

1

Example of an appropriate method

System of equations representing the situation

$x$ : cost of one chicken wing, in dollars

$y$ : cost of one pizza, in dollars

$$\begin{array}{l}
 y = 17x \\
 12\left(5x + \frac{1}{2}y\right) = 64.80
 \end{array}
 \Rightarrow
 \begin{array}{l}
 y = 17x \\
 60x + 6y = 64.80
 \end{array}$$

Solving the system of equations

$$\begin{aligned}
 60x + 6(17x) &= 64.80 \\
 60x + 102x &= 64.80 \\
 162x &= 64.80 \\
 x &= 0.40
 \end{aligned}$$

Since  $x = 0.40$ ,

$$\begin{aligned}
 y &= 17(0.40) \\
 &= 6.80
 \end{aligned}$$

Cost of the order with one more pizza

Cost of the order + Cost of a pizza

$$\$64.80 + \$6.80$$

\$71.60

**Answer:** If Fran adds one more pizza to her original order, the new total cost of the order is **\$71.60**.

**Note:** Students who use an appropriate system of equations in order to represent the situation have shown that they have a partial understanding of the problem.

Written information is considered unclear if students do not correctly define the variables they used in their solution.

2 The coordinates of points P and Q are P(7, 24) and Q(13, 48).

3 Example of an appropriate method

**System of equations representing the situation**

$x$ : price of a cucumber plant, in dollars

$y$ : price of a tomato plant, in dollars

$$3x + 6y = 25.50$$

$$2x + 5y + 4.50 = 24.50$$

Solving the system of equations

$$3x + 6y = 25.50$$

$$2x + 5y = 20.00$$

$$5(3x) + 5(6y) = 5(25.50)$$

$$6(2x) + 6(5y) = 6(20.00)$$

$$15x + 30y = 127.50$$

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$$12x + 30y = 120.00$$

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$$3x = 7.50$$

$$x = 2.50$$

If  $x = 2.50$ , then  $3(2.50) + 6y = 25.50$

$$7.50 + 6y = 25.50$$

$$6y = 18$$

$$y = 3$$

Total cost that should be indicated on Vince's receipt

Total cost

$$1x + 4y$$

$$1(2.50) + 4(3)$$

\$14.50

**Answer:** The total cost indicated on Vince's receipt should be **\$14.50**.

**Note:** Students who use an appropriate system of equations in order to represent the situation have shown that they have a partial understanding of the problem.

Written information is considered unclear if students do not correctly define the variables they have used.

4 Example of an appropriate method

Equation of the parabola

The equation of the parabola is in the form  $y = a(x - h)^2 + k$ . Given the symmetry observed in the table of values,  $h = -2$  and  $k = 2$ .

$$y = a(x + 2)^2 + 2$$

$$6 = a(0 + 2)^2 + 2$$

$$4 = 4a$$

$$1 = a$$

$$y = (x + 2)^2 + 2 \quad \text{or} \quad y = x^2 + 4x + 6$$

Points of intersection of the line and the parabola

$$x^2 + 4x + 6 = 2x + 21$$

$$x^2 + 2x - 15 = 0$$

$$(x + 5)(x - 3) = 0$$

$$x = -5 \text{ or } x = 3$$

$$\text{If } x = -5 \text{ then } y = 2(-5) + 21 = 11$$

$$\text{If } x = 3 \text{ then } y = 2(3) + 21 = 27$$

Answer: The coordinates of the points of intersection are P(-5, 11) and Q(3, 27).

**Note:** Students who use an appropriate method in order to determine the equation of the parabola have shown that they have a partial understanding of the problem.

Mrs. Nassif

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Example of an appropriate method

### Coordinates of point P

$$\text{If } x = 0 \text{ then } y = 4(0)^2 - 40(0) + 101 = 101$$

$$P(0, 101)$$

### Coordinates of point S

The x-coordinate of the vertex of the parabola:

$$\frac{-b}{2a} = \frac{-(-40)}{2 \times 4} = 5$$

The y-coordinate of the vertex of the parabola:

$$\frac{4ac - b^2}{4a} = \frac{4 \times 4 \times 101 - (-40)^2}{4 \times 4} = 1$$

$$S(5, 1)$$

### Slope of the line passing through P and S

$$\text{slope: } \frac{101 - 1}{0 - 5} = -20$$

### y-intercept of the line passing through P and S

The  $y$ -intercept of the line is the same as that of the parabola (i.e. 101).

**Answer** The equation of the line passing through points P and S is  $y = -20x + 101$ .

**Note** Students who correctly or incorrectly determine the coordinates of point P or the coordinates of point S have shown that they have a partial understanding of the problem.



6 Example of an appropriate solution

If they are to minimize the length of the new trail, they must make the two trails perpendicular to each other.

$$\text{Slope of segment AB: } \frac{0 - 30}{12 - 0} = \frac{-30}{12} = \frac{-5}{2}$$

$$\text{Equation of the line representing trail AB: } y = \frac{-5}{2}x + 30$$

$$\text{Slope of new segment: } \frac{2}{5}$$

Equation of the line representing the new trail

$$y = \frac{2}{5}x + b$$

$$17 = \frac{2}{5}(40) + b$$

$$1 = b$$

$$y = \frac{2}{5}x + 1$$

Coordinates of the point of intersection

This system of equations must be solved

$$y = \frac{2}{5}x + 1 \quad \text{and} \quad y = \frac{-5}{2}x + 30$$

$$\frac{2}{5}x + 1 = \frac{-5}{2}x + 30$$

$$\frac{29}{10}x = 29$$

$$x = 10$$

$$y = 5$$

Answer The coordinates of the point of intersection P should be (10, 5).

7 D

8 Example of an appropriate solution

Let  $x$ : speed of the airplane in km/h

Let  $y$ : wind speed in km/h

System of equations

$$\frac{x}{1800} - \frac{y}{1800} = \frac{1}{3.6} \quad \text{or} \quad x - y = 500$$

$$\frac{x}{1800} + \frac{y}{1800} = \frac{1}{3} \quad \text{or} \quad x + y = 600$$

Solving the system of equations

$$x - y = 500$$

$$x + y = 600$$

$$2x = 1100$$

$$x = 550 \text{ (speed of the airplane in km/h)}$$

$$y = 50 \quad \text{(wind speed in km/h)}$$

Answer The wind speed is 50 km/h.

9

Work : (example)

Given  $d$  : the number of deer

$t$  : the number of trout

The system of equations that represents the situation

$$15d = t$$

$$4(d + t) = 128$$

Solution of the system of equations

$$60d - 4t = 0$$

$$4d + 4t = 128$$

and  $64d = 128$

where  $d = 2$  and  $t = 30$

Result : The maximum number of deer ( $d$ ) allowed is 2.

The maximum number of trout ( $t$ ) allowed is 30.

10 Work : (example)

Let  $x$  : represent the number of white balls

$y$  : represent the number of green balls

$x$  : represent the number of yellow balls

The system of equations

$$2x + y = 120$$

$$y + 20 = 2x$$

Solution of the system of equations

$$2x + y = 120$$

$$2x - y = 20$$

$$4x = 140$$

$$x = 35 \quad \text{and} \quad y = 50$$

Result : The number of white and yellow balls is 35 each and the number of green balls is 50.

11 750 agendas.

12 Work : (example)

Translate this situation by a system of equations.

Given  $x$  : number of km travelled at 70 km/h

$y$  : number of km travelled at 100 km/h

She travelled 39 km.

therefore  $x + y = 39$  km (1)

Change 27 minutes into hours

60 minutes = 1 hour

27 minutes =  $t$  hour

$$t = \frac{27}{60} = 0.45 \text{ hours}$$

One part of the trip at 70 km/h and the other at 100 km/h. She arrives after 27 minutes (0.45 h)

$$\text{therefore } \frac{x}{70} + \frac{y}{100} = 0.45(2)$$

Solving the system of equations will allow us to find the number of km to cover at 100 km/h, that is,  $y$ .

$x + y = 39$  is equivalent to  $x = 39 - y$ .

Substitute  $39 - y$  for  $x$  in the 2nd equation.

$$\frac{x}{70} + \frac{y}{100} = 0.45 \text{ becomes } \frac{39 - y}{70} + \frac{y}{100} = 0.45$$

$$\frac{39 - y}{70} + \frac{y}{100} = 0.45$$

$$39 - y + \frac{70y}{100} = 0.45 \times 70$$

$$100(39 - y) + 70y = 0.45 \times 70 \times 100$$

$$3900 - 100y + 70y = 3150$$

$$30y = 750$$

$$y = 25$$

Result : She travels 25 km at a speed of 100 km/h.

14 Work : (example)

Given  $x$  : the number of employees

$y$  : the quantity of goods manufactured

"A company has to double its personnel so that it can triple its output of manufactured goods" can be translated by:

$$2x = 3y \text{ or any other equivalent equation.}$$

... "7 workers were absent and, as a result, they could produce only 80% of their normal output." can be translated by:

$$x - 7 = 80\%y$$

$$\text{or by the equivalent equation } x - 7 = 0.8y$$

Solve the system  $2x - 3y = 0$

$$x - 7 = 0.8y$$

by reduction

$$2 \times (x - 7 = 0,8y)$$

$$-2x \quad = 3y$$

<-->

$$2x \times 14 = 1,6y$$

$$-2x \quad = 3y$$

$$-14 \quad = -1,4y$$



therefore :  $y = 10$

Since  $y = 10$ , replace its value in the equation  $2x = 3y$

this gives  $2x = 3(10)$

$$2x = 30$$

$$x = 15$$

The company currently employs 15 people.

Result : 15 people.

15 Work : (example)

Given  $n$ , the number of students

$s$ , the number of sweaters

System of equations is

$$5n + 20 = s$$

$$6n - 11 = s$$

Solution of the system of equations

$$5n + 20 = 6n - 11$$

$$n = 31$$

$$s = 175$$

Result : The number of students in the group is 31.

The number of sweaters is 175.

Any other complete and acceptable work with the correct result.

16 A

17

The distance between the line and the point is 5.

Mrs. Nassif

Name : \_\_\_\_\_

Group : \_\_\_\_\_

Date : \_\_\_\_\_

568436 - Mathematics

Question Booklet

1

Fran orders chicken wings and pizzas for herself and some friends at a restaurant. The cost of a pizza is 17 times the cost of a chicken wing.

Fran estimates that each person can eat 5 chicken wings and half a pizza. She places an order for 12 people. The total cost of this order is \$64.80.

To ensure that they have enough food, Fran decides to order one more pizza.

If Fran adds one more pizza to her original order, what is the new total cost of the order?

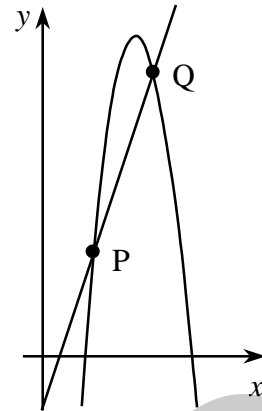
Show all your work.

2 In the Cartesian plane on the right, a parabola and a straight line intersect at points P and Q.

The equation of the parabola is  $y = -x^2 + 24x - 95$ .

The equation of the line is  $4x - y - 4 = 0$ .

What are the coordinates of points P and Q?



- 3 Catherine, Peter and Vince went to the same place to buy plants that they will then transplant to their vegetable gardens. They paid the same price for the same type of plant. Some of the information on each person's receipt is given below.

Catherine's receipt	
3 cucumber plants	_____
6 tomato plants	_____
Total Cost	\$25.50

Peter's receipt	
2 cucumber plants	_____
5 tomato plants	_____
1 green pepper plant	\$4.50
Total Cost	\$24.50

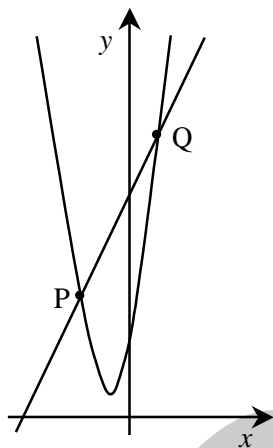
Vince's receipt	
1 cucumber plant	_____
4 tomato plants	_____
Total Cost	?

What should be the total cost indicated on Vince's receipt?

Show all your work.

- 4 Points P and Q are the points of intersection of the line and the parabola drawn in the Cartesian plane on the right.

The equation of the line is  $y = 2x + 21$ .



The following table of values shows the coordinates of different points located on the parabola above.

x	y
-4	6
-3	3
-2	2
-1	3
0	6

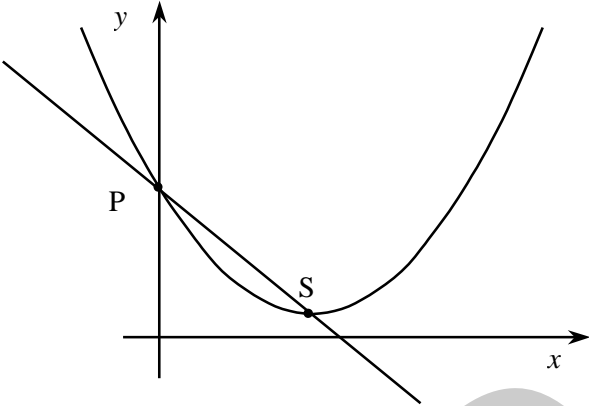
What are the coordinates of the points of intersection P and Q?

Show all your work.

5

The equation of the parabola shown below is  $y = 4x^2 - 40x + 101$ .

Point S is the vertex of this parabola. The parabola intersects the y-axis at point P.



What is the equation of the line passing through points P and S?

Show all your work.



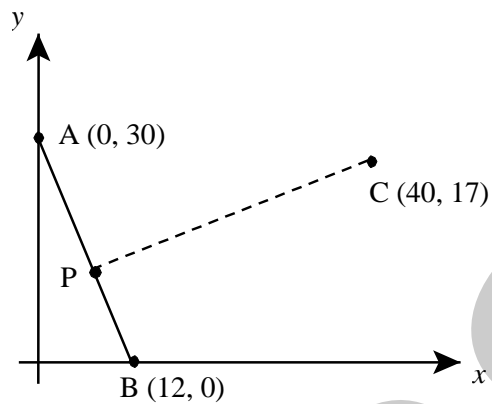
6 In the Cartesian plane on the right, points A, B and C represent the location of three towns. A hiking trail connects towns A and B.

The residents of town C want to build a new trail represented by dotted line PC.

The new trail must be as short as possible.

What should be the coordinates of the point of intersection P?

Show all your work.





9

On Anticosti Island, a tourist guide explained the fishing and hunting regulations to a group of 4 people. The maximum number of trout ( $t$ ) allowed was equal to 15 times the number of deer ( $d$ ) allowed.

At the end of their trip, the guide counted the group's take, which was a total of 128 trout and deer, and stated that each person had brought back the maximum number allowed.

What is the maximum number of deer ( $d$ ) and the maximum number of trout ( $t$ ) allowed per person?

Show your work.

10

There are 120 tennis balls in a bag : some are white, some are green and some are yellow. The number of white balls equals the number of yellow balls. If there were 20 more green balls, the number of green balls would be double the number of white balls.

How many balls of each colour are there in the bag?

Show your work.

11

To finance the year-end party, the graduating students sold agendas which brought in \$3.50 in profit per book.

In addition, they sold all of the pens that the supplier gave them on the basis of one pen for every 3 agendas ordered. Each pen gave them \$1.50 in profit.

How many agendas did they sell if they accumulated \$3000 in profit?



15

A group of students has to sell a certain number of sweaters in order to raise money for an extra-curricular activity. If each student were to take five sweaters to sell, there would be 20 sweaters left over. However if each student were to take 6 sweaters there would be 11 sweaters missing.

How many students are in the group and how many sweaters are for sale?

Show all your work.

16

The base of a rectangle is 4 cm greater than its height. If 17 is added to the perimeter of this rectangle, the resulting number is the same as the area of the rectangle.

Given  $x$  : the height of the rectangle

$y$  : the area of the rectangle

What system of equations represents this situation?

A)  $y = x^2 + 4x$

$y = 4x + 25$

B)  $y = x(x + 4)$

$y = x^2 + 4x + 17$

C)  $y = 4x + 25$

$y = 4x + 17$

D)  $y = x^2 + 4x$

$y = 2x + 21$

17

Find the distance between line  $l : 4x - 3y + 1 = 0$  and point  $P (-5, 2)$