Worksheet 3.4 Solutions

(1) $\begin{cases} 2x + 3y = 11 & (1) \\ 3x - 2y = 9 & (2) \end{cases}$ Plug $(-3, -1)$ into the system

eqn (1)

$2(-3) + 3(-1) = 11$

$-6 - 3 = 11$

$-9 = 11$ false!

Since the ordered pair is **not a solution** to one of the eqns in the system, it is not a solution to the whole system.

(2) $\begin{cases} x - y = -6 & (1) \\ -2x + 3y = -19 & (2) \end{cases}$ Plug $(-1, -7)$ into the system

eqn (1)

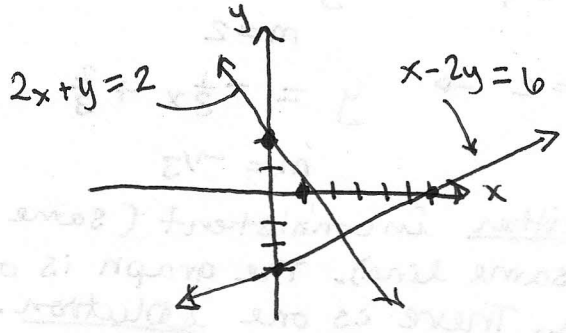
$(-1) - (-7) = -6$

$-1 + 7 = -6$

$6 = -6$ false

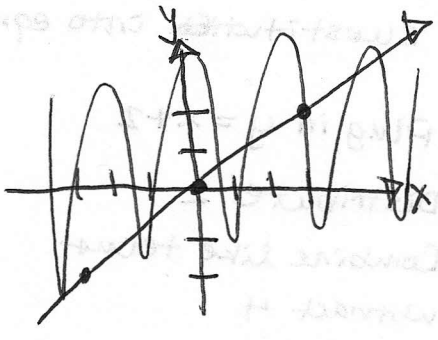
The ordered pair is not a solution to the eqn. Therefore it is **not a solution** to the system.

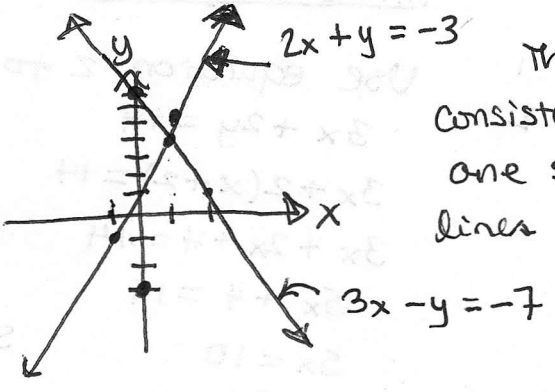
(3)



The system is consistent because the lines intersect. There is one solution to the system.

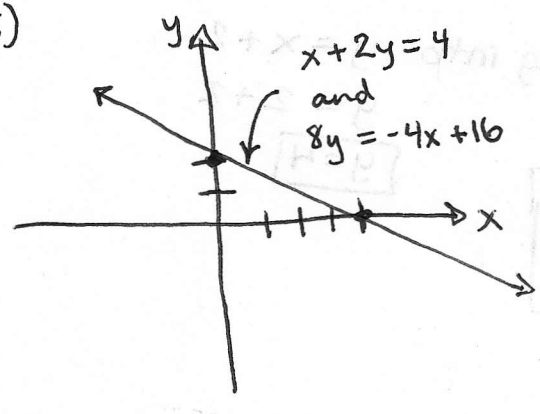
(4)





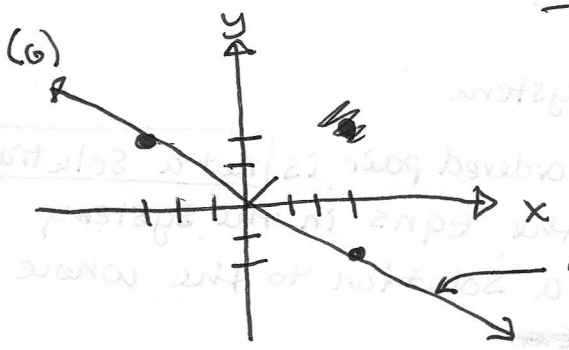
The system is consistent and has one solution since the lines are intersecting.

(5)



The equations produce the same line. There are infinite solutions.

(6)



$2x + 3y = 0$ and $6x = -9y$

The lines are the same. There are infinite solutions.

(7) $\begin{cases} x - 2y = 5 \\ 2x - 4y = 10 \end{cases}$

$\begin{cases} x - 2y = 5 \\ 2(x - 2y = 10) \end{cases}$

By visually inspecting the lines, they appear to be multiples of each other

The lines are the <u>same</u> so the equations are <u>dependent</u>. The graphs are <u>one</u> line. Therefore, there are <u>infinite solutions</u>

(8) $\begin{cases} 2x - y = 4 & (1) \\ x + 3y = 2 & (2) \end{cases}$

Let's look at the slopes of the lines

eqn (1): $2x - y = 4 \rightarrow y = 2x - 4$

$m = 2$

eqn (2): $x + 3y = 2 \rightarrow y = -\frac{1}{3}x + \frac{2}{3}$

$m = -1/3$

The lines are <u>neither</u> inconsistent (same slope) nor dependent (same line). The graph is of <u>intersecting lines</u>. There is one <u>solution</u>.

(9) $\begin{cases} 3x + 2y = 14 & 1 \\ y = x + 2 & 2 \end{cases}$

Use equation 2 to substitute into eqn 1

$3x + 2y = 14$

$3x + 2(x+2) = 14$ Plug in $y = x+2$

$3x + 2x + 4 = 14$ Distribute 2

$5x + 4 = 14$ Combine like terms

$5x = 10$ Subtract 4

$\boxed{x = 2}$ → Plug into $y = x + 2$

$y = 2 + 2$

$\boxed{y = 4}$

The solution is $(2, 4)$

Worksheet 4 Solutions

(10) $\begin{cases} 3x - 21 = y & (1) \\ y + 2x = -1 & (2) \end{cases}$

We can plug eqn (1) into eqn (2)

$y + 2x = -1$

$3x - 21 + 2x = -1$

$5x - 21 = -1$

$+21 \quad +21$

$\frac{5x}{5} = \frac{20}{5}$

$x = 4$

Plug eqn (1) in

Plug into $y = 3x - 21$

$y = 3(4) - 21$

$y = 12 - 21$

$y = -9$

The solution is (4, −9)

(11) $\begin{cases} 7x + 2y = 2x - y + 19 \\ 4x + 3y = 2x - 2y \end{cases}$

we need to first rewrite the equations into standard form.

Eqn (1): $7x + 2y = 2x - y + 19$

$-2x \quad -2x$

$5x + 2y = -y + 19$

$+y \quad +y$

$5x + 3y = 19$

Eqn (2): $4x + 3y = 2x - 2y$

$-2x \quad +2x$

$2x + 3y = -2y$

$+2y \quad +2y$

$2x + 5y = 0$

The new system is

$\begin{cases} 5x + 3y = 19 \\ 2x + 5y = 0 \end{cases}$

I'm picking eqn (2) to solve for x.

$2x + 5y = 0$

$2x = -5y$

$x = -\frac{5}{2}y$.

Plug into eqn (1)

$5(-\frac{5}{2}y) + 3y = 19$

$-\frac{25}{2}y + 3y = 19$

$2 \cdot (-\frac{25}{2}y + 3y = 19)$

$-25y + 6y = 38$

$\frac{-19y}{-19} = \frac{38}{-19}$

$y = -2$

Plug into

$x = -\frac{5}{2}y$

$x = -\frac{5}{2}(-2)$

$x = \frac{5}{2}(\frac{2}{1})$

$x = 5$

The solution is (5, −2)

Worksheet 4 Solutions

(12) $\begin{cases} 2x+7y = 5y-3x+16 \\ 2y = -x+y+2 \end{cases}$

First rewrite the equations in standard form.

Eqn (1)

$2x+7y = 5y-3x+16$

$+3x \quad -5y \quad -5y \quad +3x$

$\Rightarrow 5x+2y = 16$

Eqn (2)

$2y = -x+y+2$

$+x \quad -y \quad +x \quad -y$

$x+y = 2$

$\Rightarrow \begin{cases} 5x+2y=16 \\ x+y=2 \end{cases}$

Solve the second eqn for x

$x+y=2$

$x = 2-y$

Plug into eqn(1)

$5(2-y)+2y = 16$

$10-5y+2y = 16$

$10-3y = 16$

$-3y = 6$

$y = -2$

$x = 2-y$

$x = 2-(-2)$

$x = 2+2$

$x = 4$

The solution is $(4,-2)$

(13) $\begin{cases} 48x-56y = 32 \\ 21y-18x = -12 \end{cases}$

The first eqn can be divided by 8.
The second eqn can be divided by 3

$\begin{cases} 6x-7y=4 \\ 7y-6x=-4 \end{cases}$

Switch into standard form: $\Rightarrow \begin{cases} 6x-7y=4 \\ -6x+7y=-4 \end{cases}$

We are using substitution. Solve equation (2) for $7y$

$-6x+7y = -4$

$7y = -4+6x$

Plug into eqn. (1).

$6x-(-4+6x) = 4$

$6x+4-6x = 4$

$4 = 4$ ✓

always true

$\Rightarrow$ there are infinite solutions

Worksheet 4 Solutions

(14) $\begin{cases} \frac{5}{3}x + y = 12 & 1 \\ x + \frac{1}{2}y = 7 & 2 \end{cases}$

1) multiply eqn (2) by -2

$\frac{5}{3}x + y = 12$

$-2x - y = -14$

$\frac{5}{3}x - 2x + 0 = -2$

$\frac{5}{3}x - \frac{6}{3}x = -2$

$-3\left(-\frac{1}{3}x = -2\right)$

$\boxed{x = 6}$

Plug into eqn (2) or eqn (1)

Eqn (2): $6 + \frac{1}{2}y = 7$

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

$\boxed{y = 2}$

The Sol'n is $(6, 2)$

(15) $\begin{cases} \frac{x}{2} - \frac{y}{3} = -8 & \text{multiply first equation by 6} \\ \frac{x}{4} - \frac{y}{6} = -4 & \text{multiply second equation by 12} \end{cases}$

$\begin{cases} 3x - 2y = -48 \\ 3x - 2y = -48 \end{cases}$ → the equations are the same so there are $\boxed{\text{infinite solutions.}}$

(16) $\begin{cases} 2x - y = 10 \\ + \\ 3x + y = 10 \end{cases}$

$5x = 20$

$\boxed{x = 4}$

Plug into eqn (1) or eqn (2).

eqn (2): $3(4) + y = 10$

$12 + y = 10$

$\boxed{y = -2}$

The Solution is $(4, -2)$

(17) $8x + 2y = 14$

$+ \quad 3x - 2y = -14$

$11x + 0 = 0$

$11x = 0$

$\boxed{x = 0}$

Plug into eqn (1) or eqn (2)

eqn (1): $8(0) + 2y = 14$

$2y = 14$

$\boxed{y = 7}$

The Solution is $(0, 7)$

Worksheet 4 Solutions

(18) $-4[3x - 4y = 16]$ Multiply eqn (1) by -4

$3[4x + 5y = -20]$ Multiply eqn (2) by 3

$$\Rightarrow \begin{array}{r} -12x + 16y = -64 \\ +\ 12x + 15y = -60 \\ \hline 0 + 31y = -124 \end{array}$$

$\boxed{y = -4}$

Plug into eqn (1) or eqn (2)

$3x - 4(-4) = 16$

$3x + 16 = 16$

$3x = 0$

$\boxed{x = 0}$

Solution is $(0, -4)$

(19) $4x - 2y = -8$

$-2[2x - y = 4]$

$$\Rightarrow \begin{array}{r} 4x - 2y = -8 \\ +\ -4x + 2y = -8 \\ \hline 0 + 0 = -16 \end{array}$$

Multiply eqn (2) by -2

$0 = -16$ is false.

There are $\boxed{\text{no solutions}}$ to the system.

(20) $\begin{cases} x + y = -66 \\ x - y = -116 \end{cases}$

Add the eqns together

$$\begin{array}{r} x + y = -66 \\ +\ x - y = -116 \\ \hline 2x = -182 \end{array}$$

$\boxed{x = -91}$

Plug into eqn (1)

$x + y = -66$

$-91 + y = -66$

$\boxed{y = 25}$

Solution is $(-91, 25)$

(21) $x + y = 400$

$6x + 3y = 2100$

Multiply eqn (1) by -3

$$\begin{array}{r} -3x - 3y = -1200 \\ +\ 6x + 3y = 2100 \\ \hline 3x + 0 = 900 \\ 3x = 900 \end{array}$$

$\boxed{x = 300}$

$x + y = 400$

$300 + y = 400$

$\boxed{y = 100}$

there are
100 student tickets
300 adult tickets

Worksheet 4 Solutions

(22) x = pounds of candy at \$1.60
y = pounds of candy at \$2.50

$$\begin{cases} x+y=30 \\ 1.60x+2.50y=1.90(30) \end{cases}$$

$$\begin{cases} x+y=30 \\ 160x+250y=190(30) \end{cases}$$

Eqn (1): $x=30-y$

Plug into eqn (2) ⇒ $160(30-y)+250y=5700$

Multiply eqn (2) by 100

$4800-160y+250y=5700$

$90y=900$

$y=10$

$x=30-10$

$x=20$

20 lbs of \$1.60
10 lbs of \$2.50

(23) x = liters of 75% solution
y = liters of 55% solution

$$\begin{cases} x+y=70 \\ 75x+55y=70(63) \end{cases}$$

$x=70-y$

$75(70-y)+55y=4410$

$5250-75y+55y=4410$

$-20y=-840$

$y=42$

$x=70-42$

$x=28$

(24) $x=r$
$y=\frac{3}{2}r$

$40=r\cdot 2+r\cdot\frac{3}{2}\cdot 2$

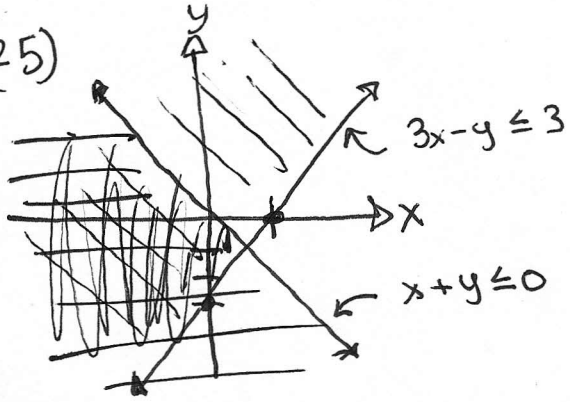
$40=2r+3r$

$40=5r$

$8=r$

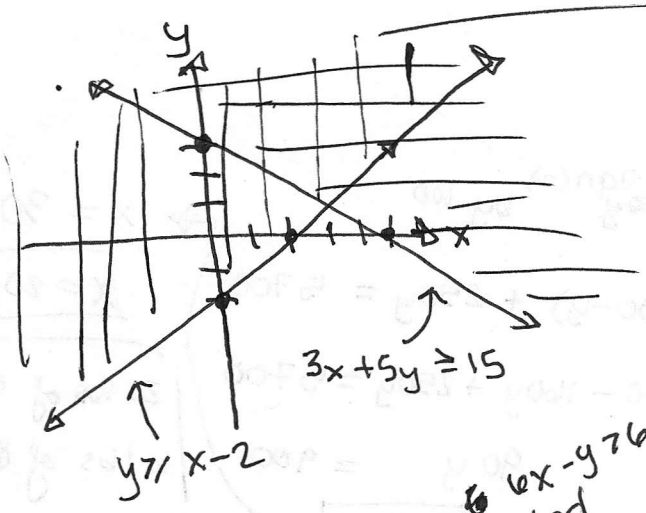
$x=8$ mi/hr
$y=12$ mi/hr

(25)

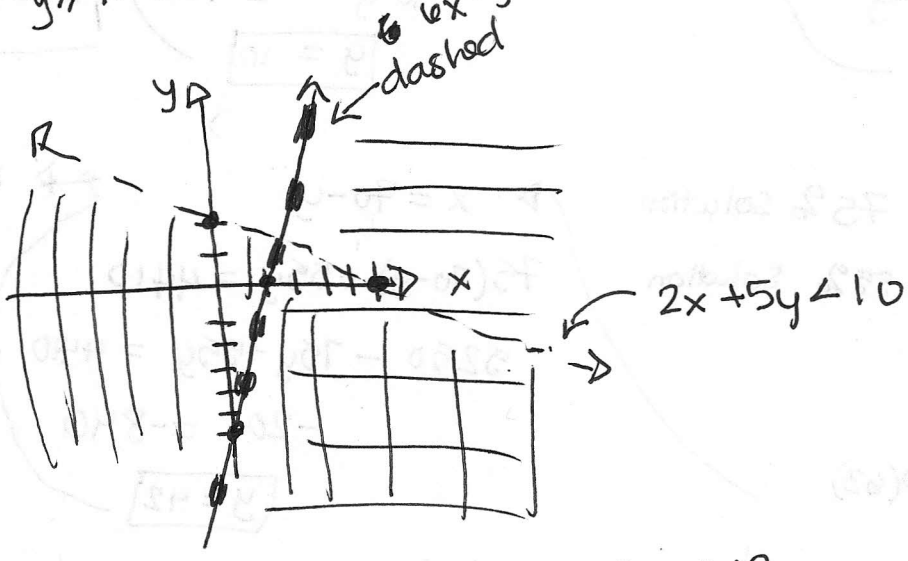


Worksheet 4 Solution

(26)



(27)



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