

**(Suggested maximum time: 10 minutes)**

$$\text{BMI} = \frac{w}{h^2}$$

(a) (i) Geri is an athlete. Her weight is 77.5 kg and her height is 1.63 m. Work out Geri's **BMI**. Give your answer correct to one decimal place.

- Work out her new **weight**. Give your answer in kg, correct to one decimal place.

[illegible]

- 



**Justification:**

**Question 2** (Suggested maximum time: 5 minutes)

**Question 2** (Suggested maximum time: 5 minutes)

A sports shop buys t-shirts for €25 and sells them for €49.

- (a) (i) Find the **mark up** for the t-shirts (profit as a percentage of cost price).

- (ii) Find the **margin** for the t-shirts (profit as a percentage of selling price). Give your answer correct to the nearest percent.

[illegible]

- (b)** The shop also sells runners, at a **mark up** of 50%.  
Find the **margin** for these runners. Give your answer correct to the nearest percent.

This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form a uniform pattern of small squares across the entire surface. There are no margins, text, or other markings on the paper.

**Question 3** (Suggested maximum time: 5 minutes)

**Question 3** (Suggested maximum time: 5 minutes)

- (a)** Write 868 million in the form  $a \times 10^n$ , where  $n \in \mathbb{Z}$  and  $1 \leq a < 10, a \in \mathbb{R}$ .

- (b)** During the Apollo-11 mission, it took approximately 1.3 seconds for a radio signal to travel 380 000 km.

Find the **average speed** of the radio signal, in km per minute. Give your answer in the form  $a \times 10^n$ , where  $n \in \mathbb{Z}$ , and where  $1 \leq a < 10$  is correct to two decimal places.

- (c)** In 2016, a spacecraft flew around Jupiter, 868 million km from earth.

Find how many minutes it would take a radio signal to travel 868 million km.

Assume that the radio signal would travel at the same speed as your answer to part (b).

### Question 4

**(Suggested maximum time: 5 minutes)**

*Fruitex* and *Juicy* are two drinks.

- (a) A shop buys cartons of *Fruitex* from the UK.  
In December 2015, the exchange rate was  $\text{€}1 = \text{£}0.7241$ .  
The shop bought *Fruitex* for  $\text{£}380$ .

Find the price of the *Fruitex* in euro (€). Give your answer correct to the nearest cent.

- (b)** *Fruitex* and *Juicy* are each made from mixing fruit juice and water. In *Fruitex*, the ratio of fruit juice to water is 3:7.

- (i) Find how many litres of fruit juice are in 20 litres of *Fruitex*.

20 litres of *Fruitex* is mixed with 40 litres of *Juicy*.

In this 60-litre **mixture**, the ratio of fruit juice to water is 7: 8.

- (ii)** Find the ratio of fruit juice to water in *Juicy*. Give your answer in its simplest form.

**(Suggested maximum time: 10 minutes)**

**(a)** Pete has saved €20 to begin with. He saves a further €12 each week.

- Pete's total savings after  $n$  weeks:

--

- Write an expression in  $n$  for the **total** amount of money Maeve will have saved after  $n$  weeks.

Maeve's total savings after  $n$  weeks:

--

- 
- This image shows a full page of blank graph paper. The grid consists of small, uniform squares formed by thin, light gray lines. There are no margins, text, or other markings on the page.

**Question 6****(Suggested maximum time: 15 minutes)**

Each of the students in sixth year in a particular school has WhatsApp ( $W$ ), Instagram ( $I$ ), or Snapchat ( $S$ ). The numbers who have each app are as follows:

36 students have WhatsApp

40 students have Instagram

54 students have Snapchat

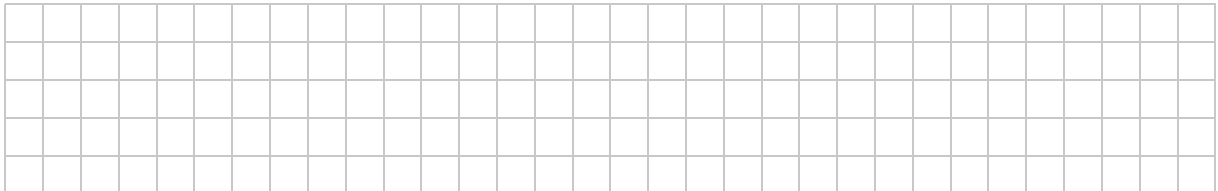
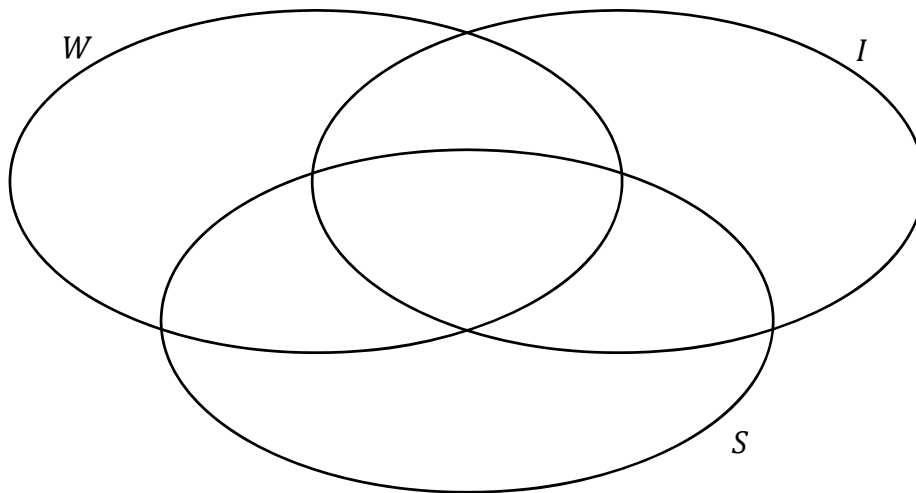
14 students have WhatsApp and Instagram

24 students have Instagram and Snapchat

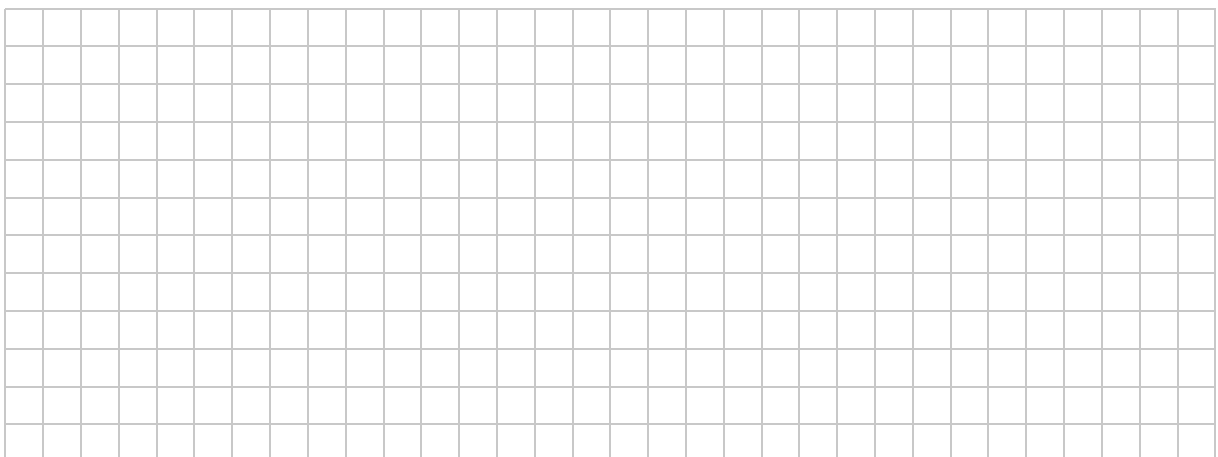
$x$  students have WhatsApp and Snapchat, but **not** Instagram

8 students have all three apps.

- (a)** Use this information to fill in the Venn diagram below, in terms of  $x$ .



- (b)** There are 80 students in total in sixth year in the school.  
Find the value of  $x$ .

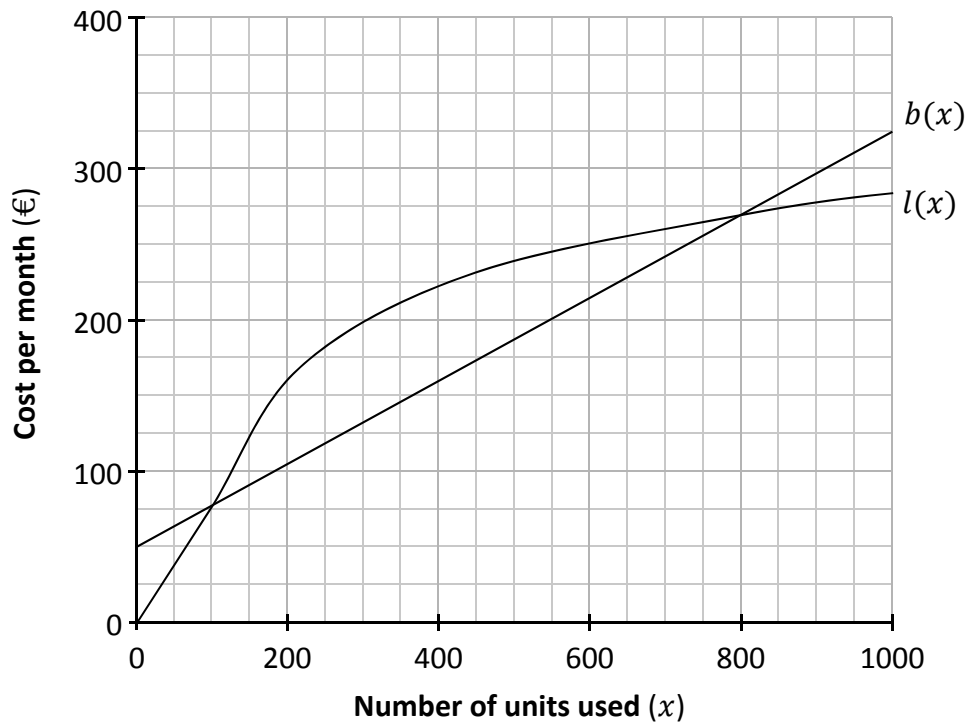




**Question 8** (Suggested maximum time: 15 minutes)

**Question 8** (Suggested maximum time: 15 minutes)

A school can get its electricity from one of two companies, *Buzz* or *Lecky*. The graphs below show the cost of the electricity per month from each company, if the school uses  $x$  units of electricity. The cost from *Buzz* is  $b(x)$ , and the cost from *Lecky* is  $l(x)$ .



One of the companies charges a fixed fee each month, plus a fee for each unit of electricity used.

- (a) State which company charges **no** fixed fee.  
Give a reason for your answer, based on the graph.

[illegible]

- (b)** Write down the **domain** and the **range** of the function  $b(x)$ , as shown on the diagram.

Domain =

--

Range =

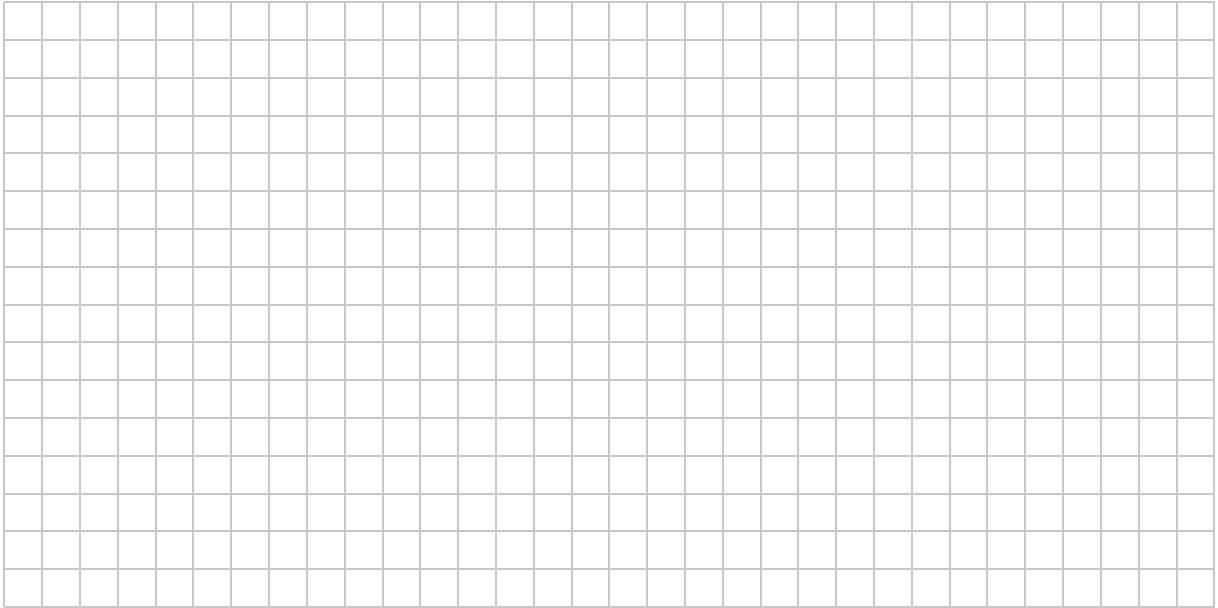
--



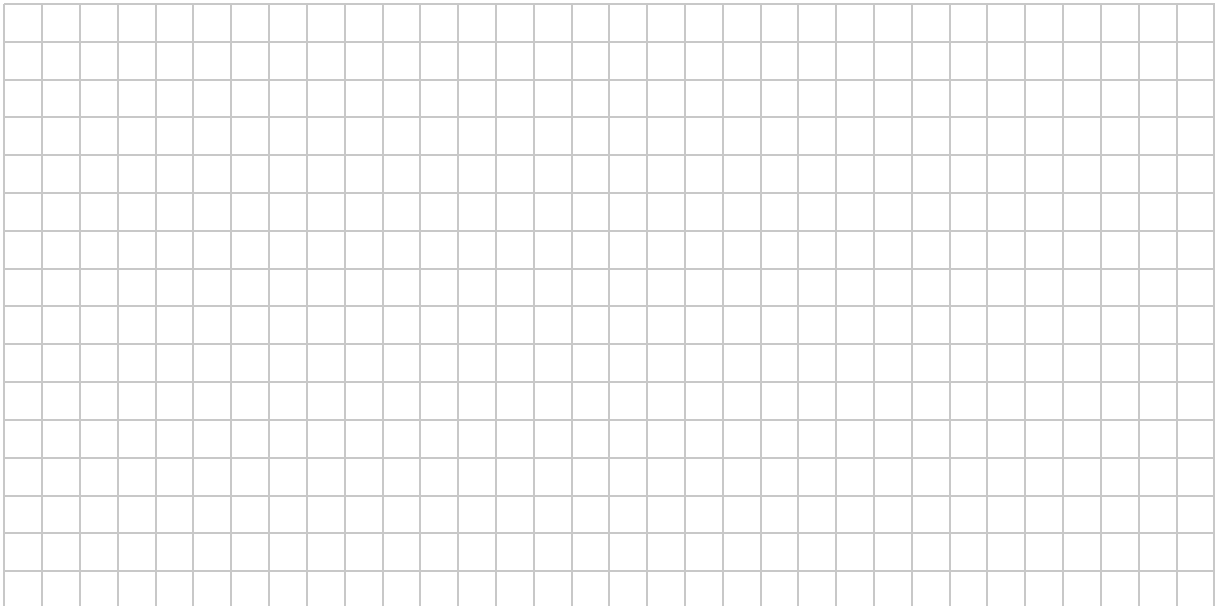


**Question 9****(Suggested maximum time: 15 minutes)**

- (a)** Solve the equation  $x^2 - 2x - 4 = 0$ . Give your answers in the form  $a \pm \sqrt{b}$ , where  $a, b \in \mathbb{N}$ .



- (b)** Given that  $(\sqrt{d})^2 = d$ , multiply out and simplify  $(c + \sqrt{d})^2$ .



- Complete** the table by writing “Yes” or “No” into each box.
- One row is already done for you: 16 is an element of  $\mathbb{N}$ ,  $\mathbb{Z}$ , and  $\mathbb{Q}$ , but not of  $\mathbb{R} \setminus \mathbb{Q}$ .

		$\mathbb{N}$	$\mathbb{Z}$	$\mathbb{Q}$	$\mathbb{R} \setminus \mathbb{Q}$
Number	16	Yes	Yes	Yes	No
	$\sqrt{6}$				
	$\frac{2}{3}$				
	$-4$				

**(Suggested maximum time: 5 minutes)**

(a)  $2^3 \times 2^5 \times 2^{10}$

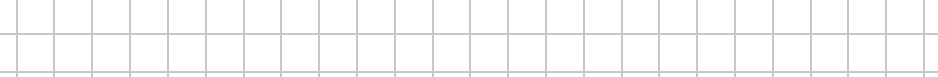
[illegible]

### Question 11

**(Suggested maximum time: 5 minutes)**

- (a) In a particular **linear** sequence, the second term is 40 and the sixth term is 116. Fill in the boxes below to show the rest of the first six terms of this sequence.

,  ,  ,  ,  ,



- (b)** Orla is asked to write down a **quadratic** sequence. She writes down the following:

5,          6,          9,          14,          22,          30,          41

Exactly **one** of the terms in Orla's sequence is incorrect.

Write down the correct quadratic sequence in the spaces below.

You may only change **one** of the terms in Orla's sequence.

This image shows a full page of blank graph paper. The grid consists of thin, light gray horizontal and vertical lines that intersect to form a uniform pattern of small squares across the entire surface. There are no margins, text, or other markings on the paper.

**Correct Sequence:**

	,		,		,		,	
--	---	--	---	--	---	--	---	--

### Question 12

**(Suggested maximum time: 20 minutes)**

- (a) Factorise  $n^2 - 11n + 18$ .

[illegible]

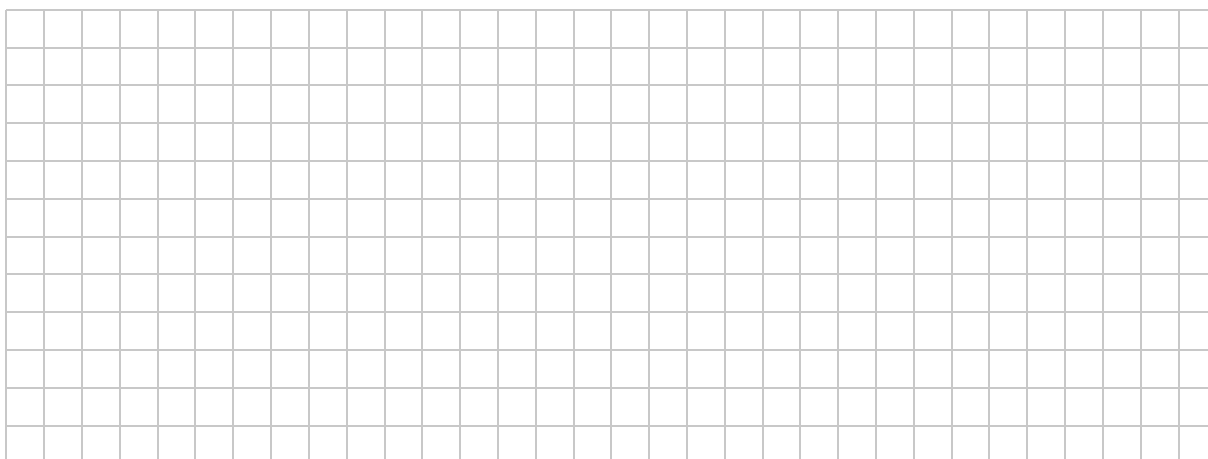
- (b)** Factorise fully  $wy - y - 1 + w$ .

[illegible]

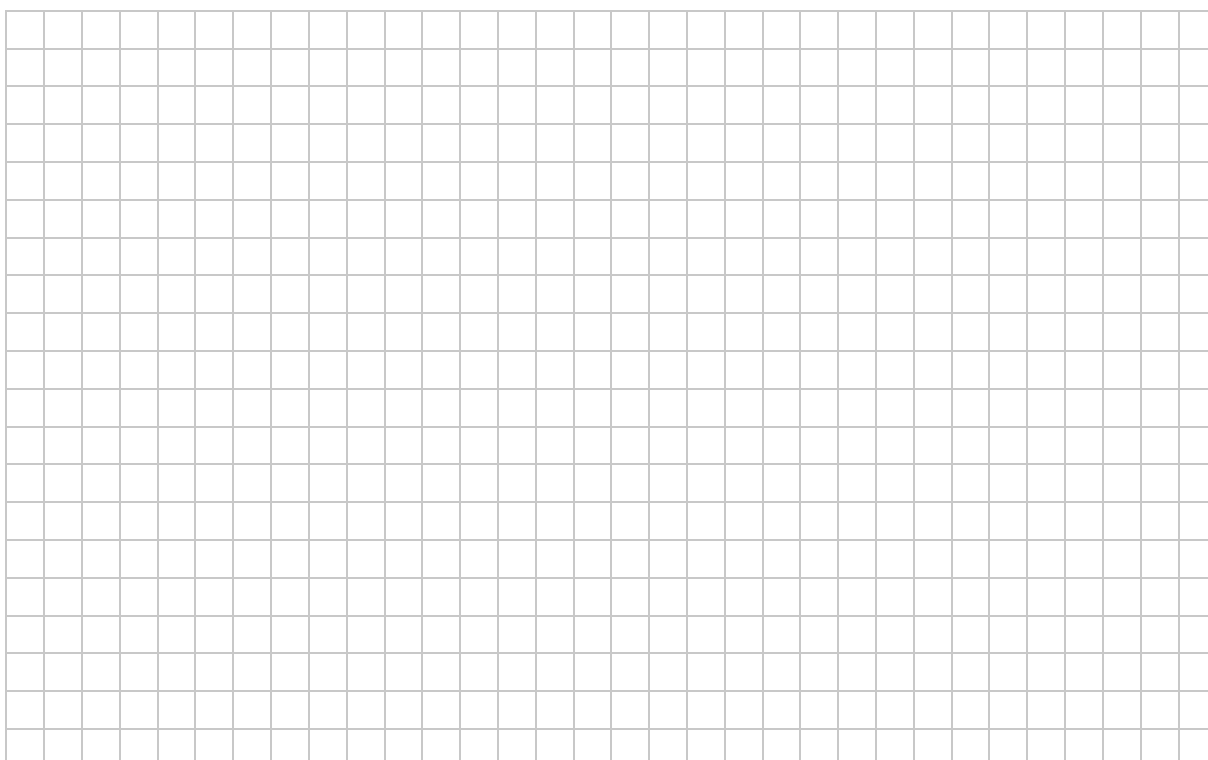
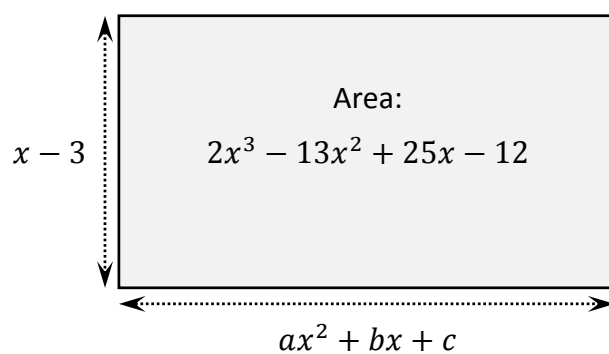
- (c) Find the value of  $\frac{5}{3x-2} - \frac{7}{6x-12}$ , when  $x = 4$ .

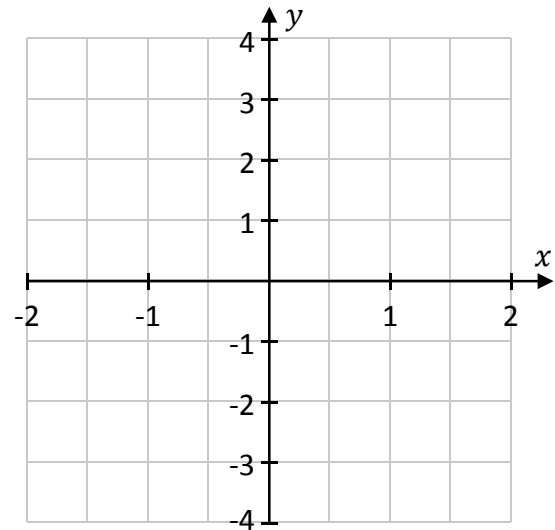
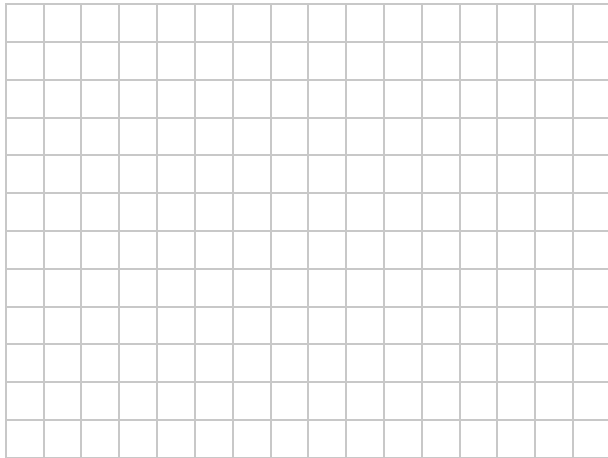
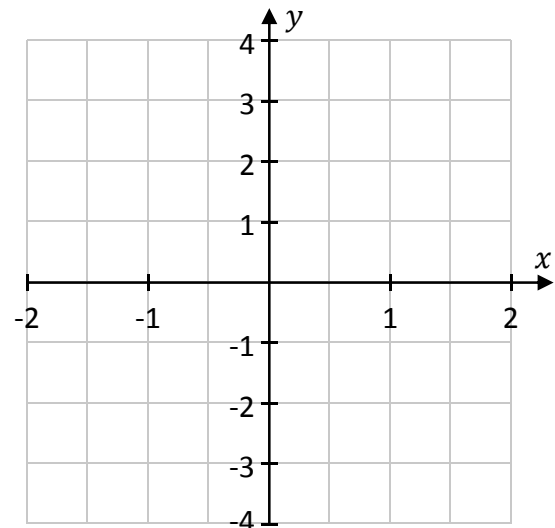
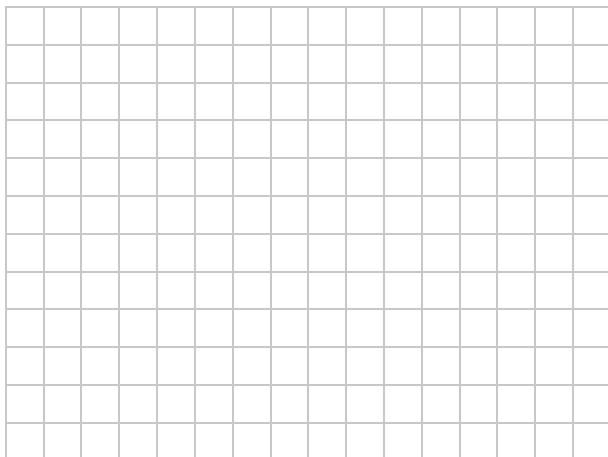
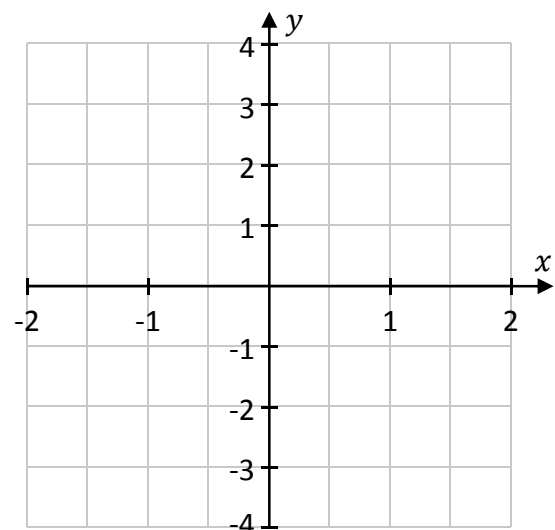
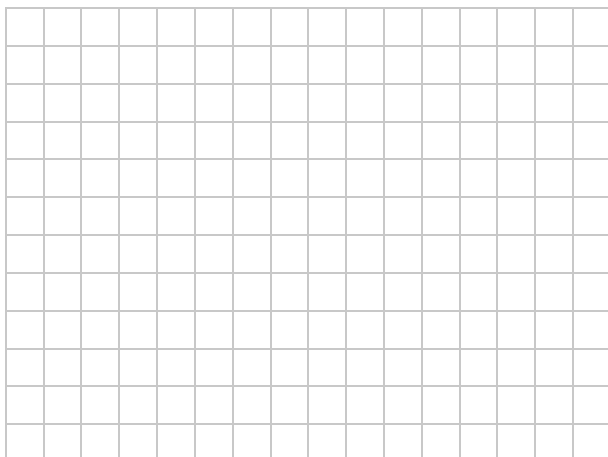
*This question continues on the next page.*

- (d) Use factorisation to simplify  $\frac{4e^2-9}{2e^2+3e-9}$ .



- (e) A rectangle has sides of length  $x - 3$  units and  $ax^2 + bx + c$  units, where  $a, b, c \in \mathbb{Z}$ . The **area** of the rectangle is  $2x^3 - 13x^2 + 25x - 12$  square units. Find the value of  $a$ , the value of  $b$ , and the value of  $c$ .



**Question 13****(Suggested maximum time: 10 minutes)****Draw** each of the following three functions in the domain  $-2 \leq x \leq 2$ , for  $x \in \mathbb{R}$ .**Function:**  $y = x - 1$ **Function:**  $y = 2 - x^2$ **Function:**  $y = 2^x$ 

previous

page

running

**Question 14** (Suggested maximum time: 10 minutes)

**Question 14** (Suggested maximum time: 10 minutes)

The table below shows some information about regular polygons.

These are shapes where all of the angles are the same size.

<b>Number</b> of angles in the polygon	<b>Part (a)</b> <b>Sum</b> of the angles	<b>Part (c)</b> <b>Size of each</b> angle
3	180°	60°
4	360°	
5		
6		

- (a)** The **sum** of the angles increases in a **linear** pattern.

Complete the column in the table above showing the sum of the angles in each of these shapes.

[illegible]

- (b)** Find a **formula** for the **sum** of the angles in a regular polygon with  $n$  angles.

Remember that these values follow a linear pattern.

- (c) Complete the column in the table above showing the **size of each** angle in each of these shapes. Remember that, in each polygon, all of the angles are the same size.



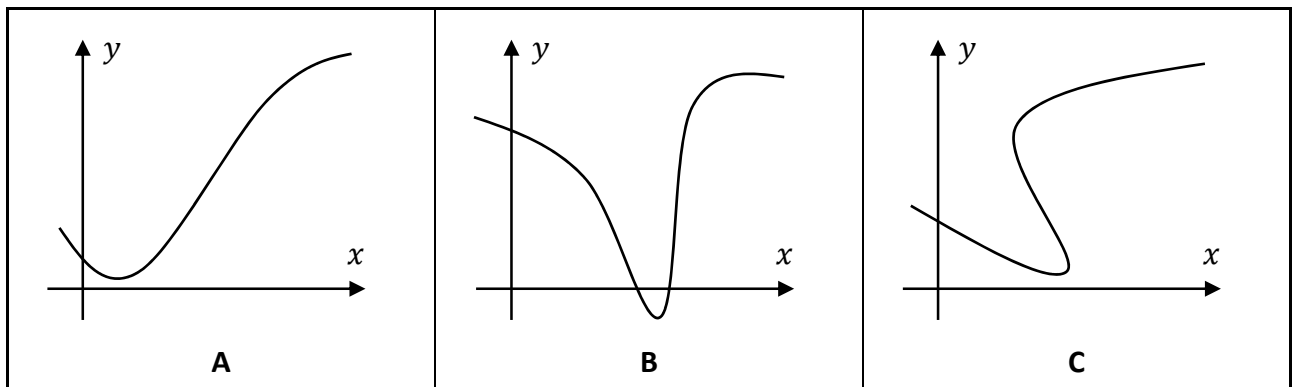
**(d)** Find a **formula** for the **size of each** angle in a regular polygon with  $n$  angles.

### Question 15

**(Suggested maximum time: 5 minutes)**

The three curves **A**, **B**, and **C** are shown in the co-ordinate diagrams below.

Two of the curves show a function of  $x$ .



Put a tick (✓) in the correct box to show which curve does **not** show a function of  $x$ .

Give a reason for your answer.

Curve which is **not** a function of  $x$ :

(tick **one** box only)

**A**



**B**



**C**



Reason:

[illegible]