

Firrhill High

Mathematics Department

Level 5

Assessment Questions

# Simultaneous Equations

**(1) 2010 Paper 1 Q.7**

A straight line has equation  $y = mx + c$ , where  $m$  and  $c$  are constants.

(a) The point  $(2, 7)$  lies on this line.

Write down an equation in  $m$  and  $c$  to illustrate this information.

(b) A second point  $(4, 17)$  also lies on this line.

Write down another equation in  $m$  and  $c$  to illustrate this information.

(c) Hence calculate the values of  $m$  and  $c$ .

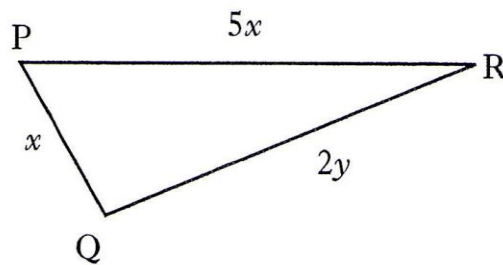
(d) Write down the gradient of this line.

KU	RE
1	
1	
	3
	1

**(2) 2009 Paper 1 Q.9**

In triangle PQR:

- $PQ = x$  centimetres
- $PR = 5x$  centimetres
- $QR = 2y$  centimetres.



(a) The perimeter of the triangle is 42 centimetres.

Write down an equation in  $x$  and  $y$  to illustrate this information.

(b) PR is 2 centimetres longer than QR.

Write down another equation in  $x$  and  $y$  to illustrate this information.

(c) Hence calculate the values of  $x$  and  $y$ .

KU	RE
2	
	2
	3

(3) 2008 Paper 2 Q.4

Aaron saves 50 pence and 20 pence coins in his piggy bank.

Let  $x$  be the number of 50 pence coins in his bank.

Let  $y$  be the number of 20 pence coins in his bank.



(a) There are 60 coins in his bank.

Write down an equation in  $x$  and  $y$  to illustrate this information.

(b) The total value of the coins is £17.40.

Write down another equation in  $x$  and  $y$  to illustrate this information.

(c) Hence find **algebraically** the number of 50 pence coins Aaron has in his piggy bank.

KU	RE
1	
1	
	3

(4) 2007 Paper 1 Q.11

(a) A cinema has 300 seats which are either standard or deluxe.

Let  $x$  be the number of standard seats and  $y$  be the number of deluxe seats.

Write down an algebraic expression to illustrate this information.

(b) A standard seat costs £4 and a deluxe seat costs £6.

When all the seats are sold the ticket sales are £1380.

Write down an algebraic expression to illustrate this information.

(c) How many standard seats and how many deluxe seats are in the cinema?

1	
2	
	3

(5) 2006 Paper 1 Q.9

Euan plays in a snooker tournament which consists of 20 games.

He wins  $x$  games and loses  $y$  games.

(a) Write down an equation in  $x$  and  $y$  to illustrate this information.

(b) He is paid £5 for each game he wins and £2 for each game he loses.

He is paid a **total** of £79.

Write down another equation in  $x$  and  $y$  to illustrate this information.

(c) How many games did Euan **win**?

KU	RE
1	
	2
	3

(6) 2004 Paper 1 Q.8

7, -2, 5, 3, 8

In the sequence above, each term after the first two terms is the sum of the previous two terms.

For example: 3rd term = 5 = 7 + (-2)

(a) A sequence follows the above rule.

The first term is  $x$  and the second term is  $y$ .

The fifth term is 5.

$x, y, -, -, 5$

Show that  $2x + 3y = 5$

(b) Using the same  $x$  and  $y$ , another sequence follows the above rule.

The first term is  $y$  and the second term is  $x$ .

The sixth term is 17.

$y, x, -, -, -, 17.$

Write down another equation in  $x$  and  $y$ .

(c) Find the values of  $x$  and  $y$ .

**(7) 2003 Paper 1 Q.7**

Andrew and Doreen each book in at the Sleepwell Lodge.

- (a) Andrew stays for 3 nights and has breakfast on 2 mornings.

His bill is £145.

Write down an algebraic equation to illustrate this.

1

- (b) Doreen stays for 5 nights and has breakfast on 3 mornings.

Her bill is £240.

Write down an algebraic equation to illustrate this.

1

- (c) Find the cost of one breakfast.

3

**(8) 2002 Paper 1 Q.13**

- (a) 4 peaches and 3 grapefruit cost £1.30.

Write down an algebraic equation to illustrate this.

KU	RE
1	
1	
	4

- (b) 2 peaches and 4 grapefruit cost £1.20.

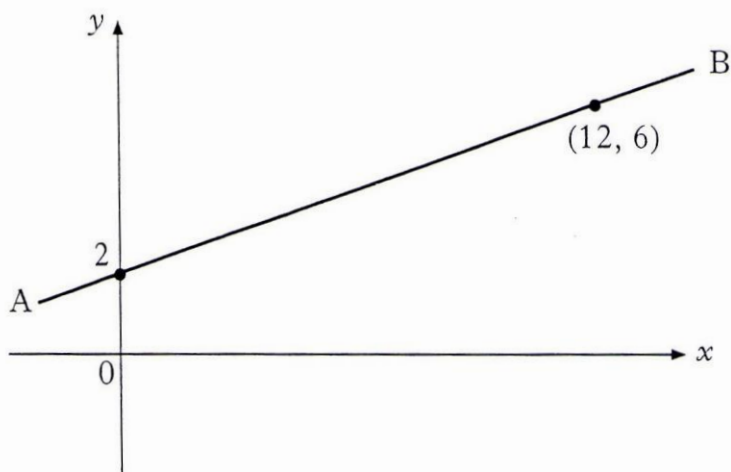
Write down an algebraic equation to illustrate this.

- (c) Find the cost of 3 peaches and 2 grapefruit.

(9) 2001 Paper 2 Q.4

A water pipe runs between two buildings.

These are represented by the points A and B in the diagram below.



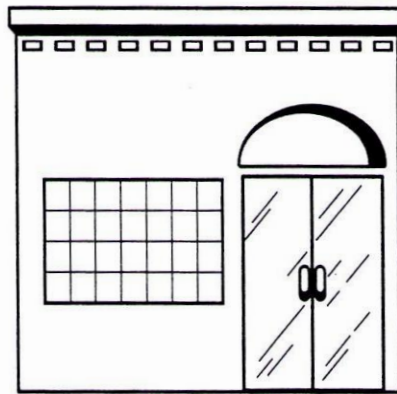
(a) Using the information in the diagram, show that the equation of the line AB is  $3y - x = 6$ .

(b) An emergency outlet pipe has to be built across the main pipe. The line representing this outlet pipe has equation  $4y + 5x = 46$ .

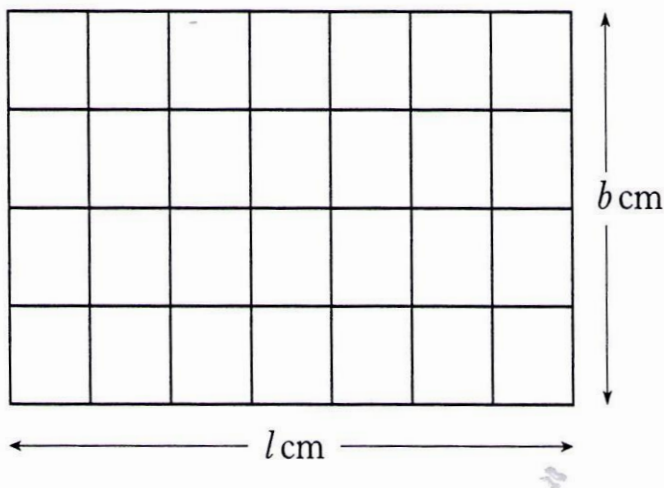
Calculate the coordinates of the point on the diagram at which the outlet pipe will cut across the main water pipe.

KU	RE
3	
	4





A rectangular window has length,  $l$  centimetres and breadth,  $b$  centimetres.



A security grid is made to fit this window. The grid has 5 horizontal wires and 8 vertical wires.

(a) The perimeter of the window is 260 centimetres.

Use this information to write down an equation involving  $l$  and  $b$ .

1

(b) In total, 770 centimetres of wire are used.

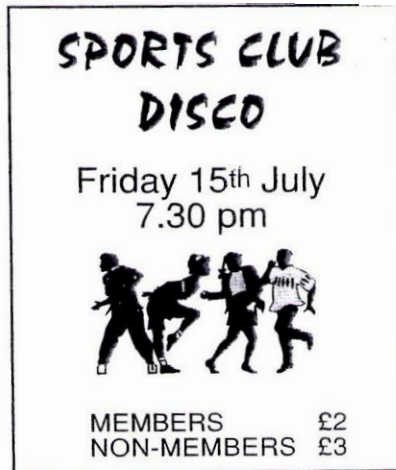
Write down another equation involving  $l$  and  $b$ .

2

(c) Find the length and breadth of the window.

3

(11) 1999 Paper 1 Q.7



The tickets for a Sports Club disco cost £2 for members and £3 for non-members.

(a) The total ticket money collected was £580.

$x$  tickets were sold to members and  $y$  tickets were sold to non-members.

Use this information to write down an equation involving  $x$  and  $y$ .

(b) 250 people bought tickets for the disco.

Write down another equation involving  $x$  and  $y$ .

(c) How many tickets were sold to members?

2

1

3

(12) 1995 Q.15

Alloys are made by mixing metals.

Two different alloys are made using iron and lead.

To make the first alloy, 3 cubic centimetres of iron and 4 cubic centimetres of lead are used.

This alloy weighs 65 grams.

(a) Let  $x$  grams be the weight of 1 cubic centimetre of iron and  $y$  grams be the weight of 1 cubic centimetre of lead.

Write down an equation in  $x$  and  $y$  which satisfies the above condition.

To make the second alloy, 5 cubic centimetres of iron and 7 cubic centimetres of lead are used.

This alloy weighs 112 grams.

(b) Write down a second equation in  $x$  and  $y$  which satisfies this condition.

(c) Find the weight of 1 cubic centimetre of iron and the weight of 1 cubic centimetre of lead.

KU	R <sub>2</sub>
	2
	2
	3



(13) 1997 Q.14

A number tower is built from bricks as shown in figure 1.

The number on the brick above is always equal to the sum of the two numbers below.

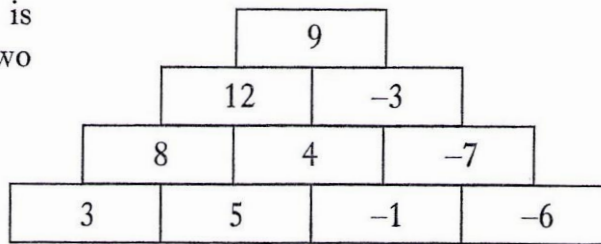


figure 1

- (a) Find the number on the shaded brick in figure 2.

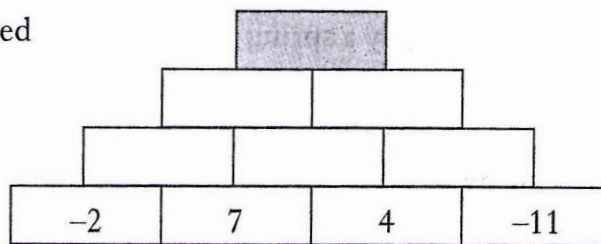


figure 2

- (b) In figure 3, two of the numbers on the base bricks are represented by  $p$  and  $q$ .

Show that  $p + 3q = 10$ .

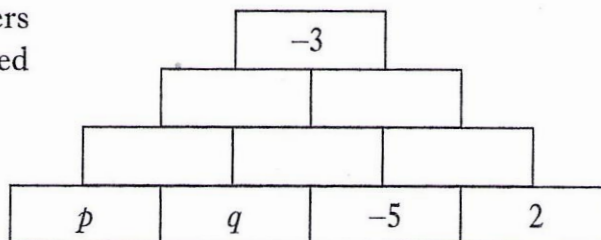


figure 3

- (c) Use figure 4 to write down a second equation in  $p$  and  $q$ .

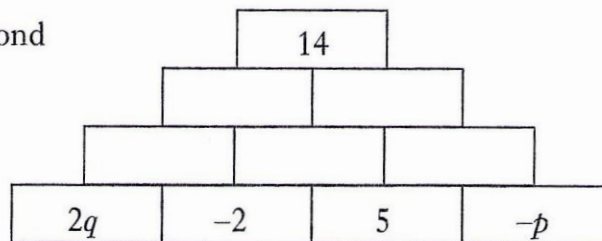


figure 4

- (d) Find the values of  $p$  and  $q$ .

KU	RA
----	----

1

2

2

3



(15) 1994 .Q.15

A large floor is to be covered with black and grey square tiles to make a chequered pattern.

The person laying the tiles must start at the centre of the floor and work outwards.

The instructions are as follows.

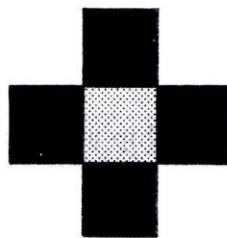
KU	RA

1. Lay a grey tile in the centre of the floor.



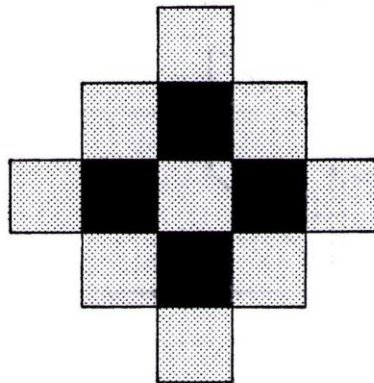
1st Arrangement

2. Place black tiles against the edges of the grey tile.



2nd Arrangement

3. Place grey tiles against the edges of all the black tiles.



3rd Arrangement

4. Place black tiles against the edges of all the grey tiles.

5. And so on . . .

- (a) How many tiles are there in the 4th arrangement?
- (b) The number of tiles,  $T$ , needed to make the  $N$ th arrangement is given by the formula

$$T = 2N^2 + aN + b.$$

Find the values of  $a$  and  $b$ .

2

4

## Answers

1. (a)  $7 = 2m + c$  (b)  $17 = 4m + c$   
(c)  $m = 7/2, c = 0$  (d) gradient =  $7/2$
2. (a)  $6x + 2y = 42$  (b)  $5x - 2y = 2$   
(c)  $x = 4, y = 9$
3. (a)  $x + y = 60$  (b)  $0.5x + 0.2y = 17.40$   
(c) 18 50p coins in the piggy bank
4. (a)  $x + y = 300$  (b)  $4x + 6y = 1380$   
(c) 210 standard and 90deluxe seats
5. (a)  $x + y = 20$  (b)  $5x + 2y = 79$   
(c) Euan wins 13 games
6. (a)  $2x + 3y = 5$  (b)  $5x + 3y = 17$   
(c)  $x = 4, y = -1$
7. (a)  $3n + 2b = 145$  (b)  $5n + 3b = 240$   
(c) One breakfast = £5
8. (a)  $4p + 3g = 1.30$  (b)  $2p + 4g = 1.20$   
(c) £0.92
9. (a)  $c = 2, m = 1/3$  so  $y = 1/3 x + 2 \dots$   
(b) (6,4)
10. (a)  $2l + 2b = 260$  (b)  $5l + 8b = 770$   
(c) length = 90cm, breadth = 40cm