Grade 9

Analytic Geometry: Solving Systems of Linear Equations

Answers:

1. a. Point of intersection: (2, 4)

Equation	Slope	x-intercept	y-intercept
$y = x + 2$	1	-2	2
$y = -2x + 8$	-2	4	8

b. Point of intersection: (-3, -2)

Equation	Slope	x-intercept	y-intercept
$2x + 3y = -12$	$-\frac{2}{3}$	-6	–4
$y = 2x + 4$	2	–2	4

c. Point of intersection: (2, -1)

Equation	Slope	x-intercept	y-intercept
$3x + 2y = 4$	$-\frac{3}{2}$	$\frac{4}{3}$	2
$y - x = -3$	1	3	–3

d. Point of intersection: (-1, 3)

Equation	Slope	x-intercept	y-intercept
$y = 2 - x$	–1	2	2
$2x + y - 1 = 0$	–2	$\frac{1}{2}$	1

2. a.

i. (0, 6)
ii. (-1, 3)
iii. No point of intersection
iv. (-2, 0)
v. (1, 3)
vi. (5, 3)
vii. (2, 0)
viii. (4, 2)
ix. (5, 1)
x. No point of intersection
xi. (6, 2)
xii. No point of intersection

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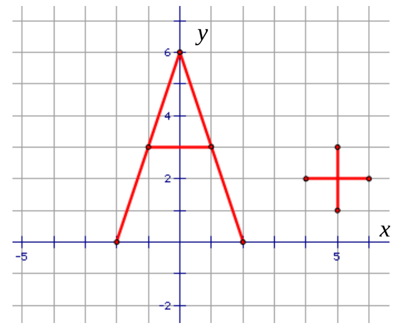
b. The lines are parallel.

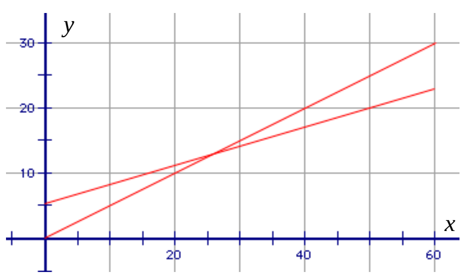
c. By connecting the points of intersection, an "A+" will appear.



3. a. Cost = (Cost Per Pencil $\times$ Number of Pencils Sold) + Initial Expenses
Let x represent the number of pencils sold.
Let y represent the total cost in dollars.
$y = 0.30x + 5.00$

b. Revenue = Selling Price Per Pencil $\times$ Number of Pencils Sold
Let x represent the number of pencils sold.
Let y represent the total revenue in dollars.
$y = 0.50x$

c.



d. From the graph, the point of intersection is (25, 12.5). This means that after 25 pencils are sold, revenue and cost will both be \$12.50 which means that Randy has "broken even", and each pencil he sells after the 25th one will make him a profit.

e. Let x equal 50 in our equations from part a).
Profit = Revenue – Cost

$$= 0.50x - (0.30x + 5.00)$$
$$= 0.20x - 5.00$$

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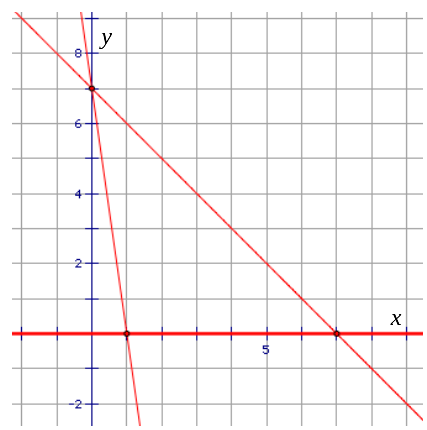
When $x = 50$,

$$\begin{aligned}\text{Profit } &= 0.20(50) - 5.00\\ &= 10.00 - 5.00\\ &= 5.00\end{aligned}$$

If Randy sells 50 pencils, he will make a \$5 profit.

f. If Randy lowers his price to 30¢, he will never be able to break even. This is because for every pencil he sells, he is making no profit, therefore he will never make up the initial \$5 he spent to start his business. Graphically, this situation is the same as two equations with the same slope but having different y-intercepts. The lines will not have a point of intersection.

4. From the graph, the points of intersection are (1, 0), (0, 7) and (7, 0). The vertices form a triangle with height of 7 and a base of length 6. Thus, the area of the triangle is 21 units^2.

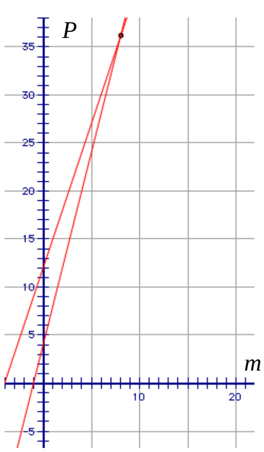


5. a. Let P represent the perimeters.

$P = 3m + 12$ (triangle)

$P = 4m + 4$ (parallelogram)

b.



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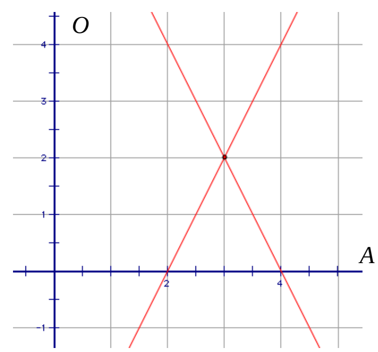
c. The point of intersection is (8, 36).

d. The perimeter of each shape is 36 cm.

6. a. Let O represent the number of oranges and A represent the number of apples.

$$O = 2A - 4$$
$$O = 8 - 2A$$

b. From the graph, the point of intersection is (3, 2).



c. Jessica bought 2 oranges and 3 apples.

d. Adding the two equations:

$$O + O = 2A - 4 + 8 - 2A$$
$$2O = 4$$
$$O = 2$$

Adding the two equations can simplify this problem because it eliminated one of the variables making it easy to solve for the number of oranges.

7. The slope of the line $2x - 3y + 5 = 0$ is $\frac{2}{3}$. If the two lines are perpendicular, then the slope of the line $kx + 2y - 1 = 0$ must be $\frac{-3}{2}$. The slope of this line is of the form $\frac{-k}{2}$, thus k = 3.