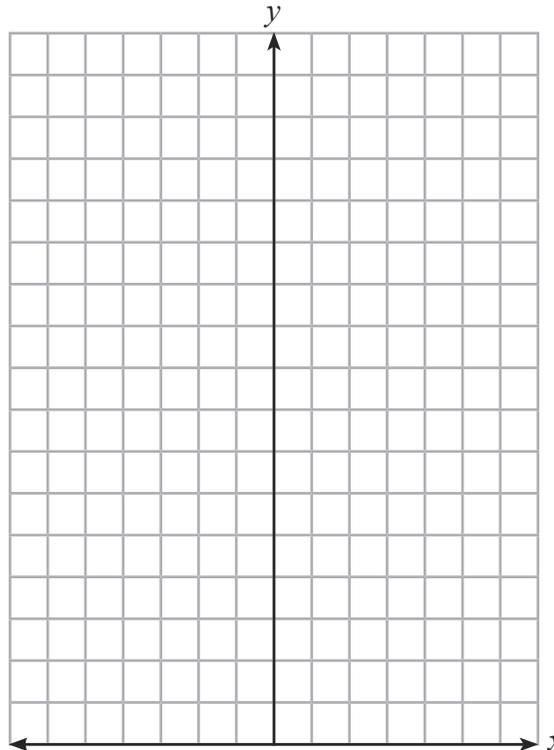


a
Two buses leave the bus station at 7am
Bus A returns to the station every 27 minutes, whereas bus B returns every 45 minutes. At what time will they next return at the same time?

b
In 2015, the population of a town was 357 000. By the end of 2016, the population had increased by 12%. Find the population at the end of 2016.

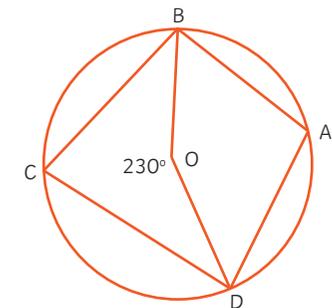
c
Simplify $\frac{a^{\frac{2}{5}} \times a^{\frac{3}{4}}}{a^{\frac{7}{20}}}$

d
Draw the graph of 2^x for the values $-4 \leq x \leq 4$.



e
The diagram shows a circle, centre O. The points A, B, C and D all lie on the circumference of the circle and angle BOD is 230° .

Find the size of angle BCD, giving reasons for every stage of your working.



f
The list shows the ages of 11 children.
Find the interquartile range of the ages.

9, 7, 11, 13, 10, 15, 13, 17, 12, 10, 8

a
Work out $(3.1 \times 10^6) - (2.4 \times 10^5)$,
leaving your answer in standard form.

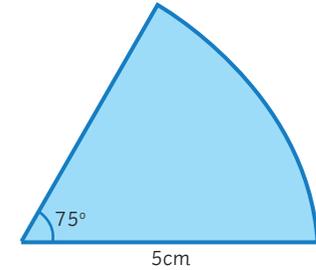
c
The functions $f(x)$ and $g(x)$ are given by
the following:

$$f(x) = 3x + 2$$

$$g(x) = 2x + 1$$

Find the value of $gf(2)$.

e
The diagram shows a sector of a circle
with radius 5cm. Find the area of the
sector, giving your answer correct to 3
significant figures.



b
Write $0.7\dot{2}\dot{5}$ as a fraction. Show all your
working.

d
Prove that the sum of three consecutive
integers is always a multiple of 3.

f
A biased coin is flipped twice.

The probability of the coin landing on tails
is 0.4. Find the probability the coin lands
on tails twice.

a Write the following numbers in order of size, starting with the smallest.

$0.23, \frac{7}{25}, 2.03 \times 10^{-1}, 2^{-2}$

b Solve

$\frac{3(2a - 5)}{4a} = 4$

c Solve the simultaneous equations:

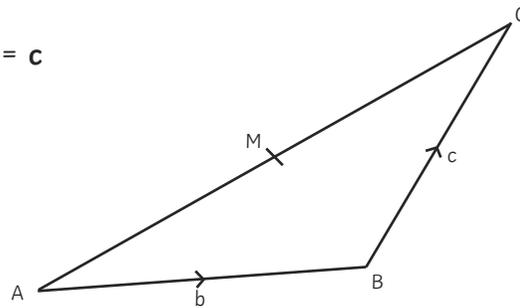
$3x + 4y = 2$

$4x + 3y = 5$

d ABC is a triangle. M is the midpoint of AC.

$\vec{AB} = b$

$\vec{BC} = c$



Express BM in terms of b and c.

e The table shows the ages of 30 staff members.

Age, x , years	Frequency
$16 \leq x < 20$	5
$20 \leq x < 24$	7
$24 \leq x < 40$	12
$40 \leq x < 60$	6

i) Write down the modal class.

ii) Find an estimate for the mean age of the staff members.

f The table shows the probabilities of picking a chocolate at random from a bag.

Fairy Milk	Sneakers	Snars Bar	Kit Kit
x	$2x$	$6x$	x

Form and solve an equation to find the probabilities of picking each of the chocolate bars.

Work out, without using a calculator:

i) $-7.5 \div 1.5$

ii) -0.3×-0.47

iii) $(-\frac{1}{4})^2$

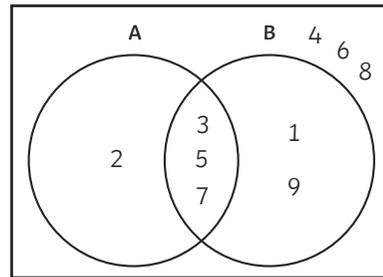
a

Look at the Venn diagram. Write down the numbers that are in set:

i) $A \cap B$

ii) A'

iii) One of the numbers is chosen at random. Find the probability the number is in set $A \cup B$.



c

A piece of iron has a density of 8g/cm^3 and mass of 1.7kg .

Find the volume of the piece of iron in cm^3 . Give your answer correct to 3 significant figures.

e

Eleanor thinks of a number, x , multiplies it by 3 and then adds 4.

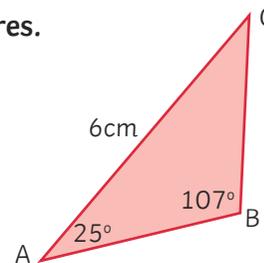
Given that her answer is 6, form and solve an equation to find the value of x .

b

Factorise $2x^2 + 9x + 10$

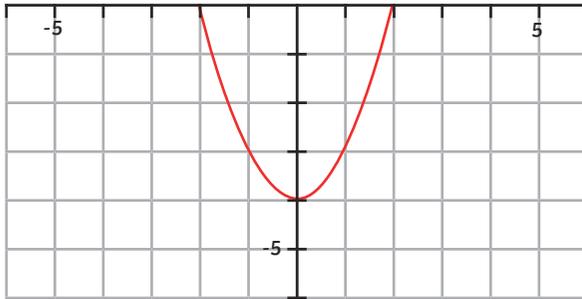
f

For the given triangle, work out the length of BC, giving your answer correct to 3 significant figures.



d

a
By drawing two triangles and a rectangle, estimate the area between the curve $y = x^2 - 4$ and the x -axis.



c
Expand $(3x + 2)(x + 4)(x - 1)$

e
There are 450 students in a school, 210 of whom are girls. Find the percentage of students in the school who are girls. Give your answer correct to 3 significant figures.

b
Using the iterative formula

$$x_{n+1} = \sqrt{28 - x_n}$$

with $x_0 = 4$, find the values of x_1 , x_2 and x_3 .

d
Find the n th term of the sequence:

3, 6, 11, 18, 27

f
A piece of string measures 72.3cm correct to 3 significant figures. Find the lower bound of the length of the piece of string.

Solve the simultaneous equations:

$$x^2 + y^2 = 10$$

$$y = x + 4$$

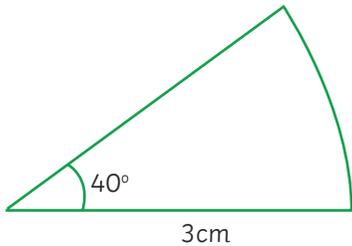
a

i) Write the expression $x^2 + 8x - 5$ in the form $(x + a)^2 + b$ where a and b are integers.

ii) Hence write down the turning point of the graph $y = x^2 + 8x - 5$.

c

The diagram shows a sector of a circle. Find the perimeter of the sector, giving your answer correct to 3 significant figures.



b

Ben and Georgie share some sweets in the ratio $7:5$. If Georgie gets 10 fewer sweets than Ben, work out how many sweets both children get.

d

Simplify $(3x^{\frac{1}{8}}y^{\frac{2}{7}})^3$

e

The table shows the ages of 40 employees. Draw a histogram to represent the data.

Age, x , years	Frequency
$16 \leq x < 20$	6
$20 \leq x < 26$	12
$26 \leq x < 30$	7
$30 \leq x < 40$	10
$40 \leq x < 60$	5

A large grid for drawing a histogram, consisting of 10 columns and 15 rows.

f

a

Two buses leave the bus station at 7am
 Bus A returns to the station every 27 minutes, whereas bus B returns every 45 minutes. At what time will they next return at the same time?

9:15am

b

In 2015, the population of a town was 357 000. By the end of 2016, the population had increased by 12%. Find the population at the end of 2016.

399 840

c

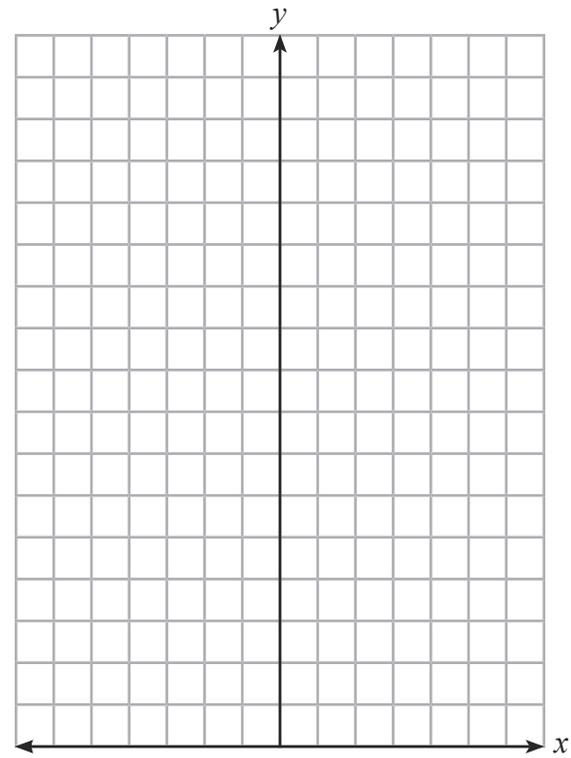
Simplify $\frac{a^{\frac{2}{5}} \times a^{\frac{3}{4}}}{a^{\frac{7}{20}}}$

$a^{\frac{4}{5}}$

d

Draw the graph of 2^x for the values $-4 \leq x \leq 4$.

Correctly drawn exponential graph passing through (0,1)



e

The diagram shows a circle, centre O. The points A, B, C and D all lie on the circumference of the circle and angle BOD is 230° .

Find the size of angle BCD, giving reasons for every stage of your working.

EITHER:

The other side of BOD is 130° because angles around a point add up to 360° . Then BCD is 65° because the angle at the centre is double the angle at the circumference.

OR:

Angle BAD is 115° because the angle at the centre is double the angle at the circumference. Then BCD is 65° because opposite angles in a cyclic quadrilateral add to 180° .

f

The list shows the ages of 11 children. Find the interquartile range of the ages.

9, 7, 11, 13, 10, 15, 13, 17, 12, 10, 8

$13 - 9 = 4$

a
Work out $(3.1 \times 10^6) - (2.4 \times 10^5)$,
leaving your answer in standard form.

$$2.86 \times 10^6$$

c
The functions $f(x)$ and $g(x)$ are given by
the following:

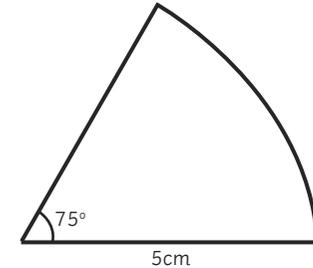
$$f(x) = 3x + 2$$

$$g(x) = 2x + 1$$

Find the value of $gf(2)$.

$$17$$

e
The diagram shows a sector of a circle
with radius 5cm. Find the area of the
sector, giving your answer correct to 3
significant figures.



$$16.4\text{cm}^2$$

b
Write $0.7\dot{2}\dot{5}$ as a fraction. Show all your
working.

$$n = 0.7\dot{2}\dot{5}$$

$$1000n = 725.\dot{2}\dot{5}$$

$$10n = 7.\dot{2}\dot{5}$$

$$990n = 718$$

$$\frac{718}{990} = \frac{359}{495}$$

d
Prove that the sum of three consecutive
integers is always a multiple of 3.

Let n be any integer. Then the next two
consecutive integers are $n + 1$ and $n + 2$.

The sum is $n + n + 1 + n + 2 = 3n + 3$.

This can be written as $3(n + 3)$ which is
a multiple of 3.

f
A biased coin is flipped twice.

The probability of the coin landing on tails
is 0.4. Find the probability the coin lands
on tails twice.

$$0.16$$

a
Write the following numbers in order of size, starting with the smallest.

$0.23, \frac{7}{25}, 2.03 \times 10^{-1}, 2^{-2}$

$2.03 \times 10^{-1}, 0.23, 2^{-2}, \frac{7}{25}$

b
Solve

$$\frac{3(2a - 5)}{4a} = 4$$

$a = -1.5$

c
Solve the simultaneous equations:

$$3x + 4y = 2$$

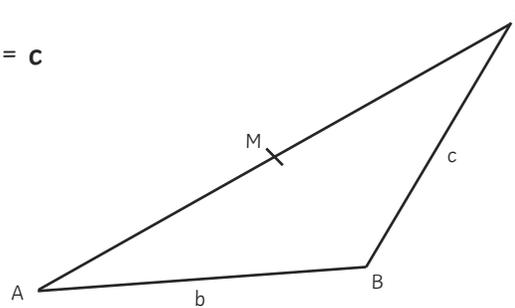
$$4x + 3y = 5$$

$x = 2, y = -1$

d
ABC is a triangle. M is the midpoint of AC.

$$\vec{AB} = b$$

$$\vec{BC} = c$$



Express BM in terms of b and c.

$BM = 0.5(c - b)$

e
The table shows the ages of 30 staff members.

Age, x, years	Frequency
$16 \leq x < 20$	5
$20 \leq x < 24$	7
$24 \leq x < 40$	12
$40 \leq x < 60$	6

i) Write down the modal class.

$24 \leq x < 40$

ii) Find an estimate for the mean age of the staff members.

30.9 (3sf)

f
The table shows the probabilities of picking a chocolate at random from a bag.

Fairy Milk	Sneakers	Snars Bar	Kit Kit
0.1	0.2	0.6	0.1

Form and solve an equation to find the probabilities of picking each of the chocolate bars.

$$10x = 1$$

So $x = 0.1$

a

Work out, without using a calculator:

i) $-7.5 \div 1.5$

ii) -0.3×-0.47

iii) $(-\frac{1}{4})^2$

b

Eleanor thinks of a number, x , multiplies it by 3 and then adds 4.

Given that her answer is 6, form and solve an equation to find the value of x .

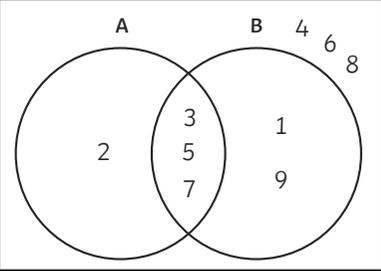
c

Look at the Venn diagram. Write down the numbers that are in set:

i) $A \cap B$

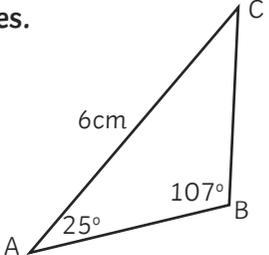
ii) A'

iii) One of the numbers is chosen at random. Find the probability the number is in set $A \cup B$.



d

For the given triangle, work out the length of BC, giving your answer correct to 3 significant figures.



e

A piece of iron has a density of 8g/cm^3 and mass of 1.7kg .

Find the volume of the piece of iron in cm^3 . Give your answer correct to 3 significant figures.

f

Factorise $2x^2 + 9x + 10$

a
By drawing two triangles and a rectangle, estimate the area between the curve $y = x^2 - 4$ and the x -axis.

10 units² for lines drawn at -1 and 1

Other rectangles will need to be considered on a case-by-case basis.

c
Expand $(3x + 2)(x + 4)(x - 1)$

$$3x^3 + 11x^2 - 6x - 8$$

e
There are 450 students in a school, 210 of whom are girls. Find the percentage of students in the school who are girls. Give your answer correct to 3 significant figures.

46.7%

b
Using the iterative formula

$$x_{n+1} = \sqrt{28 - x_n}$$

with $x_0 = 4$, find the values of x_1 , x_2 and x_3 .

$$x_1 = 4.89\dots,$$

$$x_2 = 4.80\dots,$$

$$x_3 = 4.81\dots$$

d
Find the n th term of the sequence:

3, 6, 11, 18, 27

$$n^2 + 2$$

f
A piece of string measures 72.3cm correct to 3 significant figures. Find the lower bound of the length of the piece of string.

72.25cm

Solve the simultaneous equations:

$$x^2 + y^2 = 10$$

$$y = x + 4$$

$$x = -1, \quad y = 3$$

$$x = -3, \quad y = 1$$

a

i) Write the expression $x^2 + 8x - 5$ in the form $(x + a)^2 + b$ where a and b are integers.

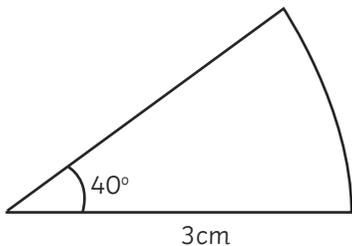
$$(x + 4)^2 - 21$$

ii) Hence write down the turning point of the graph $y = x^2 + 8x - 5$.

$$(-4, -21)$$

c

The diagram shows a sector of a circle. Find the perimeter of the sector, giving your answer correct to 3 significant figures.



$$8.09\text{cm}$$

b

Ben and Georgie share some sweets in the ratio 7:5. If Georgie gets 10 fewer sweets than Ben, work out how many sweets both children get.

Ben gets 35 Georgie gets 25

d

Simplify $(3x^{\frac{1}{8}} y^{\frac{2}{7}})^3$

$$27x^{\frac{3}{8}} y^{\frac{6}{7}}$$

e

The table shows the ages of 40 employees. Draw a histogram to represent the data.

Histogram with following frequency densities:

Age, x , years	Frequency Density
$16 \leq x < 20$	1.5
$20 \leq x < 26$	2
$26 \leq x < 30$	1.75
$30 \leq x < 40$	1
$40 \leq x < 60$	0.25

f