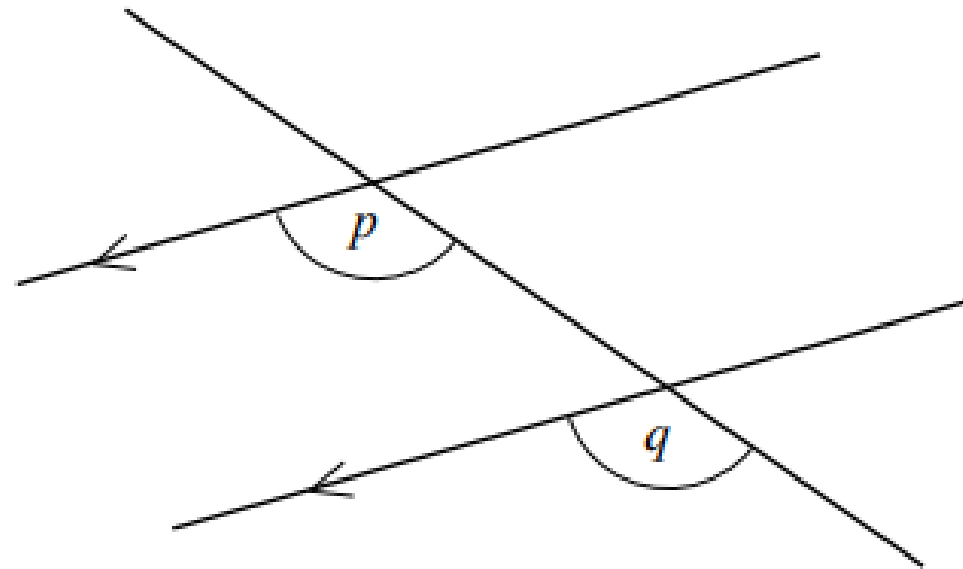


**Maths**  
**ReviSiON!**  
**FOR YEAR 11**

Paper 3 Higher  
Predicted Topics  
Revision Session  
*Monday 11<sup>th</sup> June 2018*

**G3** understand and use alternate and corresponding angles on parallel lines; *colloquial terms such as Z angles are not acceptable and should not be used*



The diagram shows a pair of parallel lines, crossed by a third straight line.

What word describes the pair of angles  $p$  and  $q$ ?

Circle your answer.

**[1 mark]**

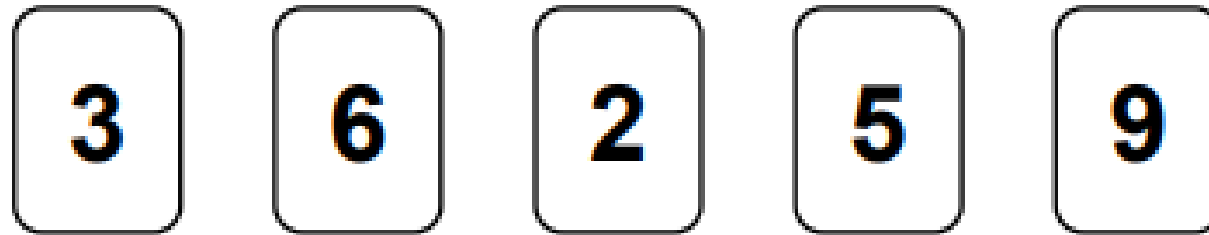
alternate

corresponding

exterior

reflex

N5 apply systematic listing strategies including use of the product rule for counting



I have these five cards. I am going to use them to make a five digit number.

In how many ways can I do this?

Circle your answer.

**[1 mark]**

5

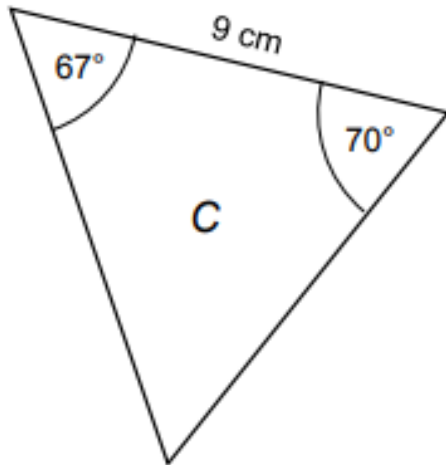
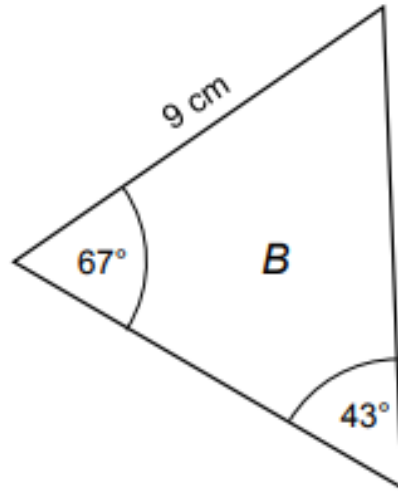
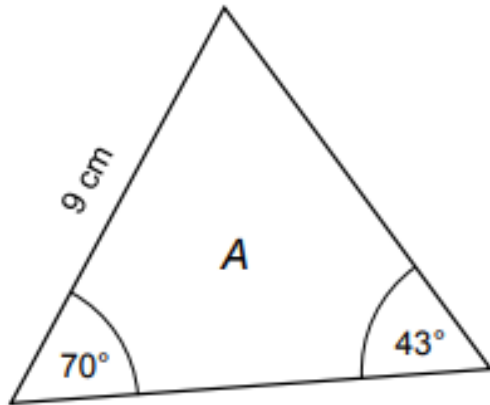
10

25

120

G5 use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)

Here are three triangles, *A*, *B* and *C*.



Not drawn accurately

Which of the following statements is correct?

Tick a box

Only triangles *A* and *B* are congruent.

Only triangles *A* and *C* are congruent.

Only triangles *B* and *C* are congruent.

Triangles *A*, *B* and *C* are all congruent.

[1 mark]

**N7** calculate with roots, and with integer indices

**N9** calculate with and interpret standard form  $A \times 10^n$ , where  $1 \leq A < 10$  and  $n$  is an integer

Which of the following is equal to  $\sqrt{4 \times 10^{2k}}$  ?

Circle your answer.

**[1 mark]**

$2 \times 10^k$

$4 \times 10^k$

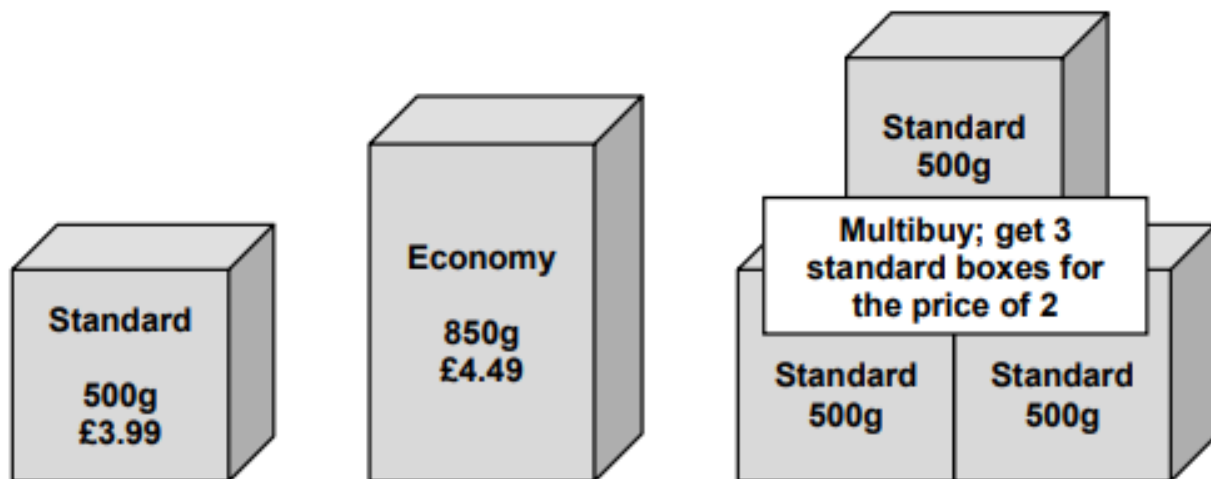
20

$2 \times 10^{2k}$

R6 apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations) *including better value or best-buy problems*

R11 use compound units such as speed, rates of pay, unit pricing *including making comparisons*

Soap powder is sold in three sizes.



Which of the three offers for boxes of box soap powder is the best value for money?

Tick a box.

You must show your working out.

[4 marks]

Standard.

Economy.

Multibuy.

**A6** know the difference between an equation and an identity

The identity  $a(x + 2) - x \equiv 3x + 8$  is true for all values of  $x$ .

Find the value of  $a$ .

**[2 marks]**

A4 simplify and manipulate algebraic expressions (including those involving surds and algebraic fractions) by expanding products of two or more binomials

Expand and simplify

$$(2x + 7)(x - 3)(x + 2).$$

**[3 marks]**



**R5** divide a given quantity into two parts in a given part : part or part : whole ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)

Concrete is made from a mixture of cement, gravel and sand.

I want to make as much concrete as possible.

The cement, gravel and sand must be in the ratio 1 : 4 : 3.

I have the following amounts of each.

cement	gravel	sand
800 kg	3 tonnes	2100 kg

How much concrete can I make?

**[4 marks]**

**S4** interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers)

A machine is designed to cut pieces of wood to a length of 2.4 metres.

The lengths to which it cuts 40 pieces of wood in a sample were recorded.

Length ( $x$ cm)	Frequency		
$230 < x \leq 235$	5		
$235 < x \leq 240$	18		
$240 < x \leq 245$	14		
$245 < x \leq 250$	3		

Work out an estimate of the mean length of a piece of wood cut by the machine.

Give your answer to the nearest millimetre.

**[4 marks]**

In 2016 the population of the United Kingdom was 64.9 million.

The table shows the population in each country of the United Kingdom

Country	Population
England	53.0 million
Northern Ireland	2.4 million
Scotland	5.8 million
Wales	3.7 million

**R9** express one quantity as a percentage of another

In 2016, what percentage of the population of the United Kingdom lived in Scotland?

**[2 marks]**

**R9** work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics

Between 1966 and 2016, the population of England increased by 31%.

What was the population of England in 1966?

**[2 marks]**

**A17** solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation

Solve

$$\frac{x}{2} + 2 = \frac{x + 1}{3} .$$

You must show your working.

**[3 marks]**

**A5** rearrange formulae to change the subject

Rearrange the expression

$$z = \frac{w - 4}{w + 7}$$

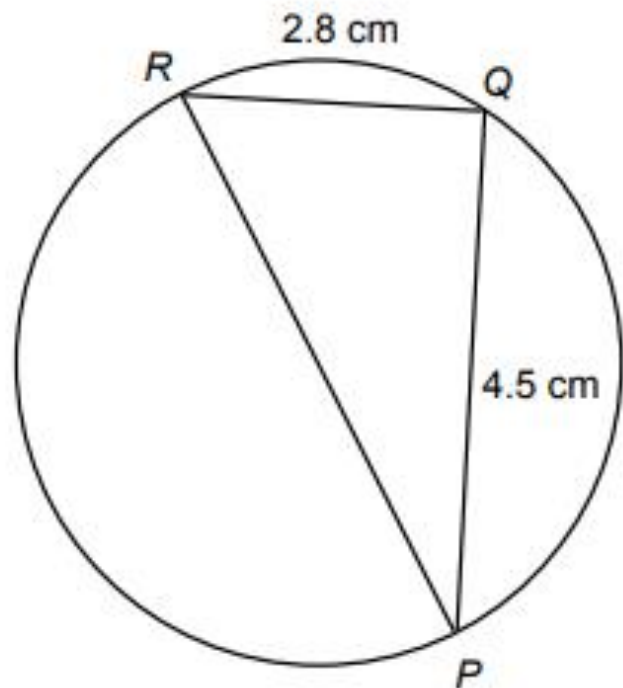
to make  $w$  the subject.

**[3 marks]**

G17 surface area and volume of spheres, pyramids, cones and composite solids

G10 apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results

G20 know the formula for Pythagoras' theorem,  $a^2 + b^2 = c^2$  and apply to find angles and lengths in right-angled triangles in two dimensional figures



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$PQR$  is a triangle whose vertices lie on a circle.

$PR$  is a diameter of the circle.

Find the area of the circle.

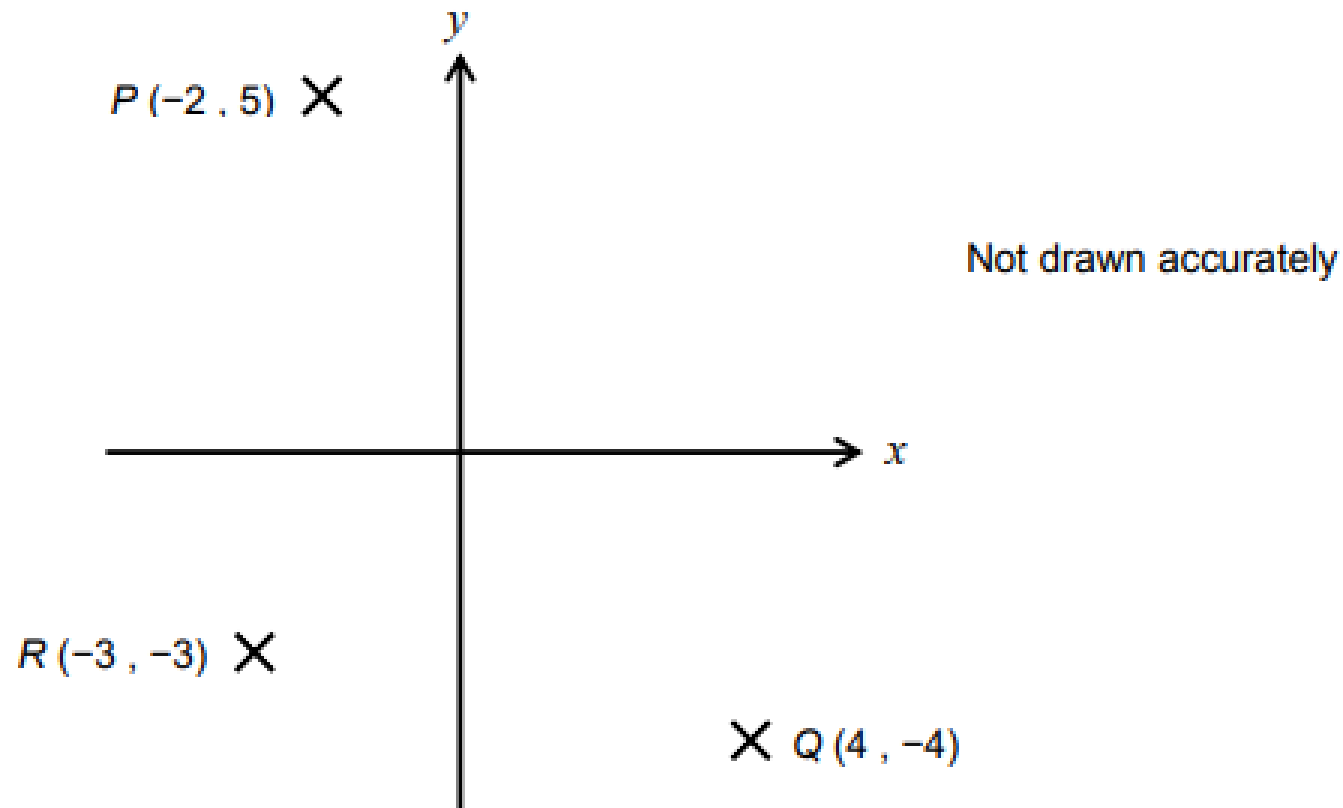
**[4 marks]**

A6 argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments to include proofs

Use algebra to prove the difference between the squares of any two consecutive positive integers is equal to the sum of the two integers.

**[3 marks]**

**A9** find the equation of the line through two given points, or through one point with a given gradient; use the form  $y = mx + c$  to identify perpendicular lines



On the diagram, point  $P$  has co-ordinates  $(-2, 5)$ , point  $Q$  has co-ordinates  $(4, -4)$  and point  $R$  has co-ordinates  $(-3, -3)$ .

Find the equation of the straight line that is perpendicular to  $PQ$  and passes through point  $R$ .

**[4 marks]**



A18 solve quadratic equations algebraically by completing the square and by using the quadratic formula

Solve the equation  $x^2 + 6x - 5 = 0$ .

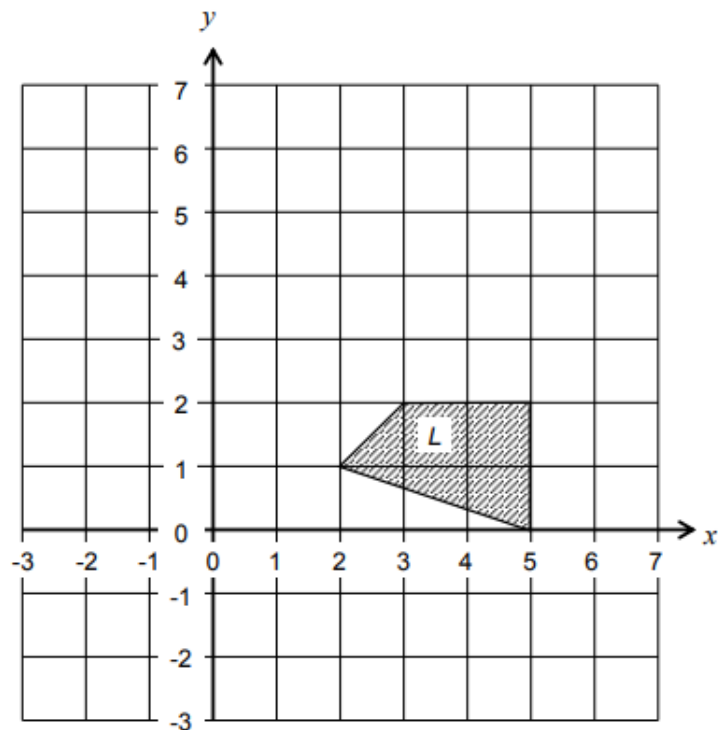
Give each of your solutions to two decimal places.

**[3 marks]**

**G7** identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement *including using column vector notation for translations*

**G8** describe the changes and invariance achieved by combinations of rotations, reflections and translations *including using column vector notation for translations*

The diagram shows a quadrilateral,  $L$ .



What single transformation would transform quadrilateral  $L$  to quadrilateral  $N$ ?

**[2 marks]**

Translate quadrilateral  $L$  using the vector  $\begin{pmatrix} 1 \\ 4 \end{pmatrix}$ .

Label your image  $M$ .

**[2 marks]**

Translate  $M$  using the vector  $\begin{pmatrix} -6 \\ 1 \end{pmatrix}$ .

Label your image  $N$ .

**[1 mark]**

A20 find approximate solutions to equations numerically using iteration, *including the use of suffix notation in recursive formulae*

Show that the equation

$$x^2 + \frac{10}{x} = 16$$

has a solution between  $x = 3$  and  $x = 4$ .

**[2 marks]**

An approximate solution to the equation  $x^2 + \frac{10}{x} = 16$  can be found using the iterative formula

$$x_{n+1} = \sqrt[3]{16x_n - 10}.$$

Using a suitable value for  $x_1$ , find a solution of  $x^2 + \frac{10}{x} = 16$  to one decimal place.

**[3 marks]**

A22 solve linear inequalities in one variable; students should know the conventions of an open circle on a number line for a strict inequality and a closed circle for an included boundary.



The number line shows the solution set of an inequality.

What is the inequality?

Circle your answer.

**[1 mark]**

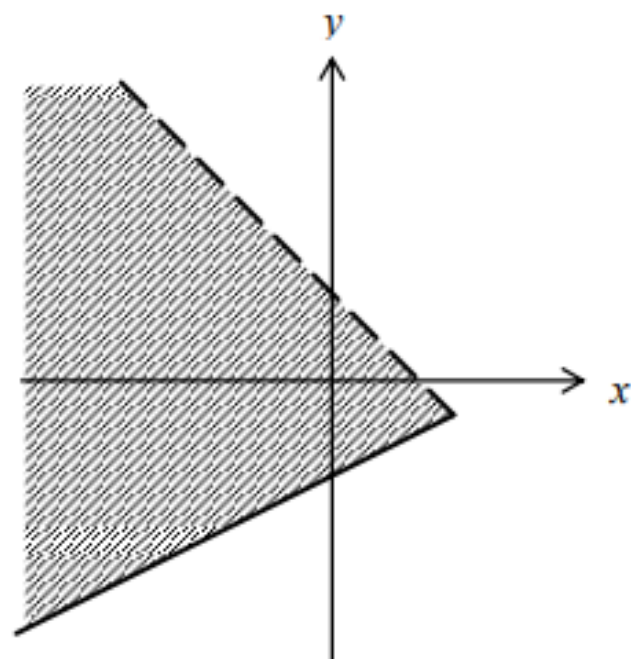
$-2 < x < 3$

$-2 < x \leq 3$

$-2 \leq x < 3$

$-2 \leq x \leq 3$

A22 solve linear inequalities in one or two variable(s); in graphical work the convention of a dashed line for a strict inequality and a solid line for an included inequality will be required



Not drawn accurately

The diagram shows a region bordered by parts of the lines  $x + y = 2$  and  $2y = x - 4$ .

Which two inequalities are satisfied by points in this region?

Circle your answer

[1 mark]

$$\begin{array}{l} x + y \leq 2 \\ 2y > x - 4 \end{array}$$

$$\begin{array}{l} x + y > 2 \\ 2y \geq x - 4 \end{array}$$

$$\begin{array}{l} x + y < 2 \\ 2y \geq x - 4 \end{array}$$

$$\begin{array}{l} x + y \geq 2 \\ 2y < x - 4 \end{array}$$

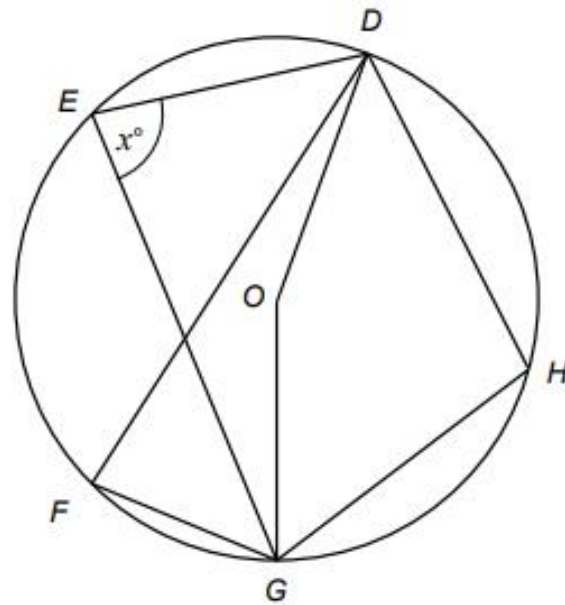
A22 solve quadratic inequalities in one variable

Solve the inequality

$$x^2 - x - 30 > 0$$

**[3 marks]**

G10 apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results



Not drawn accurately

The diagram shows five points,  $E$ ,  $F$ ,  $G$  and  $H$  which lie on a circle.  
The centre of the circle is at  $O$ .

Angle  $GED$  is  $x^\circ$

Which of the following angles **must** also be equal to  $x^\circ$  ?

Circle your answer.

[1 mark]

$DHG$

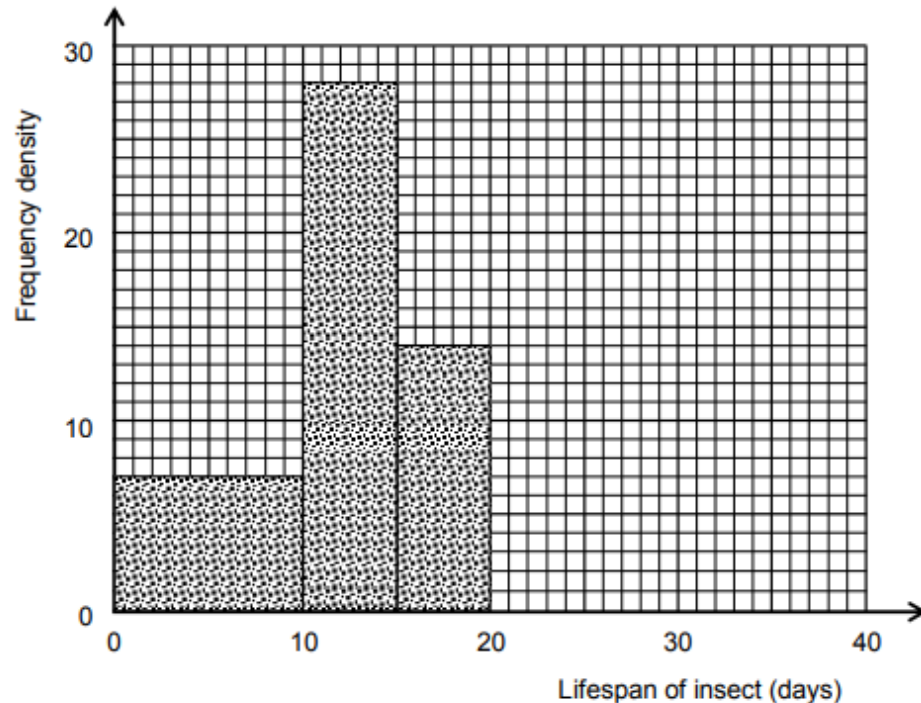
$EDF$

$GFD$

$GOD$



S3 construct and interpret diagrams for grouped discrete data and continuous ie histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use



In an experiment, the lifespans of a sample of 400 insects were recorded using a histogram.

None of the insects lived for longer than 40 days.

The histogram is not complete.

Here are four statements about the histogram.

Tick the boxes next to the **two** statements that are true.

[1 mark]

- 28 insects had a lifespan of between 10 and 15 days.
- 70 insects had a lifespan of less than 10 days.
- Twice as many insects had a lifespan of between 10 and 15 days as had a lifespan of between 15 and 20 days.
- Twice as many insects had a lifespan of between 15 and 20 days as had a lifespan of less than 10 days.

There were twice as many insects that had a lifespan of over 25 days as had a lifespan of between 20 and 25 days.

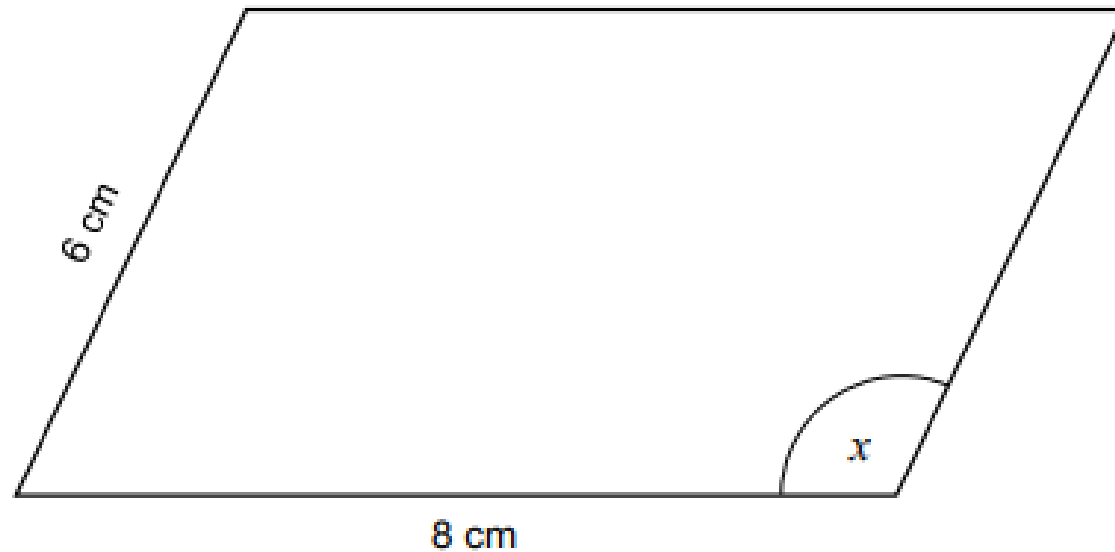
Complete the histogram.

[3 marks]

G23 know and apply  $\text{Area} = \frac{1}{2}ab\sin C$  to calculate the area, sides or angles of any triangle

The parallelogram has an area of  $40 \text{ cm}^2$ .

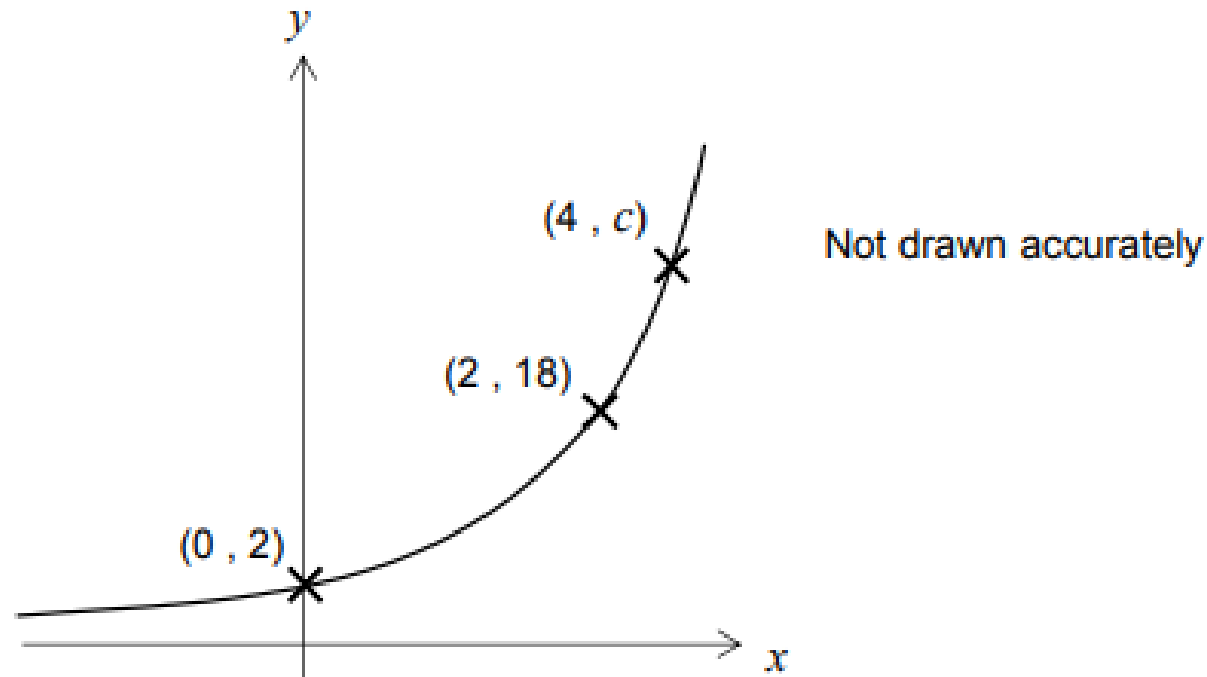
Find the size of the obtuse angle, marked  $x$ .



Not drawn accurately

**[4 marks]**

A12 recognise, sketch and interpret graphs of linear functions and quadratic functions including exponential functions  $y = k^x$  for positive values of  $k$

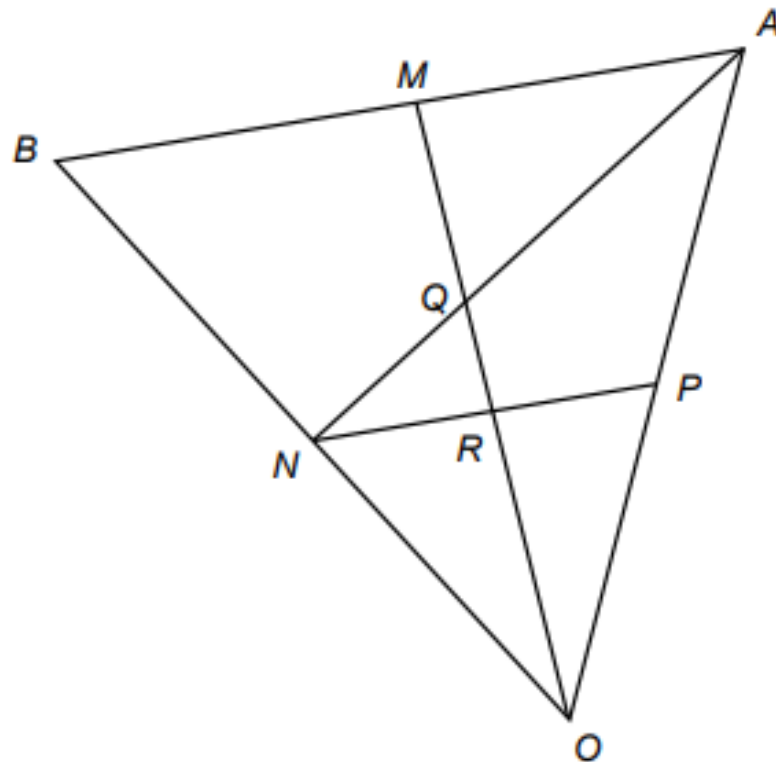


The diagram shows part of the graph of  $y = ab^x$ .  
The co-ordinates of two of the points on the graph are given.

Find the value of  $c$ .

**[4 marks]**

G25 use vectors to construct geometric arguments and proofs



Not drawn accurately

In the diagram,  $AOB$  is a triangle.

$M$  is the midpoint of  $AB$ ,  $N$  is the midpoint of  $BO$  and  $P$  is the midpoint of  $OA$ .  
The lines  $OM$  and  $AN$  intersect at  $Q$ . The lines  $OM$  and  $NP$  intersect at  $R$ .

The vector  $\vec{OA}$  is denoted  $\mathbf{a}$ .

The vector  $\vec{OB}$  is denoted  $\mathbf{b}$ .

Find, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , an expression for the vector  $\vec{MA}$ .

[2 marks]

**R12** compare lengths, areas and volumes using ratio notation, scale factors; make links to similarity (including trigonometric ratios)

Use a geometrical argument to prove that that  $\vec{OQ} = \frac{2}{3} \vec{OM}$ .

**[2 marks]**

Find, in terms of **a** and **b**, an expression for the vector  $\vec{QA}$ .

**[3 marks]**