Word Problems

1. A local farm has 15 animals consisting of cows and chickens. Determine the number of each if there are 40 legs on the farm.

Substitution:

Let x = # of cows
Let y = # of chickens

$x+y=15$
$4x+2y=40$

(i) $x+y=15$ (-y -y)
$x=15-y$

(ii) $4x+2y=40$
$4(15-y)+2y=40$
$60-4y+2y=40$
$-60 \quad -60$
$-2y=-20$
$\frac{-2y}{-2}=\frac{-20}{-2}$
$y=10$

(iii) $x=15-y$
$x=15-10$
$x=5$

(iv) There are 5 cows & 10 chickens

Elimination:

Let x = # of cows
Let y = # of chickens

$x+y=15$ (·4 ·4 ·4) $\rightarrow 4x+4y=60$
$4x+2y=40 \rightarrow 4x+2y=40$

$2y=20$
$\frac{2y}{2}=\frac{20}{2}$
$y=10$

$x+y=15$
$x+10=15$ (-10 -10)
$x=5$

There are 5 cows and 10 chickens.

2. The next JMH play is called "The Love of Math". The tickets are $5 for students and $10 for adults. People are so excited that 261 tickets were sold in advance. How many student and adult tickets were sold if the total amount collected was $1840.

Substitution:

Let x = # of students
Let y = # of adults

$x + y = 261$
$5x + 10y = 1840$

(i) $x + y = 261$ $-y$ $-y$
$x = 261 - y$

(ii) $5x + 10y = 1840$
$5(261 - y) + 10y = 1840$
$1305 - 5y + 10y = 1840$
-1305 -1305
$1305 + 5y = 1840$
$\frac{5y}{5} = \frac{535}{5}$
$y = 107$

(iii) $x = 261 - y$
$x = 261 - 107$
$x = 154$

(iv) There are 154 students and 107 adults

Elimination:

Let x = # of students
Let y = # of adults

$\cdot -5$ $\cdot -5$ $\cdot -5$
$x + y = 261 \rightarrow -5x - 5y = -1305$
$5x + 10y = 1840 \rightarrow (+)\ 5x + 10y = 1840$
$\frac{5y}{5} = \frac{535}{5}$
$y = 107$

$x + y = 261$
-107 -107
$x + 107 = 261$
$x = 154$

There are 154 students and 107 adults at the show

3. The admission fee at a small fair is $1.50 for children and $4.00 for adults. On a certain day, 2200 people enter the fair and $5050 is collected. How many children and how many adults attended?

Substitution:

Let x = # of children

Let y = # of adults

$x + y = 2200$

$1.5x + 4y = 5050$

(i) $x = -y + 2200$

(ii) $1.5x + 4y = 5050$

$1.5(-y + 2200) + 4y = 5050$

$-1.5y + 3300 + 4y = 5050$

$2.5y + 3300 = 5050$

$\frac{2.5y}{2.5} = \frac{1750}{2.5}$

$y = 700$

(iii) $x + y = 2200$

$x + 700 = 2200$

$x = 2200 - 700$

$x = 1500$

(iv) 1500 children and 700 adults

Elimination:

Let x = # of children

Let y = # of adults

$x + y = 2200$ (-1.5, -1.5, -1.5)

$1.50x + 4y = 5050$

$-1.5x - 1.5y = -3300$

(+) $1.5x + 4y = 5050$

$\frac{2.5y}{2.5} = \frac{1750}{2.5}$

$y = 700$

$x + y = 2200$ (-700, -700)

$x + 700 = 2200$

$x = 1500$

1500 children and 700 adults attended the fair.

4. Nigel has $6000 to invest. His bank offers an interest rate of 9% on an ABC investment and 11% on the GTA investment. If he makes $572 in interest, how much did he invest in each one?

Substitution:

Let x = investment in ABC (9%)

Let y = investment in GTA (11%)

$x + y = 6000$

$0.09x + 0.11y = 572$

(i) $x + y = 6000$ $-y$ $-y$

$x = 6000 - y$

(ii) $0.09x + 0.11y = 572$

$0.09(6000 - y) + 0.11y = 572$

$540 - 0.09y + 0.11y = 572$

-540 -540

$0.02y + 540 = 572$

$\frac{0.02y}{0.02} = \frac{32}{0.02}$

$y = \$1600$

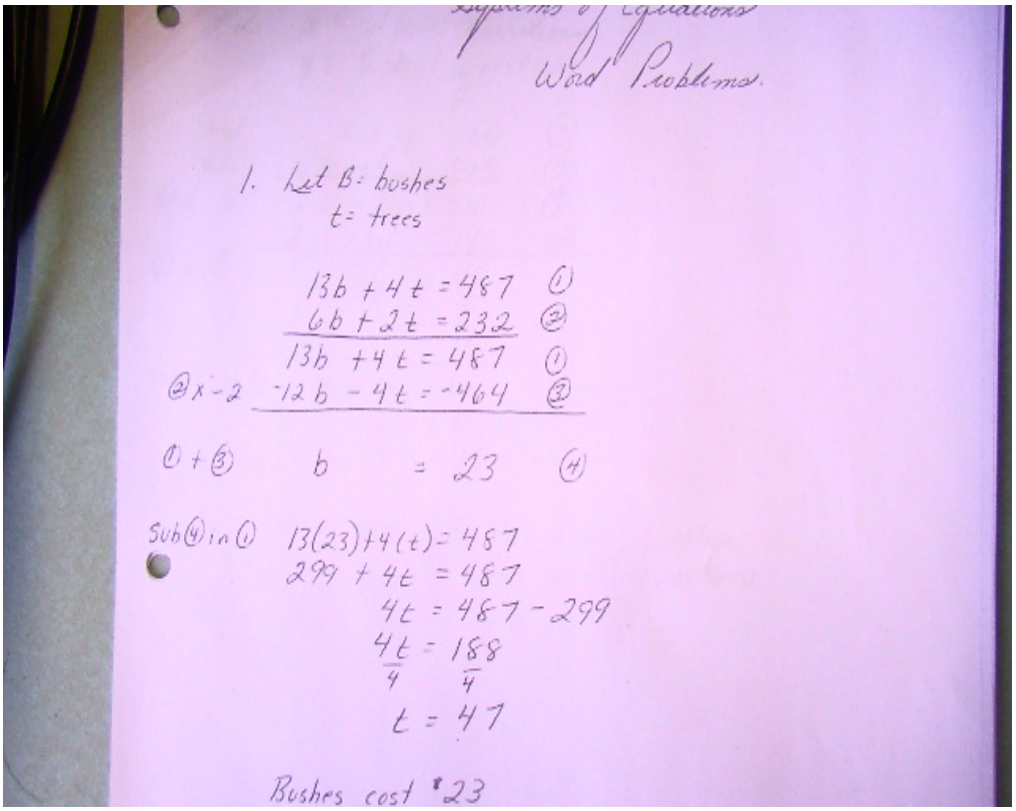
(iii) $x = 6000 - y$

$x = 6000 - 1600$

$x = \$4400$

(iv) Nigel invested $4400 in ABC and $1600 in GTA.

Questions From Homework



Systems of Equations

Word Problems

1. Let B = bushes
t = trees

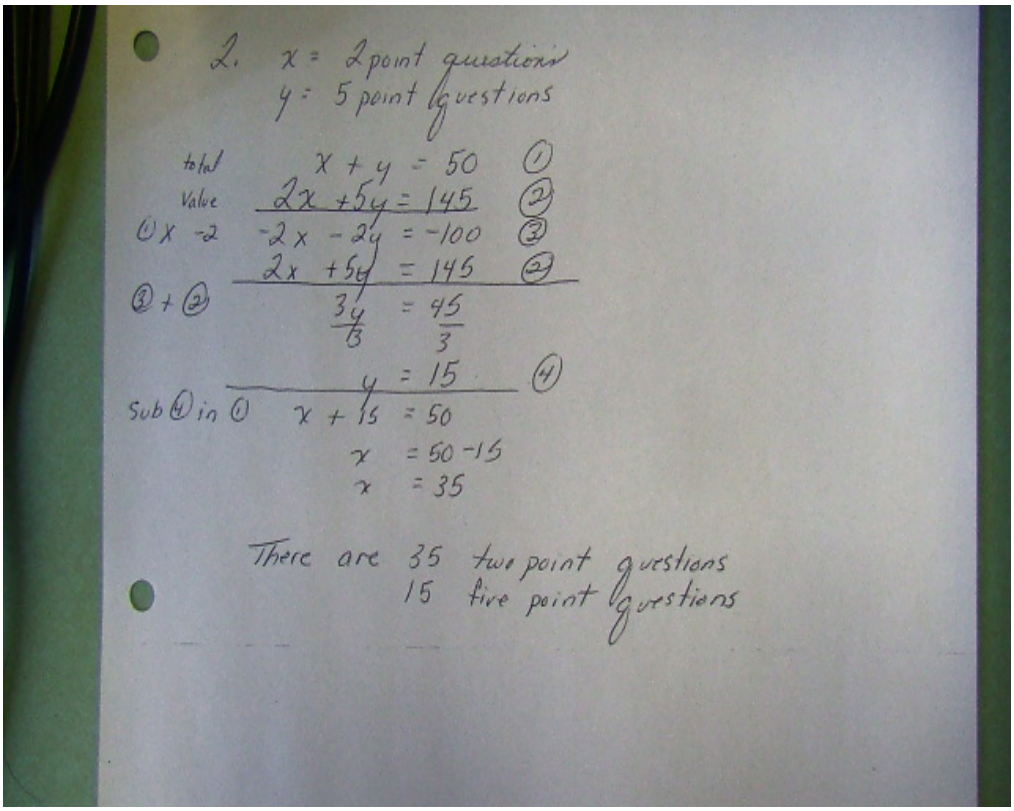
$13b + 4t = 487$ ①
$6b + 2t = 232$ ②

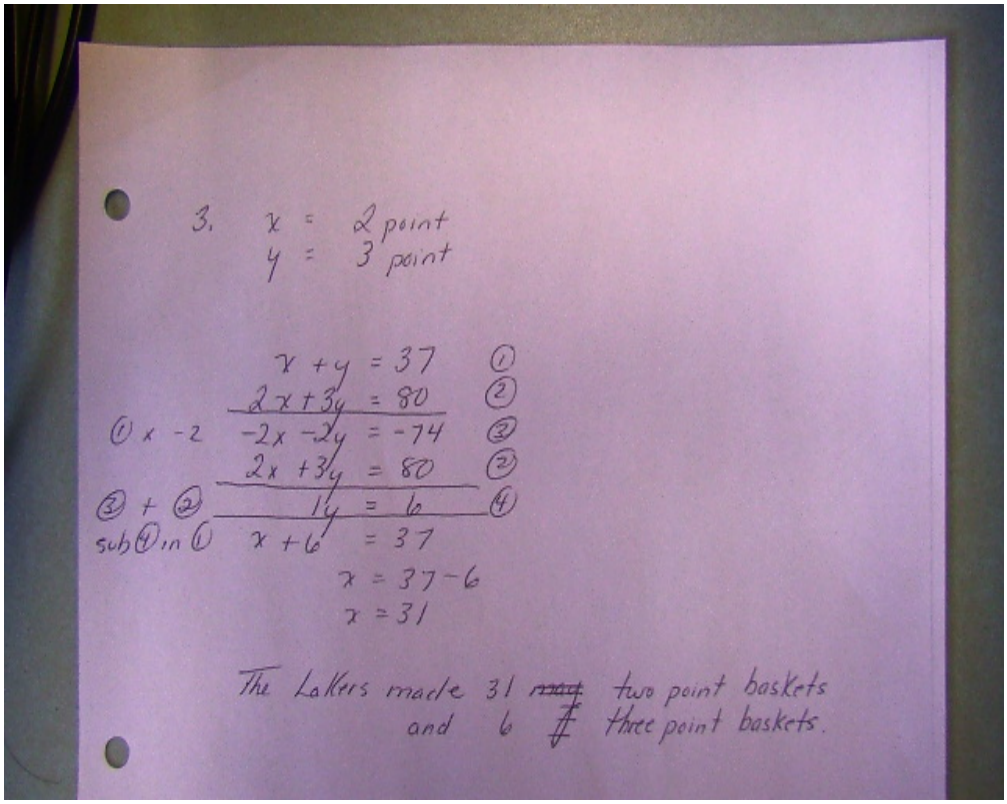
$13b + 4t = 487$ ①
② x -2 $-12b - 4t = -464$ ②

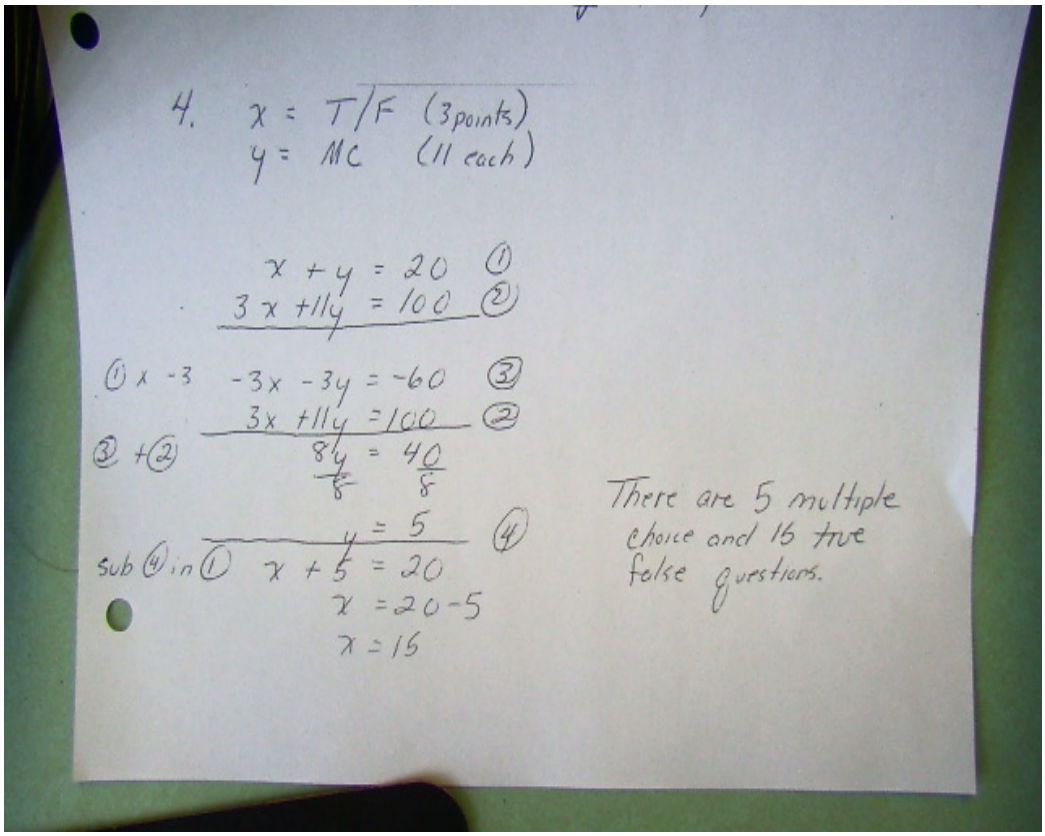
① + ③ $b = 23$ ④

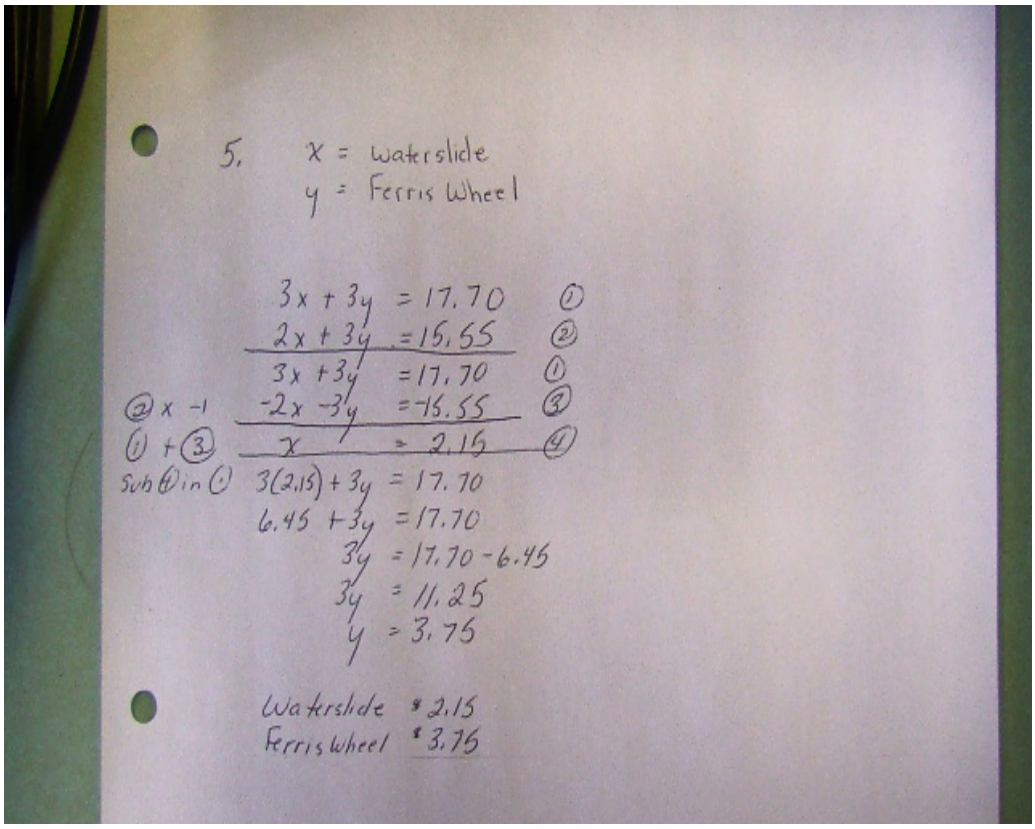
Sub ④ in ① $13(23) + 4(t) = 487$
$299 + 4t = 487$
$4t = 487 - 299$
$\frac{4t}{4} = \frac{188}{4}$
$t = 47$

Bushes cost $23


2. x = 2 point questions
y = 5 point questions
total $x + y = 50$ ①
Value $2x + 5y = 145$ ②
① x -2 $-2x - 2y = -100$ ③
② + ③ $2x + 5y = 145$ ②
$3y = 45$
$\frac{3y}{3} = \frac{45}{3}$
$y = 15$ ④
Sub ④ in ① $x + 15 = 50$
$x = 50 - 15$
$x = 35$
There are 35 two point questions
15 five point questions


3. x = 2 point
y = 3 point
x + y = 37 ①
2x + 3y = 80 ②
① x -2 -2x - 2y = -74 ③
2x + 3y = 80 ②
③ + ② 1y = 6 ④
sub ④ in ① x + 6 = 37
x = 37 - 6
x = 31
The Lakers made 31 two point baskets
and 6 # three point baskets.


4. x = T/F (3 points)
y = MC (1 each)
x + y = 20 ①
3x + 11y = 100 ②
① x -3 -3x - 3y = -60 ③
3x + 11y = 100 ②
③ + ② 8y = 40
y = 5 ④
sub ④ in ① x + 5 = 20
x = 20 - 5
x = 15
There are 5 multiple choice and 15 true false questions.



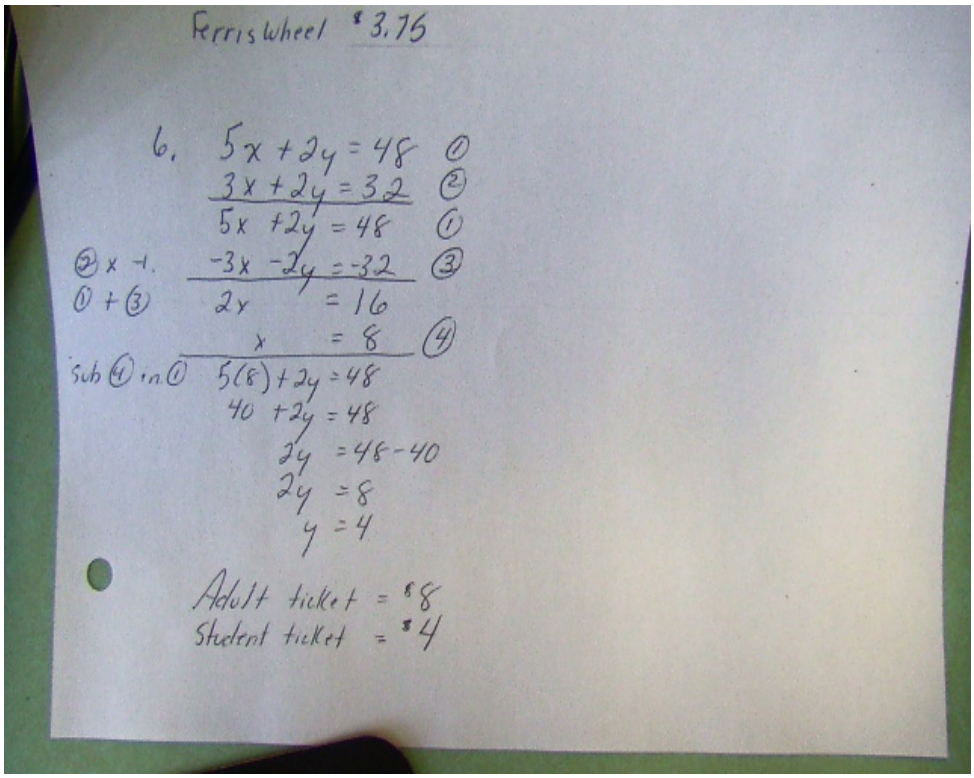
5. x = waterslide
y = Ferris Wheel

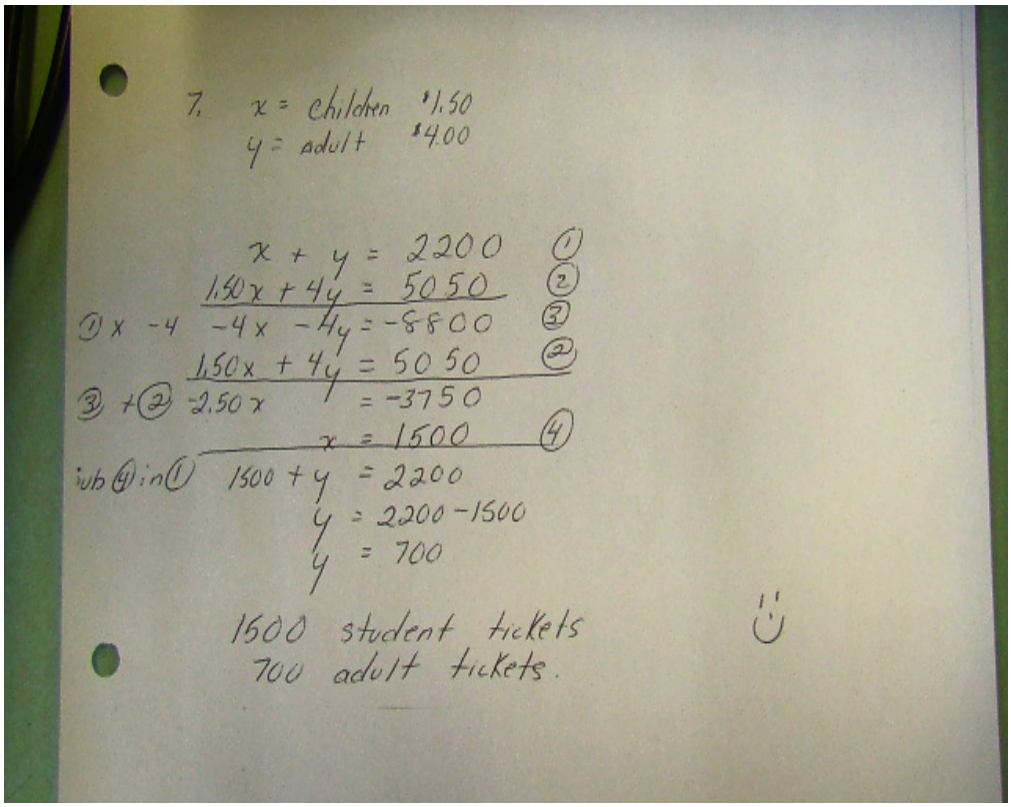
$3x + 3y = 17.70$ ①
$2x + 3y = 15.55$ ②

$3x + 3y = 17.70$ ①
② × −1 $-2x - 3y = -15.55$ ③
① + ③ $x = 2.15$ ④

Sub ④ in ① $3(2.15) + 3y = 17.70$
$6.45 + 3y = 17.70$
$3y = 17.70 - 6.45$
$3y = 11.25$
$y = 3.75$

Waterslide $2.15
Ferris wheel $3.75


Ferris wheel $3.75
6. 5x + 2y = 48 ①
3x + 2y = 32 ②
5x + 2y = 48 ①
② x -1. -3x - 2y = -32 ③
① + ③ 2x = 16
x = 8 ④
Sub ④ in ① 5(8) + 2y = 48
40 + 2y = 48
2y = 48 - 40
2y = 8
y = 4
Adult ticket = $8
Student ticket = $4


7. x = children $1.50
y = adult $4.00
x + y = 2200 ①
1.50x + 4y = 5050 ②
① x -4 -4x - 4y = -8800 ③
1.50x + 4y = 5050 ②
③ + ② -2.50x = -3750
x = 1500 ④
sub ④ in ① 1500 + y = 2200
y = 2200 - 1500
y = 700
1500 student tickets
700 adult tickets.

Solve by graphing:

- Put equations in Slope-Intercept form ($y=mx+b$)

- $y = 3x - 1$

$m = \frac{3}{1}$ $\frac{\text{rise}}{\text{run}}$

$b = y\text{-int} = -1$

$(0,-1)$

$-2x + 2y = -10$ (+2x, +2x)

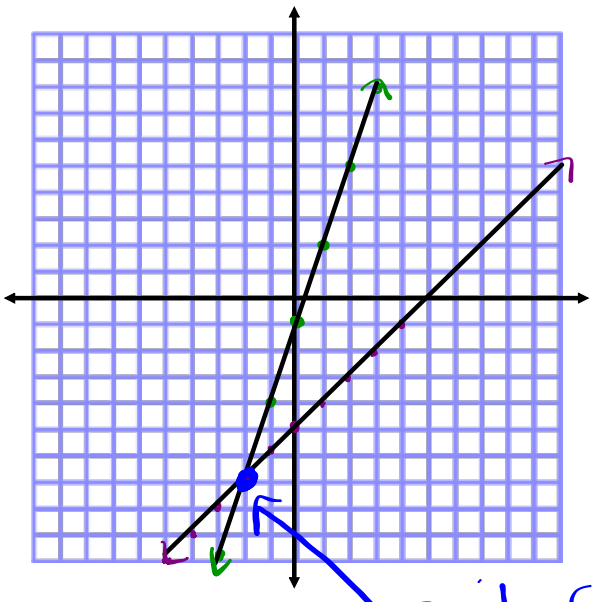
$\frac{2y}{2} = \frac{2x}{2} - \frac{10}{2}$

- $y = 1x - 5$

$m = \frac{1}{1}$ $\frac{\text{rise}}{\text{run}}$

$b = y\text{-int} = -5$

$(0,-5)$



Point of Intersection is the solution to the system.

$x = -2$ $(-2,-7)$

$y = -7$

Solve by Substitution:

$-2x+2y=-10$

$y=3x-1$ ⟶ (i) $y=3x-1$

(ii) $-2x+2y=-10$

$-2x+2(3x-1)=-10$

$-2x+6x-2=-10$

$+2 \quad +2$

$4x-2=-10$

$\frac{4x}{4}=\frac{-8}{4}$

$x=-2$

(iii) $y=3x-1$

$y=3(-2)-1$

$y=-6-1$

$y=-7$

(iv) Intersect @ $(-2,-7)$

Solve by Elimination:

$-2x+2y=-10 \rightarrow -2x+2y=-10 \rightarrow -2x+2y=-10$

$y=3x-1 \rightarrow -3x+y=-1 \quad \cdot 2 \quad \cdot 2 \quad \rightarrow (-1) \; -6x-2y=-2$

$4x=-8$

$\frac{4x}{4}=\frac{-8}{4}$

$x=-2$

$y=3(-2)-1$

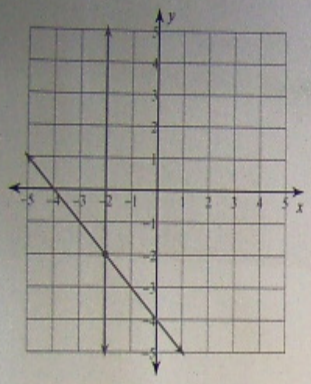
$y=-6-1$

$y=-7$

Intersect @ $(-2,-7)$

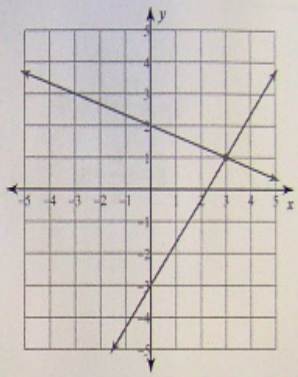
Solutions to Review

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



$(-2, -2)$

2) $y = -\frac{1}{3}x + 2$
$y = \frac{4}{3}x - 3$



$(3, 1)$

Solve each system by substitution.

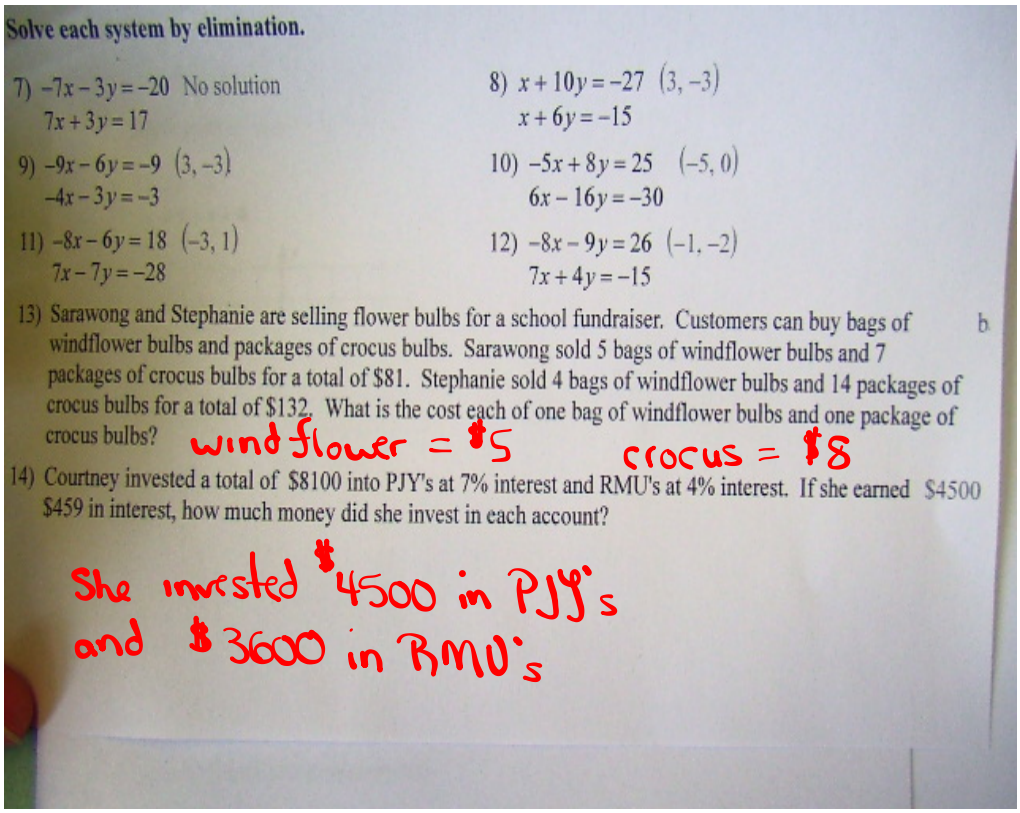
3) $-5x + 3y = -9$ $(0, -3)$
$y = -7x - 3$

4) $-x - y = 2$ $(1, -3)$
$y = -7x + 4$

5) $y = 2$ $(-3, 2)$
$4x - 4y = -20$

6) $-2x + 2y = -10$ $(-2, -7)$
$y = 3x - 1$

Solutions to Review



Solve each system by elimination.

7) $-7x-3y=-20$ No solution
$7x+3y=17$

8) $x+10y=-27$ $(3,-3)$
$x+6y=-15$

9) $-9x-6y=-9$ $(3,-3)$
$-4x-3y=-3$

10) $-5x+8y=25$ $(-5,0)$
$6x-16y=-30$

11) $-8x-6y=18$ $(-3,1)$
$7x-7y=-28$

12) $-8x-9y=26$ $(-1,-2)$
$7x+4y=-15$

13) Sarawong and Stephanie are selling flower bulbs for a school fundraiser. Customers can buy bags of windflower bulbs and packages of crocus bulbs. Sarawong sold 5 bags of windflower bulbs and 7 packages of crocus bulbs for a total of \$81. Stephanie sold 4 bags of windflower bulbs and 14 packages of crocus bulbs for a total of \$132. What is the cost each of one bag of windflower bulbs and one package of crocus bulbs? windflower = \$5 crocus = \$8

14) Courtney invested a total of \$8100 into PJY's at 7% interest and RMU's at 4% interest. If she earned \$4500 \$459 in interest, how much money did she invest in each account?

She invested \$4500 in PJY's and \$3600 in RMU's

(13) Let x = cost of windflower
Let y = cost of crocus

$5x+7y=81 \xrightarrow{\cdot 2} 10x+14y=162$

$4x+14y=132 \leftrightarrow 4x+14y=132$

$6x=30$

$\frac{6x}{6}=\frac{30}{6}$

$x=\$5$

$5x+7y=81$

$5(5)+7y=81$

$25+7y=81$ -25 -25

$7y=56$

$\frac{7y}{7}=\frac{56}{7}$

$y=\$8$

windflower bulbs cost \$5.00 and crocus bulbs cost \$8.00