GRADE 7 ACCELERATED · UNIT 11 · LESSON 8

Systems in Context; Approximate Solutions

MA.8.AR.4.3

I can solve a real-world system by graphing, say what the crossing point means, and estimate a crossing that falls between the grid lines.

Warm-Up

1. Use tables to solve: $y = x + 3$ and $y = 2x$
2. How many solutions does $5x + 4 = 2x + 4$ have?
3. A 6-ft post casts a 4-ft shadow. A tree casts 10 ft. How tall?
4. A gym costs $15 to join and $4 a visit. What do 5 visits cost?

Warm-Up

1. Use tables to solve: $y = x + 3$ and $y = 2x$ **(3, 6)**

2. How many solutions does $5x + 4 = 2x + 4$ have?

   One: $x = 0$

3. A 6-ft post casts a 4-ft shadow. A tree casts 10 ft. How tall?

   15 ft

4. A gym costs $15 to join and $4 a visit. What do 5 visits cost?

   $35

Vocabulary

approximate solution

a crossing read between the grid lines, written with "about": about (1.7, 2.3)

Notes

I. A story is a system

Pass: $10, then $2 a ride. $y = 2x + 10$

No pass: $4 a ride. $y = 4x$

pass: $y = 2x + 10$

x	0	1	2
y	10	12	14

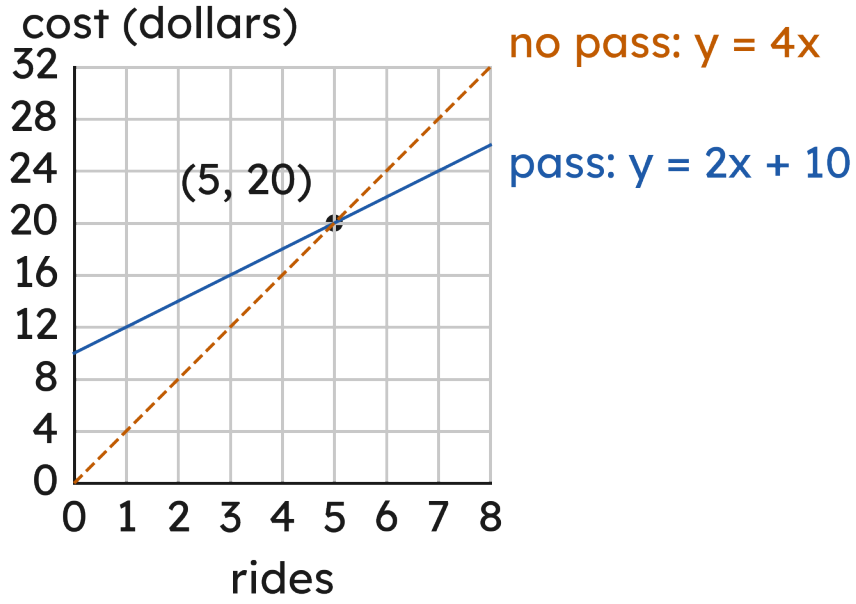
no pass: $y = 4x$

x	0	1	2
y	0	4	8

Each one: (the amount per 1) · x + (the start)

Notes

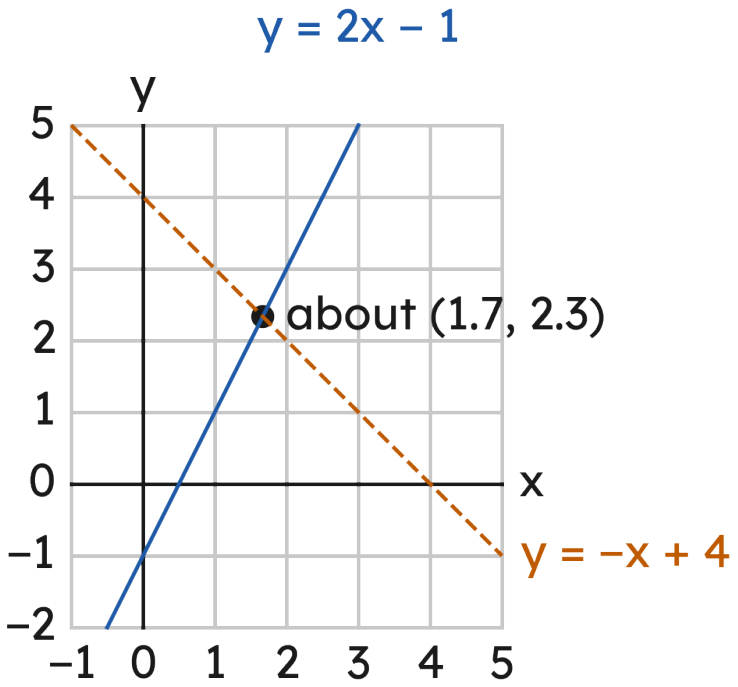
II. Say what the point means, with units



At 5 rides, both cost $20. Fewer rides: pay per ride. More: buy the pass.

Notes

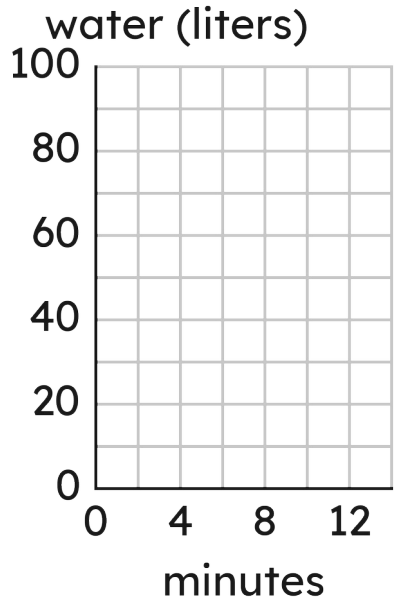
III. Between the grid lines: estimate



Check: $2(1.7) - 1 = 2.4$ and $-1.7 + 4 = 2.3$. Close: a good estimate.

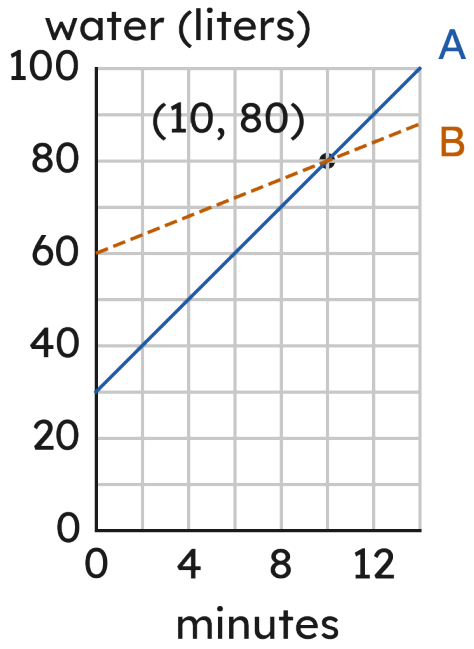
Example 1

Tank A: 30 liters, gaining 5 a minute. Tank B: 60 liters, gaining 2 a minute.



When do the tanks hold the same amount, and how much is that?

Example 1



$A: \ y = 5x + 30$

$B: \ y = 2x + 60$

$5(10) + 30 = 80$

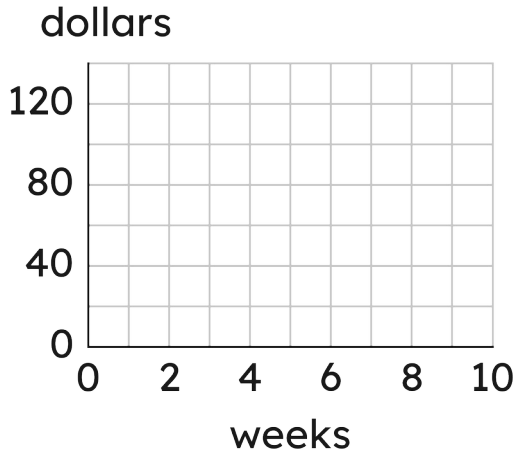
$2(10) + 60 = 80$

Answer: After 10 minutes, both hold 80 liters.

Your Turn

Mia has $40 and saves $10 a week. Noah has $70 and saves $5 a week.

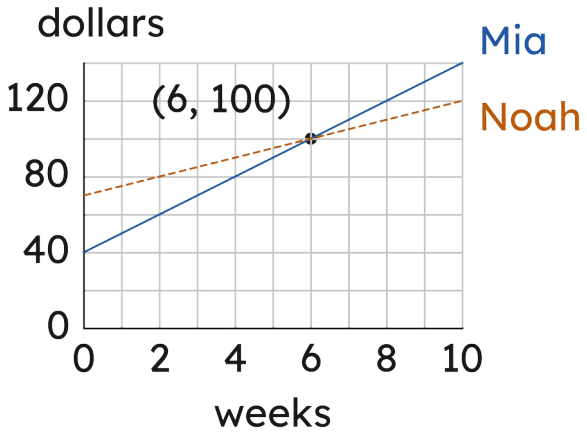
When will they have the same amount, and how much?



Your Turn

Mia has $40 and saves $10 a week. Noah has $70 and saves $5 a week.

When will they have the same amount, and how much?



Mia: $10(6) + 40 = 100$ Noah: $5(6) + 70 = 100$

Answer: After 6 weeks, both have $100.

Example 2

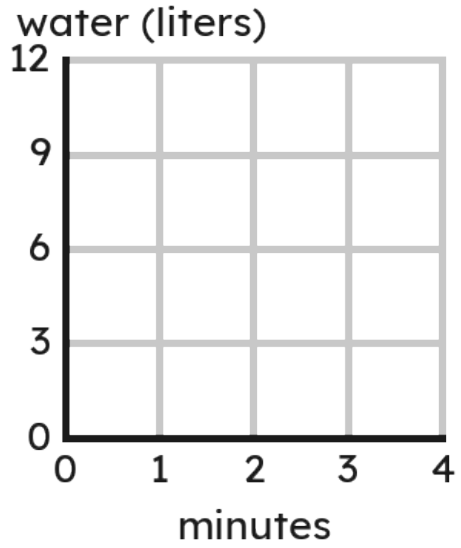
Tub A: empty, gaining 3 liters a minute. Tub B: 5 liters, gaining 1 a minute.

Tub A

x	0	1	2	3
y	0	3	6	9

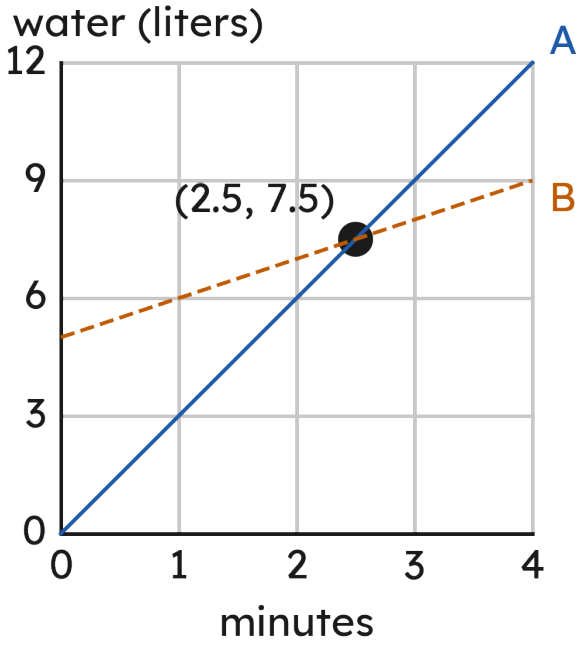
Tub B

x	0	1	2	3
y	5	6	7	8



When do the tubs hold the same amount?

Example 2



$A: \ y = 3x$

$B: \ y = x + 5$

$3(2.5) = 7.5$

$2.5 + 5 = 7.5$

Answer: After 2.5 minutes, both hold 7.5 liters.

Your Turn

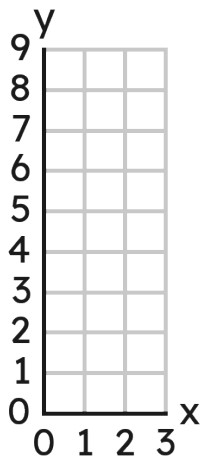
Solve the system $y = 4x$ and $y = 2x + 3$.

$y = 4x$

x	0	1	2
y	0	4	8

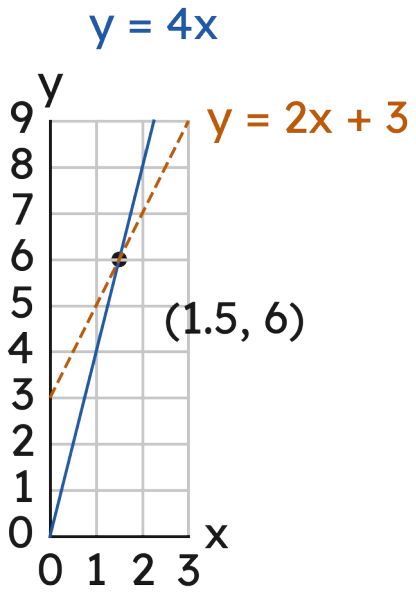
$y = 2x + 3$

x	0	1	2
y	3	5	7



Your Turn

Solve the system $y = 4x$ and $y = 2x + 3$.



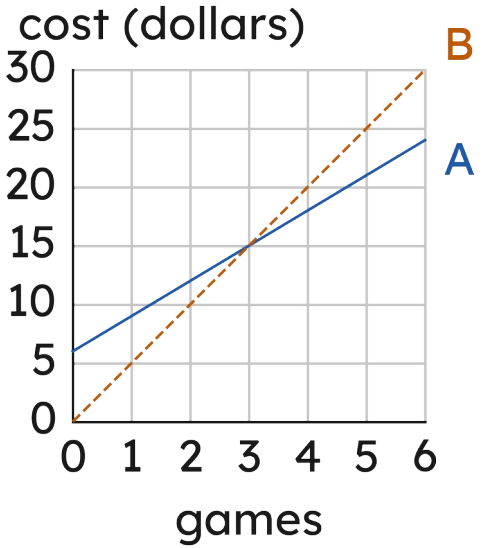
halfway from 1 to 2: $4(1.5) = 6$ and $2(1.5) + 3 = 6$

Answer: (1.5, 6)

Whiteboards · Question 1 of 9

Bowling plan A: $6 for shoes, $3 a game. Plan B: $5 a game.

After how many games do the plans cost the same?

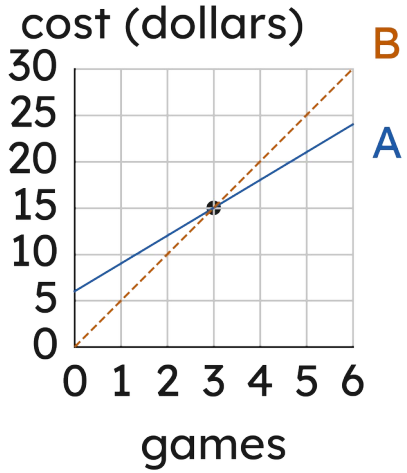


Answer it.

Whiteboards · Question 1 of 9

Bowling plan A: \$6 for shoes, \$3 a game. Plan B: \$5 a game.

After how many games do the plans cost the same?



the lines cross at $(3, 15)$

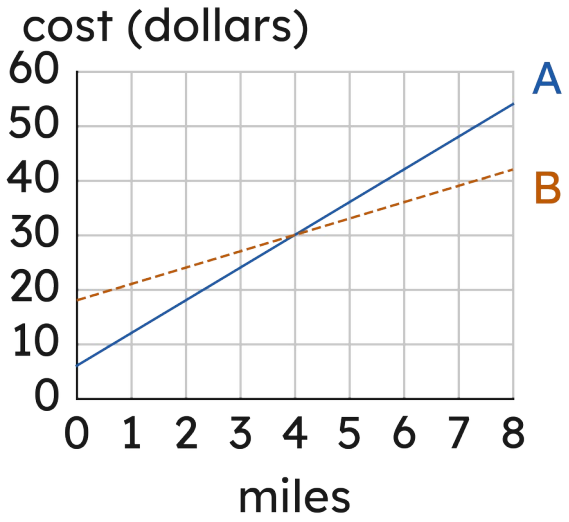
A: $3(3) + 6 = 15$ B: $5(3) = 15$

Answer: 3 games: both cost \$15.

Whiteboards · Question 2 of 9

Taxis A and B: y dollars for x miles. Their lines cross at $(4, 30)$.

What does that point mean?

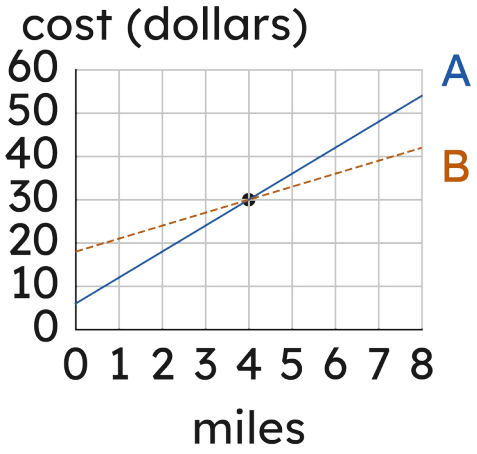


Answer it.

Whiteboards · Question 2 of 9

Taxis A and B: y dollars for x miles. Their lines cross at $(4, 30)$.

What does that point mean?



x is miles: 4

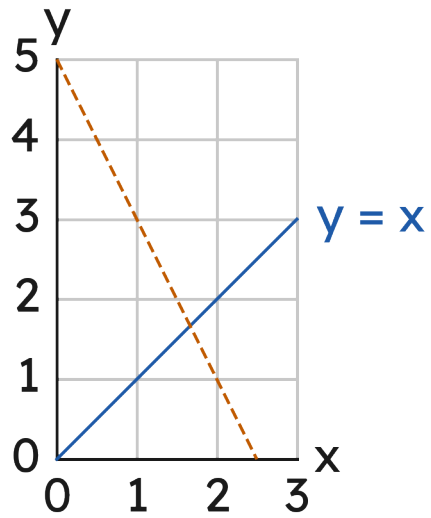
y is dollars: 30, on both lines

Answer: For a 4-mile ride, both taxis cost $30.

Whiteboards · Question 3 of 9

Between which two whole numbers is the x of the crossing?

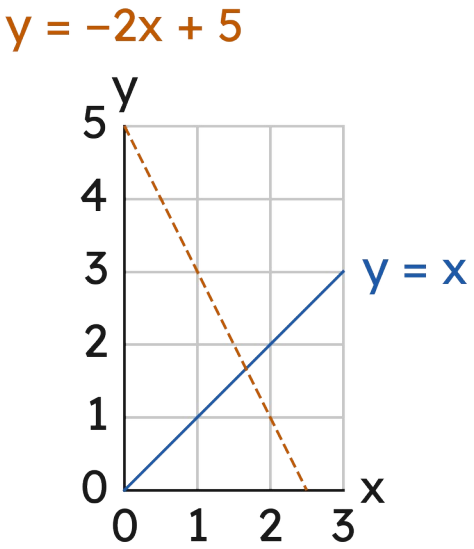
$y = -2x + 5$



Answer it.

Whiteboards · Question 3 of 9

Between which two whole numbers is the x of the crossing?



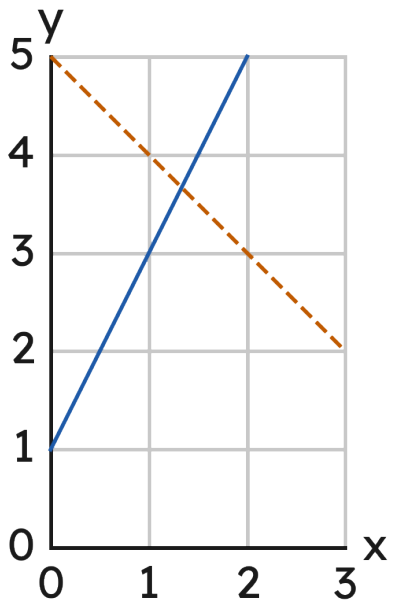
$x = 1$: 1 and $-2(1) + 5 = 3$

$x = 2$: 2 and $-2(2) + 5 = 1$

Answer: 1 and 2

Whiteboards · Question 4 of 9

$y = 2x + 1$ **and** $y = -x + 5$ **are graphed. Best estimate?**



A. $(1, 3)$

B. $(3.7, 1.3)$

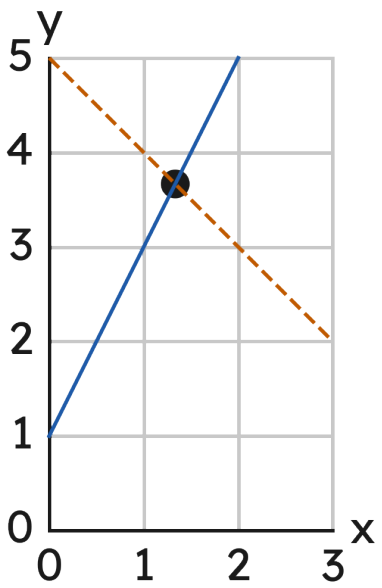
C. $(0, 5)$

D. $(1.3, 3.7)$

Answer it.

Whiteboards · Question 4 of 9

$y = 2x + 1$ **and** $y = -x + 5$ **are graphed. Best estimate?**



between $x = 1$ and $x = 2$, nearer 1: about $(1.3, 3.7)$

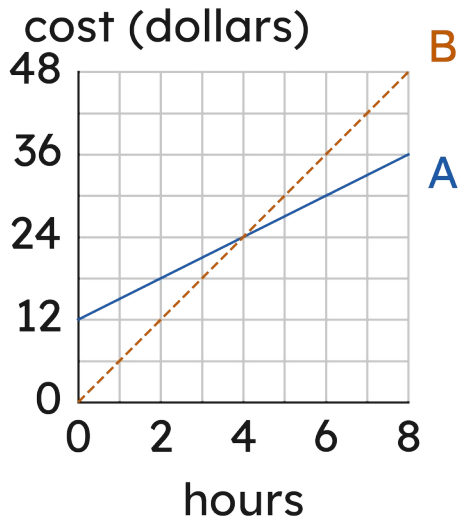
$2(1.3) + 1 = 3.6$ and $-1.3 + 5 = 3.7$: close

Answer: D — about (1.3, 3.7)

Whiteboards · Question 5 of 9

Bikes: Shop A charges $12 and $3 an hour; Shop B, $6 an hour.

Which shop costs less for 7 hours?

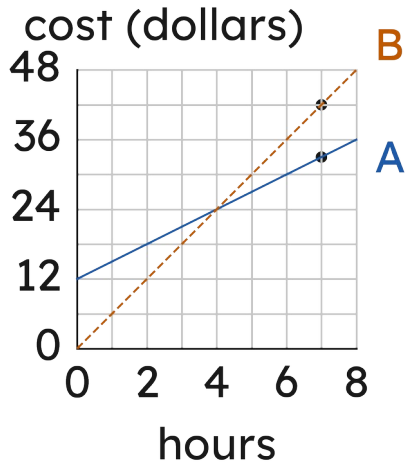


Answer it.

Whiteboards · Question 5 of 9

Bikes: Shop A charges $12 and $3 an hour; Shop B, $6 an hour.

Which shop costs less for 7 hours?



they cross at (4, 24)

A: $3(7) + 12 = 33$

B: $6(7) = 42$

Answer: Shop A: $33 against $42.

Whiteboards · Question 6 of 9

Gym A: $20 to join and $10 a month.

Gym B: $15 a month.

Which system gives each gym's cost y for x months?

A. $y = 10x + 20$ and $y = x + 15$

B. $y = 30x$ and $y = 15x$

C. $y = 20x + 10$ and $y = 15x$

D. $y = 10x + 20$ and $y = 15x$

Answer it.

Whiteboards · Question 6 of 9

Gym A: $20 to join and $10 a month.

Gym B: $15 a month.

Which system gives each gym's cost y for x months?

A: $10 a month, $20 once: $y = 10x + 20$

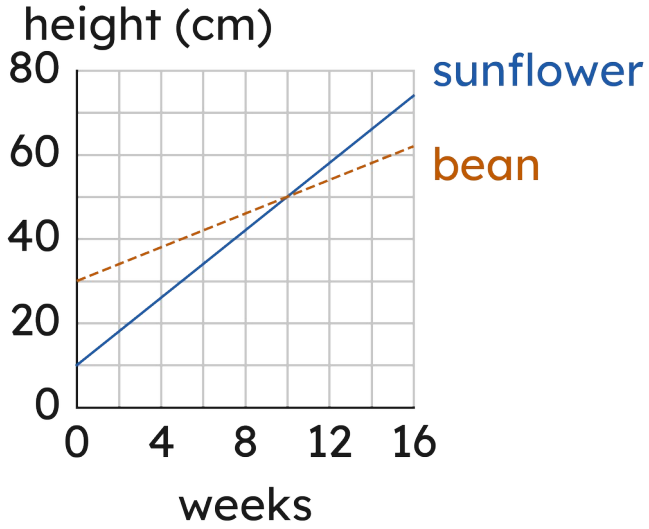
B: $15 a month, nothing to join: $y = 15x$

Answer: D — $y = 10x + 20$ and $y = 15x$

Whiteboards · Question 7 of 9

Two plants cost $8 in all. The graph shows their heights.

When are the two plants the same height?

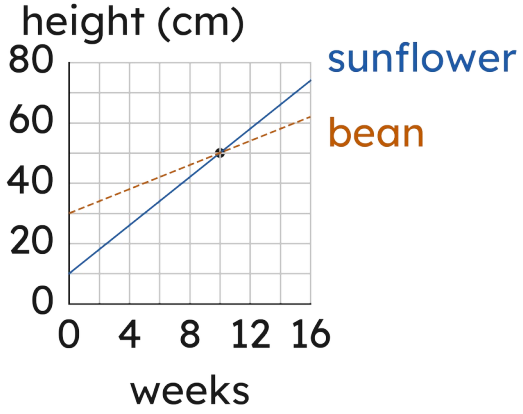


Answer it.

Whiteboards · Question 7 of 9

Two plants cost $8 in all. The graph shows their heights.

When are the two plants the same height?



the lines cross at $(10, 50)$

x is weeks: 10; y is height: 50 cm

Answer: After 10 weeks, both are 50 cm tall.

Whiteboards · Question 8 of 9

Two plans cost the same for 6 months:

$y = 8x + 30$ and $y = \square x$

What number goes in the box?

Answer it.

Whiteboards · Question 8 of 9

Two plans cost the same for 6 months:

$y = 8x + 30$ and $y = \square x$

What number goes in the box?

$$8(6) + 30 = 78$$

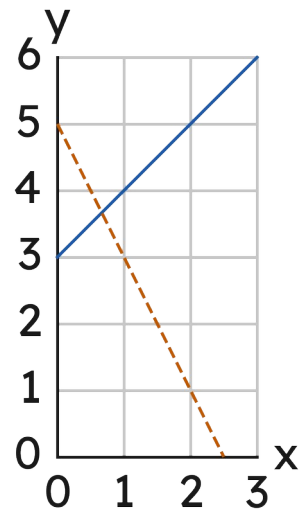
$$78 \div 6 = 13$$

Answer: 13

Whiteboards · Question 9 of 9

$y = x + 3$ and $y = -2x + 5$ are graphed.

Estimate the solution. Show that it is close in both equations.

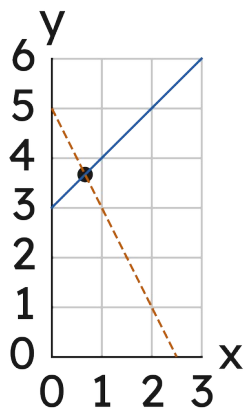


Write your answer in sentences.

Whiteboards · Question 9 of 9

$y = x + 3$ and $y = -2x + 5$ are graphed.

Estimate the solution. Show that it is close in both equations.



between $x = 0$ and $x = 1$, nearer 1: about $(0.7, 3.7)$

$-2(0.7) + 5 = 3.6$ and $0.7 + 3 = 3.7$: close

Answer: about (0.7, 3.7)

Independent Set

1. Pot A of water is 20°C and warms 6°C a minute. Pot B is 45°C and warms 1°C a minute. When are they the same temperature, and what is it?
2. Music lessons cost $y = 9x + 24$ dollars for x lessons with plan A and $y = 15x$ dollars with plan B. The graphs cross at $(4, 60)$. What does that point mean?
3. Graph both lines and estimate the solution: $y = 2x - 2$ and $y = -x + 2$
4. Shop A sells shirts for $7 each plus $15 to ship. Shop B sells them for $12 each with free shipping. Write a system for the cost y of x shirts.
5. Club A costs $12 to join and $2 a week. Club B costs $5 a week. Graph both. Which club costs less for 6 weeks?
6. Lia has $25 and saves $4 a week. Omar has $40 and saves $4 a week. Graph both. Will they ever have the same amount? Explain.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 67. Due by the Unit 11 test.

Today's skills — all required

Solve a system of equations by graphing: word problems — W9J