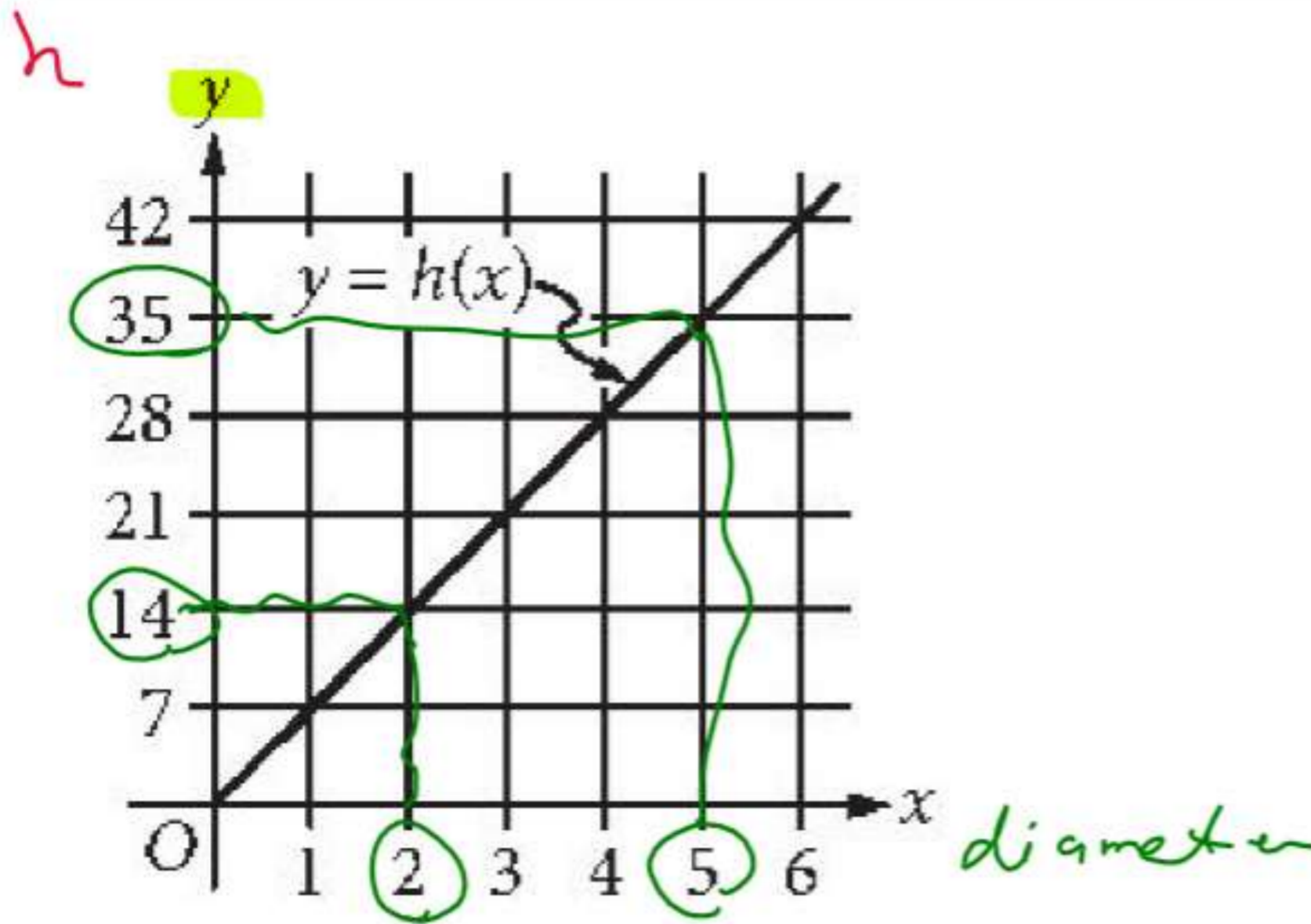


$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$a^2 - b^2 = (a-b)(a+b)$$

4



The line in the xy -plane above represents the relationship between the height $h(x)$, in feet, and the base diameter x , in feet, for cylindrical Doric columns in ancient Greek architecture. How much greater is the height of a Doric column that has a base diameter of 5 feet than the height of a Doric column that has a base diameter of 2 feet?

- A) 7 feet
- B) 14 feet
- C) 21 feet**
- D) 24 feet

$$35 - 14 = 21$$

5

$$\sqrt{9x^2}$$

If $x > 0$, which of the following is equivalent to the given expression?

- A) $3x$**
- B) $3x^2$
- C) $18x$
- D) $18x^4$

$$\sqrt{9} \sqrt{x^2} = 3x$$

$$a \sqrt{x^b} = x^{a \frac{b}{a}}$$

6

$$\frac{x^2 - 1}{x - 1} = -2$$

What are all values of x that satisfy the equation above?

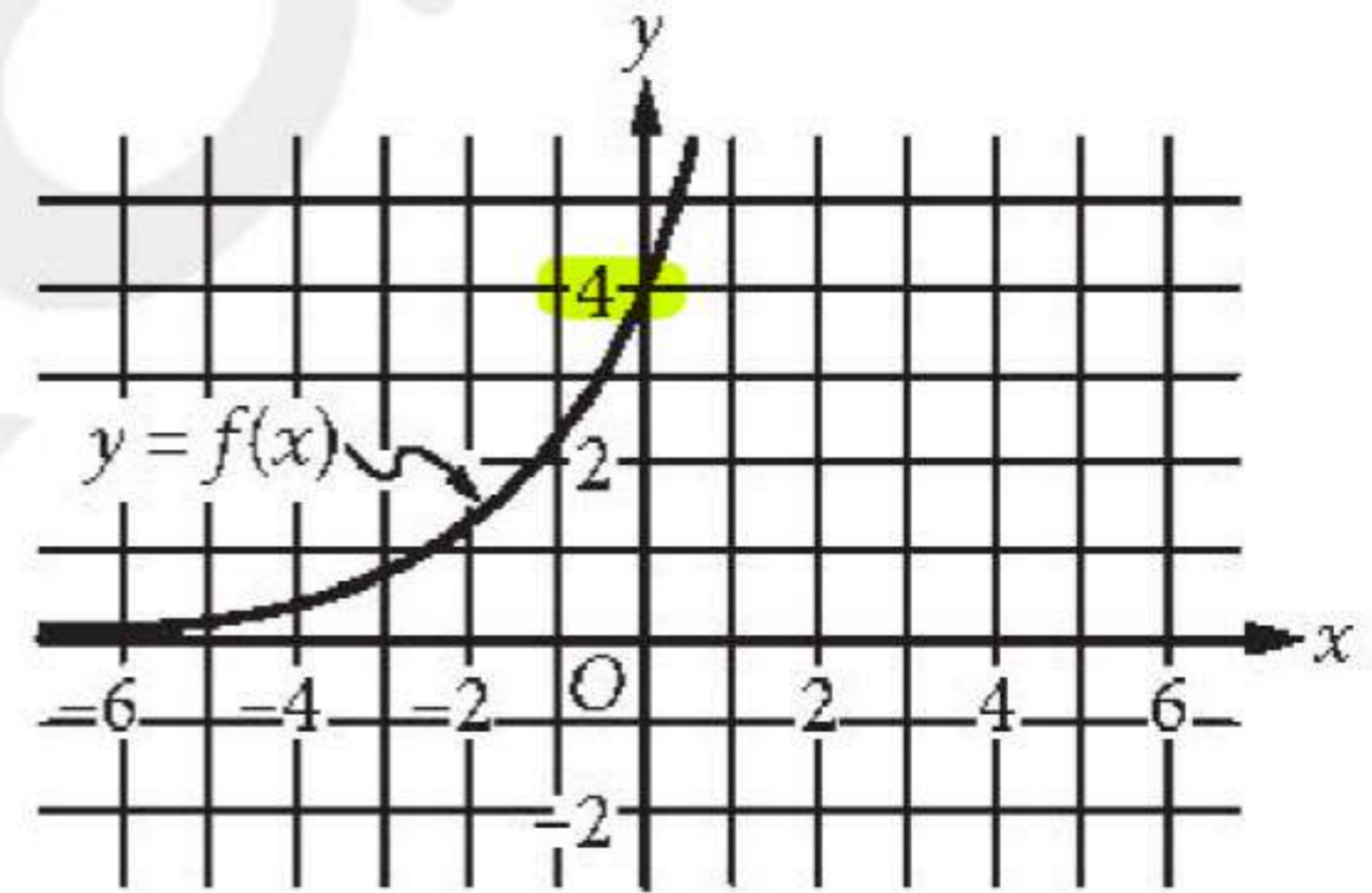
- A) -3**
- B) 0
- C) 1
- D) -3 and -1

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

$$x+1 = -2$$

$$x = -2 - 1 = -3$$

7



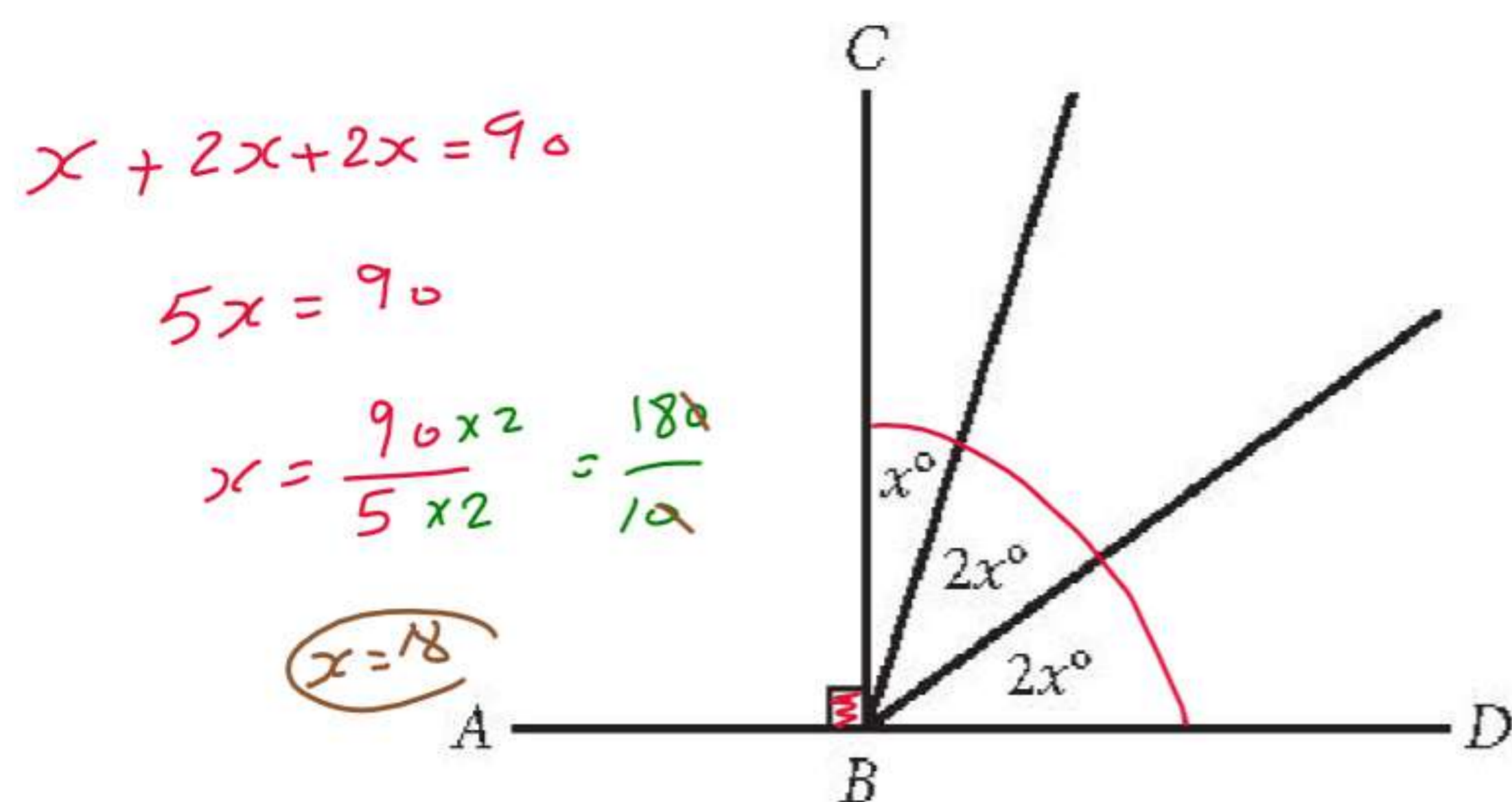
The graph of $y = f(x)$ is shown in the xy -plane. What is the value of $f(0)$?

- A) 0
- B) 2
- C) 3
- D) 4**

$$x = 0$$

$$y\text{-int} = 4$$

8

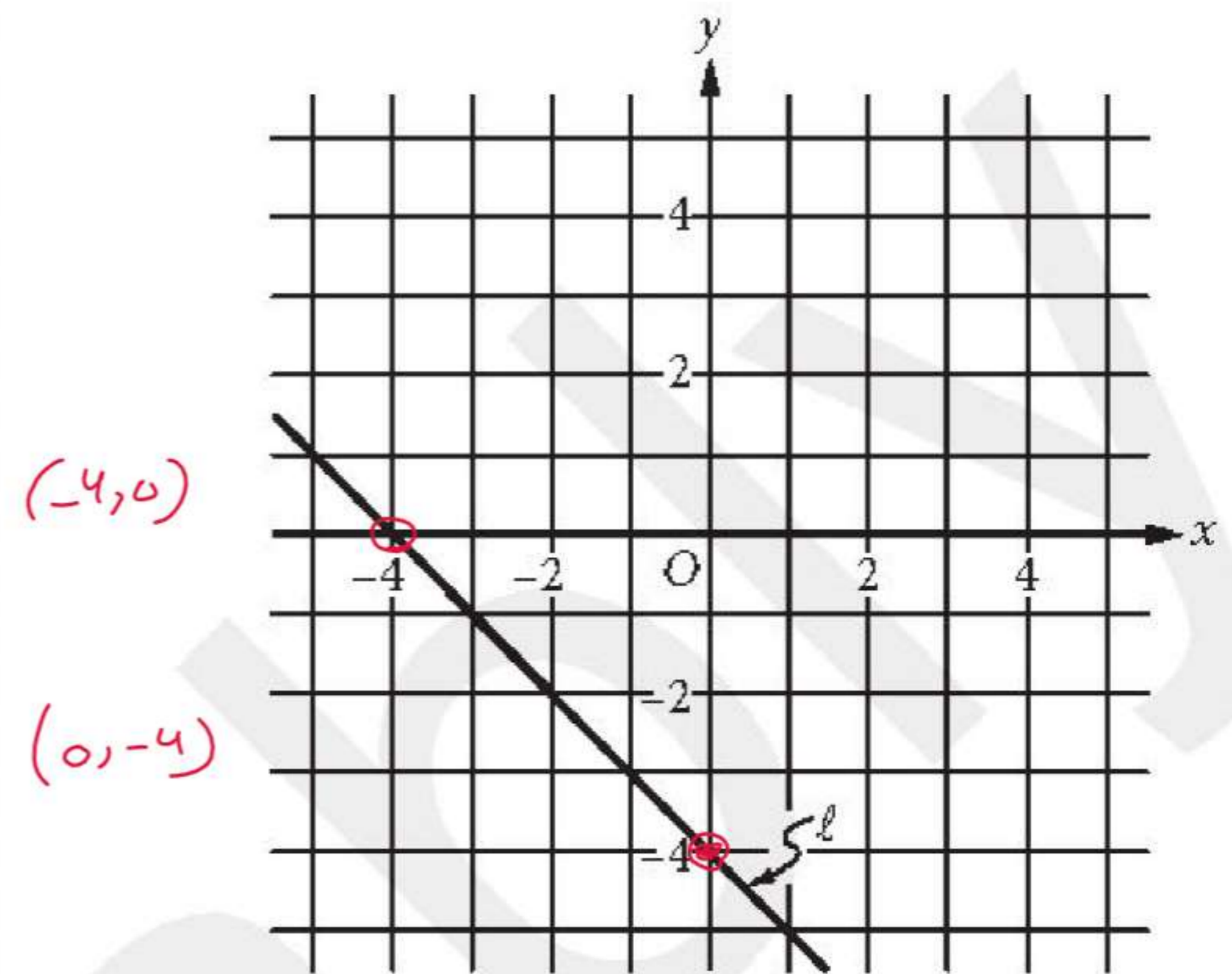


In the figure above, point B lies on \overline{AD} . What is the value of $3x$?

- A) 18
 B) 36
 C) 54
 D) 72

$3x = 3(18)$
 $= 3(20 - 2)$
 $60 - 6$
 $= 54$

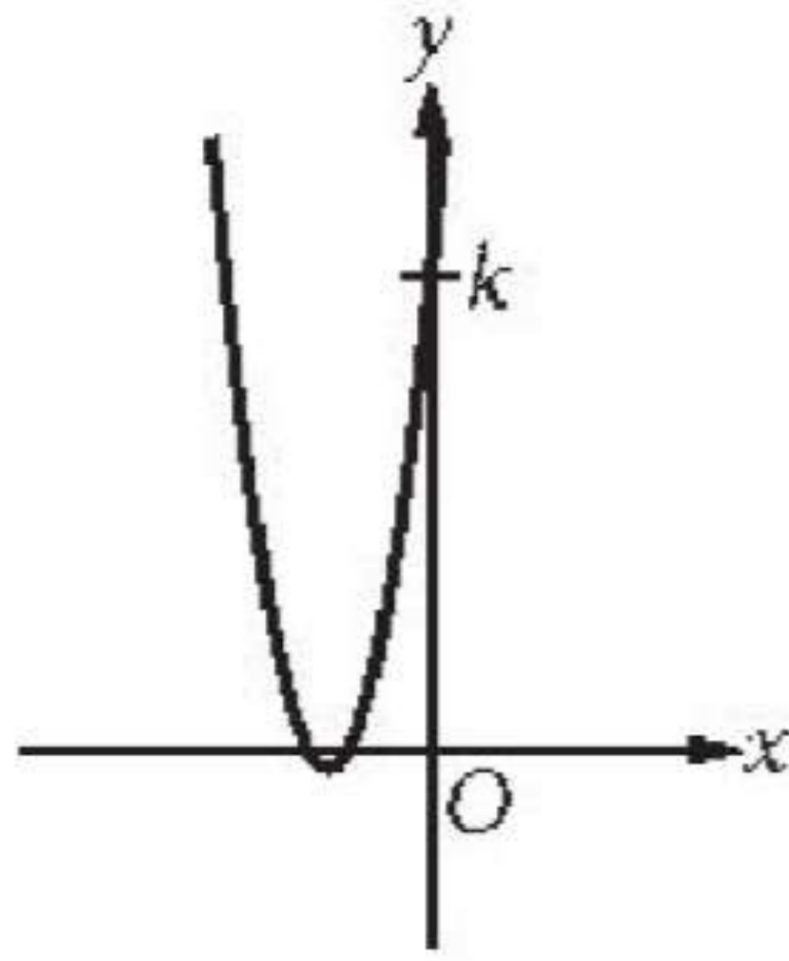
9



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

- A) $x - y = -4$ $\leftarrow \begin{matrix} -4 - 0 = -4 \checkmark \\ 0 + 4 = 4 \neq -4 \end{matrix}$ $(-4, 0)$
 B) $x - y = 4$
 C) $x + y = -4$ $\leftarrow \begin{matrix} -4 + 0 = -4 \checkmark \\ 0 + (-4) = -4 \checkmark \end{matrix}$ $(0, -4)$
 D) $x + y = 4$

10



The graph of $y = 2x^2 + 10x + 12$ is shown. If the graph crosses the y -axis at the point $(0, k)$, what is the value of k ?

- A) 2
- B) 6
- C) 10
- D) 12

$K = 2(0)^2 + 10(0) + 12$

$K = 12$

$(0, k)$ y -int

11

A circle in the xy -plane has center $(5, 7)$ and radius 2. Which of the following is an equation of the circle?

- A) $(x-5)^2 + (y-7)^2 = 4$ ←
- B) $(x+5)^2 + (y+7)^2 = 4$
- C) $(x-5)^2 + (y-7)^2 = 2$ x
- D) $(x+5)^2 + (y+7)^2 = 2$

$= 2^2$

$= 4$

Circles

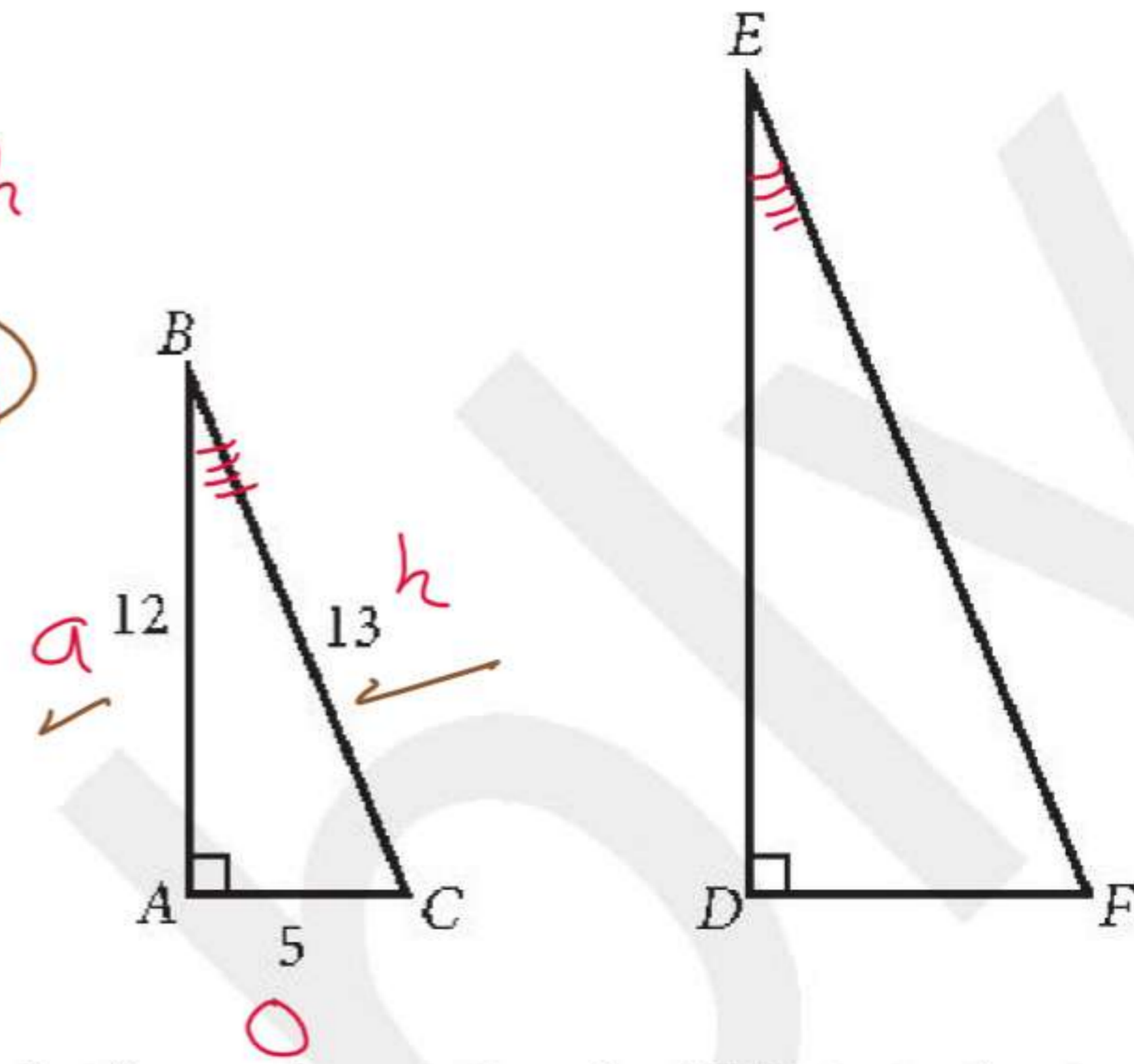
$(x-h)^2 + (y-k)^2 = r^2$
Center (h, k)
radius = $\sqrt{r^2}$

$x^2 + ax + y^2 + by = c$
 $c(\frac{a}{-2}, \frac{b}{-2})$

$r = \sqrt{(\frac{a}{-2})^2 + (\frac{b}{-2})^2 + c}$

12

Soh
Cah
Toa



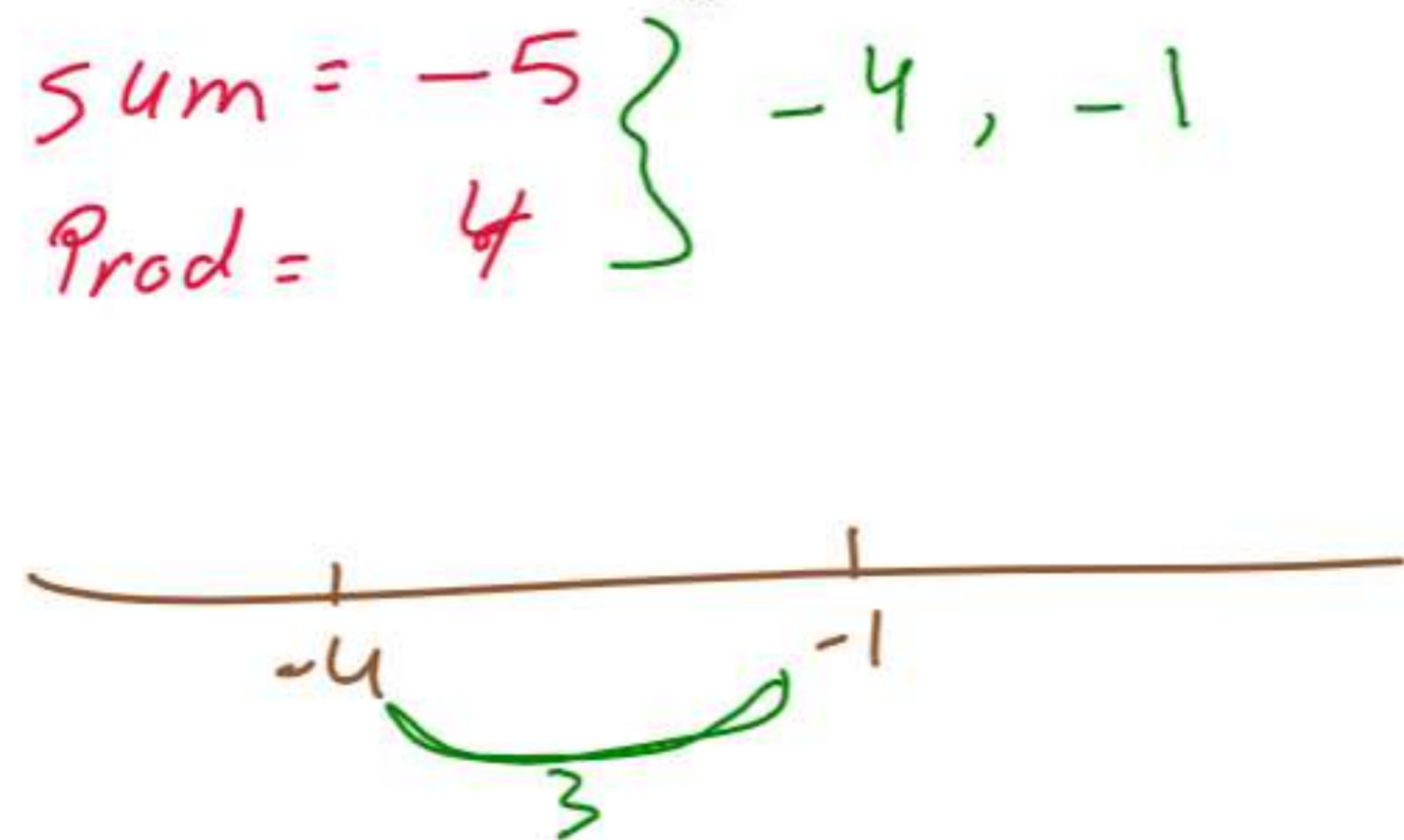
In the figure above, triangle ABC is similar to triangle DEF . What is the value of $\cos(E)$?

- A) $\frac{12}{5}$
- B) $\frac{12}{13}$
- C) $\frac{5}{12}$
- D) $\frac{5}{13}$

13

In the xy -plane, the graph of the function $f(x) = x^2 + 5x + 4$ has two x -intercepts. What is the distance between the x -intercepts?

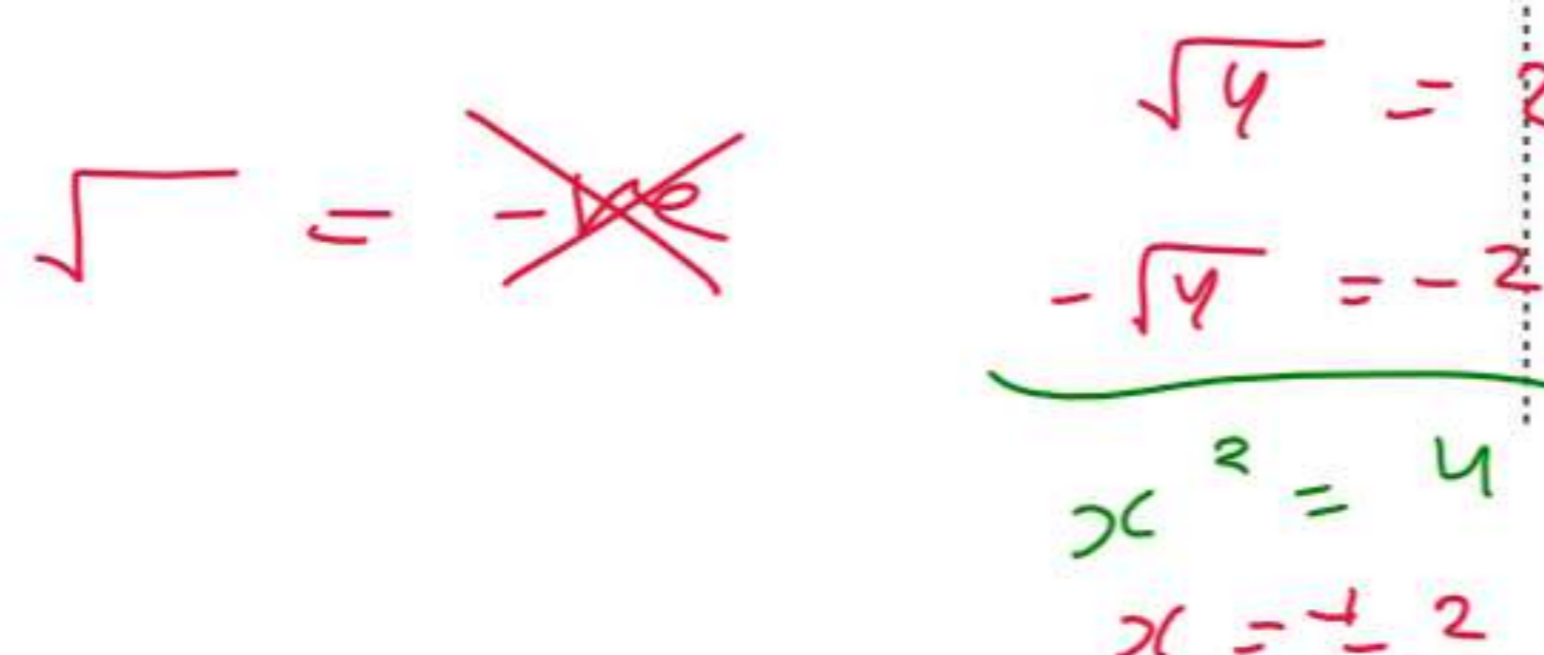
- A) 1
- B) 2
- C) 3
- D) 4



14

What are all values of x that satisfy the given equation?

- $\sqrt{4x} = x - 3$ ~~no~~
- I. 1 ~~no~~ $1 - 3 = -2$
 II. 9 $\sqrt{4 \times 9} = 6$ $9 - 3 = 6$
- A) I only
 - B) II only
 - C) I and II
 - D) Neither I nor II

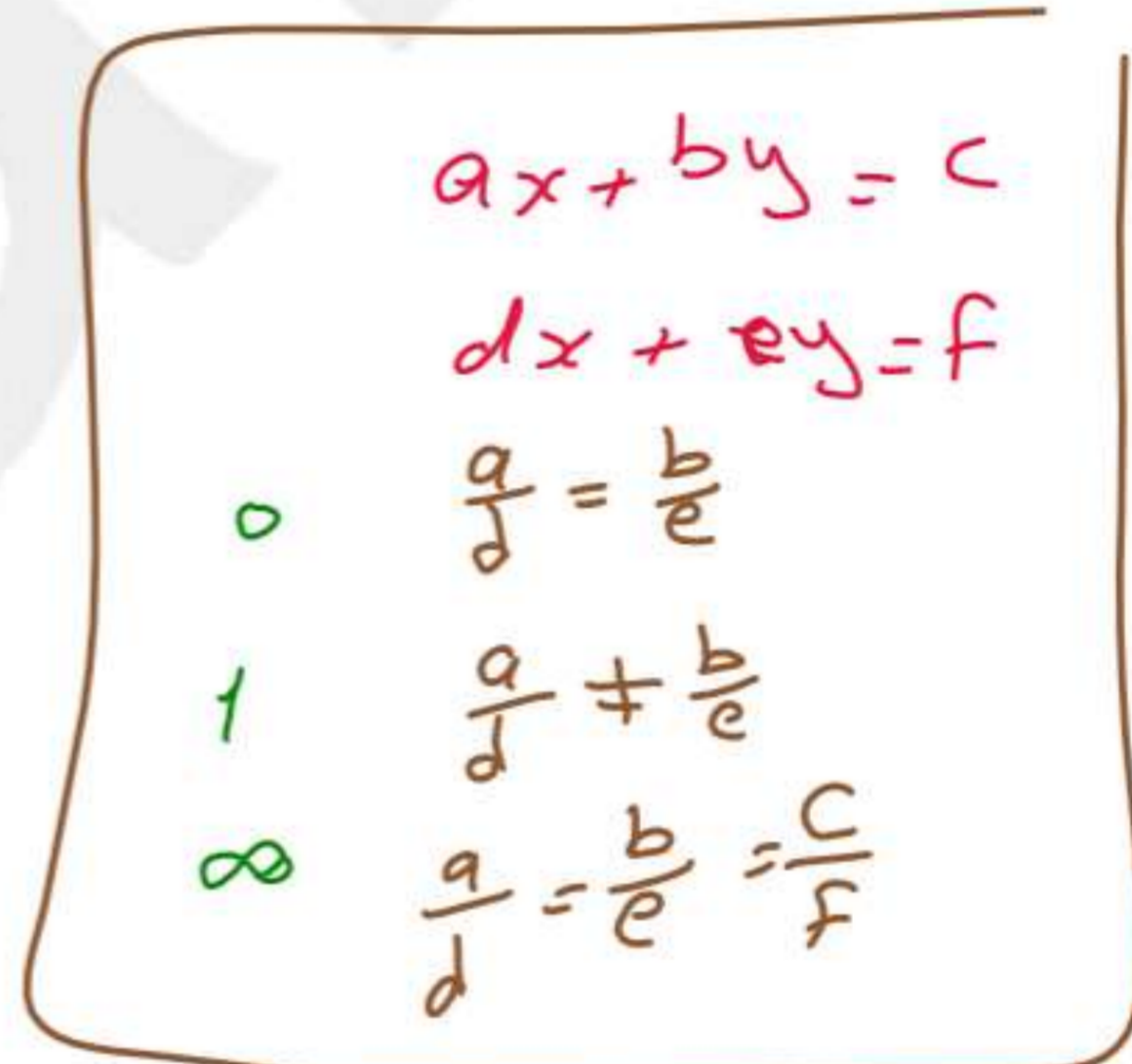


15

$$\begin{aligned} -3x + y &= 6 \\ ax + 2y &= 4 \end{aligned}$$

In the system of equations above, a is a constant. For which of the following values of a does the system have no solution?

- A) -6
- B) -3
- C) 3
- D) 6



16 $47000 = 5c + 12(3000)$

$T = 5c + 12f$

A manufacturer shipped units of a certain product to two locations. The equation above shows the total shipping cost T , in dollars, for shipping c units to the closer location and shipping f units to the farther location. If the total shipping cost was \$47,000 and 3000 units were shipped to the farther location, how many units were shipped to the closer location?

- A) 2000
- B) 2200**
- C) 2600
- D) 3000

$47000 = 5c + 36000$
 $2 \times 11000 = 5c$
 $\frac{22000}{5}$
 4400

$C = 2200$

17 $|2x + 1| = 5$

If a and b are the solutions to the equation above, what is the value of $|a - b|$?

- A) -3
- B) 1
- C) 2
- D) 5**

$2x + 1 = 5$
 $2x = 4$
 $x = 2$

$2x + 1 = -5$
 $2x = -6$
 $x = -3$

$|2 + 3| = 5$

$ x = 5$ $x = 5$ $x = -5$
$ x < 5$ $-5 < x < 5$
$ x > 5$ $x > 5, \quad x < -5$

18

Juan purchased an antique that had a value of \$200 at the time of purchase. Each year, the value of the antique is estimated to increase 10% over its value the previous year. The estimated value of the antique, in dollars, 2 years after purchase can be represented by the expression $200a$, where a is a constant. What is the value of a ?

- A) 1.1
- B) 1.2
- C) 1.21**
- D) 1.22

$200 \times 1.1 \times 1.1$
 1.1×1.1
 1.21

11×11
 $11(10 + 1)$
 $110 + 11$
 $= 121$

19

$2x + 3y = 1200$
 $3x + 2y = 1300$

Based on the system of equations above, what is the value of $5x + 5y$?

- A) 200
- B) 300
- C) 1500
- D) 2500**

$5x + 5y = 2500$

20

If $u + t = 5$ and $u - t = 2$, what is the value of $(u - t)(u^2 - t^2)$?

- A) 8
- B) 10
- C) 20**
- D) 25

$(u - t)(u - t)(u + t)$
 $2 \times 2 \times 5$
 $= 20$

STOP

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

1

A helicopter, initially hovering 40 feet above the ground, begins to gain altitude at a rate of 21 feet per second. Which of the following functions represents the helicopter's altitude above the ground y , in feet, t seconds after the helicopter begins to gain altitude?

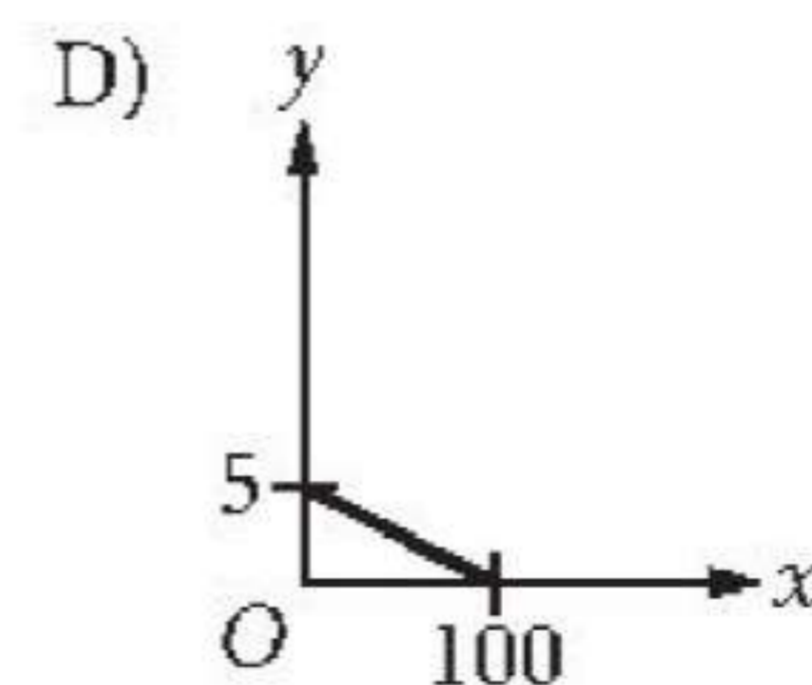
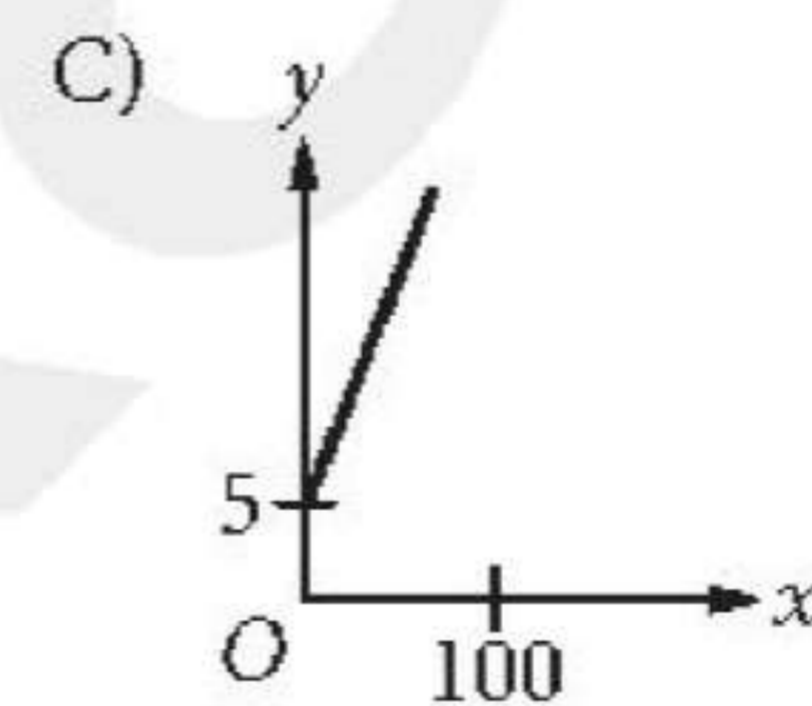
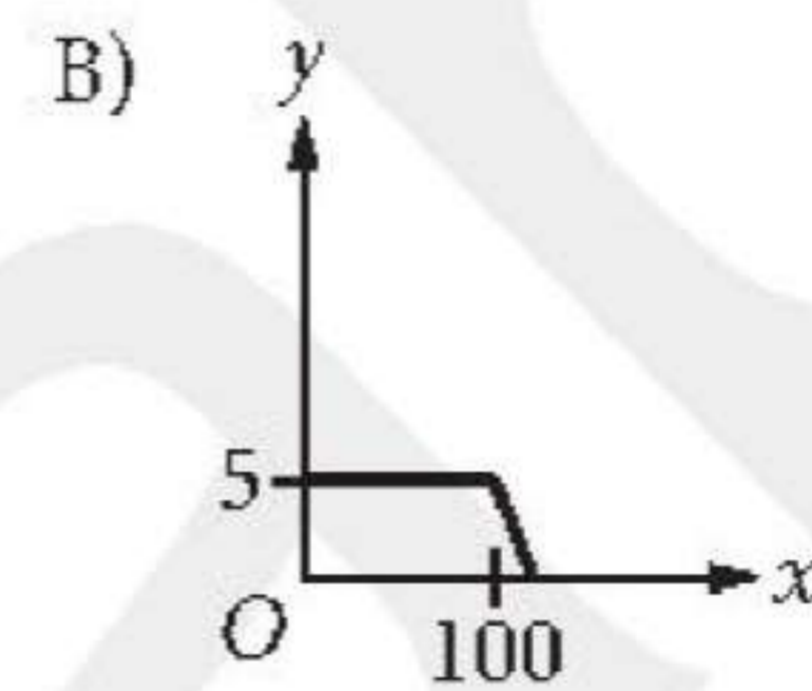
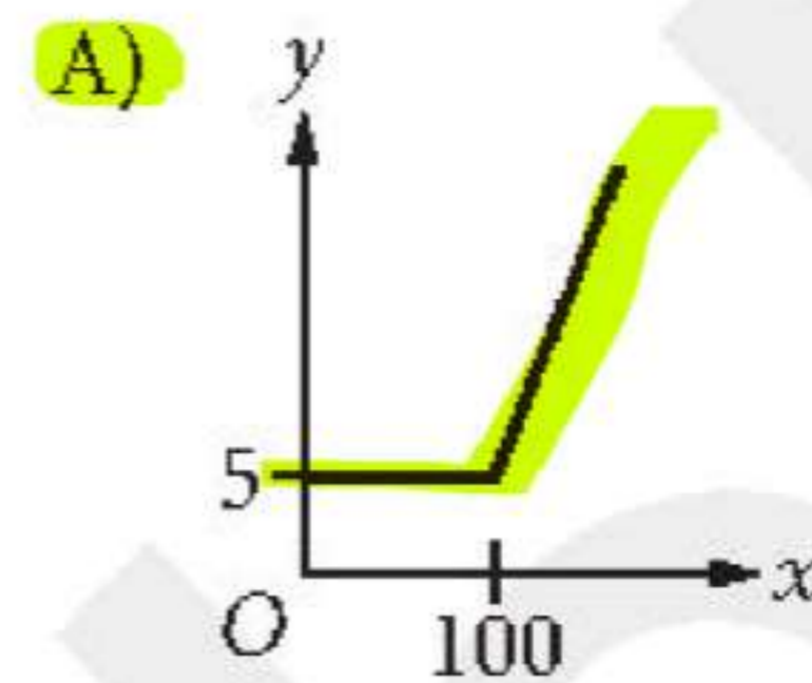
- ~~A)~~ $y = 40 + 21$
 B) $y = 40 + 21t$
 C) $y = 40 - 21t$
~~D)~~ $y = 40t + 21$

$y = mx + b$
 slope
 Average rate
 y for x

$y = i + at$
 initial
 starting
 at $x = 0$

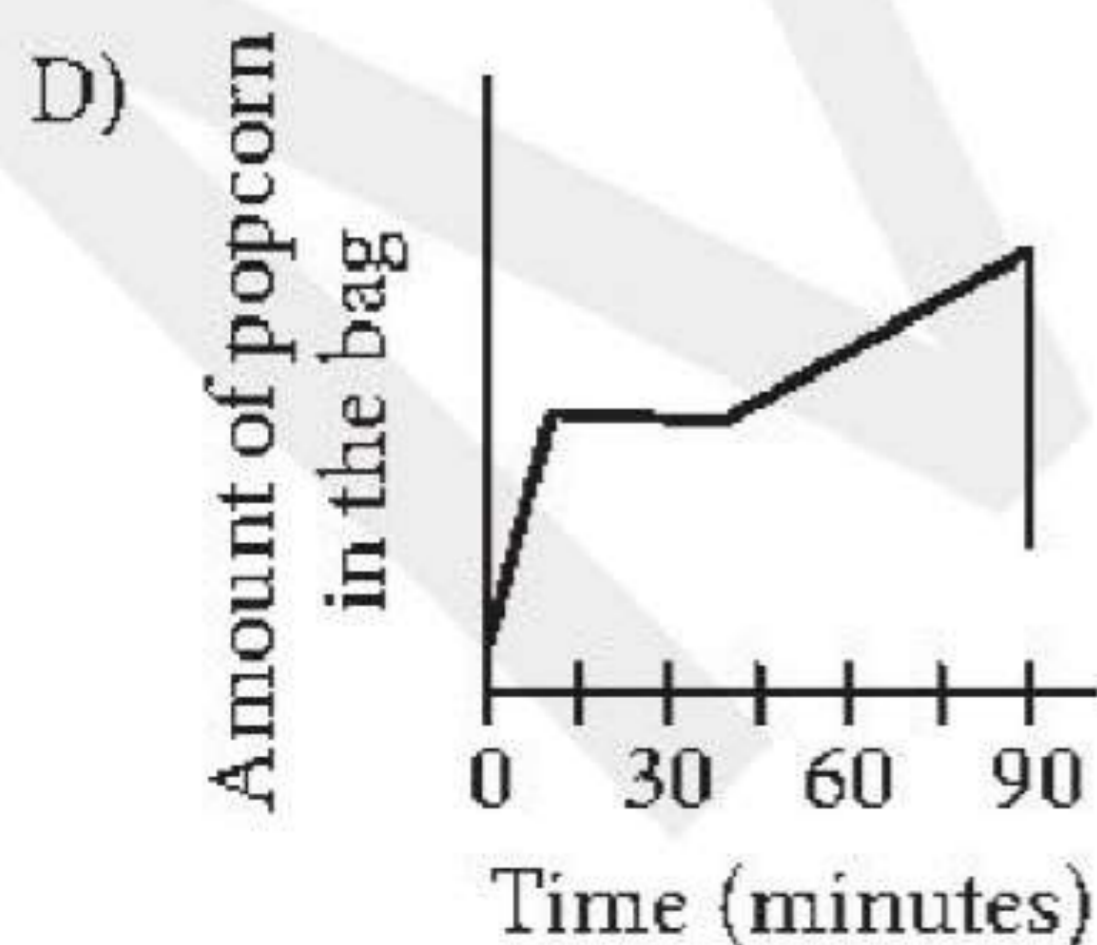
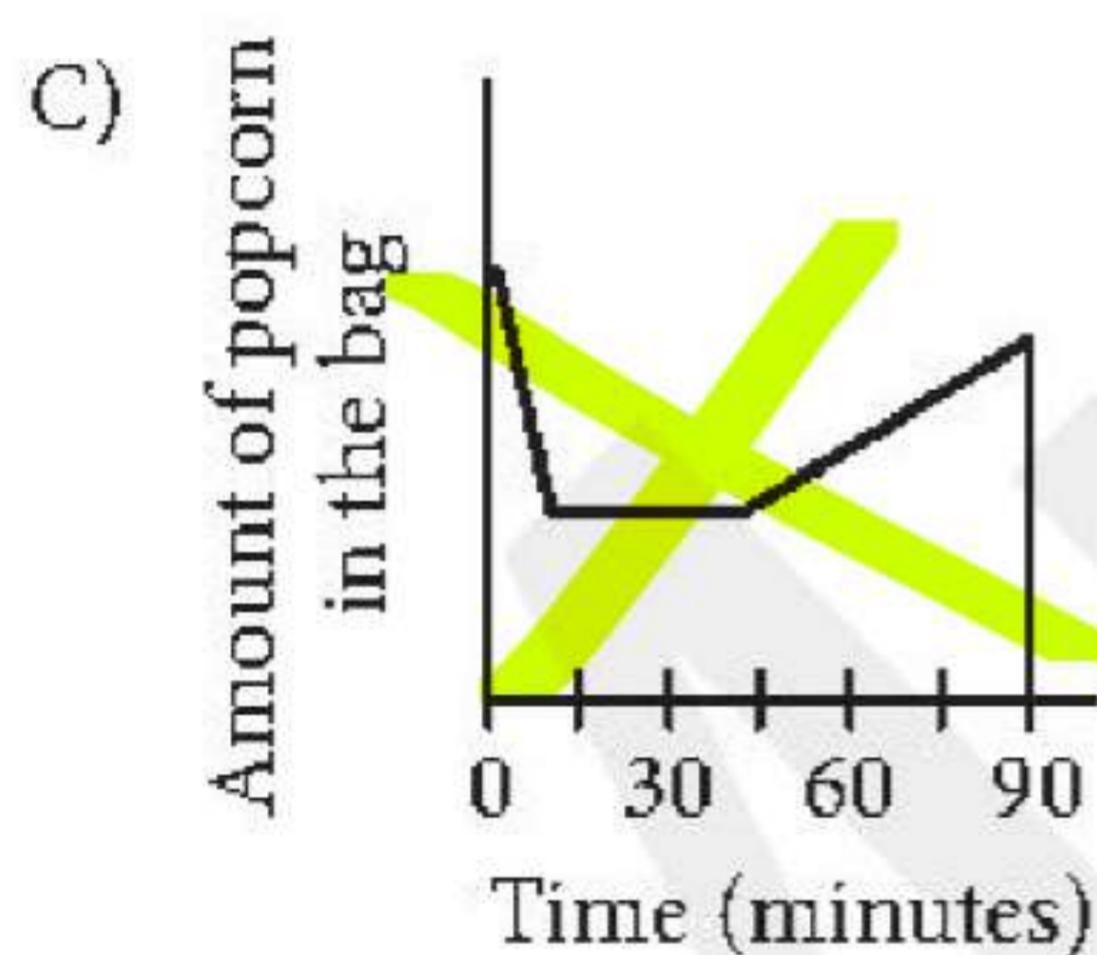
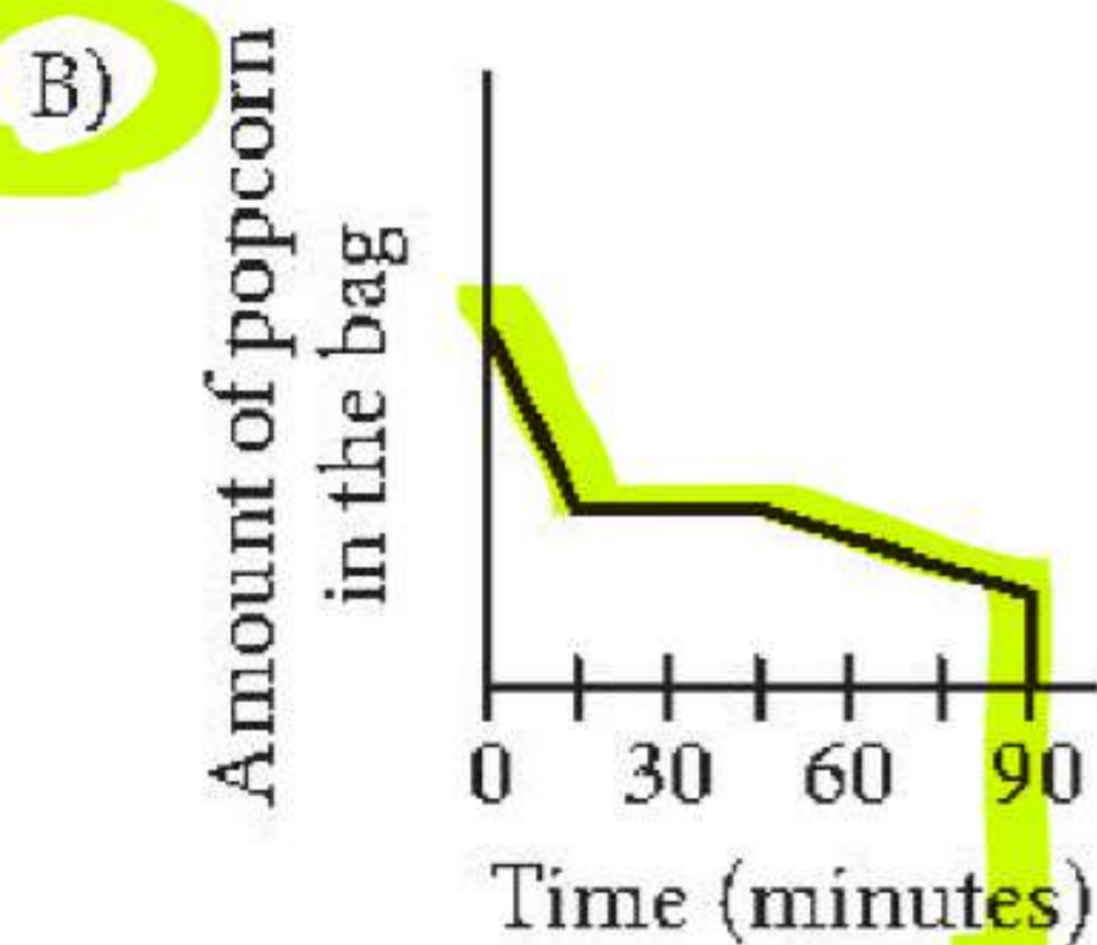
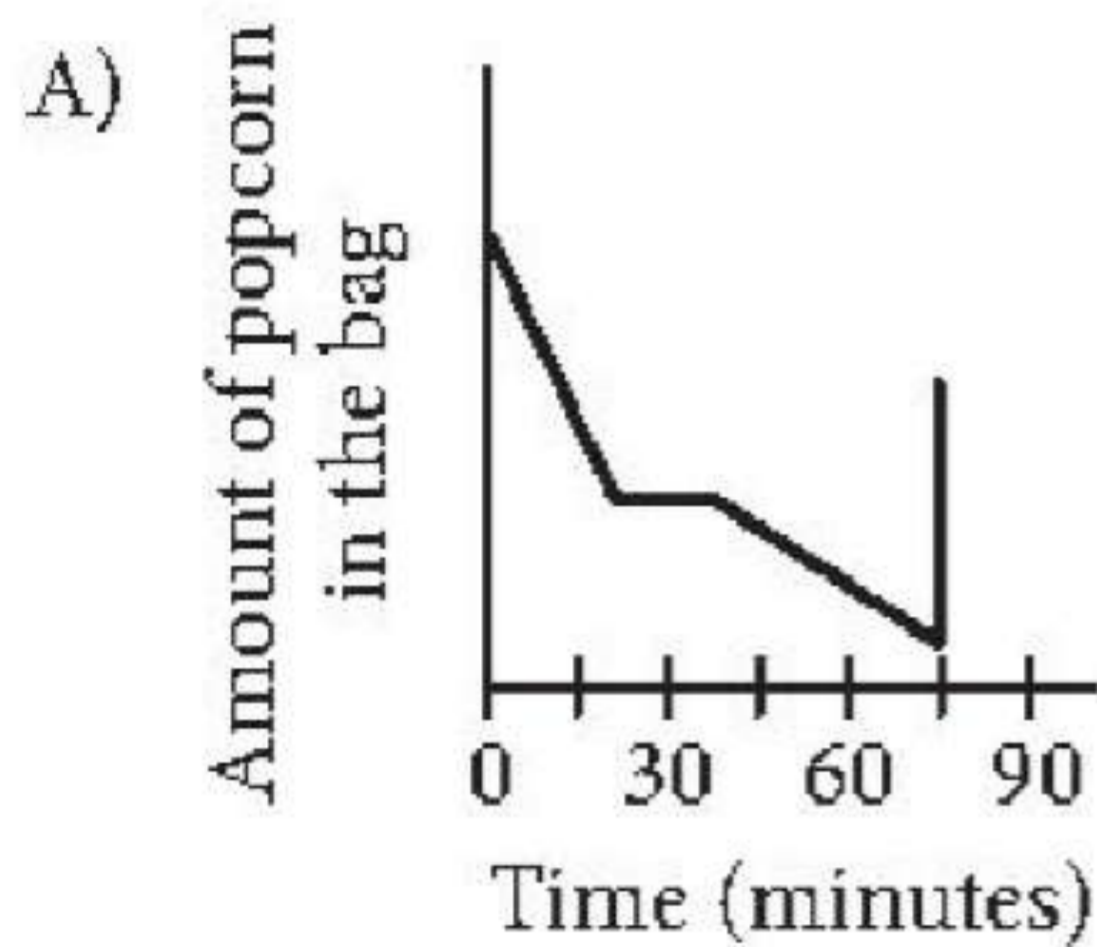
2

A text messaging plan charges a flat fee of \$5 per month for up to 100 text messages sent plus \$0.25 for each additional text message sent that month. Which of the following graphs represents the cost, y , of sending x texts in a month?



3

Jake buys a bag of popcorn at a movie theater. He eats half of the popcorn during the 15 minutes of previews. After eating half of the popcorn, he stops eating for the next 30 minutes. Then he gradually eats the popcorn until he accidentally spills all of the remaining popcorn. Which of the following graphs could represent the situation?



4

If $20 - x = 15$, what is the value of $3x$?

- A) 5
B) 10
C) 15
D) 35

$$20 - 15 = x$$

$$5 = x$$

$$3(5) = 15$$

5

$$f(x) = \frac{x+3}{2}$$

$$\frac{-1}{2} = 1$$

For the function f defined above, what is the value of $f(-1)$?

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

6

Which of the following is equivalent to $2x(x^2 - 3x)$?

- A) $-4x^2$
 B) $3x^3 - x^2$
 C) $2x^3 - 3x$
 D) $2x^3 - 6x^2$

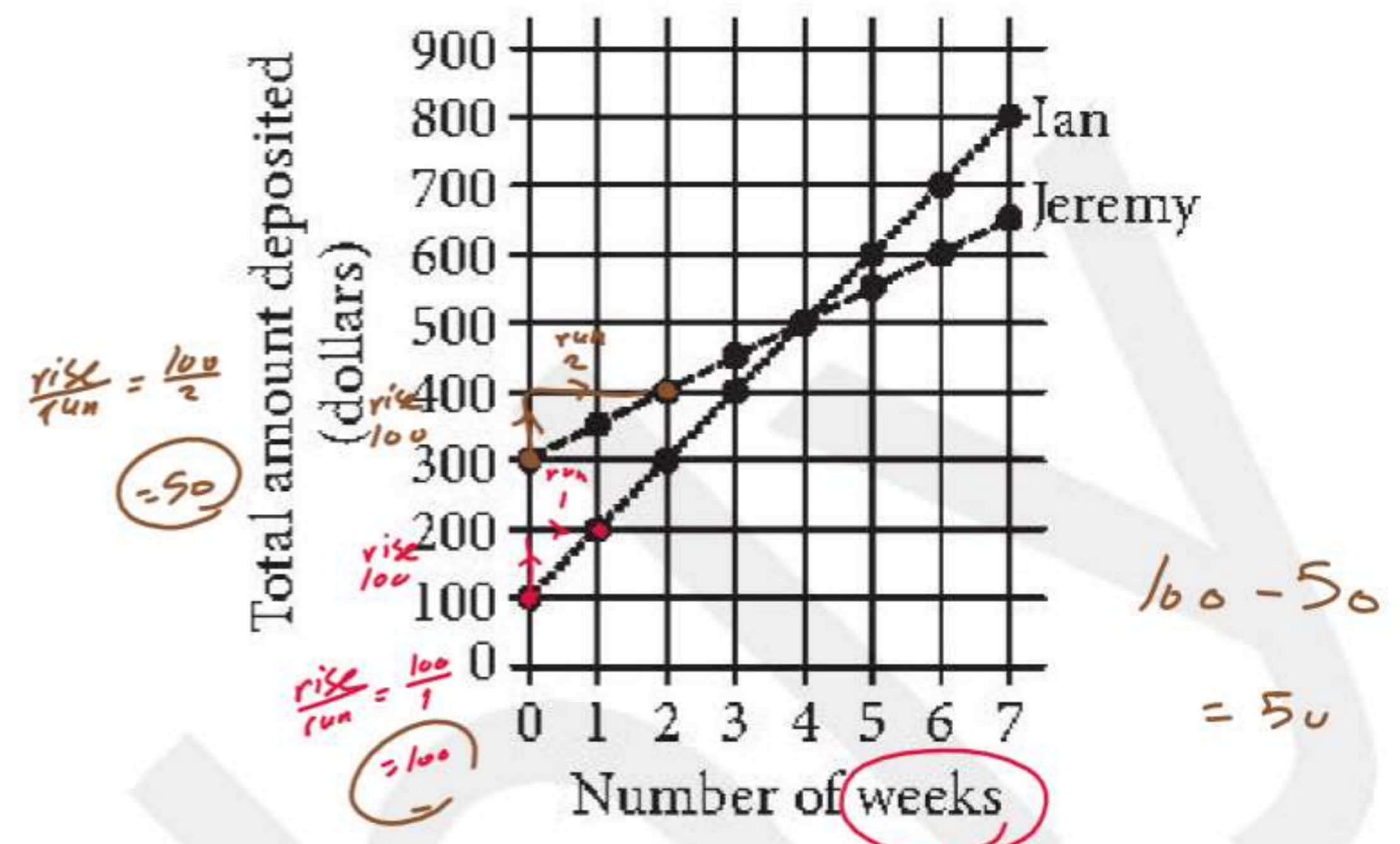
$$2x^3 - 6x^2$$

7

A retail company has 50 large stores located in different areas throughout a state. A researcher for the company believes that employee job satisfaction varies greatly from store to store. Which of the following sampling methods is most appropriate to estimate the proportion of all employees of the company who are satisfied with their job?

- A) Selecting **one** of the **50 stores** at random and then surveying **each** employee at that store
 B) Selecting **10 employees** from **each store** at random and then surveying each employee selected
 C) Surveying the **25 highest-paid** employees and the **25 lowest-paid** employees
 D) Creating a **website** on which employees can express their opinions and then using the **first 50 responses**

8



The two graphs above show the total amounts of money that Ian and Jeremy each have deposited into their savings accounts for the first seven weeks after opening their accounts. After they made their initial deposits, how much **more** did Ian deposit **each** week than Jeremy?

- A) \$200
 B) \$100
 C) \$50
 D) \$25

9

$$h(x) = 2^x$$

The function h is defined above. What is

$$h(5) - h(3)?$$

- A) 2
 B) 4
 C) 24
 D) 28

$$2^5 - 2^3 = 32 - 8 = 24$$

$$23 - 4 = 19$$

$$23 + 4 = 27$$

10

A researcher surveyed a random sample of students from a large university about how often they see movies. Using the sample data, the researcher estimated that 23% of the students in the population saw a movie at least once per month. The margin of error for this estimation is 4%. Which of the following is the most appropriate conclusion about all students at the university, based on the given estimate and margin of error?

- A) It is unlikely that less than 23% of the students see a movie at least once per month.
- B) At least 23%, but no more than 25%, of the students see a movie at least once per month.
- C) The researcher is between 19% and 27% sure that most students see a movie at least once per month.
- D) It is plausible that the percentage of students who see a movie at least once per month is between 19% and 27%.

11

List A	1	2	3	4	5	6	3-5
List B	2	+3	+3	+4	+4	+5	3-5

The table above shows two lists of numbers. Which of the following is a true statement comparing list A and list B?

- A) The means are the same, and the standard deviations are different.
- B) The means are the same, and the standard deviations are the same.
- C) The means are different, and the standard deviations are different.
- D) The means are different, and the standard deviations are the same.

12

A book was on sale for 40% off its original price. If the sale price of the book was \$18.00, what was the original price of the book? (Assume there is no sales tax.)

- A) \$7.20
- B) \$10.80
- C) \$30.00
- D) \$45.00

$$0.60n = 18$$

$$n = 30$$