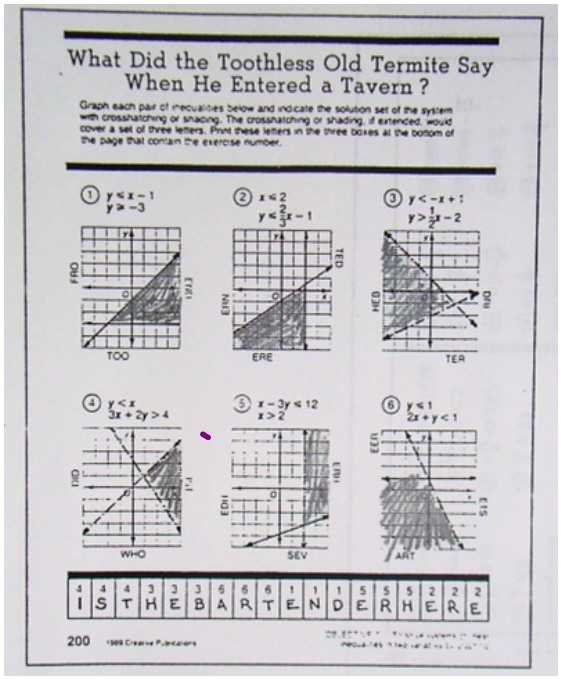
SOLUTIONS...

PUZZLE WORKSHEET:



What Did the Toothless Old Termite Say When He Entered a Tavern ?

Graph each pair of inequalities below and indicate the solution set of the system with crosshatching or shading. The crosshatching or shading, if extended, would cover a set of three letters. Print these letters in the three boxes at the bottom of the page that contain the exercise number.

① $y \le x - 1$, $y \ge -3$ — TOO

② $x \le 2$, $y \le \frac{2}{3}x - 1$ — ERE

③ $y < -x + 1$, $y > \frac{1}{2}x - 2$ — TER

④ $y < x$, $3x + 2y > 4$ — WHO

⑤ $x - 3y < 12$, $x > 2$ — SEV

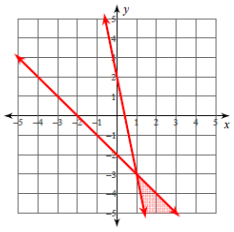
⑥ $y \le 1$, $2x + y < 1$ — ART

4	4	4	3	3	3	6	6	1	1	1	5	5	5	2	2	2
I	S	T	H	E	B	A	R	T	E	N	D	E	R	E	R	E

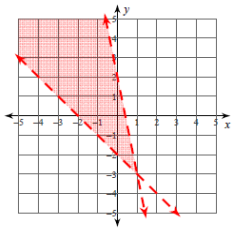
200

WORKSHEET:

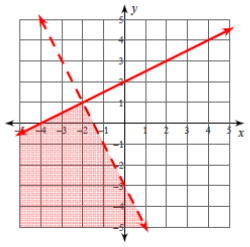
1) $y \le -x - 2$, $y \ge -5x + 2$



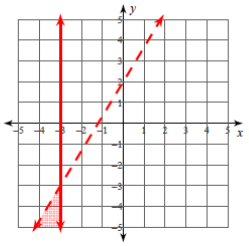
2) $y > -x - 2$, $y < -5x + 2$



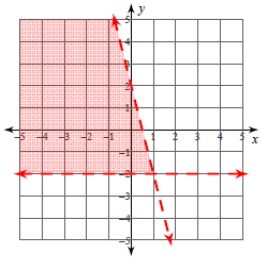
3) $y \le \frac{1}{2}x + 2$, $y < -2x - 3$



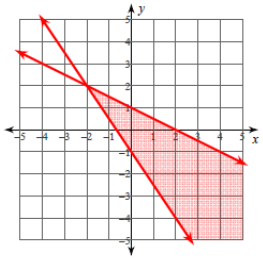
4) $x \le -3$, $y < \frac{5}{3}x + 2$



5) $4x + y < 2$, $y > -2$



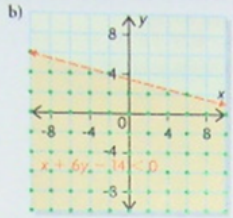
6) $3x + 2y \ge -2$, $x + 2y \le 2$



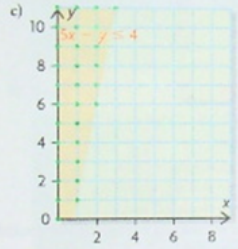
SOLUTIONS...

6. a) no solution

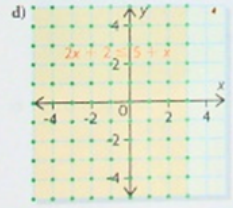
b)



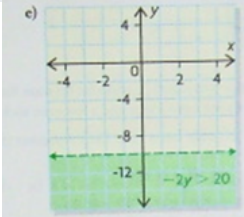
c)



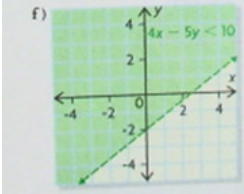
d)



e)



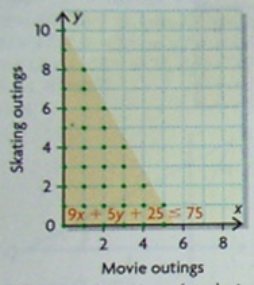
f)



7. a) Let x represent the number of movies Grace sees. Let y represent the number of times Grace goes skating.
$\{(x, y) \mid 9x + 5y + 25 \leq 75, x \in W, y \in W\}$

b) The variables must be whole numbers. $x \in W, y \in W$

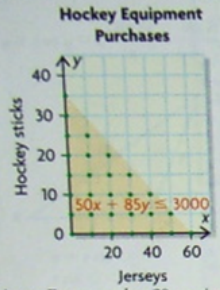
c)



i) e.g., see 3 movies and go skating 4 times
ii) e.g., see 5 movies and go skating once
iii) e.g., see 3 movies and go skating 6 times

8. a) Let x represent the number of jerseys. Let y represent the number of sticks.
$\{(x, y) \mid 50x + 85y \leq 3000, x \in W, y \in W\}$

b)

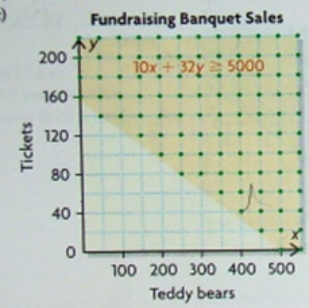


c) e.g., Eamon can buy 20 practice jerseys and 20 sticks for his team for $2700. It's reasonable to have a few extra jerseys and a few extra sticks.

9. a) Let x represent the number of teddy bears sold. Let y represent the number of tickets sold.
$\{(x, y) \mid 10x + 32y \geq 5000, x \in W, y \in W\}$

b) The variables must be whole numbers. $x \in W, y \in W$

c)

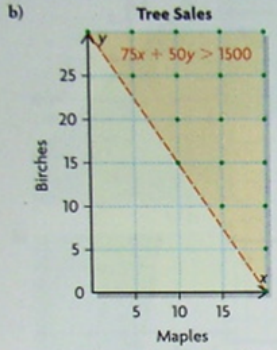


i) not a solution
ii) Yes, this is a solution.
iii) not a solution

10. a) Let x represent the number of maple trees sold. Let y represent the number of birch trees sold.
$\{(x, y) \mid 75x + 50y > 1500, x \in W, y \in W\}$

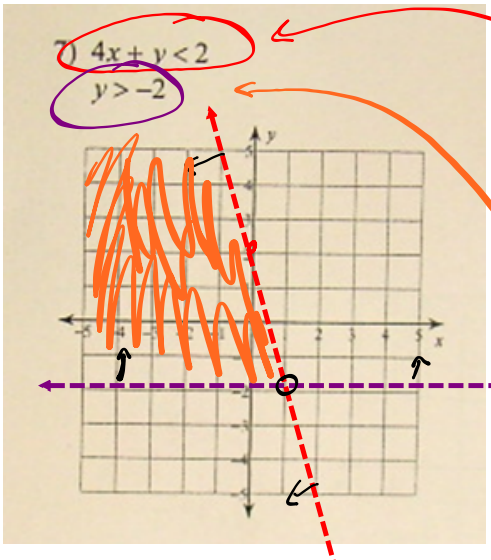
The variables must be whole numbers. $x \in W, y \in W$

b)



c) i) Yes, because (13, 13) is in the solution region.
ii) No, because (14, 9) lies on the dashed boundary and is not included in the shaded region; the point (9, 14) is also not in the solution region.

7) $4x + y < 2$
$y > -2$



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

Test (0,0) LS < RS

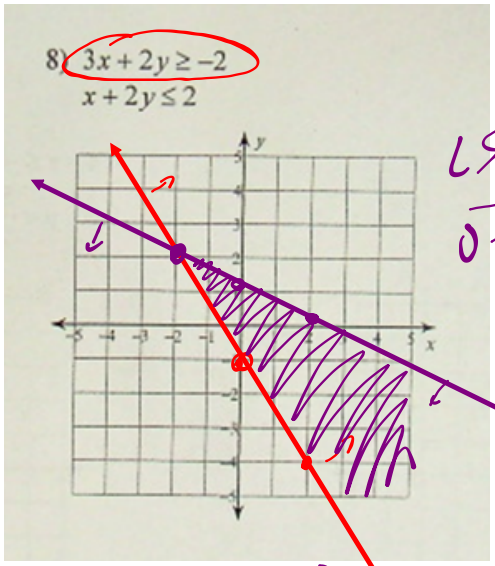
$4(0) + 0$	2
0	True

$y = -2$ horizontal

Test (0,0) LS > RS

0	-2 True

8) $3x + 2y \geq -2$
$x + 2y \leq 2$



$3x + 2y = -2$

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

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

LS ≤ RS

$0 + 2(0)$	2
0	True

LS ≥ RS

$3(0) + 2(0)$	-2
0	True

$x + 2y = 2$

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

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

WARM-UP: Graph the solution and state 2 possible solutions...

$\{(x,y) \mid 2x + y > 8, x \varepsilon W, y \varepsilon W\}$

$\{(x,y) \mid y \leq 2, x \varepsilon W, y \varepsilon W\}$

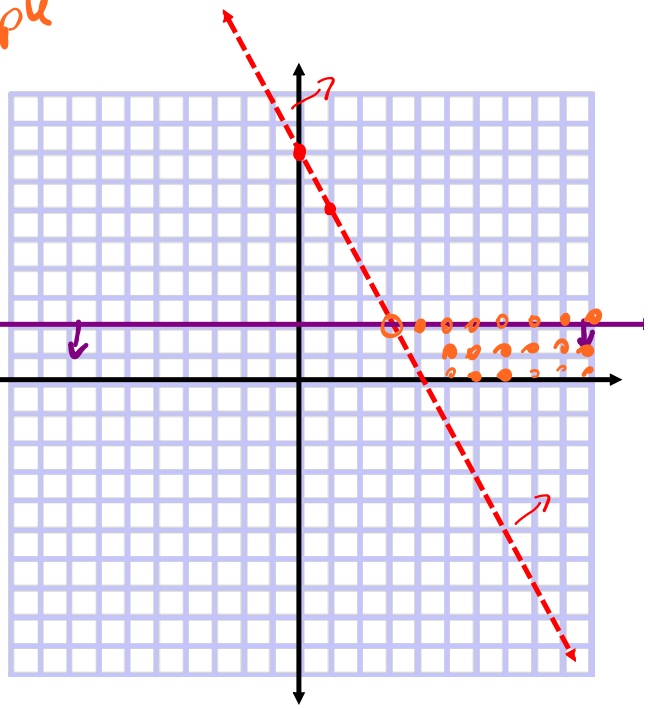
Quad I Stipple

$y = -\frac{2}{1}x + 8$

LS > RS	
2(0)+0	8
0	False

$y = 2$

LS ≤ RS	
0	2
True	



Applications: Systems Involving Inequalities

STEP 1 - Declare Variables
State Restrictions

STEP 2 - Create Linear Inequalities

STEP 3 - Graph Solution Set

STEP 4 - Answer question(s)

EXAMPLE #1:

To raise funds for π - day, the PI Committee has 500 T-shirts to sell.

They have two varieties:

#1. 'I 8 Sum π' or #2.'π- DAY 2016'.

They expect to sell at least twice as many of the first as the second.

$y \geq 2x$ (y depends on x)

Independent Variable
- plotted on the x-axis
ex: time

Dependent Variable
- plotted on y axis
ex: Distance

"What depends on what?"

a) Define the variables and restrictions. Write a system of linear inequalities that models the situation.

$x \rightarrow$ # of option #2 sold
$y \rightarrow$ # of option #1 sold
$x \in W$ $y \in W$

b) Graph the system of inequalities.

$x + y \leq 500$

$y \geq 2x$

x	y
10	20

1st and

c) State a combination of T-shirt sales.

LS ≥ RS Test (0, 300)
300 ≥ 200
True

T-shirt Sales

$x + y \leq 500$

x-int
$x + 0 = 500$
$x = 500$
(500, 0)

y-int
$0 + y = 500$
$y = 500$
(0, 500)

$y \geq 2x$
$y = 2x$

x	y
0	0
100	200

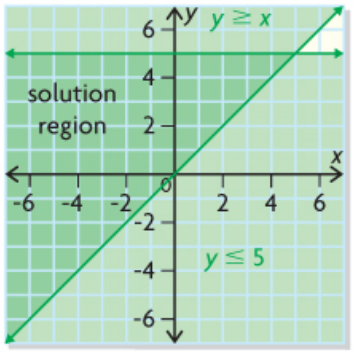
c) (50, 400)
50 → # day 2016
400 → I 8 Sum #

day 2016

In Summary

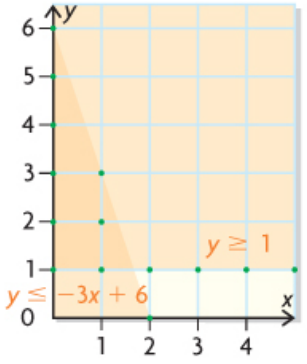
Key Ideas

- Some contextual situations can be modelled by a system of two or more linear inequalities.
- All of the inequalities in a system of linear inequalities are graphed on the same coordinate plane. The region where their solution regions intersect or overlap represents the solution set to the system. For example, this graph shows the solution region to this system:
  $\{(x, y) \mid y \geq x, x \in R, y \in R\}$
  $\{(x, y) \mid y \leq 5, x \in R, y \in R\}$



Need to Know

- As with the solution region for a single linear inequality, the solution region for a system of linear inequalities can be discrete or continuous and can be restricted to certain quadrants. For example, the graph to the right shows the system described below:
  $\{(x, y) \mid y \geq 1, x \in W, y \in W\}$
  $\{(x, y) \mid y \leq -3x + 6, x \in W, y \in W\}$
  Its solution region is restricted to discrete points with whole-number coordinates in the first quadrant.
- If the solution regions for the linear inequalities in the system do not overlap, there is no solution.



HOMEWORK...

p. 225: #1 & 2

p. 235: #2, 5 & 6