

# Mathematics 10 Practice Final Exam

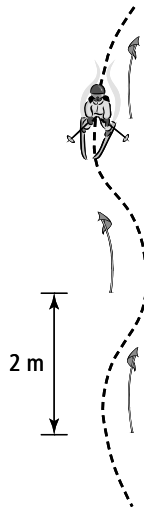
For each multiple choice question, identify the correct letter. For each numerical response question, record your answer.

## Sports

Sports often involve mathematics. Apply your mathematical knowledge and skills to solve problems related to sports.

Use this information to answer #1.

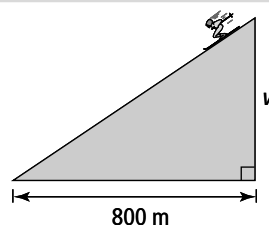
A beginning skier practises by making turns around flags on a ski hill. The flags are spaced 2 m apart.



- If there are 8 flags, what is the approximate distance that the skier travelled, to the nearest foot?  
**A** 42 ft      **B** 46 ft  
**C** 48 ft      **D** 52 ft
- A trail map for a wall in the ski patrol office is  $8\frac{1}{2}$  ft long. If 7 in. of white border needs to be cut off, what is the final length of the trail map?  
**A** 7'11"    **B** 7'5"    **C** 87"    **D** 84"

Use this information to answer #3.

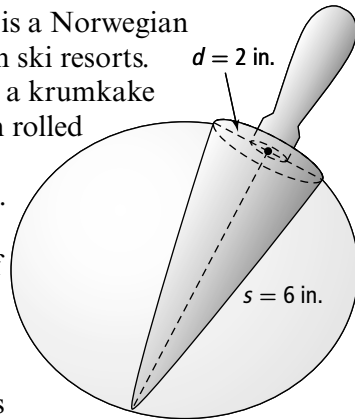
A ski hill has a slope of  $\frac{7}{20}$ .



- What is the vertical distance,  $v$ ?  
**A** 40 m      **B** 110 m  
**C** 280 m    **D** 320 m

Use this information to answer #4.

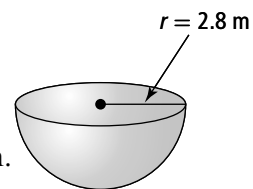
A krumkake is a Norwegian cookie sold in ski resorts. It is baked in a krumkake iron and then rolled around a wooden cone. The cone has a diameter of 2 in. and a slant height of 6 in. The cookie covers only the lateral surface and not the circular base of the cone.



- What is the minimum amount of cookie dough needed to cover the lateral surface of the cone, to the nearest square inch?  
**A** 19 in.<sup>2</sup>      **B** 21 in.<sup>2</sup>  
**C** 29 in.<sup>2</sup>      **D** 30 in.<sup>2</sup>

Use this information to answer #5.

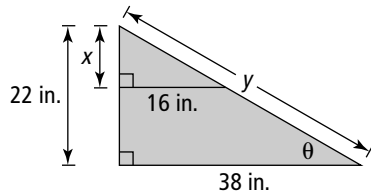
At a winter sports event, one ice sculpture shaped like a hemisphere has a radius of 2.8 m.



- What is the volume of the ice sculpture, to the nearest cubic metre?  
**A** 46 m<sup>3</sup>      **B** 49 m<sup>3</sup>  
**C** 92 m<sup>3</sup>      **D** 98 m<sup>3</sup>

Use this information to answer #6 to 8.

Freestyle skiers train by skiing up a specially constructed ramp toward a jump. The ramp can be lengthened, creating two right triangles.



6. What is the height of the short ski ramp,  $x$ , to the nearest inch?
- A 6 in.            B 9 in.  
C 14 in.           D 16 in.
7. What is the measure of  $\angle \theta$ , to the nearest degree?
- A  $30^\circ$     B  $35^\circ$     C  $55^\circ$     D  $60^\circ$

### Numerical Response

8. What is the length of the long ramp,  $y$ , to the nearest inch?

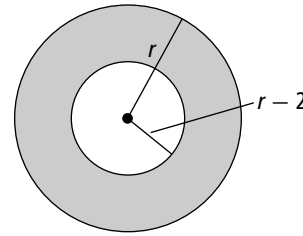
Use this information to answer #9.

Satellites transmit sports events around the world. When a satellite is  $h$  kilometres above Earth, the time,  $t$ , in minutes, that it takes to complete one orbit is given by the formula  $t = \frac{\sqrt{(6370 + h)^3}}{6024}$ .

9. How long would it take a satellite that is 28 km above Earth to orbit our planet twice? Express the answer to the nearest minute.
- A 66 min            B 85 min  
C 132 min           D 170 min

Use this information to answer #10.

Circles are painted into the ice surface of a rink for a curling bonspiel.



10. Which algebraic expression represents the surface area of the shaded region?
- A  $4\pi r$                     B  $4\pi(r - 1)$   
C  $\pi(4r^2 - 4)$         D  $\pi(4r^2 - r + 40)$

Use this information to answer #11 and 12.

The manager of a snack bar in the ski chalet used a table of values to determine how many people ( $p$ ) need to buy each of two types of sausages for the costs ( $C$ ) of the sausages to be equal.

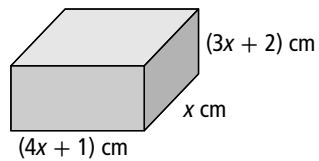
$p$	$C_1$	$C_2$
0	4.00	5.00
1	3.50	4.25
2	3.00	3.50
3	2.50	2.75
4		
5		

### Numerical Response

11. How many customers for sausages are needed for the costs to be the same?
12. Which system of equations represents the table of values?
- A  $C_1 = \frac{-1}{2}p - 4$         B  $C_1 = \frac{-1}{2}p + 4$   
 $C_2 = \frac{-3}{4}p - 5$          $C_2 = \frac{-3}{4}p + 5$   
C  $C_1 = \frac{1}{2}p - 4$         D  $C_1 = \frac{1}{2}p + 4$   
 $C_2 = \frac{3}{4}p - 5$          $C_2 = \frac{3}{4}p + 5$

Use this information to answer #13 and 14.

The cross-country ski team stores ski waxes in a box.



13. What is the simplified expression for the volume of the box?

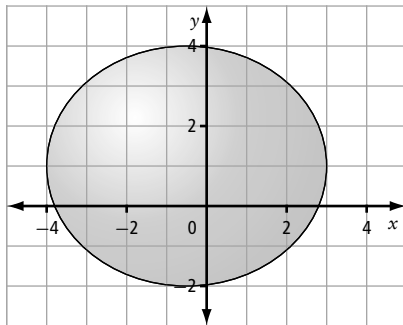
- A  $x(4x + 1)(3x + 2)$
- B  $7x^2 + 3x^3$
- C  $(3x^3 + 2x)(4x + 1)$
- D  $12x^3 + 11x^2 + 2x$

### Numerical Response

14. If  $x = 20$  cm, what is the volume of the box, to the nearest tenth of a cubic metre?

Use this information to answer #15.

Short track speed skaters train on an oval ice rink.



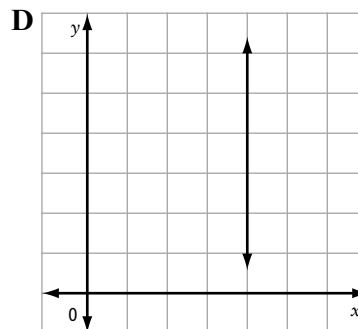
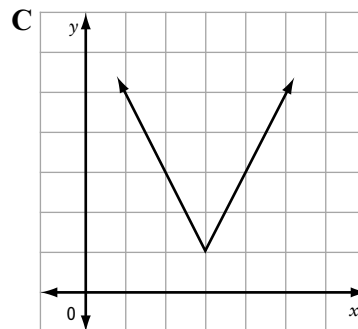
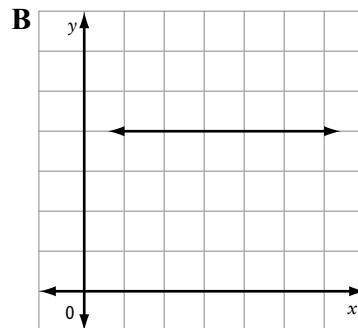
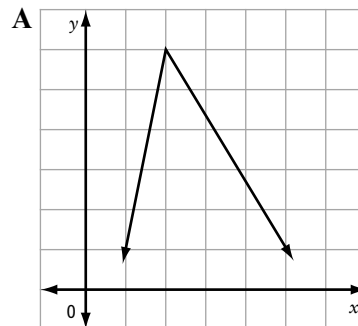
15. What are the domain and the range of the oval?

- A domain:  $x = -4, 3$ ; range:  $y = 4, -2$
- B domain:  $[-4, 3]$ ; range:  $[4, -2]$
- C domain:  $\{x \mid -4 \leq x \leq 3; x \in \mathbb{R}\}$ ; range  $\{y \mid -2 \leq y \leq 4; y \in \mathbb{R}\}$
- D domain:  $\{-4, 3\}$ ; range:  $\{4, -2\}$

### Connections

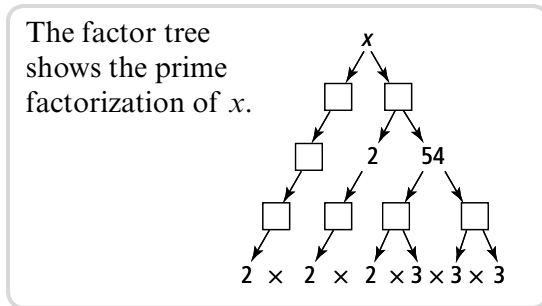
Many of the concepts that you study in mathematics are related and can help you solve different kinds of problems. Connect the concepts and skills you have learned to solve the following problems.

16. Which graph of a relation is *not* a function?



17. The general form of a line is given as  $3x + 6y + 12 = 0$ . What are the intercepts?
- A The  $x$ -intercept is  $-4$ . The  $y$ -intercept is  $-2$ .
- B The  $x$ -intercept is  $-3$ . The  $y$ -intercept is  $-6$ .
- C The  $x$ -intercept is  $3$ . The  $y$ -intercept is  $6$ .
- D The  $x$ -intercept is  $4$ . The  $y$ -intercept is  $2$ .

Use this information to answer #18 and 19.

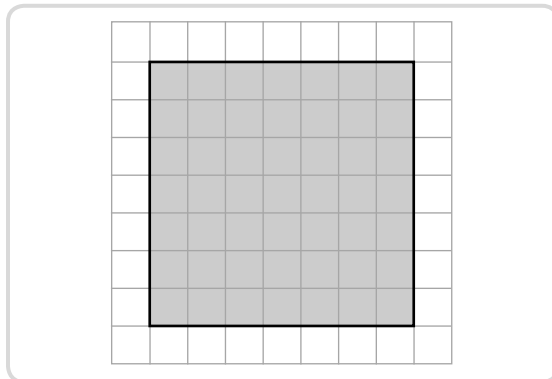


18. What is the value of  $x^{\frac{1}{3}}$ ?
- A 2    B 3    C 6    D 9

### Numerical Response

19. What is the value of  $x$ ?
20. Simplify, then evaluate  $\left[\left(\frac{3}{4}\right)^{-5} \div \left(\frac{3}{4}\right)^3\right]^{-1}$ .
- A  $\frac{1}{\left(\frac{3}{4}\right)^8}$     B  $\frac{3}{4}$     C  $\frac{9}{16}$     D  $\frac{1}{10}$

Use this diagram to answer #21.

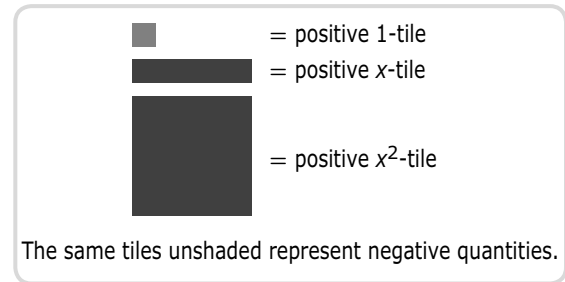


21. Which of the following square roots of perfect squares is represented by the shaded region?
- A 2    B 5    C 7    D 9

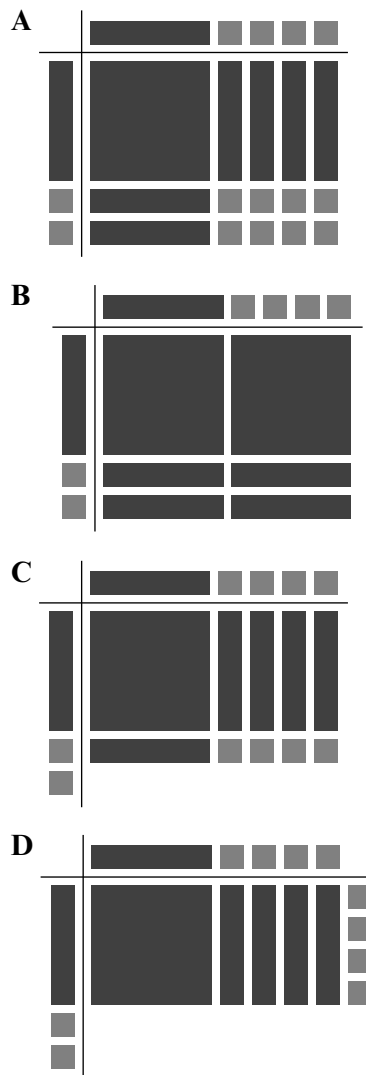
### Numerical Response

22. If  $p(x) = 2x^3 + x^2 - 5x + 3$ , what is the value of  $p(-2)$ ?

Use this key to interpret the algebra tile models in #23.



23. Which model represents the product of  $(x + 4)(x + 2)$ ?



24. Given the linear equation  $y = 2x + 7$ , which of the following statements is correct?

- A The linear function  $f(x) = 2x + 1$  is parallel to  $y = 2x + 7$ .
- B The line joining  $(-2, 3)$  and  $(0, 4)$  is parallel to  $y = 2x + 7$ .
- C The slope of a line perpendicular to  $y = 2x + 7$  is  $m = -2$ .
- D The  $y$ -intercept of  $y = 2x + 7$  is 2.

25. Amelie simplified  $(x + a)(x + b)$ , where  $a$  and  $b$  are  $> 0$ , to the form  $x^2 + mx + n$ . Which statement about  $m$  and  $n$  is true?

- A  $m < 0$  and  $n > 0$
- B  $m < 0$  and  $n < 0$
- C  $m > 0$  and  $n < 0$
- D  $m > 0$  and  $n > 0$

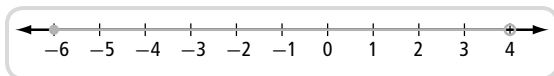
Use this number line to answer #26.



26. Which of the following correctly describes the number line?

- A  $\{n \mid -1 \leq n \leq 5, n \in \mathbb{R}\}$
- B  $\{n \mid -1 < n < 5, n \in \mathbb{I}\}$
- C  $[-1, 5], n \in \mathbb{I}$
- D  $\{-3, -2, -1, 0, 1, 2, 3, 4, 5\}$

Use this number line to answer #27.



27. Which of the following correctly describes the number line?

- A  $-6 < x < 4$
- B  $-6 \leq x < 4$
- C  $[-6, 4]$
- D  $(-6, 4)$

28. What is  $\sqrt{48}$  as an equivalent mixed radical?

- A  $4\sqrt{6}$
- B  $4\sqrt{3}$
- C  $4\sqrt[3]{3}$
- D  $2\sqrt{3}$

29. What is  $(3a^2)^3(4a^3)^0$  simplified?

- A  $9a^6$
- B  $27a^6$
- C  $36a^8$
- D  $108a^9$

30. Which ordered pair represents  $f(7) = -3$ ?

- A  $(-7, 3)$
- B  $(-3, 7)$
- C  $(3, 7)$
- D  $(7, -3)$

31. What is the equation  $y = \frac{x}{7} - 6$  expressed in general form?

- A  $x - 7y - 6 = 0$
- B  $x - 7y - 42 = 0$
- C  $7x - y - 6 = 0$
- D  $7x - 7y - 42 = 0$

32. Which expression represents  $(4x - 5)^2$  expanded and simplified?

- A  $16x^2 + 25$
- B  $16x^2 - 25$
- C  $16x^2 + 40x + 25$
- D  $16x^2 - 40x + 25$

Use this information to answer #33.

Melanie expanded and simplified  $(x - 2)(x^2 + 4x + 4)$ . Her work was as follows:

$$\begin{aligned}
 &(x - 2)(x^2 + 4x + 4) \\
 &= x(x^2 + 4x + 4) - 1(x^2 + 4x + 4) \quad \text{Step 1} \\
 &= x^3 + 4x^2 + 4x - x^2 + 4x + 4 \quad \text{Step 2} \\
 &= x^3 + 3x^2 + 8x^2 + 4 \quad \text{Step 3} \\
 &= x^3 + 11x^2 + 4 \quad \text{Step 4}
 \end{aligned}$$

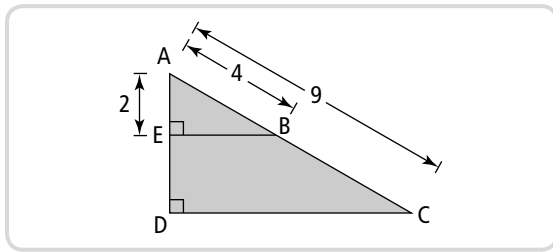
33. Melanie has errors in

- A Step 1 and Step 2
- B Step 1 and Step 4
- C Step 1, Step 2, and Step 3
- D Step 1, Step 3, and Step 4

34. Which set of numbers has rational numbers only?

- A  $\frac{-1}{2}$  6.9  $\sqrt{25}$   
 B  $\frac{1}{2}$   $-6$   $\frac{\sqrt{3}}{2}$   
 C  $-3$   $4.\overline{17}$  4.12131415...  
 D  $\sqrt{11}$   $3\sqrt{7}$   $\pi$

Use this information to answer #35 to 37.



**Numerical Response**

35. What is the length of side AD, to the nearest tenth?

**Numerical Response**

36. The exact length of side EB can be written in the form  $x\sqrt{y}$ . What is the value of  $y$ ?

37. The ratio for  $\cos \angle B$  is  
 A  $\frac{\sqrt{20}}{42}$     B  $\frac{2}{4}$     C  $\frac{\sqrt{3}}{2}$     D  $\frac{4}{\sqrt{12}}$

38. A right pyramid fits exactly into a cube with edge length 5 cm. Suppose that the dimensions of the solids are doubled. By what factor would the volumes of the pyramid and the cube increase?

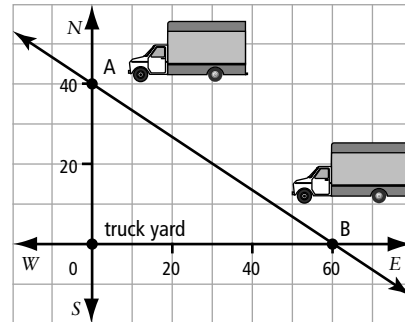
- A 2    B 4    C 6    D 8

**Business**

It is challenging to set up and operate a business that can compete successfully in the global market. Managing a business involves many skills, including mathematics skills. Use the concepts and skills you have learned to solve business-related problems.

Use this information to answer #39 and 40.

Safe Transport has a fleet of delivery trucks. Two trucks leave the truck yard at the same time. Truck A travels north at 40 km/h and Truck B travels east at 60 km/h.



**Numerical Response**

39. How far apart are the two trucks after 1 h, to the nearest kilometre?

40. The shortest distance from a point to a line can be determined by drawing a perpendicular line. If the slope of the line shown is  $-\frac{2}{3}$ , what is the equation of the perpendicular line through the point at the truck yard?

- A  $y = \frac{-2}{3}x + 20$     B  $y = \frac{-3}{2}x + 20$   
 C  $y = \frac{3}{2}x + 20$     D  $y = x + 20$

Use this information to answer #41.

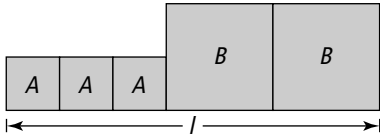
The U Move company's daily revenue can be represented by the function  $R(t) = 210t - 550$ , where  $t$  represents the number of trucks rented.

41. To ensure U Move earns daily revenue, what is the minimum number of trucks that must be rented?

- A  $\{t \mid t \geq 3, t \in \mathbb{I}\}$     B  $\{t \mid t > 3, t \in \mathbb{R}\}$   
 C  $\{t \mid t \leq 3, t \in \mathbb{R}\}$     D  $\{t \mid t < 3, t \in \mathbb{I}\}$

Use this information to answer #42.

The owner of U Move decided to expand the truck yard. He purchased three smaller square fields, each with area  $A$ , and two larger square fields, each with area  $B$ .

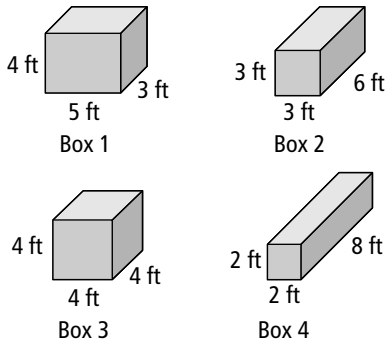


42. Which simplified radical represents length  $l$ ?

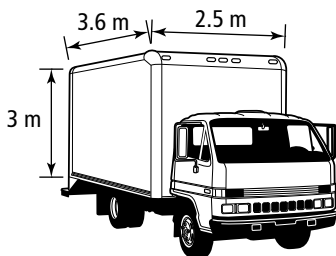
- A  $5\sqrt{AB}$                       B  $5\sqrt{A + B}$   
 C  $3\sqrt{A} + 2\sqrt{B}$             D  $\sqrt{3A + 2B}$

Use this information to answer #43 and 44.

U Move sends out a flyer advertising cardboard boxes.



The dimensions of the storage compartment in a U Move truck are shown.



43. The correct order of the boxes from least to greatest volume is

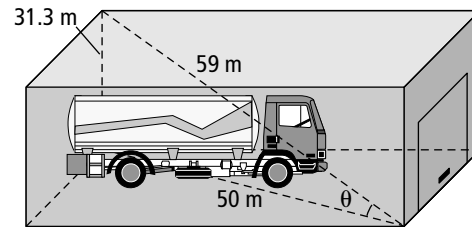
- A 1, 2, 3, 4                      B 2, 1, 3, 4  
 C 4, 2, 1, 3                      D 4, 3, 2, 1

44. If only one type of box is used to fill the truck, which one will waste the least amount of space?

- A Box 1                              B Box 2  
 C Box 3                              D Box 4

Use this information to answer #45.

A truck repair business uses a laser beam security system.



### Numerical Response

45. What angle does the laser beam form with the garage floor, to the nearest degree?

### Written Response

You will need one sheet of grid paper.

Use this information to answer #46a) and b).

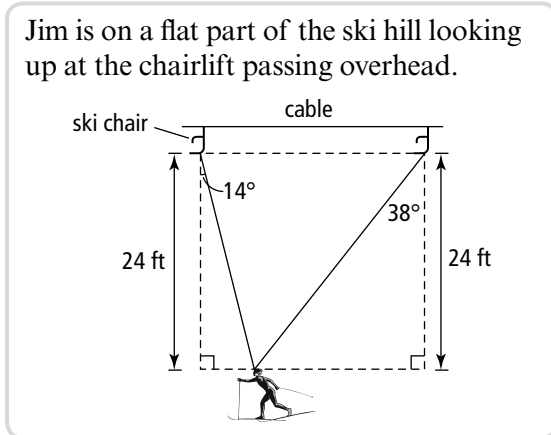
Marmot Basin ski resort in Jasper, Alberta, has the longest high-speed quad chair in the Canadian Rockies. The Canadian Rockies Express takes skiers up a vertical height of 600 m in 8 min.



46. a) Assume that the quad chair moves at a constant speed. What is the rate of change for height and time?

b) Sketch the shape of the graph representing the relationship between height and time.

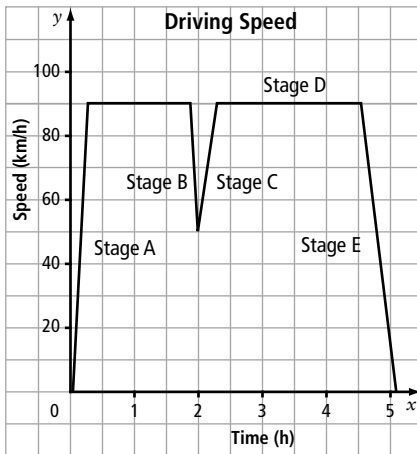
Use this information to answer #46c).



- c) How far apart are the chairs, to the nearest foot? Justify your answer mathematically.

Use this graph to answer #47.

Kelly is driving home from a figure skating event. The graph represents changes in speed during the trip.



47. Describe a possible reason for the changes in speed at each stage.

Use this information to answer #48.

A company introduces a new product,  $B_2$ , which it expects will sell well. The company plans to discontinue selling an older product,  $B_1$ , over a short period of time. Assume that the daily sales of both products are constant. The situation can be represented using a system of linear equations.

$$B_1: 3m + \frac{3}{2}P = 6$$

$$B_2: P = 3m - 1$$

In the equations,  $P$  represents profit, in thousands of dollars, and  $m$  represents the number of months of sales.

48. a) Solve the system graphically. Label the lines as  $B_1$  and  $B_2$ .  
 b) Verify your solution algebraically.  
 c) After how many months can product  $B_1$  be discontinued?  
 d) Explain the meaning of the  $y$ -intercept for  $B_2$ .

Use this information to answer #48e).

In his first attempts, the business manager records the following systems of equations to represent the two products.

**Trial 1**

$$B_1: \frac{-3}{2}m = -3P + 4.5$$

$$B_2: 2m - 4P = -6$$

**Trial 2**

$$B_1: 3m = \frac{6}{5}P + 2$$

$$B_2: \frac{1}{5}P = \frac{1}{2}m - \frac{2}{3}$$

- e) The manager realizes that these systems of equations do not provide the needed solutions. Explain how many solutions each system has. Give a reason why the solutions cannot be applied to new product sales.