

Key

Topics:

Writing Linear Equations in:

Slope Intercept form, Point Slope form, and Standard form

Graphing Linear Equations

Parallel & Perpendicular Lines

Solving Equations

Algebraic Word Problems:

Age, Coin, Consecutive Integers, Perimeter, and Motion ($D = R \times T$)

1. The length of a rectangle is 12 cm longer than 3 times the width. If the length is increased by 2 cm and the width is decreased by 4 cm, the perimeter will be 212 cm. Find the dimensions of the original rectangle.



$$P = 2L + 2W$$

$$212 = 2(3x+14) + 2(x-4)$$

$$212 = 6x + 28 + 2x - 8$$

$$212 = 8x + 20$$

$$\begin{array}{r} 212 \\ -20 \\ \hline 192 = 8x \\ \hline 24 = x \end{array}$$

width = 24 cm
length = 84 cm

2. The sum of Emma's age and Charlotte's age is 40. Five years from now, Charlotte will be 4 times as old as Emma will be then. Find their present ages.

young
Emma | x | $x+5$
old
Charlotte | $40-x$ | $40-x+5 = 45-x$

$$4(\text{young}) = \text{old}$$

$$4(x+5) = 45-x$$

$$4x + 20 = 45 - x$$

$$\begin{array}{r} 4x + 20 = 45 - x \\ +x \quad \quad \quad +x \\ \hline 5x + 20 = 45 \\ -20 \quad -20 \\ \hline 5x = 25 \\ \hline x = 5 \end{array}$$

Emma = 5 yr
Char = 35 yr

3. Valerie has \$3.20 in nickels, dimes, and quarters in her purse. There are two more dimes than nickels, and one less than twice as many quarters as nickels. How many of each kind of coin does she have?

ans

N	5	x	5
D	10	x+2	7
Q	25	2x-1	9

$$5x + 10(x+2) + 25(2x-1) = 320$$

$$5x + 10x + 20 + 50x - 25 = 320$$

$$65x - 5 = 320$$

$$\begin{array}{r} 65x - 5 = 320 \\ +5 \quad +5 \\ \hline 65x = 325 \\ \hline 65 \quad 65 \\ \hline x = 5 \end{array}$$

4. Two trains started at the same time from stations which were 600 miles apart and traveled toward each other. The rate of the first train exceeded the rate of the second train by 15 miles per hour. At the end of 3 hours, the trains were still 27 miles apart. Find the rate of each train.

2nd	x	3	600
1st	x+15	3	27

$$3x + 3(x+15) = 573$$

$$3x + 3x + 45 = 573$$

$$6x + 45 = 573$$

$$\begin{array}{r} 6x + 45 = 573 \\ -45 \quad -45 \\ \hline 6x = 528 \\ \hline 6 \quad 6 \\ \hline x = 88 \end{array}$$

$x+15 = 103$

5. Given the equation $3x - 2y = 12$,

Part A Write the equation of the line that is perpendicular and passes through the point $(-12, 10)$.

Part B Write the equation of the line in point slope form and standard form.

$$\begin{array}{r} 3x - 2y = 12 \\ \hline -3x \quad -3x \\ \hline -2y = -3x + 12 \\ \hline -2 \quad -2 \quad -2 \\ \hline y = \frac{3}{2}x - 6 \end{array}$$

$$y = \frac{3}{2}x - 6$$

$$m = \frac{3}{2}$$

$$\perp \quad y - y_1 = m(x - x_1)$$

$$y - 10 = -\frac{2}{3}(x + 12)$$

$$y - 10 = -\frac{2}{3}x - 8$$

$$3 \left[y = -\frac{2}{3}x + 2 \right] \rightarrow$$

$$3y = -2x + 6 \rightarrow 6x + 3y = 6$$

6. What is the equation of the line that passes through the point $(-3, 1)$ and has a slope of -5 ?

(1) $5x + y = 14$

(2) $-5x + y = -14$

(3) $5x - y = 14$

(4) $5x + y = -14$

$$y - y_1 = m(x - x_1)$$

$$y - 1 = -5(x + 3)$$

$$y - y = -5x - 15$$

$$y = -5x - 14$$

$$5x + y = -14$$

7. Josh graphed a line that passes through the points $(-5, 2)$ and $(-2, -10)$. Write the equation of his line.

Slope intercept form: $y = mx + b$

Point slope form: $y - y_1 = m(x - x_1)$

Standard form: $ax + by = c$

$$y - y_1 = m(x - x_1)$$

$$y - 2 = -4(x + 5)$$

$$y = -4x - 20 + 2$$

$$y = -4x - 18$$

$$4x + y = -18$$

x	y
-5	2
-2	-10

$$m = \frac{\Delta y}{\Delta x} = \frac{-12}{3} = -4$$

8. Find two consecutive odd integers such that the sum of the smaller and twice the larger is equal to 55.

$$\text{Let 1st COI} = x = 17$$

$$\text{2nd COI} = x + 2 = 19$$

$$x + 2(x + 2) = 55$$

$$x + 2x + 4 = 55$$

$$3x + 4 = 55$$

$$\begin{array}{r} 3x + 4 = 55 \\ -4 \quad -4 \\ \hline 3x = 51 \\ \hline x = \frac{51}{3} \end{array}$$

$$x = 17$$

9. Simplify.

$$2x - 3(3x + 1) + 5(x - 2)$$

$$2x - 9x - 3 + 5x - 10$$

$$-4x - 13$$

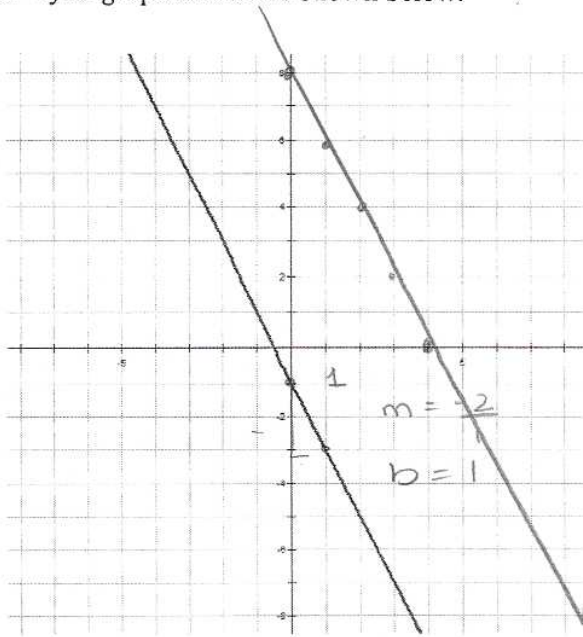
10. Simplify.

$$9x + 5 - (2x - 1)$$

$$9x + 5 - 2x + 1$$

$$7x + 6$$

11. Tyler graphed the line shown below.



Part A Write the equation of Tyler's line in slope intercept form.

$$y = -2x + 1$$

Part B Write the equation of a line that is parallel to Tyler's line and passes through the point (4, 0).

$$y - y_1 = m(x - x_1)$$

$$y = -2(x - 4)$$

$$y = -2x + 8$$

12. Solve for x.

$$\begin{aligned} -9x + 3 &= 4x - 2(x + 1) \\ -9x + 3 &= 4x - 2x - 2 \\ -9x + 3 &= 2x - 2 \\ \underline{2x \quad -2x} & \\ -11x + 3 &= -2 \\ \underline{-3 \quad -3} & \\ -11x &= -5 \\ \underline{-11 \quad -11} & \\ x &= \frac{5}{11} \end{aligned}$$

13. Solve for x.

$$\begin{aligned} \frac{1}{3}(6x - 9) &= 7x + 12 \\ \underline{2x - 3 = 7x + 12} & \\ \underline{-7x \quad -7x} & \\ -3 &= 5x + 12 \\ \underline{-12 \quad -12} & \\ -15 &= 5x \\ \underline{5 \quad 5} & \\ -3 &= x \end{aligned}$$

14. Which of the equations listed below represent the line passing through the points (2, 3) and (4, -7)? This is not a multiple choice question.

1) $5x + y = 13$

2) $y + 7 = -5(x - 4)$

3) $y = -5x + 13$

4) $y - 7 = 5(x - 4)$

$$\begin{aligned} 5x + y &= 13 \\ \underline{-5x \quad -5x} & \\ y &= -5x + 13 \end{aligned}$$

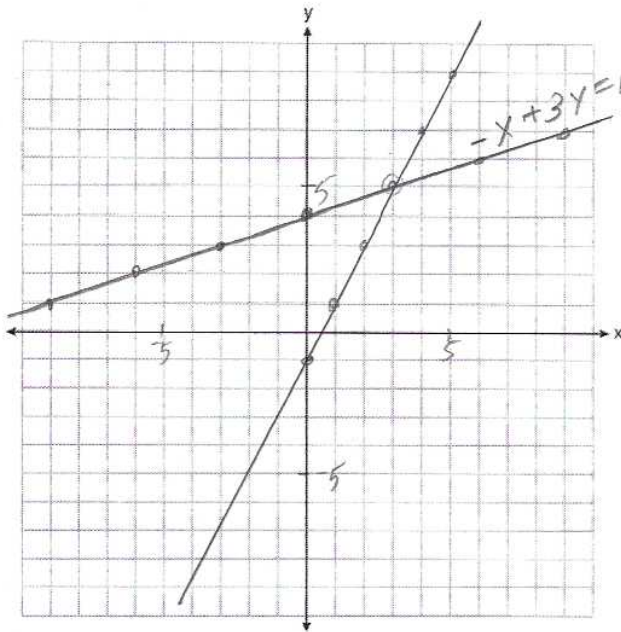
plug into calc. & check the table

$$\begin{aligned} y + 7 &= -5(x - 4) \\ y + 7 &= -5x + 20 \\ \underline{-7 \quad -7} & \\ y &= -5x + 13 \end{aligned}$$

Same $y = -5x + 13$

$$\begin{aligned} y - 7 &= 5(x - 4) \\ y - 7 &= 5x - 20 \\ \underline{+7 \quad +7} & \\ y &= 5x - 13 \end{aligned}$$

15. Solve the system of equations graphically and state the coordinates of the solution.



$$\begin{array}{r} -x + 3y = 12 \\ +x \quad +y \\ \hline 3y = x + 12 \\ \frac{3y}{3} = \frac{x+12}{3} \\ y = \frac{1}{3}x + 4 \\ m = \frac{1}{3} \\ b = 4 \end{array}$$

$$\begin{array}{r} 2x - y = 1 \\ -2x \quad -2x \\ \hline -y = -2x + 1 \\ y = 2x - 1 \\ m = \frac{2}{1} \\ b = -1 \end{array}$$

POI
(3, 5)

16. Jocelyn and her family are going on vacation. Their destination is 610 miles from their home. Jocelyn is going to share some of the driving with her dad. Her average speed while driving is 55 mph and her dad's average speed while driving is 65 mph. The plan is for Jocelyn to drive for the first 4 hours of the trip and her dad to drive for the remainder of the trip. Determine the number of hours it will take her family to reach their destination.

	R	T	D
Jocelyn	55	4	55(4)
Dad	65	x-4	65(x-4)

10 hrs

$$\begin{aligned} 55(4) + 65(x-4) &= 610 \\ 220 + 65x - 260 &= 610 \\ 65x - 40 &= 610 \\ +40 \quad +40 & \\ \hline 65x &= 650 \\ \frac{65x}{65} &= \frac{650}{65} \\ x &= 10 \end{aligned}$$

* There are other ways to do these questions

After Jocelyn has been driving for 2 hours, she gets tired and asks her dad to take over. Determine, to the nearest tenth of an hour, how much time the family will save by having Jocelyn's dad drive for the remainder of the trip.

	R	T	D
J	55	2	55(2)
d	65	x-2	65(x-2)

$$\left(\frac{0.3 \text{ hr}}{1}\right) \left(\frac{60 \text{ mi}}{1 \text{ hr}}\right) = 18 \text{ min}$$

$$\begin{aligned} 110 + 65(x-2) &= 610 \\ 110 + 65x - 130 &= 610 \\ 65x - 20 &= 610 \\ +20 \quad +20 & \\ \hline 65x &= 630 \\ \frac{65x}{65} &= \frac{630}{65} \\ x &= 9.7 \end{aligned}$$

16.) Jocelyn's distance

$$R \times T = d$$

$$55(4) = d$$

$$220 \text{ mil} = \text{distance}$$

dad's

$$R \times T = D$$

$$\frac{65x}{65} = \frac{390}{65}$$

$$x = 6 \text{ hrs}$$

$$\begin{array}{r} 610 \\ -220 \\ \hline 390 \text{ mi} \end{array}$$

Joc. + dad = total hrs

$$4 \text{ hrs} + 6 \text{ hrs} = 10 \text{ hrs}$$

Jocelyn

$$R \times T = d$$

$$55(2) = d$$

$$110 \text{ mi} = d$$

dad

$$R \times T = d$$

$$\frac{65x}{65} = \frac{500}{65}$$

$$\begin{array}{r} 610 \\ -110 \\ \hline 500 \end{array}$$

$$x = 7.7 \text{ hrs}$$

$$2 + 7.7 = 9.7 \text{ hrs}$$

$$10 \text{ hr} - 9.7 \text{ hr} = 0.3 \text{ hr}$$

convert

$$\left(\frac{0.3 \text{ hr}}{1} \right) \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) = 18 \text{ min}$$