

Tutorial Worksheet #3
Tuesday, May 22

Name: _____

Student Number: _____

Write your solutions to the following exercises on the provided paper. *Show all of your work.* Remember to use good notation and full sentences.

1. Graph all solutions of the following inequalities:

- (a) $2x + 3y \leq 4$
- (b) $-5x > 2 - 4y$
- (c) $6x \leq 5y$

2. Graph the feasible set for each of the following systems of inequalities:

- (a) $3x + 2y \leq 6, \quad -x + 2y \leq 4, \quad x \geq 0, \quad y \geq 0$
- (b) $y \leq -\frac{2}{5}x + 6, \quad 4x + y \leq 24, \quad x \geq 0, \quad y \geq 0$
- (c) $x + 2y \geq 10, \quad 3x + y \geq 10, \quad x \geq 0, \quad y \geq 0$

3. Between the years 1960 and 1995, the worldwide consumption of bananas was increasing steadily. The number of trillions of bananas, y , purchased x years after 1960 was estimated by the linear equation

$$y = \frac{3}{40}x + \frac{5}{2}.$$

- (a) When were there approximately 4 trillion bananas sold?
 - (b) If this trend had continued, how many bananas would have been sold in 2017?
4. The cost of manufacturing shoes can be described as follows: It takes a fixed cost of \$10,000 to set up the factory, plus a cost of \$4 in materials and labour for each pair of shoes that is manufactured.
- (a) Write a linear equation describing the relationship between the cost of manufacturing shoes (C) and the number of pairs of shoes manufactured (x).
 - (b) What is the total cost of manufacturing 6,000 pairs shoes?
 - (c) How many pairs of shoes are manufactured if the total cost is \$24,500?
5. Minimize the objective function $P = 2x - y + 14$ subject to the constraints

$$2x - y \leq 3, \quad x + 3y \geq -2 \quad \text{and} \quad x - y \geq -2.$$

6. A stationary company produces pens and pencils. Long term projections predict a demand of at least 6 crates of pencils and 5 crates of pens per day. Due to limitations on production capacity, no more than 8 crates of pencils and 7 crates of pens can be made daily. To satisfy a shipping constraint, at least 12 crates must be shipped each day.

If each crate of pencils is sold for \$100 and each crate of pens is sold for \$140, how much of each type should be made in order to maximize revenue?

7. A company needs to buy filing cabinets. Cabinet A is \$10 per unit, requires 6 square feet of floor space, and holds 8 cubic feet of files. Cabinet B costs \$20 per unit, requires 8 square feet of floor space and holds 12 cubic feet of files. The company has a budget of a maximum of \$140 for filing cabinets. The office can only accommodate a maximum of 72 square feet of floor space for filing cabinets.

How many of each type should they buy in order to maximize storage space?

8. A company is planning an employee retreat in Clear Lake. The company has two branches one in Winnipeg and one in Brandon. The Winnipeg branch has 23 employees, while the Brandon branch has 20. The company decides that they want to send at least 25 employees, with at least 8 from the Winnipeg branch and at least 10 from the Brandon branch. Transport to Clear Lake from Winnipeg is \$50 per person, while transport from Brandon to Clear Lake is \$40.

How many employees from each branch should the company send in order to minimize transport cost?

Brief Answers:

1. Recall that we shade *OUT* the region that does *NOT* satisfy the inequality!

(a)

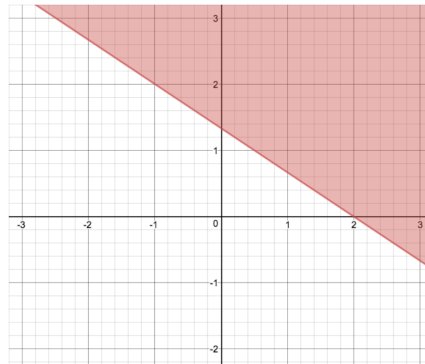


Figure 1: $2x + 3y \leq 4$

(b)

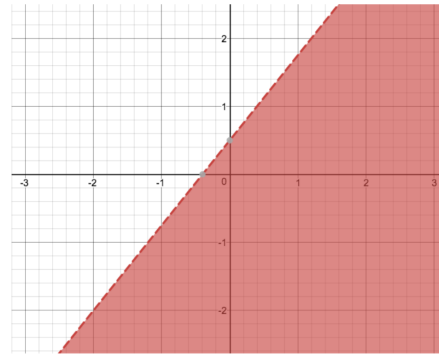


Figure 2: $-5x > 2 - 4y$

(c)

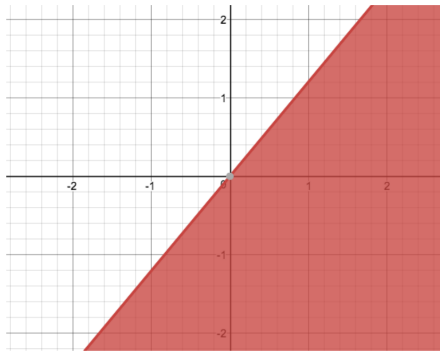
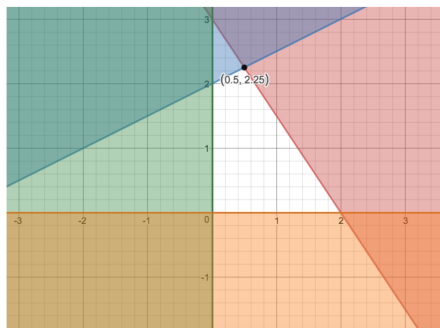


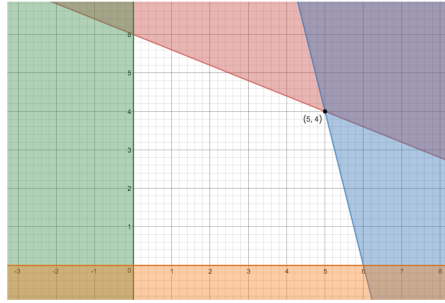
Figure 3: $6x \leq 5y$

2. Recall that we graph the solutions to each inequality on the same graph!

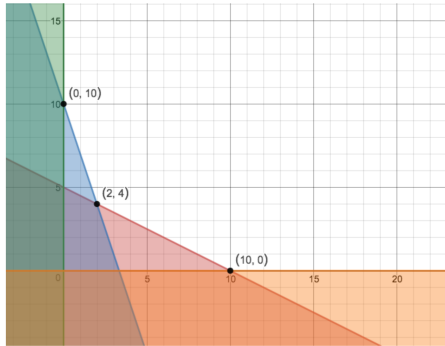
(a)



(b)



(c)



3. (a) 1980

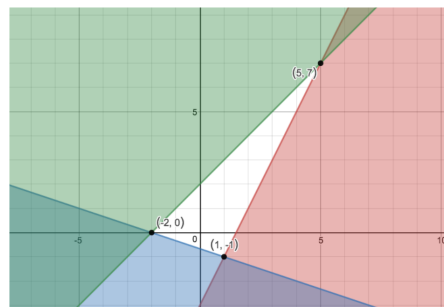
(b) 6.775 trillion

4. (a) $C(x) = 10000 + 4x$

(b) \$34,000

(c) 3,625

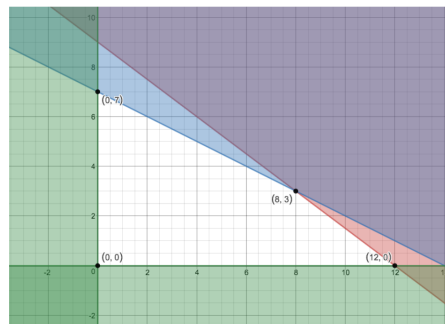
5. The minimum value is 10:



6. They should make 8 crates of pencils and 7 crates of pens. Here is the feasible set graph:



7. They should buy 8 of cabinet A and 3 of cabinet B. Here is the feasible set graph:



8. They should send 8 from Winnipeg and 17 from Brandon. Here is the feasible set graph:

