

Simultaneous equations

Exam questions

Foundation and Higher tiers

Please write clearly in block capitals.

Name

Class

Teacher

Time allowed: 100 minutes

Materials

For this booklet you need a black pen, a pencil, a ruler, a rubber and a calculator for Section B.

Instructions

- Use black ink or black ballpoint pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- **Section A** (questions 1 to 13): you must not use a calculator.
- **Section B** (questions 14 to 21): you may use a calculator.
- Do all rough work in this booklet. Cross through any work you do not want marked.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this booklet is 87.

Advice

- Read each question carefully.
- In all calculations, show clearly how you work out your answer.

For teacher's use

Q	Mark	Q	Mark
1		12	
2		13	
3		14	
4		15	
5		16	
6		17	
7		18	
8		19	
9		20	
10		21	
11			
TOTAL			

Section A**You must not use a calculator**Do not
write
outside
the box

- 1** Solve the simultaneous equations

$$3x + y = 19$$

$$x + y = 9$$

You must show your working.

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

[3 marks]**2**

$$2x + y = 7$$

$$x - 3y = 14$$

Circle the values of x and y that fit both equations.

$$x = 3, y = 1 \quad x = 5, y = -3 \quad x = 2, y = -4 \quad x = -1, y = -5$$

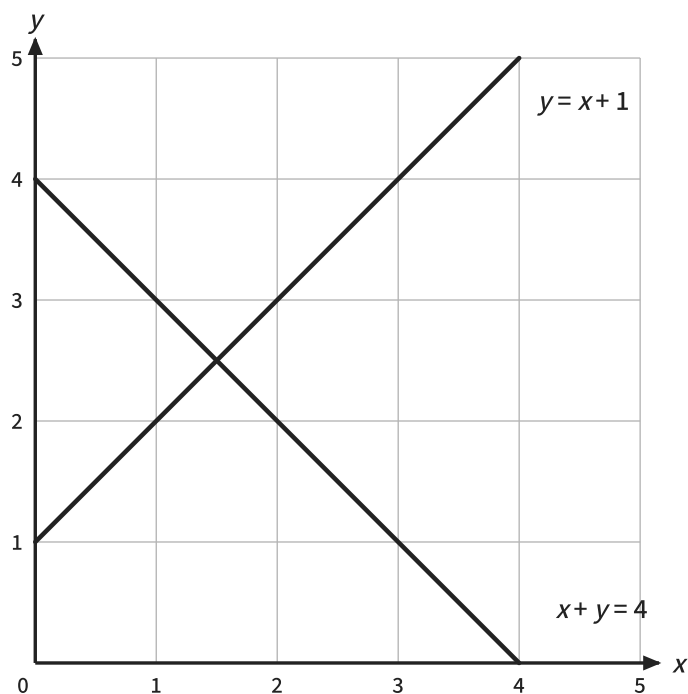
[1 mark]

- 5 The graphs of $y = x + 1$ and $x + y = 4$ are drawn on the grid.

Use the graphs to solve the simultaneous equations

$$y = x + 1$$

$$x + y = 4$$



$x =$ _____ $y =$ _____

[2 marks]

Do not
write
outside
the box

- 6** Ravi solves the simultaneous equations $2x + 3y = 13$ and $2x - y = 1$
Here is the start of his working.

$$2x + 3y = 13$$

$$2x - y = 1$$

$$\text{Subtract: } 2y = 12$$

$$y = 6$$

- (a)** Describe the mistake Ravi makes.

[1 mark]

- (b)** Work out the correct solution.

$$x = \quad \quad \quad y = \quad \quad \quad$$

[2 marks]

- 7** Solve the simultaneous equations

$$5a + 2b = 1$$

$$3a - 5b = 44$$

You must show your working.

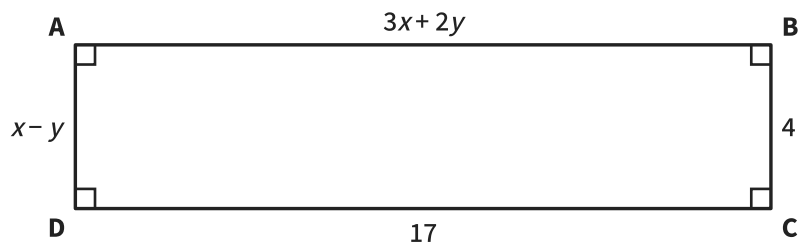
$$a = \quad \quad \quad b = \quad \quad \quad$$

[4 marks]

8

ABCD is a rectangle.
All lengths are in centimetres.

Do not
write
outside
the box



Not drawn accurately

Work out the value of x and the value of y .

$x =$ _____ $y =$ _____

[4 marks]

[5 marks]

Answer m

[5 marks]

11 Solve the simultaneous equations

$$x^2 + y^2 = 34$$

$$y = x + 2$$

You must show your working.

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

[5 marks]

12 A circle has equation $x^2 + y^2 = 9$
A straight line has equation $y = 2x + 7$

Show that the line and the circle do not meet.

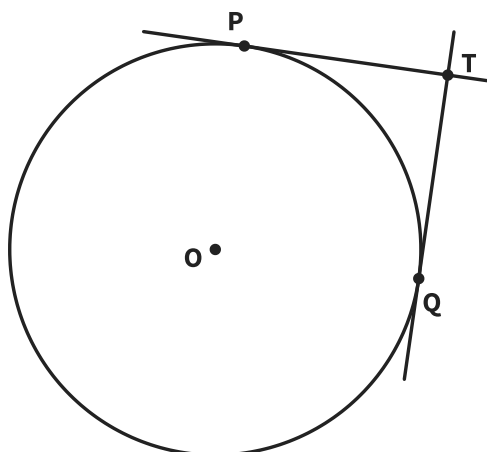
[4 marks]

13

The diagram shows the circle $x^2 + y^2 = 50$

$P(1, 7)$ and $Q(7, -1)$ both lie on the circle.

The tangents to the circle at P and at Q cross at T , outside the circle.



Not drawn accurately

- (a) Work out the coordinates of T .
You must show your working.

Answer _____

[4 marks]

- (b) O is the origin.
Show that the quadrilateral $OPTQ$ is a square.

[2 marks]

Do not
write
outside
the box

Section B

You may use a calculator

Do not
write
outside
the box

- 14** A shop hires out bikes.
The cost is a fixed charge plus an amount for each hour.
Hiring a bike for 3 hours costs £27.60
Hiring a bike for 5 hours costs £39.20

Work out the cost of hiring a bike for 8 hours.

Answer £ _____

[4 marks]

- 15** A theatre sells tickets for seats in the stalls and in the circle.
A stalls ticket costs £24.50
A circle ticket costs £18.75
For one show the theatre sold 420 tickets and took £9341.25

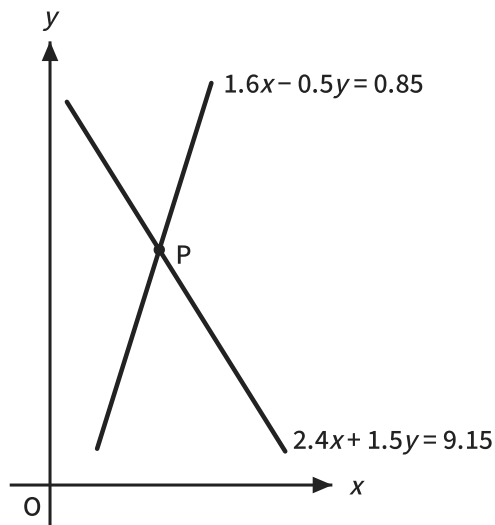
How many stalls tickets did the theatre sell for this show?
You must show your working.

Answer _____

[4 marks]

- 16** The lines with equations $2.4x + 1.5y = 9.15$ and $1.6x - 0.5y = 0.85$ meet at the point P.

- (a) Work out the coordinates of P.
You must show your working.



Not drawn accurately

Answer _____

[4 marks]

- (b) The line $y = kx$ also passes through P.
Work out the value of k .
Give your answer to 3 significant figures.

Answer _____

[1 mark]

17

Ola's electricity bill is made of two parts:

- a standing charge of s pence for each day
- a charge of u pence for each kWh of electricity she uses.

In March (31 days) Ola used 284 kWh of electricity. Her bill was £85.70

In April (30 days) she used 252 kWh. Her bill was £77.34

- (a) Work out the value of s and the value of u .
You must show your working.

$$s = \underline{\hspace{2cm}} \quad u = \underline{\hspace{2cm}}$$

[4 marks]

- (b) In May (31 days) Ola expects to use 230 kWh.
Work out her expected bill for May.

Answer £ $\underline{\hspace{2cm}}$

[1 mark]

18

A jeweller has two silver alloys.

Alloy P is 92.5% silver by mass.

Alloy Q is 80% silver by mass.

She melts some of each alloy together to make 600 g of a new alloy that is 87.5% silver by mass.

Work out the mass of alloy P and the mass of alloy Q that she uses.

You must show your working.

Alloy P _____ g Alloy Q _____ g

[5 marks]

19

Mira travels to college by cycling and then walking.

She always cycles at the same speed and always walks at the same speed.

On Monday she cycles for 45 minutes and walks for 20 minutes. She travels 13.4 km.

On Tuesday she cycles for 30 minutes and walks for 50 minutes. She travels 11.5 km.

Work out Mira's walking speed in km/h.

You must show your working.

Answer _____ km/h

[4 marks]

20

A curve has equation $y = x^2 + px + q$, where p and q are numbers.
The curve passes through the points $(2, 3.6)$ and $(-1.5, 7.1)$

Work out the value of p and the value of q .
You must show your working.

$$p = \underline{\hspace{2cm}} \quad q = \underline{\hspace{2cm}}$$

[4 marks]

21

Solve the simultaneous equations

$$xy = 6$$

$$y = x + 2$$

Give your answers to 2 decimal places.

You must show your working.

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

[5 marks]**END OF QUESTIONS**