

## Extra Practice Exercises—Chapter 4

9. A company makes couches and love seats. Due to space constraints in the work area, no more than 10 couches or 15 love seats can be made in one day. In total, no more than 20 pieces of furniture can be made in one day. Let  $x$  represent the number of couches and  $y$  the number of love seats made in one day.
- Write a system of inequalities that represents this situation.
  - Graph the ordered pairs that show the number of couches and love seats that can be made in one day.
10. A company makes televisions and radios. Because the work area is small, no more than 40 televisions or 50 radios can be made in one day. In all, no more than 60 appliances can be made in one day. Let  $x$  represent the number of televisions and  $y$  the number of radios made in one day.
- Write a system of inequalities that represents this situation.
  - Graph the ordered pairs that show the number of televisions and radios that can be made in one day.

**Tutorial 4.4 Modelling a Problem Situation**

1. A company makes backpacks and briefcases. Daily output cannot exceed a total of 40 backpacks and briefcases. A maximum of 20 backpacks can be made in one day. The maximum daily output of briefcases is 30.
- Define variables  $x$  and  $y$  for this problem.
  - State the constraints given in this problem. Write an inequality for each constraint.
  - What implicit constraints exist for the variables? Write an inequality for each implicit constraint.
  - Draw a graph that shows the possible numbers of bags that can be made in one day.
2. Alyssa plays soccer and baseball. She burns 400 calories/h playing soccer and 50 calories/h playing baseball. Each week she is willing to spend at most 18 h exercising and wishes to burn at least 4000 calories.
- Define variables  $x$  and  $y$  for this problem.
  - Write a system of inequalities to represent the constraints in this problem.
  - Draw a graph to show the time Alyssa could spend on each activity in one week.
3. A company manufactures solar-powered calculators and battery-powered calculators. In one day, a maximum of 110 solar-powered and 80 battery-powered calculators can be made. Each solar-powered calculator requires 1 work-hour to produce and each battery-powered calculator requires 2 work-hours. There are a maximum of 200 work-hours available each day.

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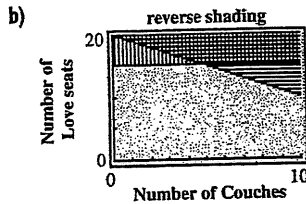
- a) Define variables  $a$  and  $b$  for this problem.
  - b) Write a system of inequalities to represent the constraints.
  - c) Draw a graph to determine the region that satisfies all inequalities.
4. Ramesh likes to run outdoors and ride his bicycle at the velodrome. He burns about 400 calories/h running and 300 calories/h riding his bike. It costs \$6/h to ride at the velodrome. Ramesh hopes to develop a weekly exercise program that will burn at least 4800 calories, cost no more than \$24, and require a maximum of 8 h.
- a) What quantities should  $x$  and  $y$  represent for this problem?
  - b) Write a system of inequalities for this problem.
  - c) Draw a graph to determine if it is possible for Ramesh to develop an exercise program.
5. The owner of a pet store wishes to buy at least 8 cats and 8 dogs from a particular breeder. Cats cost \$25 each and dogs cost \$75 each.
- a) Develop a system of inequalities to determine how many animals the storeowner can buy if he does not want to spend more than \$1500.00.
  - b) Draw the graph to determine the number of animals the owner can purchase.
6. A manufacturer produces two kinds of sleeping bags. The time required to produce one of each type of sleeping bag is summarized in the table

	Sleeping Bag A	Sleeping Bag B
Machine time (min)	30	15
Skilled Labour (min)	25	30
Unskilled Labour (min)	30	25

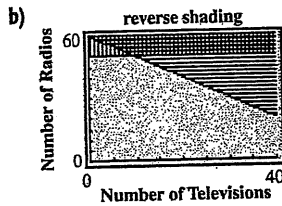
- In one day, the company has a maximum of 15 h of machine time available, 18 h of skilled labour, and 18 h of unskilled labour. A minimum of 15 of each type of sleeping bag must be produced every day.
- a) Write a system of inequalities to represent the constraints.
  - b) Draw a graph that shows the numbers of sleeping bags that can be produced each day.
  - c) The company wishes to produce a minimum of 45 sleeping bags each day. Write the inequality that represents this constraint and graph it to determine if this is possible.
7. A farmer has 150 m of fencing to build a rectangular pen. The length of the pen must not be less than twice the width, and the area must be at least 350 m<sup>2</sup>.
- a) Develop a system of inequalities to represent the constraints in this problem.
  - b) On a graph, indicate the region that represents the possible dimensions of the pen.

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9. a)  $x \geq 0$ ;  $x \leq 10$ ;  $y \geq 0$ ;  $y \leq 15$ ;  $x + y \leq 20$



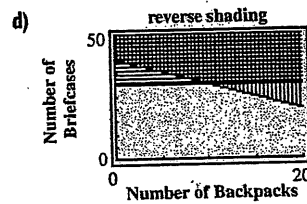
10. a)  $x \geq 0$ ;  $x \leq 40$ ;  $y \geq 0$ ;  $y \leq 50$ ;  $x + y \leq 60$



**Tutorial 4.4**

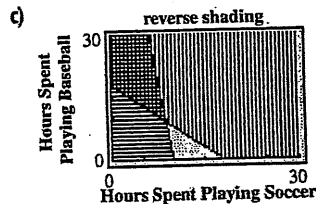
1. a)  $x$ : number of backpacks made;  $y$ : number of briefcases made

b)  $x + y \leq 40$ ;  $x \leq 20$ ;  $y \leq 30$       c)  $x \geq 0$ ;  $y \geq 0$



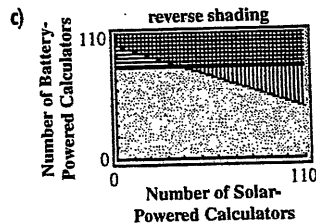
2. a)  $x$ : number of hours spent playing soccer;  $y$ : number of hours spent playing baseball

b)  $x \geq 0$ ;  $y \geq 0$ ;  $x + y \leq 18$ ;  $400x + 50y \geq 4000$



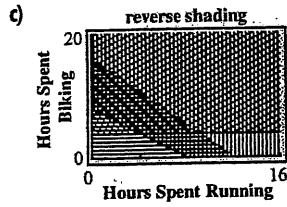
3. a)  $a$ : number of solar-powered calculators produced;  $b$ : number of battery-powered calculators produced

b)  $a \geq 0$ ;  $b \geq 0$ ;  $a \leq 110$ ;  $b \leq 80$ ;  $a + 2b \leq 200$



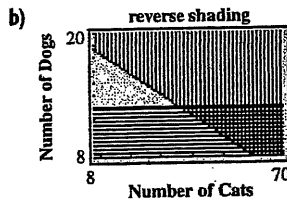
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4. a)  $x$ : number of hours spent running;  $y$ : number of hours spent riding the bike  
 b)  $x \geq 0$ ;  $y \geq 0$ ;  $x + y \leq 8$ ;  $400x + 300y \geq 4800$ ;  $6y \leq 24$

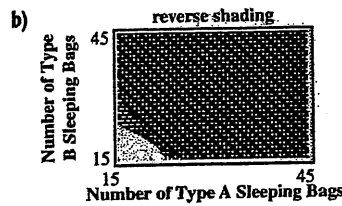


There is no area that satisfies all inequalities; so no program can be developed.

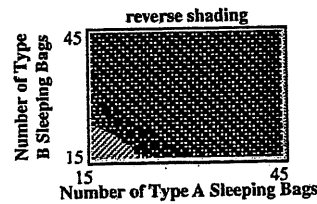
5. a)  $x$ : number of cats;  $y$ : number of dogs;  $x \geq 8$ ;  $y \geq 8$ ;  $25x + 75y \leq 1500$



6. a)  $x \geq 15$ ;  $y \geq 15$ ;  $30x + 15y \leq 900$ ;  $25x + 30y \leq 1080$ ;  $30x + 25y \leq 1080$



- c)  $x + y \geq 45$



It is not possible to produce 45 sleeping bags each day.

7. a)  $x > 0$ ;  $y > 0$ ;  $2x + 2y \leq 150$ ;  $xy \geq 350$ ;  $y \geq 2x$

