$i^{7-4} = i^3$
$= -i$

1

Salim wants to purchase tickets from a vendor to watch a tennis match. The vendor charges a one-time service fee for processing the purchase of the tickets. The equation $T = 15n + 12$ represents the total amount T, in dollars, Salim will pay for n tickets. What does 12 represent in the equation?

A) The price of one ticket, in dollars

B) The amount of the service fee, in dollars

C) The total amount, in dollars, Salim will pay for one ticket

D) The total amount, in dollars, Salim will pay for any number of tickets

$y = mx + b$

slope / Average rate / Y Per x

y-int / initial starting / at $x=0$

2

A gardener buys two kinds of fertilizer. Fertilizer A contains 60% filler materials by weight and Fertilizer B contains 40% filler materials by weight. Together, the fertilizers bought by the gardener contain a total of 240 pounds of filler materials. Which equation models this relationship, where x is the number of pounds of Fertilizer A and y is the number of pounds of Fertilizer B?

A) $0.4x + 0.6y = 240$

B) $0.6x + 0.4y = 240$

C) $40x + 60y = 240$

D) $60x + 40y = 240$

3

What is the sum of the complex numbers $2 + 3i$ and $4 + 8i$, where $i = \sqrt{-1}$?

A) 17

B) $17i$

C) $6 + 11i$

D) $8 + 24i$

$2+3i + 4+8i$

$6 + 11i$

$i^2 = -1$
$i^3 = -i$
$i^4 = 1$
$i^{\square \pm 4}$

4

$$4x^2 - 9 = (px + t)(px - t)$$

In the equation above, p and t are constants. Which of the following could be the value of p ?

A) 2

B) 3

C) 4

D) 9

5alik ve5u

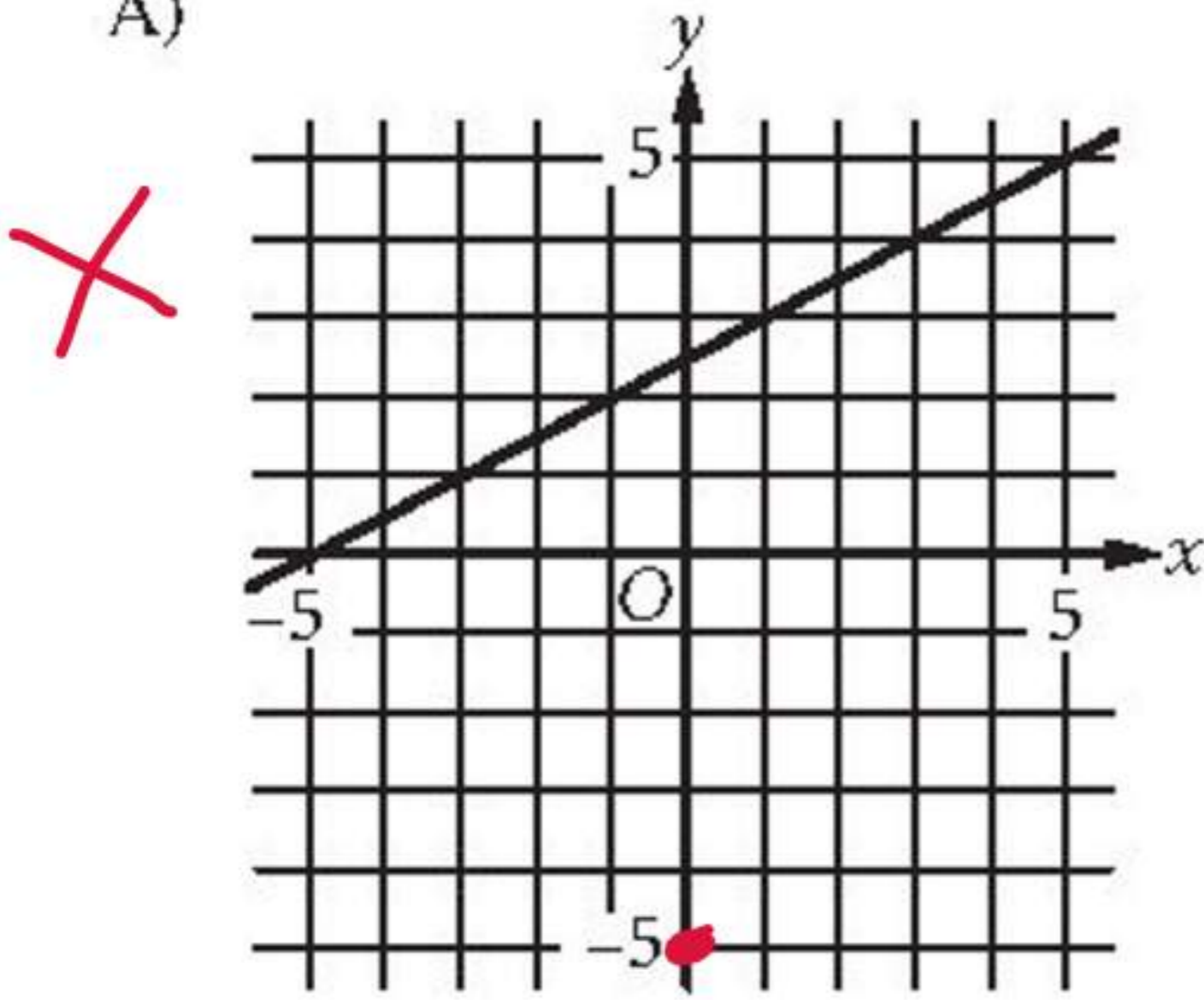$(a+b)^2 = a^2 + 2ab + b^2$

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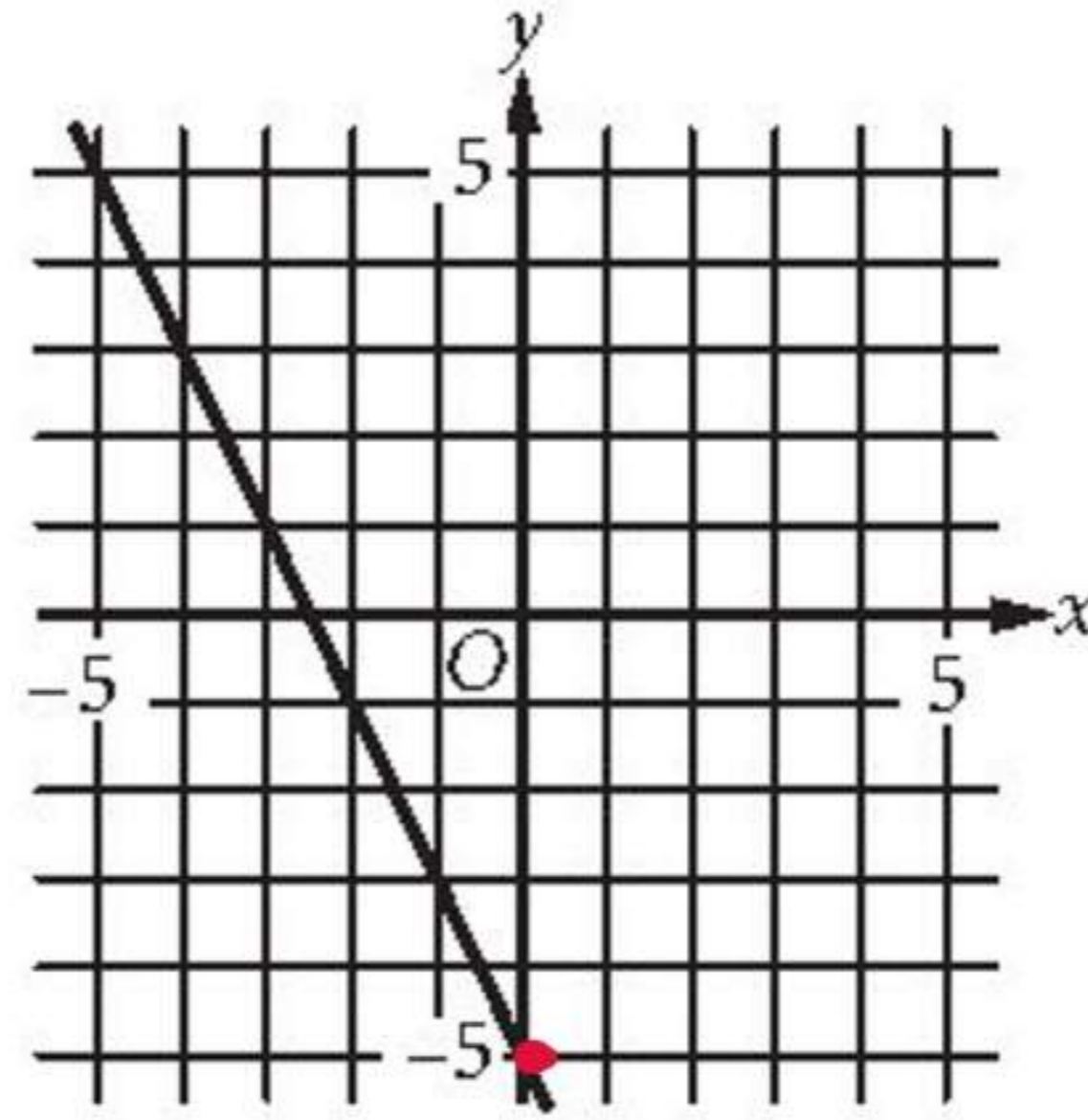
$a^2 - b^2 = (a-b)(a+b)$

5

Which of the following is the graph of the equation $y = 2x - 5$ in the xy-plane?
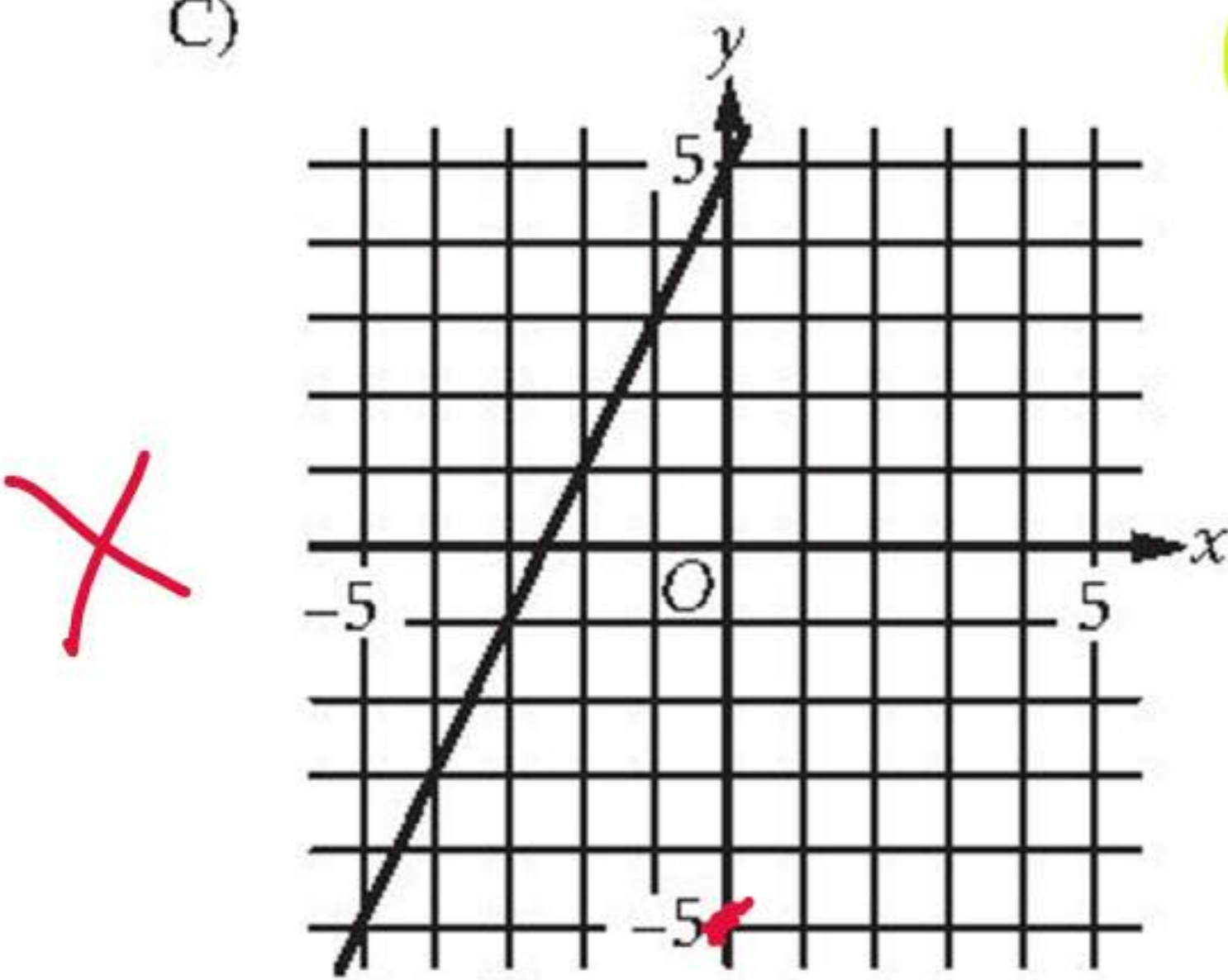
A)

B)

C)

D)
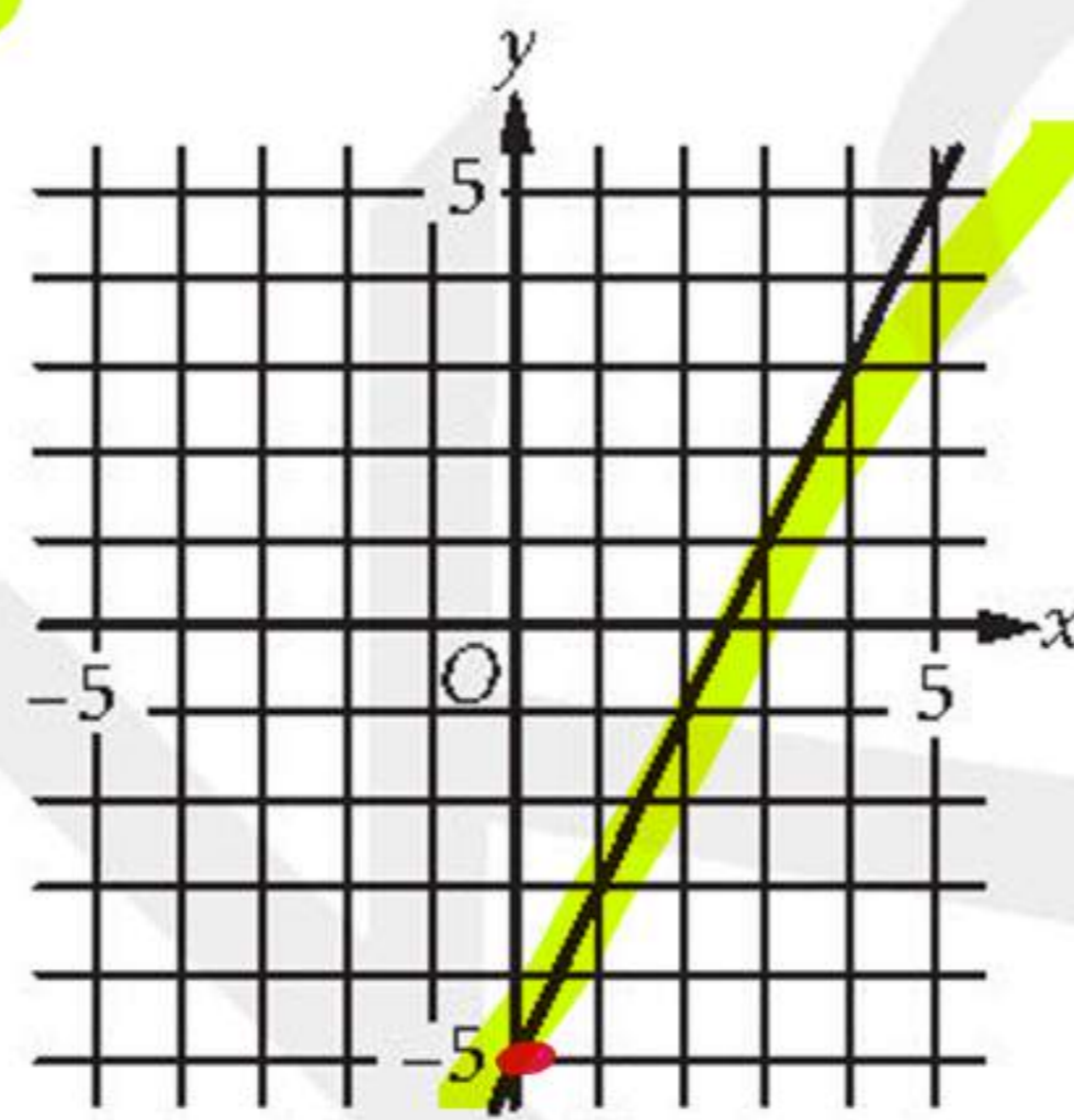
$y = mx + b$

slope → y-int

2 Points: $\dfrac{y_2 - y_1}{x_2 - x_1}$

Graph: $\dfrac{rise}{run}$

Equi: no beside x

/ +ve

\ -ve

— Zero

| undefined

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Math is Root of Knowledge

19

CONTINUE

MATH = √KNOWLEDGE

6

If $x = \frac{2}{3}y$ and $y = 18$, what is the value of $2x - 3$?

A) 21
B) 15
C) 12
D) 10

(handwritten work)
$x = \frac{2}{3}\cdot\frac{(18)^6}{1}$
$= \frac{2\times 6}{1}$
$= 12$

$2x - 3$
$2(12) - 3$
$24 - 3$
$\boxed{21}$

7

A bricklayer uses the formula $n = 7\,\ell\,h$ to estimate the number of bricks, n, needed to build a wall that is ℓ feet long and h feet high. Which of the following correctly expresses ℓ in terms of n and h ?

A) $\ell = \frac{7}{nh}$

B) $\ell = \frac{h}{7n}$

C) $\ell = \frac{n}{7h}$

D) $\ell = \frac{n}{7 + h}$

(handwritten work)
$n = 7\,\ell\,h$
$\frac{n}{7h} = \ell$

8

x	$w(x)$	$t(x)$
1	−1	−3
2	3	−1
3	4	1
4	3	3
5	−1	5

The table above shows some values of the functions w and t. For which value of x is $w(x) + t(x) = x$?

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

9

If $\sqrt{x} + \sqrt{9} = \sqrt{64}$, what is the value of x ?

A) $\sqrt{5}$
B) 5
C) 25
D) 55

(handwritten work)
$\sqrt{x} + 3 = 8$
$\sqrt{x} = 5^2$
$\boxed{x = 25}$

CONTINUE

10

Jaime is preparing for a bicycle race. His goal is to bicycle an average of at least 280 miles per week for 4 weeks. He bicycled 240 miles the first week, 310 miles the second week, and 320 miles the third week. Which inequality can be used to represent the number of miles, x, Jaime could bicycle on the 4th week to meet his goal?

A) $\dfrac{240 + 310 + 320}{3} + x \geq 280$

B) $240 + 310 + 320 \geq x(280)$

C) $\dfrac{240}{4} + \dfrac{310}{4} + \dfrac{320}{4} + x \geq 280$

D) $240 + 310 + 320 + x \geq 4(280)$

Handwritten: Mean = $\dfrac{\text{sum}}{\text{no.}}$

Mean ≥ 280

$\dfrac{\text{sum}}{4} \geq 280$

Sum $\geq 4(280)$

11

Handwritten:
$f(x) + a \uparrow$
$f(x) - a \downarrow$
$f(x + a) \leftarrow$
$f(x - a) \rightarrow$
$-f(x)$ reflect x-axis

$y = ax^2 + c$
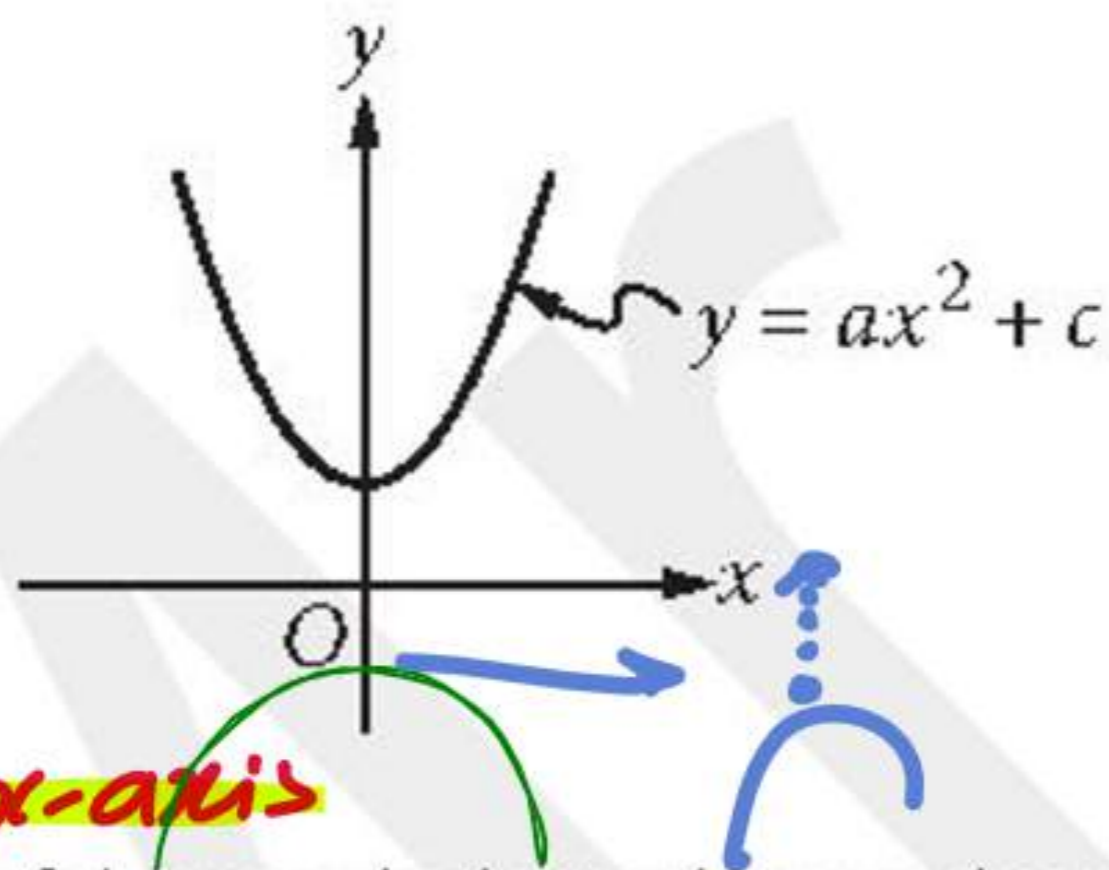
The vertex of the parabola in the xy-plane above is $(0, c)$. Which of the following is true about the parabola with the equation $y = -a(x - b)^2 + c$?

A) The vertex is (b, c) and the graph opens upward.

B) The vertex is (b, c) and the graph opens downward.

C) The vertex is $(-b, c)$ and the graph opens upward.

D) The vertex is $(-b, c)$ and the graph opens downward.

12

Handwritten: $x = 2$

Which of the following is equivalent to $\dfrac{4x^2 + 6x}{4x + 2}$?

A) x *(handwritten: 2)*

B) $x + 4$

C) $x - \dfrac{2}{4x + 2}$

D) $x + 1 - \dfrac{2}{4x + 2}$

Handwritten:
$\dfrac{4(2)^2 + 6(2)}{4(2) + 2} = \dfrac{16 + 12}{10}$

$\dfrac{28}{10} = 2.8$

13

$$2x^2 - 4x = t$$

In the equation above, t is a constant. If the equation has no real solutions, which of the following could be the value of t?

A) -3

B) -1

C) 1

D) 3

Handwritten:
$2x^2 - 4x - t = 0$
$a = 2 \quad b = -4 \quad c = -t$

$b^2 - 4ac \begin{cases} +ve & \to \text{2 sol} \\ 0 & \to \text{1 sol} \\ -ve & \to \text{no} \end{cases}$

$b^2 - 4ac < 0$
$(-4)^2 - 4(2)(-t) < 0$
$16 + 8t < 0$
$8t < -16$
$t < -2$

CONTINUE

14

A laundry service is buying detergent and fabric softener from its supplier. The supplier will deliver no more than 300 pounds in a shipment. Each container of detergent weighs 7.35 pounds, and each container of fabric softener weighs 6.2 pounds. The service wants to buy at least twice as many containers of detergent as containers of fabric softener. Let d represent the number of containers of detergent, and let s represent the number of containers of fabric softener, where d and s are nonnegative integers. Which of the following systems of inequalities best represents this situation?

A) $7.35d + 6.2s \leq 300$
$d \geq 2s$

B) $7.35d + 6.2s \leq 300$
$2d \geq s$

C) $14.7d + 6.2s \leq 300$
$d \geq 2s$

D) $14.7d + 6.2s \leq 300$
$2d \geq s$

handwritten: ≤ 300
$d \geq 2s$

15

Which of the following is equivalent to $\left(a + \dfrac{b}{2}\right)^2$?

A) $a^2 + \dfrac{b^2}{2}$

B) $a^2 + \dfrac{b^2}{4}$

C) $a^2 + \dfrac{ab}{2} + \dfrac{b^2}{2}$

D) $a^2 + ab + \dfrac{b^2}{4}$ ✓

handwritten:
$\left(\dfrac{b}{2}\right)^2 = \dfrac{b^2}{4}$

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

MATH = √KNOWLEDGE

16

If $a^{\frac{b}{4}} = 16$ for positive integers a and b, what is **one** possible value of b?

A) 0
B) 2
C) 10
D) 16

$a^{\frac{b}{4}} = 4^2$ $a^{\frac{b}{4}} = 2^?$ $a^{\frac{b}{4}} = 16^1$

$\frac{b}{4} = 2$ $\frac{b}{4} = 4$ $\frac{b}{4} = 1$

$b = 8$ $b = 16$ $b = 4$

17

$$\frac{2}{3}t = \frac{5}{2}$$

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

A) 3/2
B) 4/15
C) 15/4
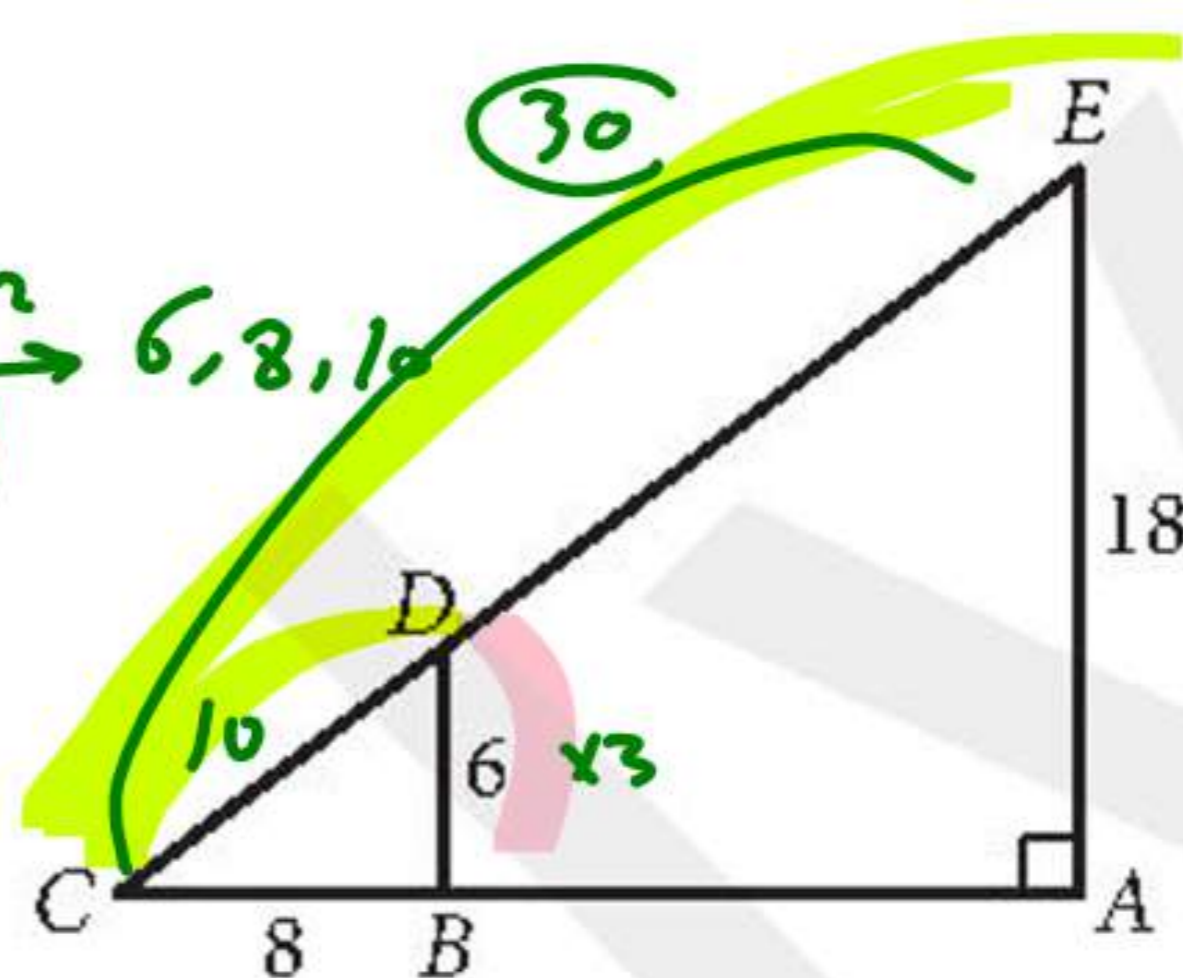D) 5/3

$2(2t) = 3(5)$

$4t = 15$

$t = \frac{15}{4}$

18

30

3, 4, 5 → 6, 8, 10

5, 12, 13

10   18

D

6

C   8   B   A

In the figure above, $\overline{BD}$ is parallel to $\overline{AE}$. What is the length of $\overline{CE}$?

A) 18
B) 24
C) 30
D) 50

$\frac{10}{CE} = \frac{6}{18}$

CONTINUE

19

How many liters of a 25% saline solution must be added to 3 liters of a 10% saline solution to obtain a 15% saline solution?

A) 1.5
B) 3.5
C) 5.5
D) 10

$$0.25x + 0.10 \times 3 = 0.15(3+x)$$

$$0.25x + 0.30 = 0.45 + 0.15x$$

$$0.25x - 0.15x = 0.45 - 0.30$$

$$0.10x = 0.15$$

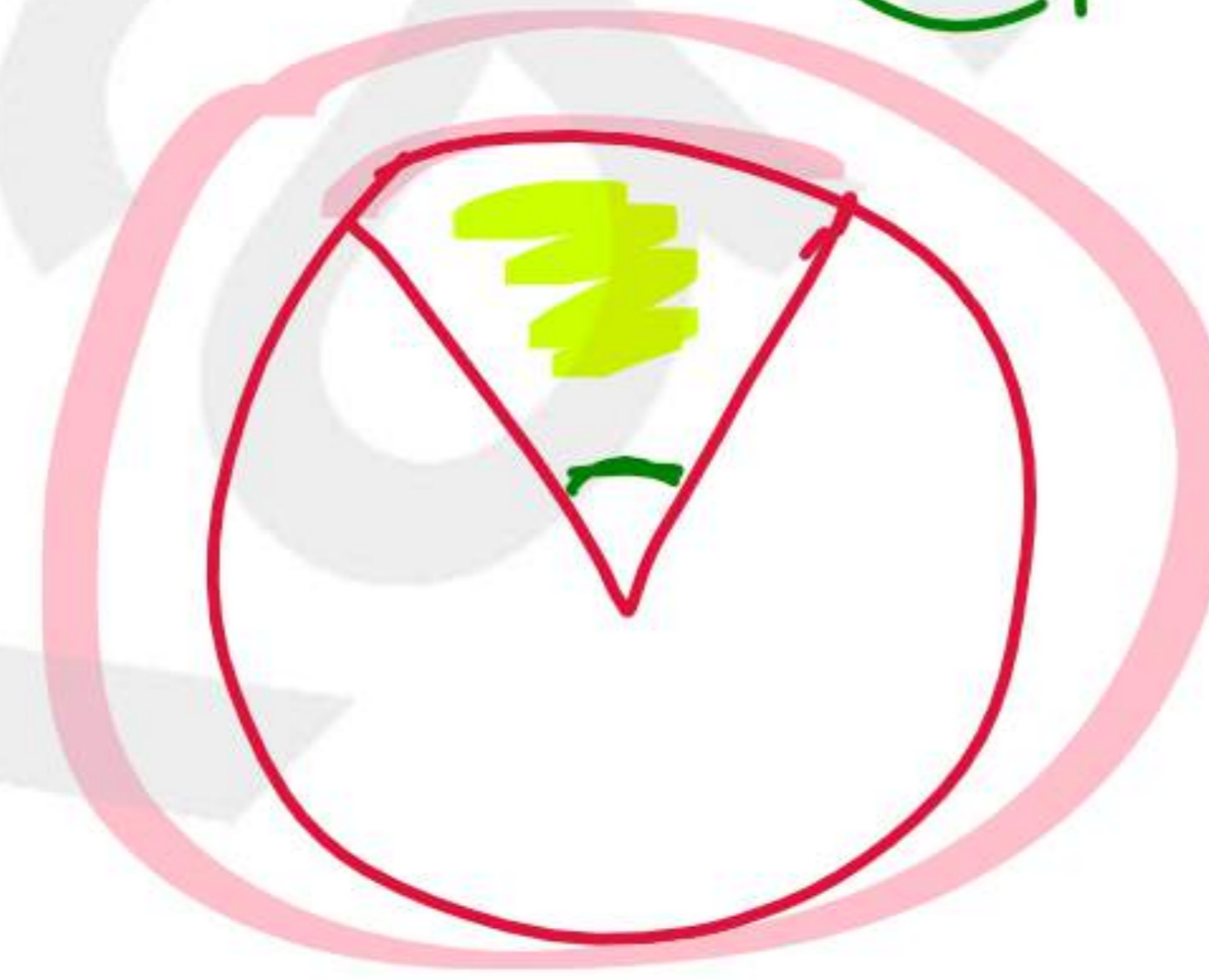$$x = \frac{0.15}{0.10}$$

$$x = 1.5$$

20

Points A and B lie on a circle with radius 1, and arc $\overarc{AB}$ has length $\frac{\pi}{3}$. What fraction of the circumference of the circle is the length of arc $\overarc{AB}$?

A) 1/6
B) 1/2
C) 2
D) 6

$$\frac{l}{\text{Circ}} = \frac{l}{2\pi r} = \frac{\frac{\pi}{3}}{2\pi(1)}$$

$$\frac{\frac{\pi}{3}}{2\pi} = \frac{\pi}{6\pi}$$

$$\frac{\frac{a}{b}}{\frac{c}{d}} = \frac{ad}{bc}$$

STOP

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section.

24

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