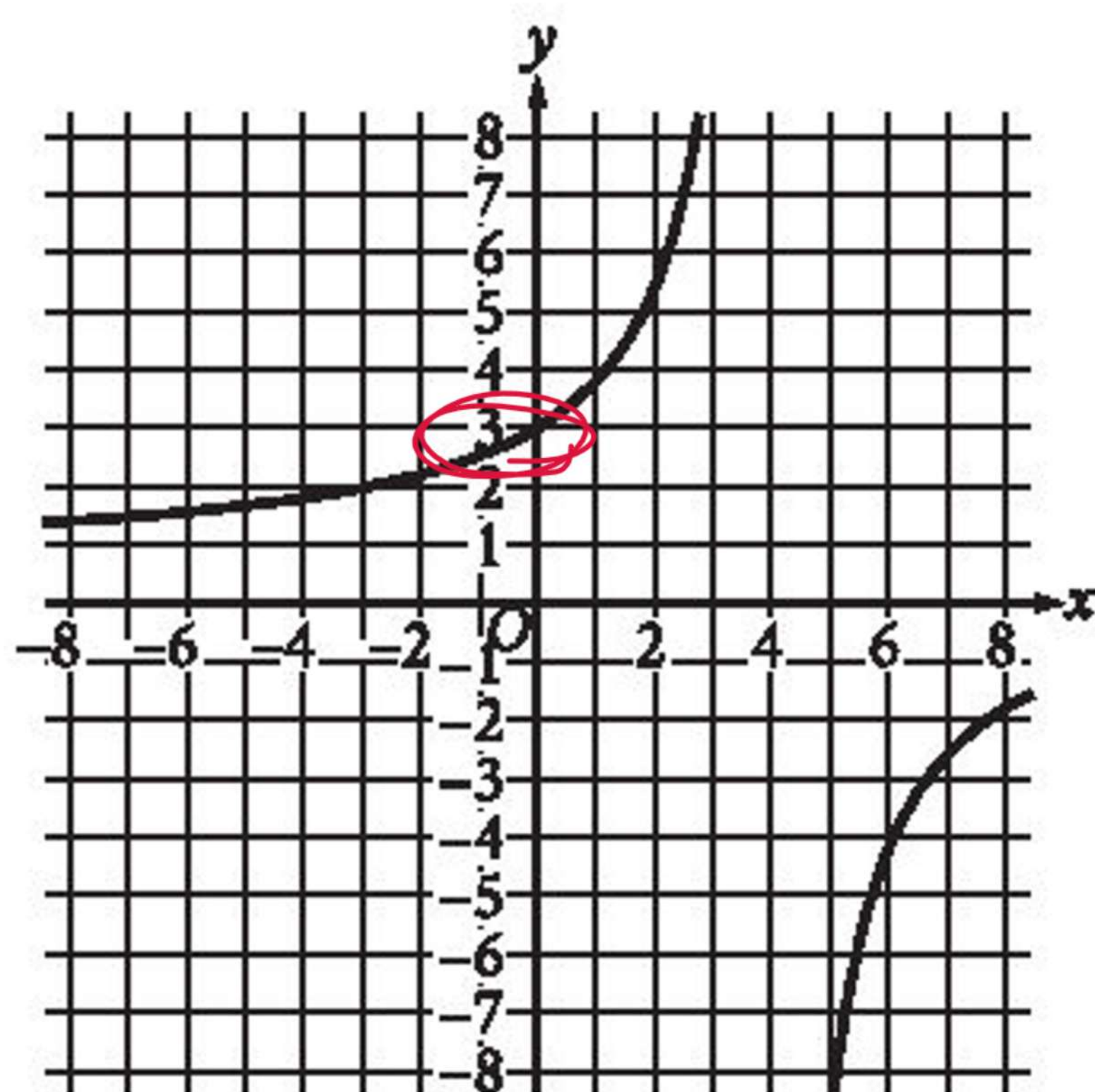

Which of the following equations best represents the line of best fit shown?

A) $y = 2.8 + 1.7x$

B) $y = 2.8 - 1.7x$

C) $y = -2.8 + 1.7x$

D) $y = -2.8 - 1.7x$

4

The graph of $y = f(x)$ is shown in the xy-plane. What is the value of $f(0)$? $x = 0$

y-int

A) -3

B) 0

C) $\dfrac{3}{5}$

D) 3

5

Which expression is equivalent to $(m^4 q^4 z^{-1})(mq^5 z^3)$, where m, q, and z are positive?

$m = 2$

m^{4+1} m^5 $q = 3$ $z = 5$

A) $m^4 q^{20} z^{-3}$

B) $m^5 q^9 z^2$

C) $m^6 q^8 z^{-1}$

D) $m^{20} q^{12} z^{-2}$

6

73, 74, 75, 77, 79, 82, 84, 85, 91

What is the median of the data shown?

79

7

$$x + 40 = 95$$

What value of x is the solution to the given equation?

$95 - 40$

55

8

D

$$5x = 15 \quad x = 3$$
$$-4x + y = -2$$

Mode
$\dfrac{5}{1}$

The solution to the given system of equations is (x, y). What is the value of $x + y$?

A) -17

B) -13

C) 13

D) 17

$-4(3) + y = -2$

$y = 10$

$x + y = 3 + 10 = 13$

9

$$g(m) = -0.05m + 12.1$$

The given function g models the number of gallons of gasoline that remains from a full gas tank in a car after driving m miles. According to the model, about how many gallons of gasoline are used to drive each mile?

A) 0.05

B) 12.1

C) 20

D) 242.0

(handwritten notes: $y = mx + b$; slope — Average rate — Y per x; y-int — initial starting at $x=0$)

10

$$\frac{1}{7b} = \frac{11x}{y}$$

The given equation relates the positive numbers b, x, and y. Which equation correctly expresses x in terms of b and y?

A) $x = \dfrac{7by}{11}$

B) $x = y - 77b$

C) $x = \dfrac{y}{77b}$

D) $x = 77by$

(handwritten notes: $y = 77b \, x$; $\frac{y}{77b} = x$)

11

$$y = 76$$
$$y = x^2 - 5$$

The graphs of the given equations in the xy-plane intersect at the point (x, y). What is a possible value of x?

A) $-\dfrac{76}{5}$

B) -9

C) 5

D) 76

(handwritten notes: $x^2 - 5 = 76$; $x^2 = \pm\sqrt{81}$; $x = \pm 9$)

12

$$y > 14$$
$$4x + y < 18$$

The point $(x, 53)$ is a solution to the system of inequalities in the xy-plane. Which of the following could be the value of x?

A) -9

B) -5

C) 5

D) 9

(handwritten notes: $4x + 53 < 18 - 53$; $4x < -\frac{35}{4}$; $x < -8.75$)

13

Out of **300 seeds** that were planted, **80% sprouted.** How many of these seeds sprouted?

$$0.80 \times 300 = 240$$

14

The function f is defined by $f(x) = 4x$. For what value of x does $f(x) = 8$?

$4(8)$
32

$4x = 8$
$x = 2$

15

Which expression is equivalent to

$$\frac{8x(x-7) - 3(x-7)}{2x - 14}, \text{ where } x > 7 ?$$

A) $\dfrac{x-7}{5}$

B) $\dfrac{8x-3}{2}$

C) $\dfrac{8x^2 - 3x - 14}{2x - 14}$

D) $\dfrac{8x^2 - 3x - 77}{2x - 14}$

$\dfrac{(x-7)(8x-3)}{2(x-7)}$

$\dfrac{8(8)-3}{2} = \dfrac{61}{2}$

$x = 8 \quad \dfrac{61}{2}$

16

Line p is defined by $2y + 18x = 9$. Line r is **perpendicular** to line p in the xy-plane. What is the slope of line r ?

A) -9

B) $-\dfrac{1}{9}$

C) $\dfrac{1}{9}$

D) 9

$2y = \dfrac{-18x}{2} + \dfrac{9}{2}$

$y = -9x + \dfrac{9}{2}$

$m = \dfrac{-9}{1} \qquad m_\perp = \dfrac{1}{9}$

17

$$f(t) = 8{,}000(0.65)^t$$

The given function f models the number of coupons a company sent to their customers at the end of each year, where t represents the number of years since the end of 1998, and $0 \le t \le 5$. If $y = f(t)$ is graphed in the ty-plane, which of the following is the best interpretation of the **y-intercept** of the graph in this context?

A) The minimum estimated number of coupons the company sent to their customers during the 5 years was 1,428.

B) The minimum estimated number of coupons the company sent to their customers during the 5 years was 8,000.

C) The estimated number of coupons the company sent to their customers at the end of 1998 was 1,428.

D) The estimated number of coupons the company sent to their customers at the end of 1998 was 8,000.

18

Triangle XYZ is similar to triangle RST such that X, Y, and Z correspond to R, S, and T, respectively. The measure of $\angle Z$ is 20° and $2XY = RS$. What is the measure of $\angle T$?

A) 2°

B) 10°

C) 20°

D) 40°

19

$$y = 6x + 18$$

One of the equations in a system of two linear equations is given. The system has no solution. Which equation could be the second equation in the system?

A) $-6x + y = 18$

B) $-6x + y = 22$

C) $-12x + y = 36$

D) $-12x + y = 18$

20

What is the area, in square centimeters, of a rectangle with a length of 34 centimeters (cm) and a width of 29 cm?

$A = l \cdot w$

34×29

$= 986$

21

$-4x + y = 1$

$-15x + 4y = -8$

$$y = 4x + 1$$
$$4y = 15x - 8$$

The solution to the given system of equations is (x, y). What is the value of $x - y$?

$x = -12$

$y = -47$

$x - y$

$-12 - (-47)$

$= 35$

22

$$5x^2 + 10x + 16 = 0$$

How many distinct real solutions does the given equation have?

A) Exactly one

B) Exactly two

C) Infinitely many

D) Zero

Mode 5, 3, i

23

A certain park has an area of 11,863,808 square yards. What is the area, in square miles, of this park? (1 mile^2 = $1,760$ yards^2)

A) 1.96

B) 3.83

C) 3,444.39

D) 6,740.8

11 863 808
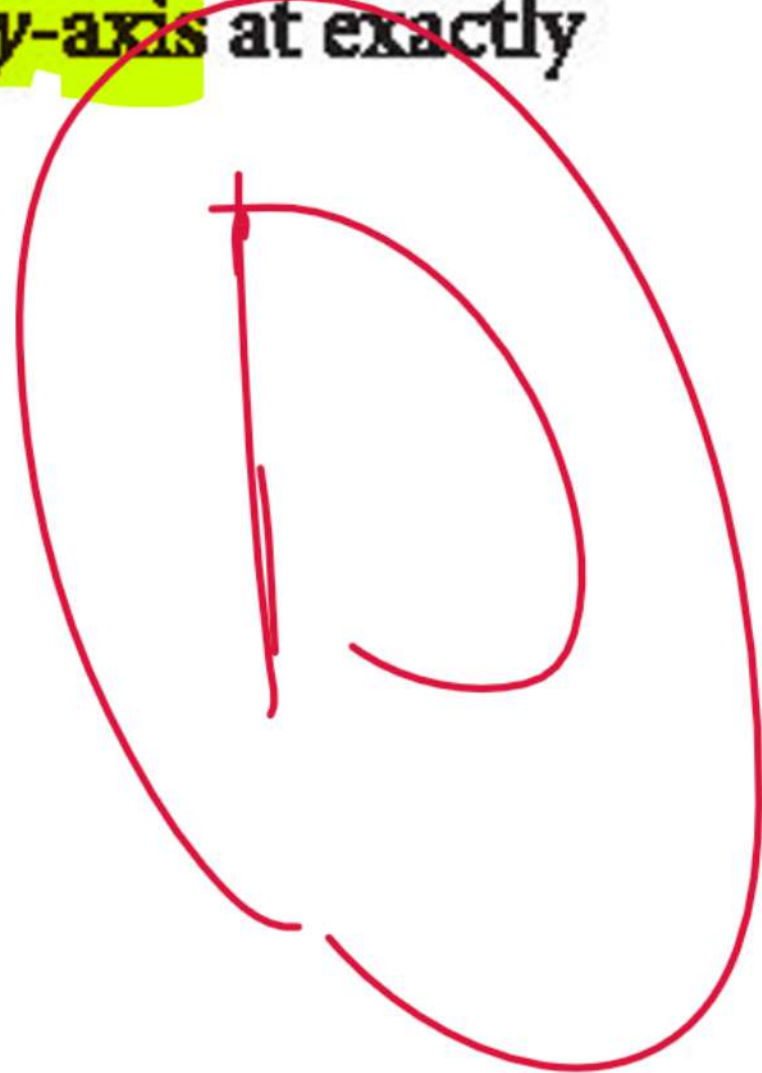
$\dfrac{11\ 863\ 808 \times 1^2}{1760^2}$

Handwritten notes (top): $\frac{31+33+5+17+50}{5} = 27.2$

$\frac{32+34+6+18+51}{5} = 28.2$

24

Which of the following equations represents a circle in the xy-plane that intersects the y-axis at exactly one point?

A) $(x-8)^2 + (y-8)^2 = 16$

B) $(x-8)^2 + (y-4)^2 = 16$

C) $(x-4)^2 + (y-9)^2 = 16$

D) $x^2 + (y-9)^2 = 16$

25
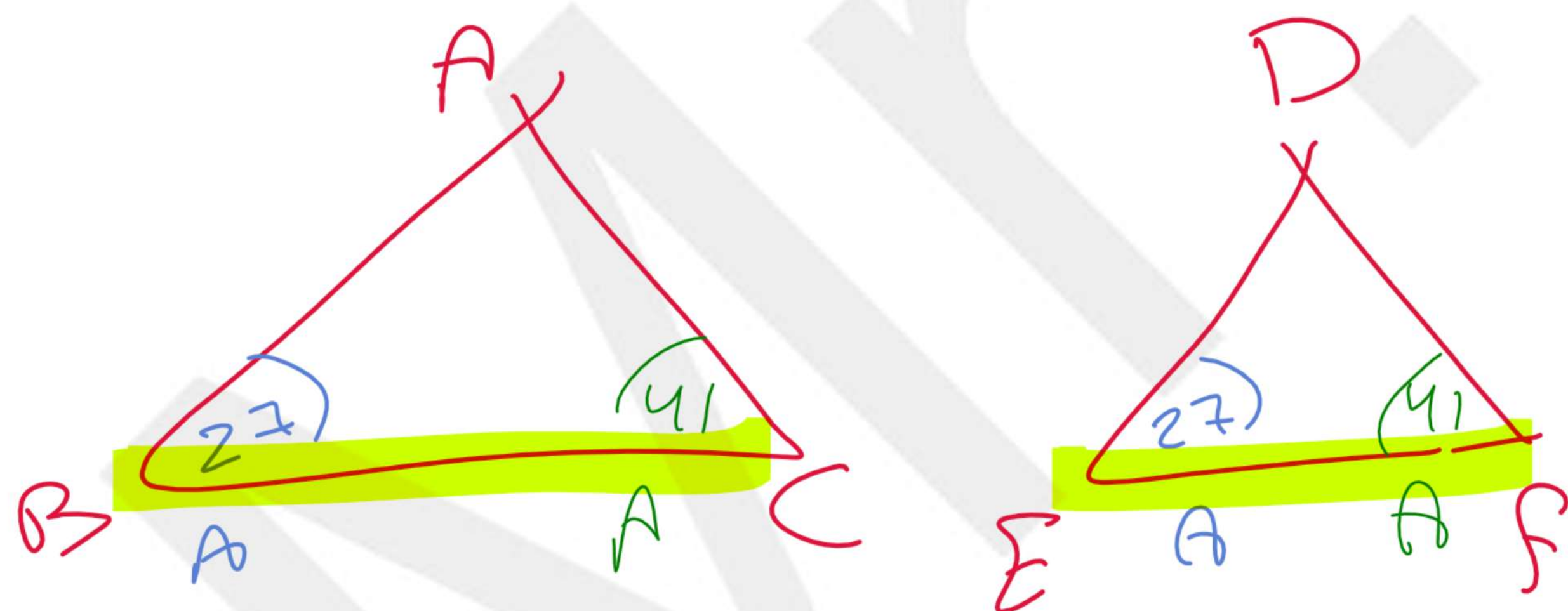
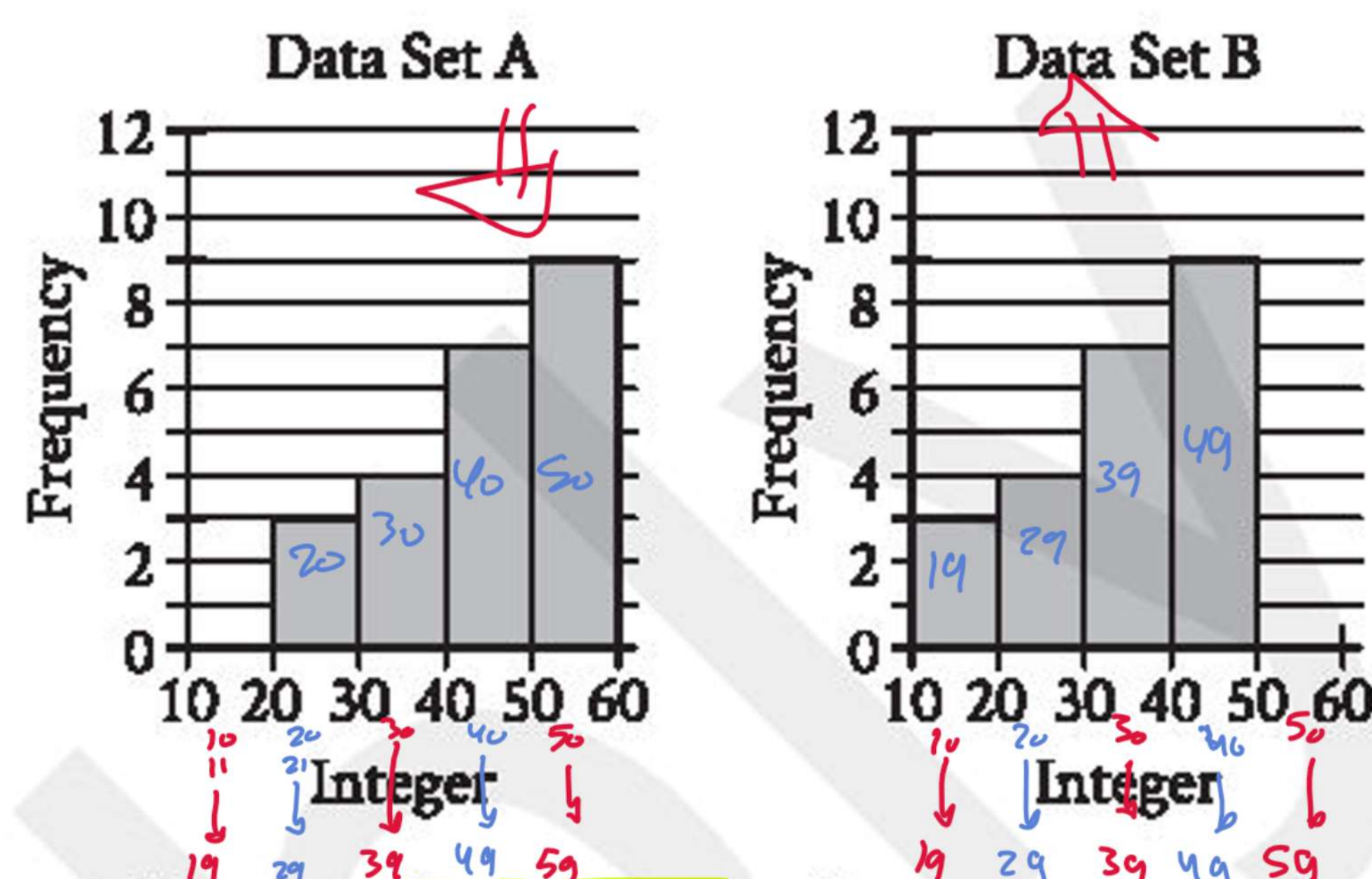In triangles ABC and DEF, angles B and E each have measure $27°$ and angles C and F each have measure $41°$. Which additional piece of information is sufficient to determine whether triangle ABC is congruent to triangle DEF?

A) The measure of angle A

B) The length of side AB

C) The lengths of sides BC and EF

D) No additional information is necessary.

SAS
ASA
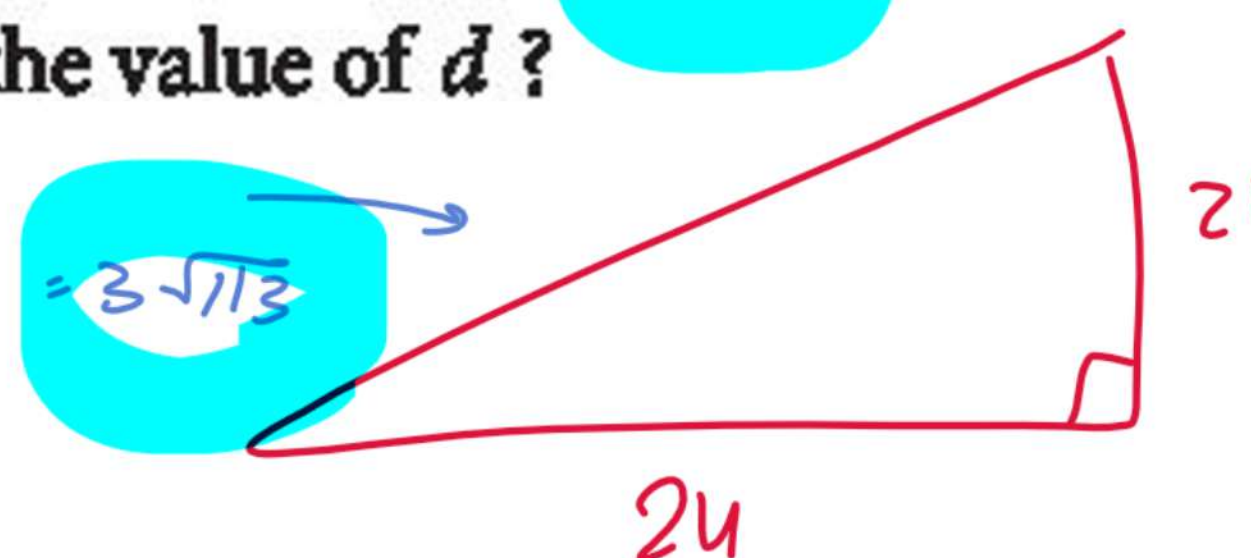SSS

26

Data Set A

Data Set B

Two data sets of 23 integers each are summarized in the histograms shown. For each of the histograms, the first interval represents the frequency of integers greater than or equal to 10, but less than 20. The second interval represents the frequency of integers greater than or equal to 20, but less than 30, and so on. What is the smallest possible difference between the mean of data set A and the mean of data set B?

A) 0

B) 1

C) 10

D) 23

27

A right triangle has legs with lengths of 24 centimeters and 21 centimeters. If the length of this triangle's hypotenuse, in centimeters, can be written in the form $3\sqrt{d}$, where d is an integer, what is the value of d?

$\sqrt{21^2 + 24^2}$

$= 3\sqrt{113}$

113

STOP

If you finish before time is called, you may check your work on this module only. Do not turn to any other module in the test.