

**TGMT**

**THE ULTIMATE**

**REVISION GUIDE**

**FOR GCSE MATHS**

EVERYTHING YOU NEED TO  
PASS YOUR GCSE MATHS EXAM

**HIGHER TIER**

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# Everything You Need to Pass GCSE Maths Higher Revision Guide

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## Instructions!

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# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 1: Number

### Multiplying Decimals

Work out  $54.6 \times 4.3$

Full  
Lesson  
Here



234.78

Answer

..... 3 marks

### Product of Prime Factors

Express 56 as the product of its prime factors.

Full  
Lesson  
Here



$2^3 \times 7$   
 $2 \times 2 \times 2 \times 7$

Answer

..... 2 marks

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## Highest Common Factor

Find the Highest Common Factor (HCF) of 84 and 180

Full  
Lesson  
Here



12

Answer

..... 2 marks

## Lowest Common Multiple

Find the lowest common multiple (LCM) of 40 and 56

Full  
Lesson  
Here



280

Answer

..... 2 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Laws of Indices

Work out the value of  $\frac{3^7 \times 3^{-2}}{3^3}$

Full  
Lesson  
Here



6

Answer

..... 2 marks

## Negative and Fractional Indices

(a) Find the value of  $81^{-\frac{1}{2}}$

(b) Find the value of  $\left(\frac{64}{125}\right)^{\frac{2}{3}}$

Full  
Lesson  
Here



a) 1/9  
b) 16/25

Answer

..... 4 marks

## Indices Problems

Given that  $3^{-n} = 0.2$   
find the value of  $(3^4)^n$

Full  
Lesson  
Here



625

Answer

..... 3 marks

## Standard Form Conversions

(a) Write 0.00562 in standard form.

(b) Write  $1.452 \times 10^3$  as an ordinary number.

Full  
Lesson  
Here



a)  $5.62 \times 10^{-3}$   
b) 1452

Answer

..... 2 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Standard Form Calculations

Work out  $(13.8 \times 10^7) \times (5.4 \times 10^{-12})$   
Give your answer as an ordinary number.

Full  
Lesson  
Here



0.0007452

Answer

..... 2 marks

## Simplifying Surds

Write  $5\sqrt{27}$  in the form  $k\sqrt{3}$ , where  $k$  is an integer.

Full  
Lesson  
Here



$15\sqrt{3}$

Answer

..... 2 marks

## Adding and Subtracting Surds

$\sqrt{5}(\sqrt{8} + \sqrt{18})$  can be written in the form  $a\sqrt{10}$  where  $a$  is an integer.

Find the value of  $a$ .

Full  
Lesson  
Here



5

Answer

..... 3 marks

## Expanding Brackets with Surds

Write  $(3 + \sqrt{5})^2$  in the form  $a + b\sqrt{5}$ , where  $a$  and  $b$  are integers.

Full  
Lesson  
Here



14+6√5

Answer

..... 2 marks

## Rationalising the Denominator

Show that  $\frac{6 - \sqrt{8}}{\sqrt{2} - 1}$  can be written in the form  $a + b\sqrt{2}$  where  $a$  and  $b$  are integers.

Full  
Lesson  
Here



.....  
**3 marks**

$2+4\sqrt{2}$

Answer

## Rationalising Harder Denominators

$\frac{1 + \sqrt{2}}{(3 - \sqrt{2})^2}$  can be written in the form  $a + b\sqrt{2}$

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

Full  
Lesson  
Here



.....  
**5 marks**

$a = \frac{23}{49}$   
 $b = \frac{17}{49}$

Answer

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## Unit 2: Algebra, Equations and Sequences

### Expanding Brackets

Expand and simplify  $5(p + 3) - 2(1 - 2p)$

..... **2 marks**

Full  
Lesson  
Here



9p+13

Answer

### Factorise Expressions

(a) Factorise  $5 - 10m$

(b) Factorise fully  $2a^2b + 6ab^2$

..... **3 marks**

Full  
Lesson  
Here



a)  $5(1-2m)$   
b)  $2ab(a+3b)$

Answer

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Substitution

$$v^2 = u^2 + 2as$$

$$u = 12 \quad a = -3 \quad s = 18$$

Work out a value of  $v$ .

Full  
Lesson  
Here



9-10 9

Answer

..... 2 marks

## Laws of Indices

(a) Simplify  $m^3 \times m^4$

(b) Simplify  $(5np^3)^3$

(c) Simplify  $\frac{32q^9r^4}{4q^3r}$

Full  
Lesson  
Here



(c)  $8q^6r^3$   
(b)  $125n^3p^9$   
(a)  $m^7$

Answer

..... 5 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Changing the Subject

Make  $s$  the subject of  $v^2 = u^2 + 2as$

Full  
Lesson  
Here



Answer  $s = \frac{v^2 - u^2}{2a}$

..... 2 marks

## Expanding Double Brackets

Expand and simplify  $(5x + 2)(2x - 3)$

Full  
Lesson  
Here



Answer  $10x^2 - 11x - 6$

..... 2 marks

## Factorising Quadratics

Factorise  $x^2 + 4x + 3$



$(x+1)(x+3)$

Answer

..... 2 marks

## Solving Equations with an Unknown One Side

Solve  $3(m - 4) = 21$



$m = 11$

Answer

..... 2 marks

## Solving Equations with an Unknown Both Sides

Solve  $5x - 6 = 3(x - 1)$



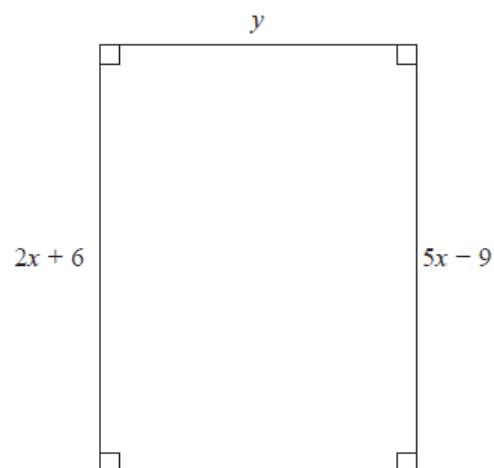
$x = 1.5$  or  $\frac{3}{2}$

Answer

..... 3 marks

## Forming and Solving Equations

Here is a rectangle.



All measurements are in centimetres.

The area of the rectangle is  $48 \text{ cm}^2$ .

Show that  $y = 3$



Answer  $2x + 6 = 5x - 9$   
 $2(5) + 6 = 16$   
 $48 \div 16 = 3$

..... 4 marks

## Finding the $n$ th Term of a Sequences

Here are the first four terms of an arithmetic sequence.

5                      11                      17                      23

Write down an expression, in terms of  $n$ , for the  $n$ th term of the sequence.

.....

**2 marks**

Full  
Lesson  
Here



$6n - 1$

Answer

## Using the $n$ th Term of Sequences

The  $n$ th term of a sequence is  $2n^2 - 1$

The  $n$ th term of a different sequence is  $40 - n^2$

Show that there is only one number that is in both of these sequences.

.....

**3 marks**

Full  
Lesson  
Here



$2n^2 - 1 =$   
 $1, 7, 17, 31, 49$   
 $40 - n^2 =$   
 $39, 36, 31, 24, 15, 4$

Answer

## Special Sequences

The first 3 terms of a Fibonacci type sequence are:

$$a, b, a + b$$

a) Show that the 6<sup>th</sup> term is  $3a+5b$

b) Given that the 3<sup>rd</sup> term is 7 and the 6<sup>th</sup> term is 29

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

Full  
Lesson  
Here



Answer  
a)  $a+2b, 2a+3b, 3a+5b$   
b)  $a=3, b=4$

..... 5 marks

## Quadratic Sequences

Here are the first five terms of a sequence.

$$4 \quad 11 \quad 22 \quad 37 \quad 56$$

Find an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

Full  
Lesson  
Here



$2n^2+n+1$

Answer

..... 3 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 3: Averages and Data

### Reverse Mean

There are 10 boys and 20 girls in a class.  
The class has a test.

The mean mark for all the class is 60  
The mean mark for the girls is 54

Work out the mean mark for the boys.

Full  
Lesson  
Here



72

Answer

..... 3 marks

### Two Way Tables

60 people were asked if they prefer to go on holiday in Britain or in Spain or in Italy.

38 of the people were male.  
11 of the 32 people who said Britain were female.  
8 males said Italy.  
12 people said Spain.

One of the females is chosen at random.

What is the probability that this female said Spain?

Full  
Lesson  
Here



$\frac{22}{3}$

Answer

..... 4 marks

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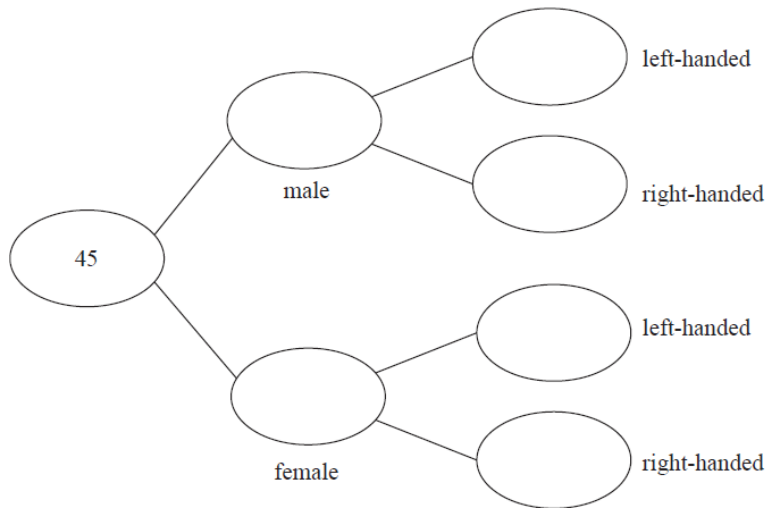
## Frequency Trees

Each worker in a factory is either left-handed or right-handed.

22 of the 45 workers are male.

16 of the 34 right-handed workers are female.

Complete the frequency tree for this information.



**3 marks**

Full  
Lesson  
Here



4, 18, 7, 16  
22, 23

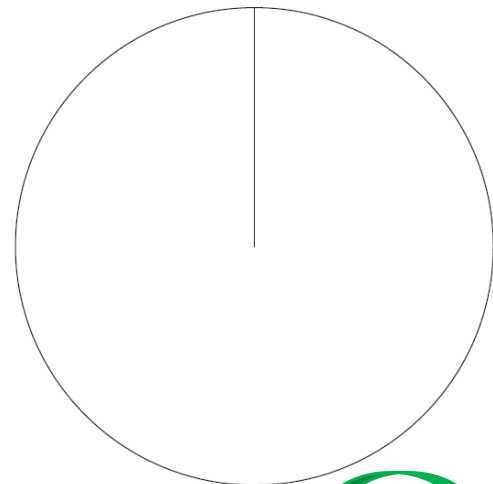
Answer

## Pie Charts

A group of football fans were asked what their half time snack was.

The table below gives information about their answers.

Snack	Number of fans
burger	11
pie	17
hot dog	8



Draw an accurate pie chart for this information.

**3 marks**

Full  
Lesson  
Here



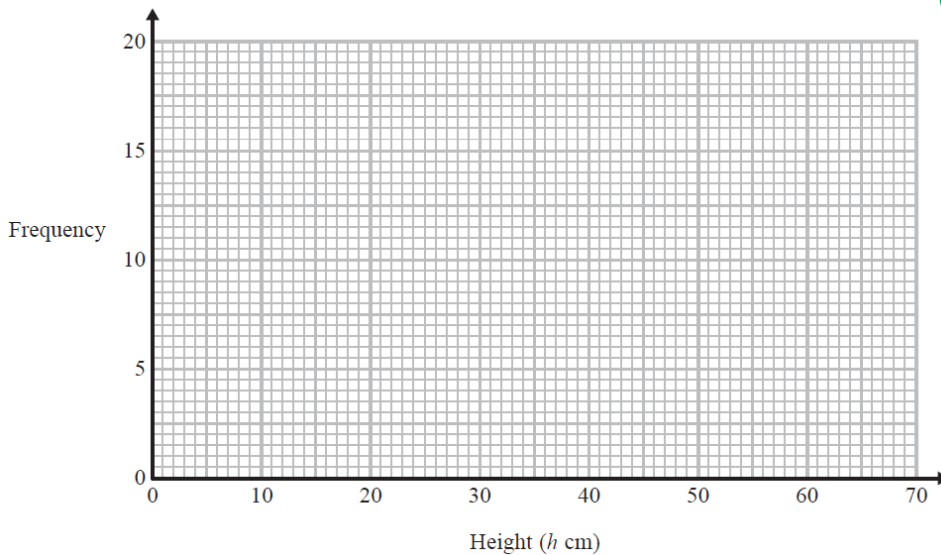
Correct labelled pie chart  
with angles 110°, 170°, 80°

Answer

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## Frequency Polygons

On the grid, draw a frequency polygon for the information in the table.



Height ( $h$ cm)	Frequency
$10 < h \leq 20$	7
$20 < h \leq 30$	13
$30 < h \leq 40$	14
$40 < h \leq 50$	12
$50 < h \leq 60$	16
$60 < h \leq 70$	18

Full  
Lesson  
Here

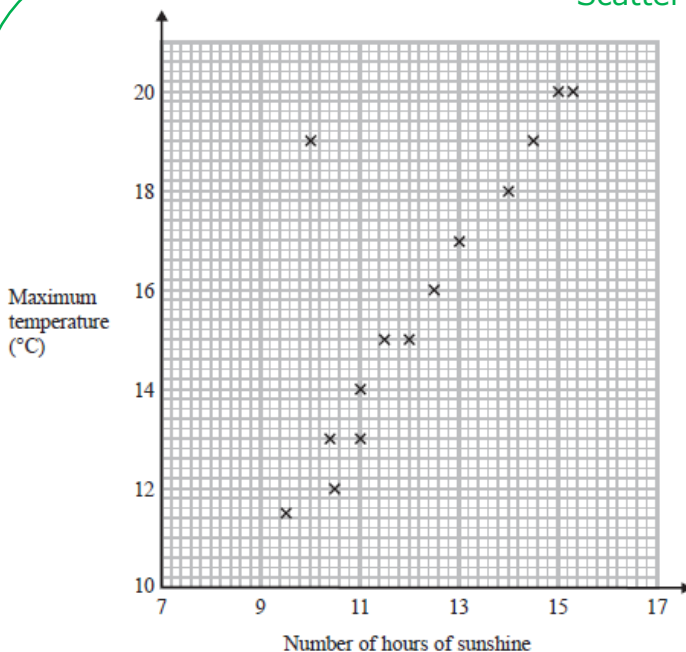


Diagram drawn  
using midpoints  
and connected via  
straight lines

..... **2 marks**

**Answer**

## Scatter Graphs



One of the points is an outlier.

Write down the coordinates

For all the other points write  
down the type of correlation.

On the same day, in another British town,  
the maximum temperature was  $16.4^{\circ}\text{C}$ .

Estimate the number of hours  
of sunshine in this town on this day.

Full  
Lesson  
Here



a) (10,19)  
b) Positive  
c) 12-13

..... **4 marks**

**Answer**

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Averages from a Table

Work out an estimate for the mean of the weekly earnings.

Weekly earnings (£ $x$ )	Frequency
$150 < x \leq 250$	1
$250 < x \leq 350$	11
$350 < x \leq 450$	5
$450 < x \leq 550$	0
$550 < x \leq 650$	3

Full  
Lesson  
Here



£365

Answer

..... 3 marks

## Averages from a Stem and Leaf

The table shows the heights of a group of students in year 9.

least height	150 cm
median	165 cm
greatest height	170 cm

The stem and leaf shows the heights of some students in year 12.

15	8 9 9
16	4 5 7 7 8
17	0 3 4 4 7
18	0 2

Key: 15 | 8 represents 158 cm

Compare the distribution of heights for the year 9 students with the year 12 students.

Full  
Lesson  
Here



Median: Yr9 (165) < Yr12 (168)  
Range: Yr9 (20) < Yr12 (24)

Answer

..... 3 marks

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## Unit 4: Fractions, Decimals, Ratio and Percentages

### Percentage Changes

Renee buys 5 kg of sweets to sell.  
She pays £10 for the sweets.

Renee puts all the sweets into bags.  
She puts 250 g of sweets into each bag.  
She sells each bag of sweets for 65p.

Renee sells all the bags of sweets.

Work out her percentage profit.

..... **4 marks**

Full  
Lesson  
Here



30%

Answer

### Reverse Percentages

Jules buys a washing machine.

20% VAT is added to the price of the washing machine.  
Jules then has to pay a total of £600

What is the price of the washing machine with **no** VAT added?

..... **2 marks**

Full  
Lesson  
Here



£500

Answer

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Fraction Calculations

(a) Work out  $2\frac{1}{7} + 1\frac{1}{4}$

(b) Work out  $1\frac{1}{5} \div \frac{3}{4}$

Give your answer as a mixed number in its simplest form.

Full  
Lesson  
Here



..... **4 marks**

Answer  
a)  $\frac{95}{28}$  or  $3\frac{11}{28}$   
b)  $1\frac{3}{5}$

## Ratio, Fraction and Percentage Problems

Daniel bakes 420 cakes.

He bakes only vanilla cakes, banana cakes, lemon cakes and chocolate cakes.

$\frac{2}{7}$  of the cakes are vanilla cakes.

35% of the cakes are banana cakes.

The ratio of the number of lemon cakes to the number of chocolate cakes is 4:5

Work out the number of lemon cakes Daniel bakes.

Full  
Lesson  
Here



..... **5 marks**

Answer  
89

## Sharing in a Ratio

The perimeter of a right-angled triangle is 72 cm.  
The lengths of its sides are in the ratio 3 : 4 : 5

Work out the area of the triangle.



216cm<sup>2</sup>

Answer

..... 4 marks

## Combining Ratios

In a village

the number of houses and the number of flats are in the ratio 7 : 4  
the number of flats and the number of bungalows are in the ratio 8 : 5

There are 50 bungalows in the village.

How many houses are there in the village?



140

Answer

..... 3 marks

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## Ratios as Fractions

White shapes and black shapes are used in a game.  
Some of the shapes are circles.  
All the other shapes are squares.

The ratio of the number of white shapes to the number of black shapes is 3:7

The ratio of the number of white circles to the number of white squares is 4:5

The ratio of the number of black circles to the number of black squares is 2:5

Work out what fraction of all the shapes are circles.



$\frac{3}{1}$  or equivalent

..... **4 marks**

Answer

## Direct Proportion in Context

Jack is building a wall.

He uses 300 bricks to build part of the wall.

This part of the wall is 5 metres long and 1.5 metres high.

The complete wall will be 8 metres long and 1.5 metres high.

How many more bricks does Jack need to complete the wall?



180

..... **3 marks**

Answer

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## Inverse Proportion in Context

It would take 120 minutes to fill a swimming pool using water from 5 taps.

(a) How many minutes will it take to fill the pool if only 3 of the taps are used?

(b) State one assumption you made in working out your answer to part (a).



Full  
Lesson  
Here

Answer  
a) 200  
b) The taps are running at  
the same rate/speed

..... 3 marks

## Best Buys

In London, 1 litre of petrol costs 108.9p

In New York, 1 US gallon of petrol costs \$2.83

1 US gallon = 3.785 litres

£1 = \$1.46

In which city is petrol better value for money, London or New York?

You must show your working.



Full  
Lesson  
Here

New York

Answer

..... 3 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Exchange Rates

Gina finds out the price of a CD box set in three different countries.

The price is

- £98 in the UK
- \$134.99 in the USA
- €139.99 in Germany

The exchange rates are

- £1 = \$1.43
- €1 = £0.73

Gina wants to pay the cheapest price for the box set.


- (a) From which country should Gina buy the box set?  
You must show how you get your answer.

Gina lives in the UK.

- (b) Why might your answer to (a) **not** be the best country for Gina to buy the box set from?

..... **4 marks**

Full Lesson Here



Answer  
a) USA  
b) Postage costs

## Recipes

Deon needs 50g of sugar to make 15 biscuits.

She also needs

- three times as much flour as sugar
- two times as much butter as sugar

Deon is going to make 60 biscuits.


- (a) Work out the amount of flour she needs.

Deon has to buy all the butter she needs to make 60 biscuits.  
She buys the butter in 250 g packs.

- (b) How many packs of butter does Deon need to buy?

..... **5 marks**

Full Lesson Here

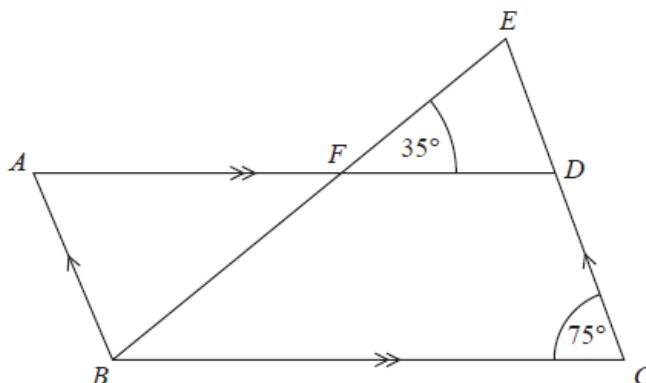


Answer  
a) 600  
b) 2

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 5: Angles, Pythagoras and Trigonometry

### Angles in Triangles and Quadrilaterals



*ABCD* is a parallelogram.  
*EDC* is a straight line.  
*F* is the point on *AD* so that *BFE* is a straight line.

Angle *EFD* =  $35^\circ$   
 Angle *DCB* =  $75^\circ$

Show that angle *ABF* =  $70^\circ$   
 Give a reason for each stage of your working.

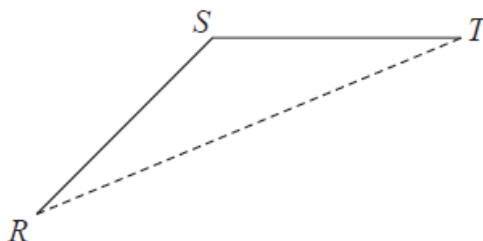
..... **4 marks**

Full Lesson Here



**Answer**  
 Reasoning shown:  
 Option:  $\angle FBA = 35^\circ$  (vertically opposite angles in a parallelogram are equal),  $\angle BAF = 75^\circ$  (opposite angles in a parallelogram are equal),  $\angle ABF = 180^\circ - (35^\circ + 75^\circ) = 70^\circ$  (angles in a triangle =  $180^\circ$ ).

### Angles in Polygons




*RS* and *ST* are 2 sides of a regular 12-sided polygon.  
*RT* is a diagonal of the polygon.

Work out the size of angle *STR*.  
 You must show your working.

..... **3 marks**

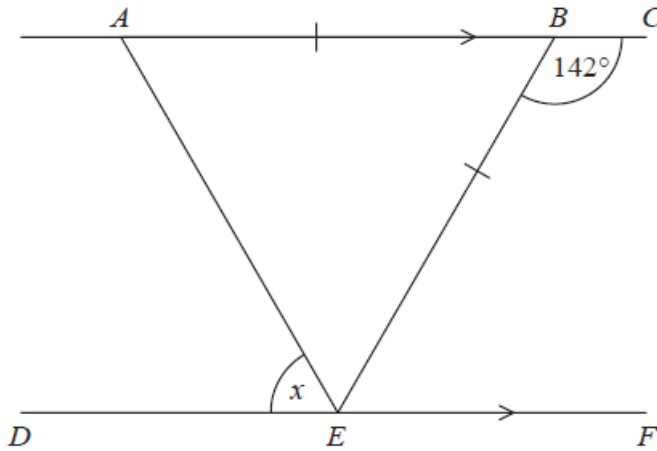
Full Lesson Here



**Answer**  
 $15^\circ$

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## Angles in Parallel Lines



$ABC$  and  $DEF$  are parallel straight lines.  
 $ABE$  is an isosceles triangle with  $AB = BE$ .  
 Angle  $CBE = 142^\circ$

Work out the size of angle  $x$ .  
 Give a reason for each stage in your working.

..... **5 marks**

Full  
Lesson  
Here



Answer  
 71° Reasons including:  
 Base angles in an isosceles are equal,  
 angles on straight line = 180 and  
 alternate angles are equal.

## Pythagoras

Triangle  $ABC$  has perimeter 20 cm.

$AB = 7$  cm.  
 $BC = 4$  cm.

By calculation, deduce whether triangle  $ABC$  is a right-angled triangle.

..... **4 marks**

Full  
Lesson  
Here

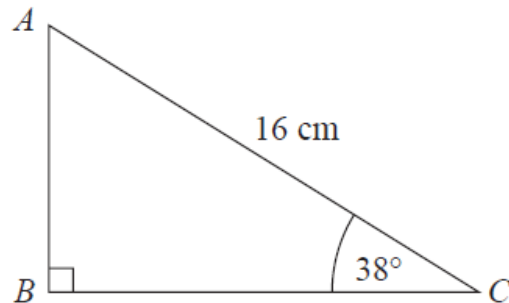


Answer No,  $AC=9$ cm  
 $4^2+7^2=65$   
 $\sqrt{65} \neq 9$ cm

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## Trigonometry (Side Lengths)

$ABC$  is a right-angled triangle.



Calculate the length of  $AB$ .  
Give your answer correct to 2 decimal places.



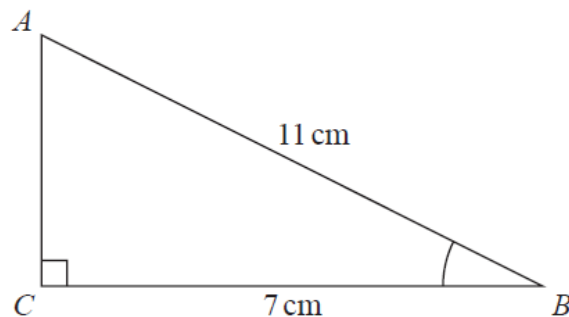
9.85cm

Answer

..... 2 marks

## Trigonometry (Angles)

$ABC$  is a right-angled triangle.



Work out the size of angle  $ABC$ .  
Give your answer correct to 1 decimal place.



50.5°

Answer

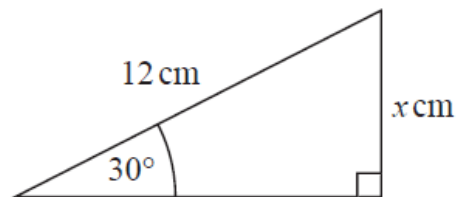
..... 2 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Using Exact Values of Trigonometry

(a) Write down the exact value of  $\cos 30^\circ$

(b)



Given that  $\sin 30^\circ = 0.5$ ,  
work out the value of  $x$ .

Full  
Lesson  
Here



Answer  
a)  $\frac{\sqrt{3}}{2}$   
b) 6 cm

..... 3 marks

## Calculations with Exact Values of Trigonometry

Find the exact value of  $\tan 30^\circ \times \sin 60^\circ$   
Give your answer in its simplest form.

Full  
Lesson  
Here



Answer  
 $\frac{1}{2}$  or 0.5

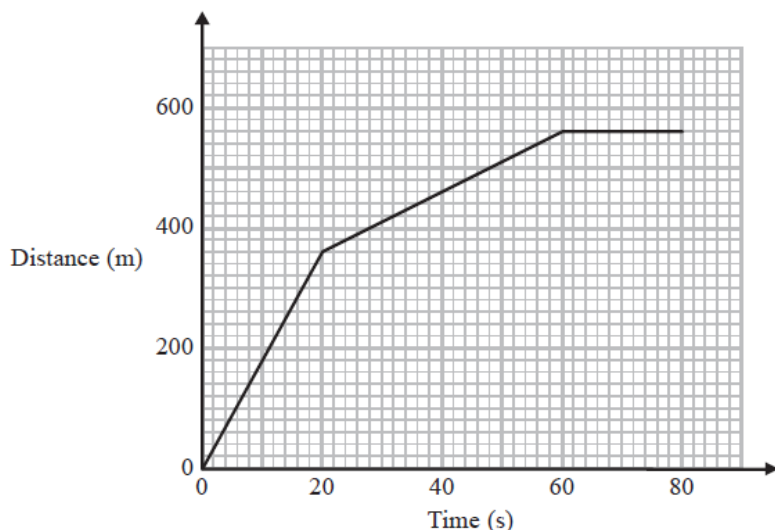
..... 2 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 6: Algebraic Linear, Quadratic and Cubic Graphs

### Distance-Time Graphs

Here is part of a distance-time graph for a car's journey.



- (a) Between which two times does the car travel at its greatest speed?  
Give a reason for your answer.
- (b) Work out this greatest speed.

**3 marks**

Full  
Lesson  
Here



Answer  
a) 0-20  
b) 18m/s  
has the highest gradient

### Equation of a Line

$A$  is the point with coordinates  $(5, 9)$

$B$  is the point with coordinates  $(d, 15)$

The gradient of the line  $AB$  is 3

Work out the value of  $d$ .

Full  
Lesson  
Here

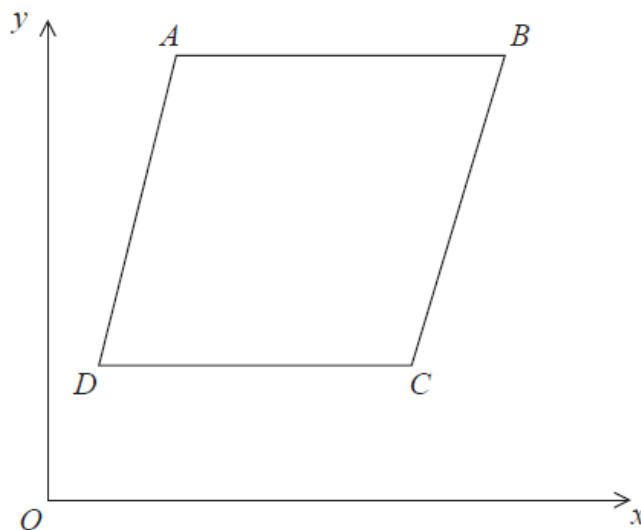


7

**3 marks**

Answer

## Perpendicular Lines



$ABCD$  is a rhombus.

The coordinates of  $A$  are  $(5, 11)$

The equation of the diagonal  $DB$  is  $y = \frac{1}{2}x + 6$

Find an equation of the diagonal  $AC$ .

**4 marks**

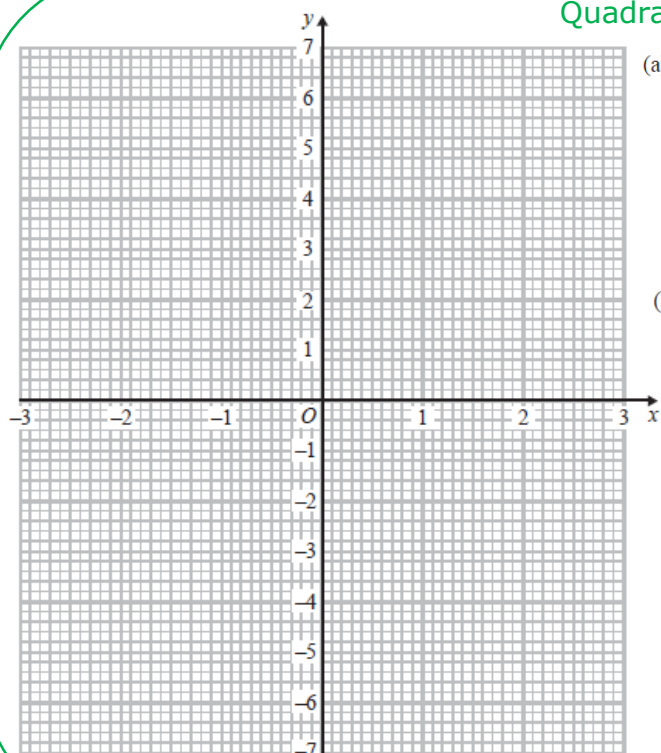
Full  
Lesson  
Here



$y = -2x + 21$

Answer

## Quadratic Graphs



(a) Complete the table of values for  $y = x^2 - x - 6$

$x$	-3	-2	-1	0	1	2	3
$y$	6			-6			

(b) On the grid, draw the graph of  $y = x^2 - x - 6$  for values of  $x$  from  $-3$  to  $3$

**4 marks**

Full  
Lesson  
Here



a)  $0, -4, -6, -4, 0$   
b) Graph drawn

Answer

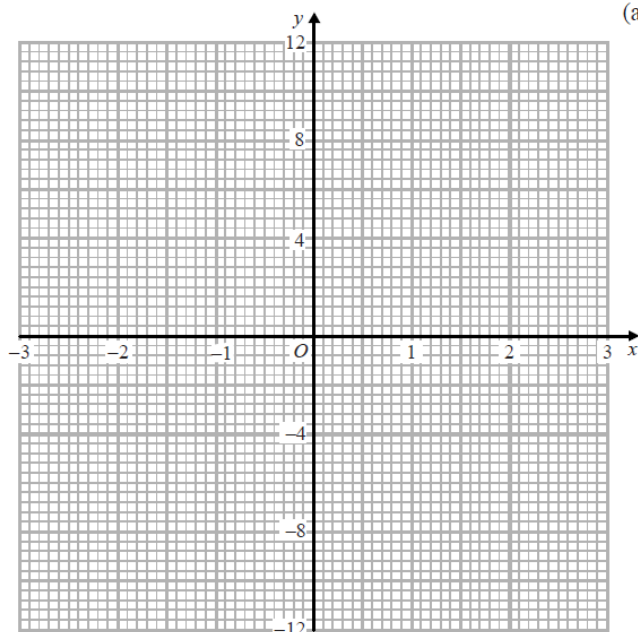
# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Cubic Graphs

(a) Complete the table of values for  $y = x^3 + x^2 - 2x + 1$

$x$	-3	-2	-1	0	1	2
$y$		1	3		1	

(b) On the grid, draw the graph of  $y = x^3 + x^2 - 2x + 1$  for values of  $x$  from -3 to 2



Full  
Lesson  
Here



b) Graph drawn  
a) -11, 1, 9

Answer

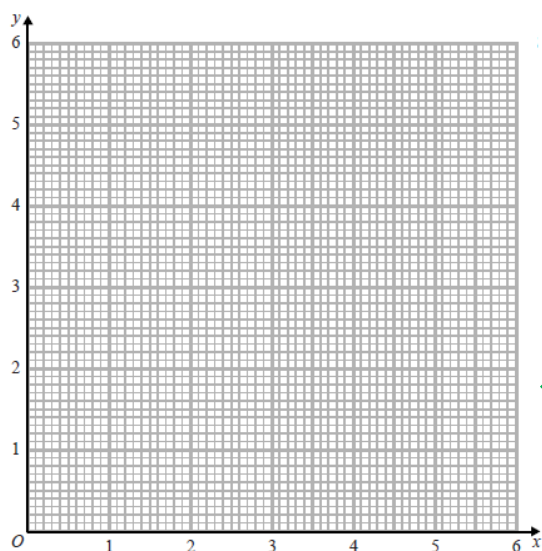
..... 4 marks

## Reciprocal Graphs

(a) Complete the table of values for  $y = \frac{3}{x}$

$x$	0.5	1	2	3	4	5	6
$y$		3	1.5		0.75		

(b) On the grid, draw the graph of  $y = \frac{3}{x}$  for values of  $x$  from 0.5 to 6



Full  
Lesson  
Here



b) graph drawn  
a) 6, 1, 0.6, 0.5

Answer

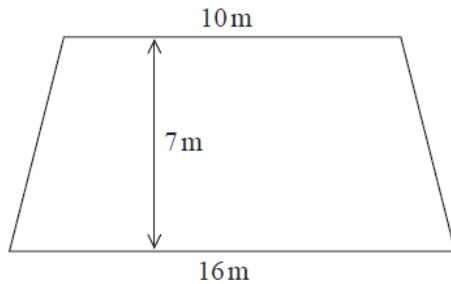
..... 4 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 7: Area, Volume, Circles, Accuracy and Bounds

### Area of Trapezia

The diagram shows a floor in the shape of a trapezium.



John is going to paint the floor.

Each 5 litre tin of paint costs £16.99

1 litre of paint covers an area of  $2\text{m}^2$

John has £160 to spend on paint.

Has John got enough money to buy all the paint he needs?

You must show how you get your answer.

Full  
Lesson  
Here

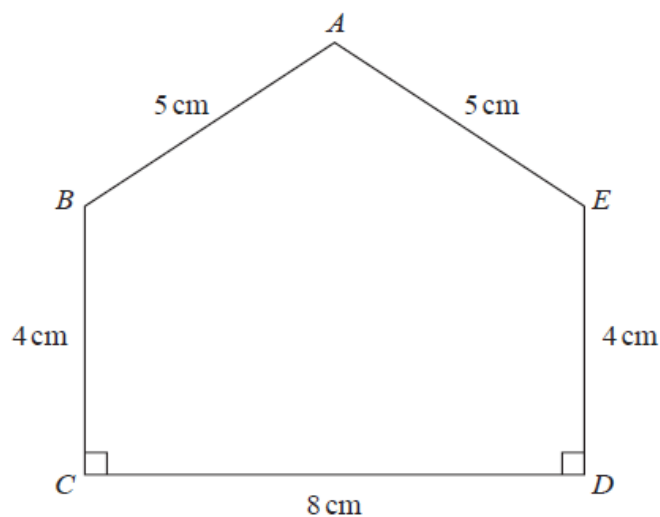


Answer No,  
£169.90 or  
 $90\text{m}^2$

..... **5 marks**

### Area of Compound Shapes

$ABCDE$  is a pentagon.



Work out the area of  $ABCDE$ .

Full  
Lesson  
Here



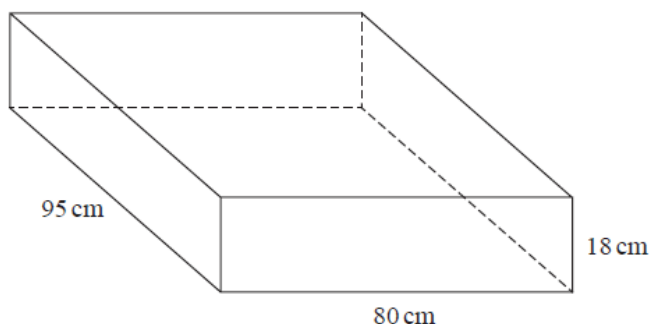
Answer  
 $44\text{cm}^2$

..... **5 marks**

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Surface Area of Prisms

A sofa has 6 identical cushions.  
Each cushion is a cuboid 18 cm by 80 cm by 95 cm.



The cushions are covered with a protective spray.  
The protective spray is in cans.

The label on each can has this information.

Spray in this can covers 4m<sup>2</sup>

Work out how many cans are needed to cover the 6 cushions with protective spray.

..... **5 marks**

Full  
Lesson  
Here

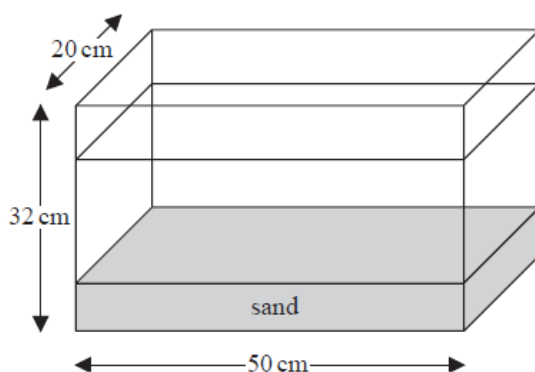


4

Answer

## Volume of Prisms

The diagram shows a fish tank in the shape of a cuboid.



The dimensions of the tank are 50 cm by 32 cm by 20 cm.

The tank is  $\frac{3}{4}$  full of water and sand.

The ratio of the volume of water to the volume of sand is 5 : 1

Work out the number of litres of water in the tank.  
You must show all your working.

..... **5 marks**

Full  
Lesson  
Here



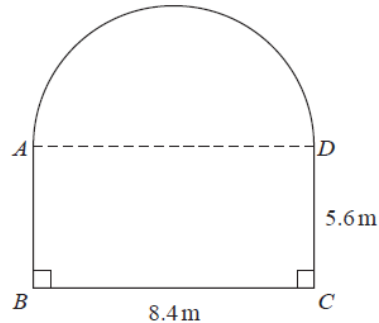
20

Answer

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Area and Circumference of a Circle

A garden is in the shape of a rectangle,  $ABCD$ , and a semicircle.  
 $AD$  is the diameter of the semicircle.



Carol is going to cover the garden with fertiliser.

A box of fertiliser costs £4.99

Carol has been told that one box of fertiliser will cover  $12\text{ m}^2$  of garden.

(a) Work out the cost of buying enough fertiliser to cover the garden completely.

Carol finds out that one box of fertiliser will cover more than  $12\text{ m}^2$  of garden.

(b) Explain how this might affect the number of boxes she needs to buy.

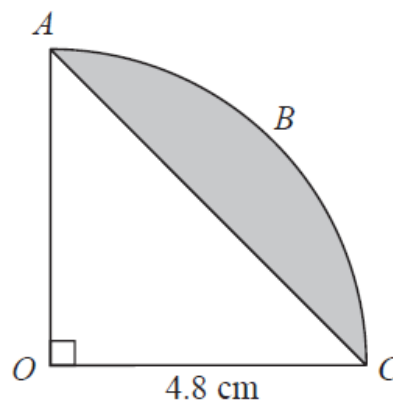
..... **6 marks**

Full  
Lesson  
Here



Answer a) £34.93  
b) May need to buy  
less boxes

## Circle Sectors (Area)



The arc  $ABC$  is a quarter of a circle with centre  $O$  and radius  $4.8\text{ cm}$ .  
 $AC$  is a chord of the circle.

Work out the area of the shaded segment.  
Give your answer correct to 3 significant figures.

..... **3 marks**

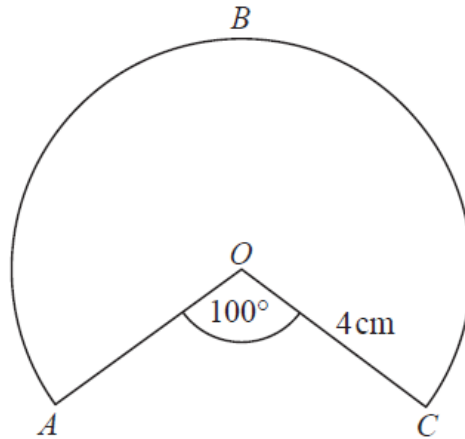
Full  
Lesson  
Here



Answer  
 $6.56 - 6.58\text{ cm}^2$

## Circle Sectors (Arc Length)

The diagram shows a sector of a circle of radius 4 cm.



Work out the length of the arc  $ABC$ .  
Give your answer correct to 3 significant figures.

Full  
Lesson  
Here



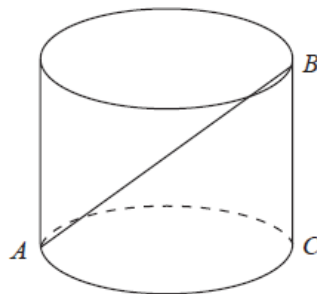
18.2cm

Answer

..... 2 marks

## Cylinders

The diagram shows a metal rod,  $AB$ , resting inside a cylindrical tin.



The tin is on a horizontal table.  
 $AC$  is a diameter of the base of the tin.  
 $B$  is on the top edge of the tin.  
 $BC$  is vertical.

The radius of the base of the tin is 5 cm.  
The volume of the tin is  $1178 \text{ cm}^3$

Find the angle between the rod and the base of the tin.  
Give your answer correct to the nearest degree.

Full  
Lesson  
Here



56°

Answer

..... 4 marks

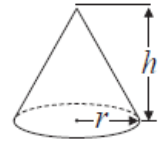
# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Cones

A cone has a volume of  $98 \text{ cm}^3$ .  
The radius of the cone is  $5.13 \text{ cm}$ .

(a) Work out an estimate for the height of the cone.

$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$



John uses a calculator to work out the height of the cone to 2 decimal places.

(b) Will your estimate be more than John's answer or less than John's answer?  
Give reasons for your answer.

Full  
Lesson  
Here

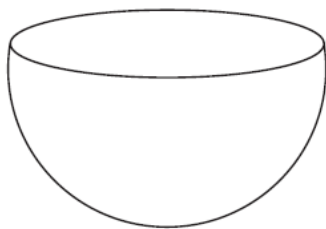


**Answer**  
a)  $3.5 - 4.5$   
b) More, the numerator goes up  
& denominator goes down.

.....  
**4 marks**

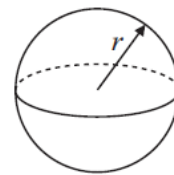
## Spheres

The diagram shows a solid hemisphere.



$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

$$\text{Surface area of sphere} = 4\pi r^2$$



The volume of the hemisphere is  $\frac{250}{3} \pi$

Work out the exact total surface area of the solid hemisphere.  
Give your answer as a multiple of  $\pi$ .

Full  
Lesson  
Here



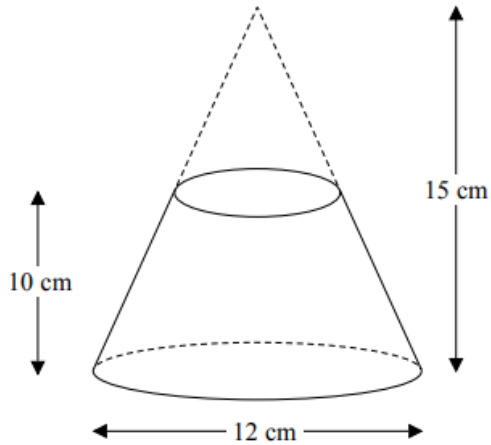
**Answer**  
75π

.....  
**4 marks**

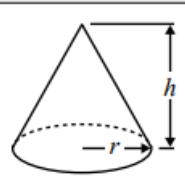
# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Volume of a Frustum

A frustum is made by removing a small cone from a large cone as shown in the diagram.



$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$



The frustum is made from glass.  
The glass has a density of  $2.5 \text{ g/cm}^3$

Work out the mass of the frustum.  
Give your answer to an appropriate degree of accuracy.

..... **5 marks**

Full  
Lesson  
Here



1360 - 1362g

Answer

## Error Intervals

A number,  $y$ , is rounded to 2 significant figures.

The result is 0.46

Write down the error interval for  $y$ .

..... **2 marks**

Full  
Lesson  
Here



$0.455 < x < 0.465$

Answer

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Truncation

Kiera used her calculator to work out the value of a number  $x$ .  
She wrote down the first two digits of the answer on her calculator.

She wrote down 7.3

Write down the error interval for  $x$ .

Full  
Lesson  
Here



$$6.3 > x > 7.4$$

Answer

..... 2 marks

## Bounds Calculations

$$m = \frac{\sqrt{s}}{t}$$

$s = 3.47$  correct to 3 significant figures

$t = 8.132$  correct to 4 significant figures

By considering bounds, work out the value of  $m$  to a suitable degree of accuracy.  
Give a reason for your answer.

Full  
Lesson  
Here



$$0.229 \text{ (3dp)}$$

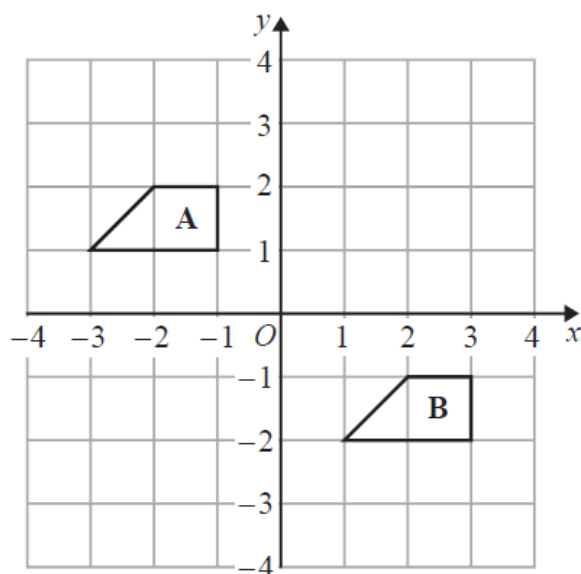
Answer

..... 5 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 8: Transformations, Plans and Elevations, Loci and Bearings

### Translations



Describe the single transformation that maps shape A onto shape B.

..... **2 marks**

Full  
Lesson  
Here



Answer  
Translation by the  
vector  $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$

### Column Vectors

Shape A is translated by the vector  $\begin{pmatrix} 4 \\ -7 \end{pmatrix}$  to make Shape B.

Shape B is then translated by the vector  $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$  to make Shape C.

Describe the single transformation that maps Shape A onto Shape C.

..... **2 marks**

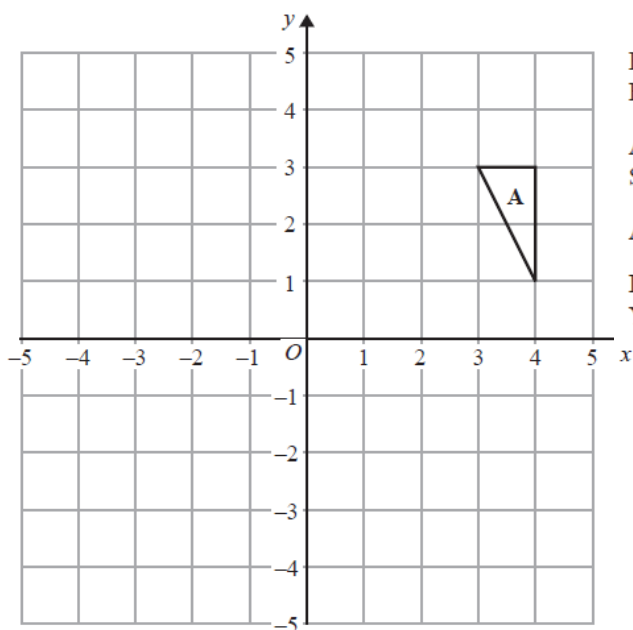
Full  
Lesson  
Here



Answer  
Translation by the  
vector  $\begin{pmatrix} 1 \\ -9 \end{pmatrix}$

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Reflections



Kyle reflects triangle **A** in the  $x$ -axis to get triangle **B**.  
He then reflects triangle **B** in the line  $y = x$  to get triangle **C**.

Amy reflects triangle **A** in the line  $y = x$  to get triangle **D**.  
She is then going to reflect triangle **D** in the  $x$ -axis to get triangle **E**.

Amy says that triangle **E** should be in the same position as triangle **C**.

Is Amy correct?  
You must show how you get your answer.

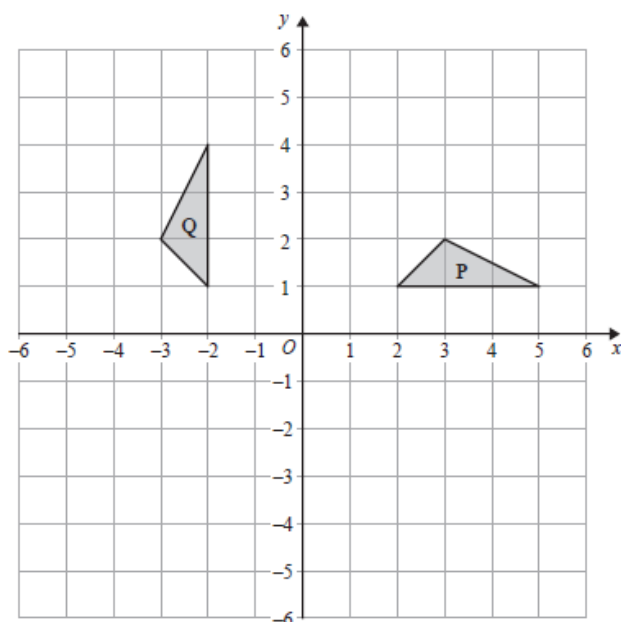
Full  
Lesson  
Here



**Answer**  
No, C is a rotation of  $90^\circ$   
anti-clockwise about O

..... **3 marks**

## Rotations



Describe fully the single transformation that maps triangle **P** onto triangle **Q**.

Full  
Lesson  
Here

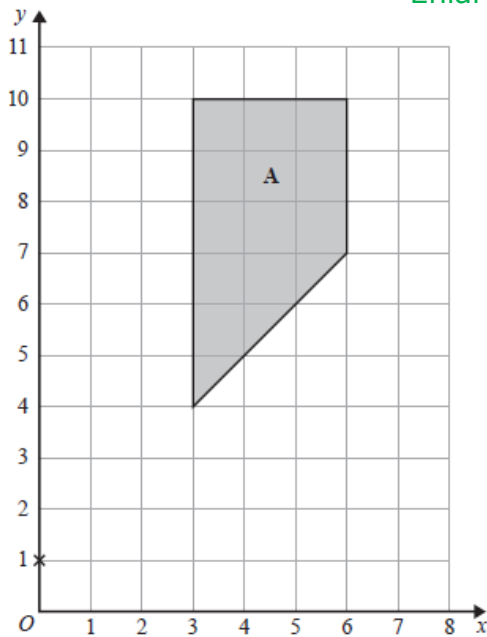


**Answer**  
Rotation,  $90^\circ$ , Anti-  
Clockwise, Centre (0,-1)

..... **2 marks**

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Enlargements



Enlarge shape A by scale factor  $\frac{1}{3}$  centre (0, 1)

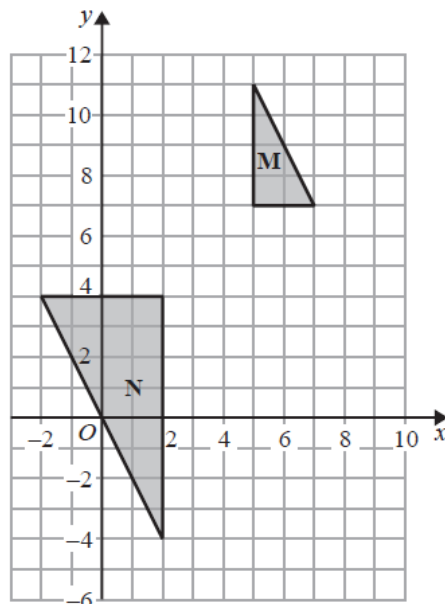
..... **2 marks**

Full  
Lesson  
Here



Answer  
Correct enlargement at  
(1,2), (2,3), (2,4), (1,4)

## Negative Enlargements



Describe fully the single transformation that maps triangle M onto triangle N.

..... **2 marks**

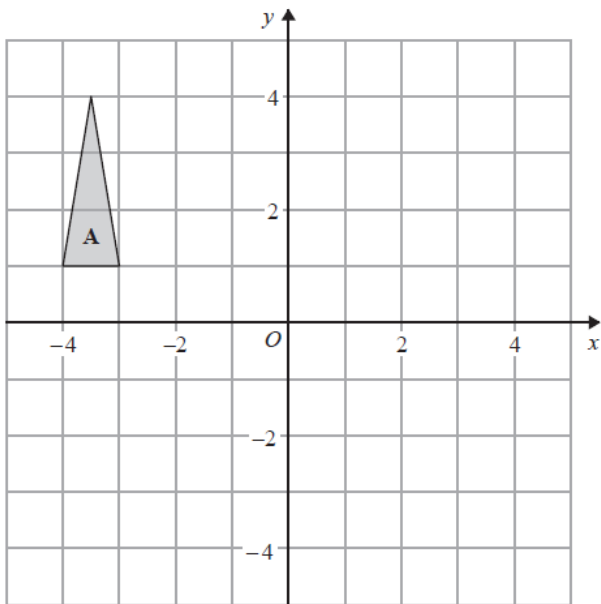
Full  
Lesson  
Here



Answer  
Enlargement,  
SF -2, Centre (4,6)

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Invariant Points



Triangle **A** is transformed by the combined transformation of a rotation of  $180^\circ$  about the point  $(-2, 0)$  followed by a translation with vector  $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$

One point on triangle **A** is invariant under the combined transformation.

Find the coordinates of this point.



Full  
Lesson  
Here



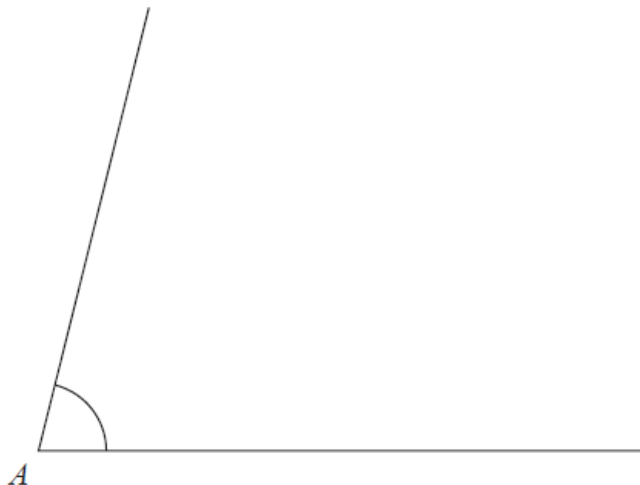
$(-3.5, 1)$

Answer

..... 2 marks

## Angle Bisector

Use ruler and compasses to bisect the angle at *A*.  
You must show all your construction lines.



Full  
Lesson  
Here



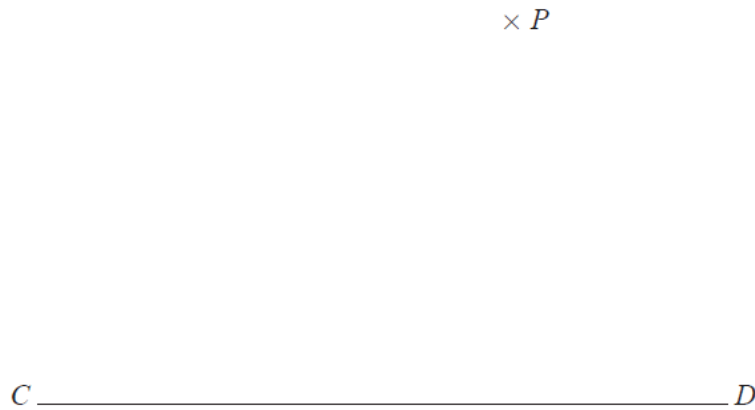
Answer  
Correct  
Construction  
Drawn

..... 2 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Perpendicular Bisector

Use a ruler and compasses to construct the line from the point  $P$  perpendicular to the line  $CD$ .  
You must show **all** construction lines.



Full  
Lesson  
Here



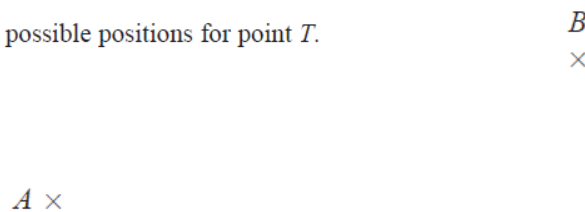
Answer  
Perpendicular line  
constructed through P

..... **2 marks**

## Loci Problems

Point  $T$  is 250 metres from point  $A$ .  
Point  $T$  is equidistant from point  $B$  and point  $C$ .

On the map, show one of the possible positions for point  $T$ .



Full  
Lesson  
Here



Answer  
2.5cm circle around A and a  
perpendicular bisector of BC

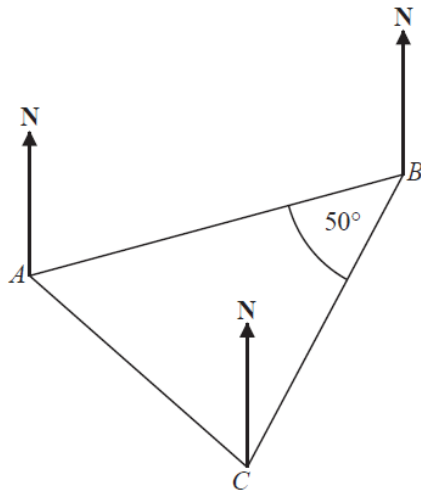
1 cm represents 100 metres.

**Note: The image is scaled  
down so it will be different  
but you can still do it!**

..... **3 marks**

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Bearings



The bearing of  $B$  from  $A$  is  $070^\circ$

Angle  $ABC$  is  $50^\circ$   
 $AB = CB$

Work out the bearing of  $C$  from  $A$ .

..... **3 marks**

Full  
Lesson  
Here

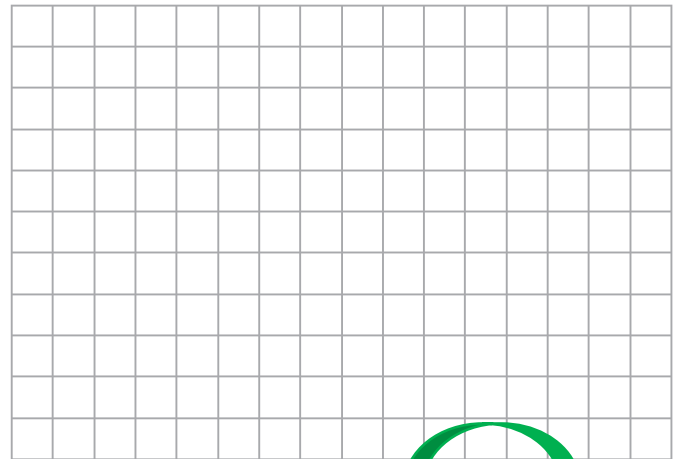
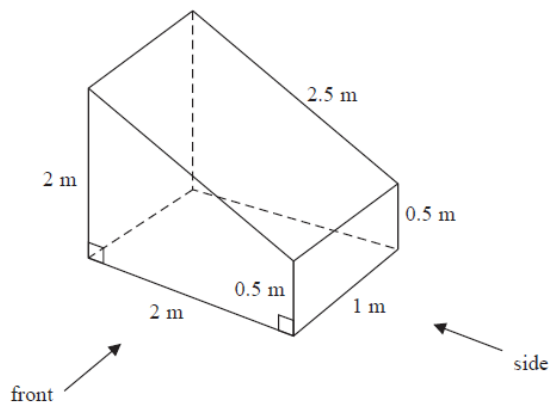


135°

Answer

## Plans and Elevations

The diagram shows a prism with a cross section in the shape of a trapezium.



On the centimetre grid below, draw the front elevation and the side elevation of the prism.  
Use a scale of 2 cm to 1 m.

..... **4 marks**

Full  
Lesson  
Here



Answer  
Side:  $4 \times 2$  rectangle  
with a line drawn 1cm from the 2cm  
edge: Front: Trapezium base 4cm,  
parallel sides 1cm and 4cm

# Everything You Need to Pass GCSE Maths Higher Revision Guide

Unit 9: Quadratic Equations, Inequalities and Simultaneous Equations

## Factorising Harder Quadratics

Factorise  $2p^2 - p - 10$

Full  
Lesson  
Here



(z + d)(s - dz)

Answer

..... 2 marks

## Solve Quadratic Equations by Factorising

Solve  $x^2 + 5x - 24 = 0$

Full  
Lesson  
Here



$x = 3$  and  $x = -8$

Answer

..... 3 marks

## Completing the Square

Write  $x^2 + 2x - 8$  in the form  $(x + m)^2 + n$   
where  $m$  and  $n$  are integers.

Full  
Lesson  
Here



$$(x + 1)^2 - 9$$

Answer

..... **2 marks**

## Harder Completing the Square

(a) Write  $2x^2 + 16x + 35$  in the form  $a(x + b)^2 + c$  where  $a$ ,  $b$ , and  $c$  are integers.

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of  $y = 2x^2 + 16x + 35$

Full  
Lesson  
Here



$$\begin{aligned} \text{a) } & 2(x + 4)^2 + 3 \\ \text{b) } & (-4, 3) \end{aligned}$$

Answer

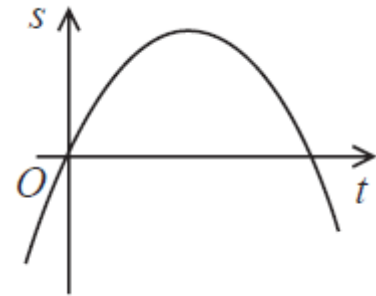
..... **4 marks**

## Negative Quadratics

A particle  $P$  is moving in a straight line.  
 $O$  is a fixed point on the straight line.  
The distance,  $s$  metres, of  $P$  from  $O$  at time  $t$  seconds is given by

$$s = 80t - 5t^2$$

Use algebra to find the greatest distance of  $P$  from  $O$  when  $0 \leq t \leq 16$



Full  
Lesson  
Here



020

Answer

..... 4 marks

## The Quadratic Formula

Solve  $x^2 - 5x + 3 = 0$

Give your solutions correct to 3 significant figures.

Full  
Lesson  
Here



4.30 and 0.697

Answer

..... 3 marks

## Simultaneous Equations

Solve the simultaneous equations

$$\begin{aligned}2x - 4y &= 19 \\ 3x + 5y &= 1\end{aligned}$$

.....  
**4 marks**

Full  
Lesson  
Here



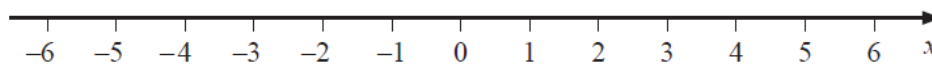
$$\begin{aligned}y &= -2.5 \\ x &= 4.5\end{aligned}$$

Answer

## Solving Inequalities and Number Lines

(a) Solve  $14n > 11n + 6$

(b) On the number line below, show the set of values of  $x$  for which  $-2 < x + 3 \leq 4$



Full  
Lesson  
Here



.....  
**4 marks**

Answer  
a)  $n > 2$   
b) Open circle above -5, closed circle above 1 and a line connecting them.

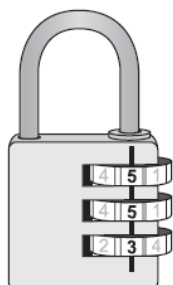
# Everything You Need to Pass GCSE Maths

## Higher Revision Guide

### Unit 10: Probability

#### The Product Rule

There are three dials on a combination lock.  
Each dial can be set to one of the numbers 1, 2, 3, 4, 5  
The three digit number 553 is one way the dials can be set, as shown in the diagram.



- (a) Work out the number of different three digit numbers that can be set for the combination lock.
- (b) How many of the possible three digit numbers have three different digits?

..... **4 marks**

Full  
Lesson  
Here



09 (b)  
521 a) 125

Answer

#### Probability from a Table

There are only blue cubes, red cubes and yellow cubes in a box.  
The table shows the probability of taking at random a blue cube from the box.

<b>Colour</b>	blue	red	yellow
<b>Probability</b>	0.2		

The number of red cubes in the box is the same as the number of yellow cubes in the box.

- (a) Complete the table.

There are 12 blue cubes in the box.

- (b) Work out the total number of cubes in the box.

..... **4 marks**

Full  
Lesson  
Here

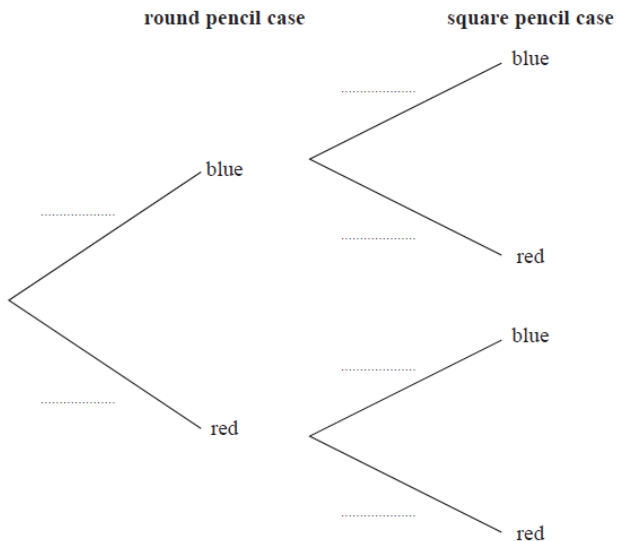


09 (b)  
60 a) 0.4, 0.4

Answer

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Probability Trees (Independent)



Sameena has a round pencil case and a square pencil case.

There are 4 blue pens and 3 red pens in the round pencil case.  
There are 3 blue pens and 5 red pens in the square pencil case.

Sameena takes at random one pen out of each pencil case.

(a) Complete the probability tree diagram.

(b) Work out the probability that the pens Sameena takes are both red.

Full  
Lesson  
Here



Answer  
a) Round:  $\frac{4}{3}, \frac{7}{7}$   
Square:  $\frac{3}{5}, \frac{8}{8}, \frac{8}{8}, \frac{8}{56}$   
b)  $\frac{15}{56}$

..... 4 marks

## Probability Trees (Dependent/Conditional)

There are 9 counters in a bag.

7 of the counters are green.

2 of the counters are blue.

Ria takes at random two counters from the bag.

Work out the probability that Ria takes one counter of each colour.

You must show your working.

Full  
Lesson  
Here



Answer  
 $\frac{28}{72}$  or equivalent

..... 4 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

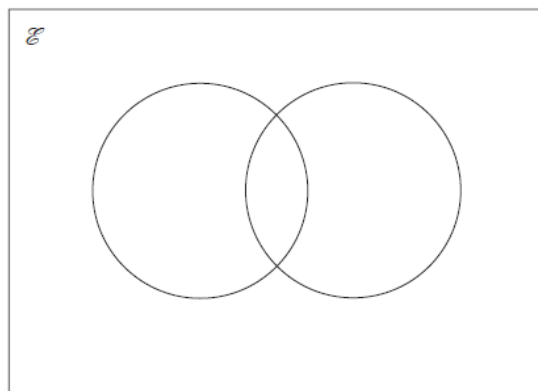
## Venn Diagrams and Set Theory

$$\mathcal{E} = \{\text{odd numbers less than } 30\}$$

$$A = \{3, 9, 15, 21, 27\}$$

$$B = \{5, 15, 25\}$$

(a) Complete the Venn diagram to represent this information.

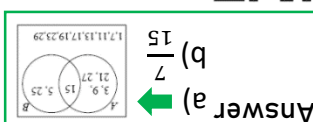


A number is chosen at random from the universal set,  $\mathcal{E}$ .

(b) What is the probability that the number is in the set  $A \cup B$ ?

..... **6 marks**

Full  
Lesson  
Here

Answer a)  $\frac{7}{15}$  b)  $\frac{15}{15}$

## Solving Problems with Venn Diagrams 1

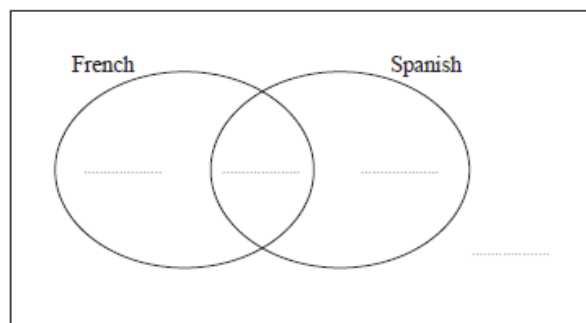
There are 60 students at a college.

20 students study both French and Spanish.

13 students study French but not Spanish.

A total of 43 students study Spanish.

(a) Complete the Venn diagram for this information.

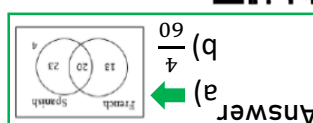


One of the students at the college is to be selected at random.

(b) Write down the probability that this student studies neither French nor Spanish.

..... **4 marks**

Full  
Lesson  
Here

Answer a)  $\frac{4}{60}$  b)  $\frac{4}{60}$

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Solving Problems with Venn Diagrams 2

50 people were asked if they speak French or German or Spanish.

Of these people,

- 31 speak French
- 2 speak French, German and Spanish
- 4 speak French and Spanish but not German
- 7 speak German and Spanish
- 8 do not speak any of the languages
- all 10 people who speak German speak at least one other language

Two of the 50 people are chosen at random.

Work out the probability that they both only speak Spanish.

Full  
Lesson  
Here



Answer  
 $\frac{490}{6}$  or equivalent

..... 5 marks

## Probability Equations

There are only green pens and blue pens in a box.

There are three more blue pens than green pens in the box.

There are more than 12 pens in the box.

Simon is going to take at random two pens from the box.

The probability that Simon will take two pens of the same colour is  $\frac{27}{55}$

Work out the number of green pens in the box.

Full  
Lesson  
Here



21

Answer

..... 6 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 11: Multiplicative Reasoning and Compound Measures

### Compound Interest without a Calculator

Toby invested £7500 for 2 years in a savings account.  
He was paid 4% per annum compound interest.

How much money did Toby have in his savings account at the end of 2 years?

Full  
Lesson  
Here



£8112

Answer

..... 2 marks

### Compound Interest

Katy invests £200 000 in a savings account for 4 years.  
The account pays compound interest at a rate of 1.5% per annum.

Calculate the total amount of interest Katy will get at the end of 4 years.

Full  
Lesson  
Here



£12,272.70 -  
£12,272.72

Answer

..... 3 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Reverse Compound Interest

Naoby invests £6000 for 5 years.  
The investment gets compound interest of  $x\%$  per annum.  
At the end of 5 years the investment is worth £8029.35  
Work out the value of  $x$ .

Full  
Lesson  
Here



%9

Answer

..... **3 marks**

## Depreciation

Natalia pays £13 995 for a car.  
Lauren pays £14 495 for a car.  
Assume that  
the rate of depreciation for Natalia's car is 12% per annum  
and the rate of depreciation for Lauren's car is 13% per annum.  
(a) Work out whose car will have the greater value at the end of 3 years.  
You must show all your working.

The rate of depreciation assumed for Natalia's car was too low.  
(b) How does this affect the value of her car at the end of 3 years?

Full  
Lesson  
Here



Answer  
a) Lauren  
b) Her car will be worth  
less

..... **5 marks**

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Speed, Distance and Time (Non-Calculator)

Gary drove from London to Sheffield.  
It took him 3 hours at an average speed of 80km/h.

Lyn drove from London to Sheffield.  
She took 5 hours.

Assuming that Lyn  
drove along the same roads as Gary  
and did not take a break,

- (a) work out Lyn's average speed from London to Sheffield.
- (b) If Lyn did **not** drive along the same roads as Gary, explain how this could affect your answer to part (a).

Full  
Lesson  
Here



Answer  
a) 48km/h  
b) She may drive a different distance / have a different average speed

..... 4 marks

## Speed, Distance and Time Journeys

Olly drove 56 km from Liverpool to Manchester.  
He then drove 61 km from Manchester to Sheffield.

Olly's average speed from Liverpool to Manchester was 70 km/h.  
Olly took 75 minutes to drive from Manchester to Sheffield.

Work out Olly's average speed for his total drive from Liverpool to Sheffield.

Full  
Lesson  
Here



Answer  
57.1km/h

..... 4 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Density, Mass and Volume

A gold bar has a mass of 12.5 kg.

The density of gold is  $19.3 \text{ g/cm}^3$

Work out the volume of the gold bar.  
Give your answer correct to 3 significant figures.



648cm<sup>3</sup>

Answer

..... 3 marks

## Density, Mass and Volume Mixtures

The density of apple juice is 1.05 grams per  $\text{cm}^3$ .

The density of fruit syrup is 1.4 grams per  $\text{cm}^3$ .

The density of carbonated water is 0.99 grams per  $\text{cm}^3$ .

25  $\text{cm}^3$  of apple juice are mixed with 15  $\text{cm}^3$  of fruit syrup and  
280  $\text{cm}^3$  of carbonated water to make a drink with a volume of 320  $\text{cm}^3$ .

Work out the density of the drink.  
Give your answer correct to 2 decimal places.



1.01g/cm<sup>3</sup>

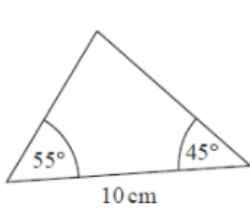
Answer

..... 4 marks

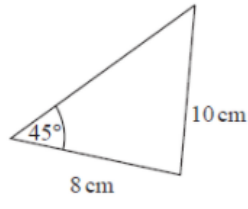
# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 12: Similarity and Congruence in 2D and 3D

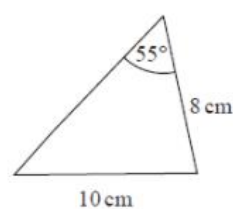
### Congruent Triangles



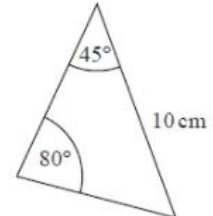
Triangle A



Triangle B



Triangle C



Triangle D

Two of these triangles are congruent.

Write down the letters of these two triangles.

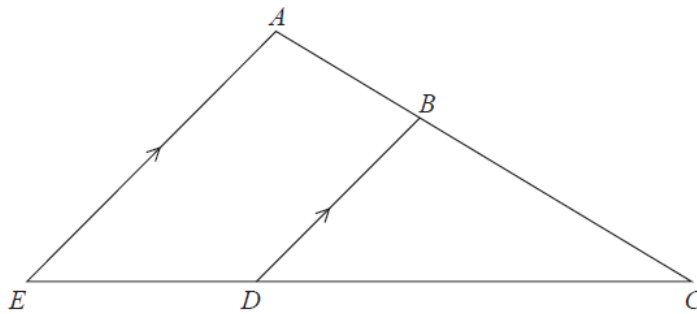


A and D

Answer

1 mark

### Similar Shapes (Lengths)



$ABC$  and  $EDC$  are straight lines.  
 $EA$  is parallel to  $DB$ .

$EC = 8.1$  cm.  
 $DC = 5.4$  cm.  
 $DB = 2.6$  cm.

(a) Work out the length of  $AE$ .

$AC = 6.15$  cm.

(b) Work out the length of  $AB$ .



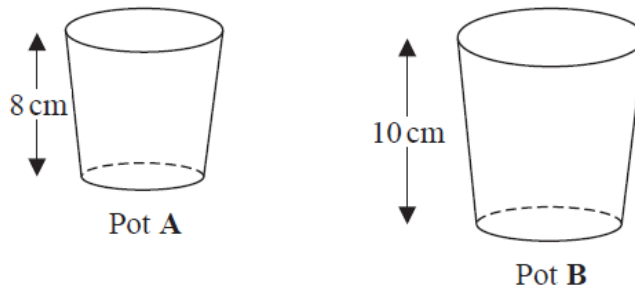
a) 3.9cm  
b) 2.05cm

Answer

4 marks

## Similar Shapes (Area and Volume)

Here are two pots.



Pot A and pot B are mathematically similar.

The area of the base of pot B is  $160 \text{ cm}^2$ .

Work out the area of the base of pot A.

Full  
Lesson  
Here



102.4cm<sup>2</sup>

Answer

..... 2 marks

## Similar Shapes with Ratios

Three solid shapes A, B and C are similar.

The surface area of shape A is  $4 \text{ cm}^2$

The surface area of shape B is  $25 \text{ cm}^2$

The ratio of the volume of shape B to the volume of shape C is 27 : 64

Work out the ratio of the height of shape A to the height of shape C.

Give your answer in its simplest form.

Full  
Lesson  
Here



3:10

Answer

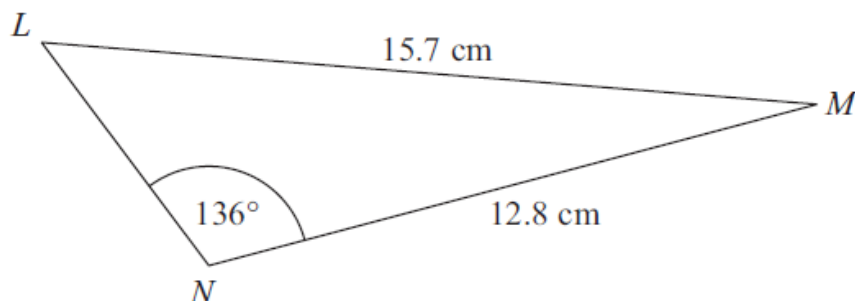
..... 4 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 13: Further Trigonometry

### The Sine Rule

The diagram shows triangle  $LMN$ .



Calculate the length of  $LN$ .  
Give your answer correct to 3 significant figures.

Full  
Lesson  
Here

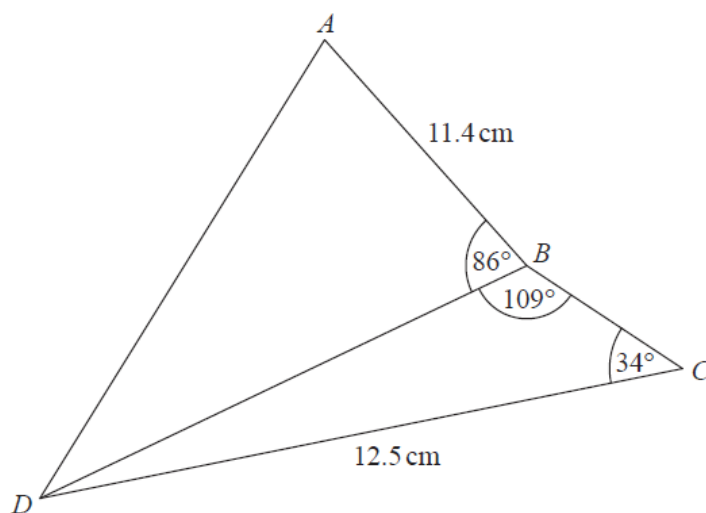


3.73-3.74cm

Answer

..... 5 marks

### The Cosine Rule



Work out the length of  $AD$ .  
Give your answer correct to 3 significant figures.

Full  
Lesson  
Here



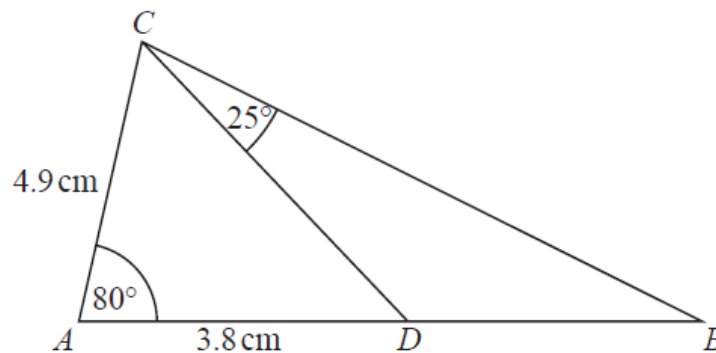
13.1cm

Answer

..... 5 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Area of a Triangle



*ABC* is a triangle.  
*D* is a point on *AB*.

Work out the area of triangle *BCD*.  
Give your answer correct to 3 significant figures.



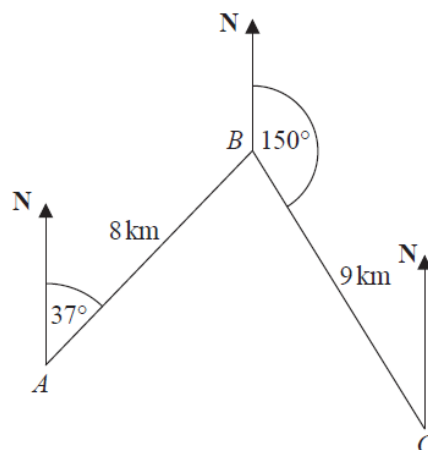
10.4cm<sup>2</sup>

Answer

..... 5 marks

## Bearings with Trigonometry

The diagram shows the positions of three towns, Acton (*A*), Barston (*B*) and Chorlton (*C*).



Barston is 8 km from Acton on a bearing of  $037^\circ$   
Chorlton is 9 km from Barston on a bearing of  $150^\circ$

Find the bearing of Chorlton from Acton.  
Give your answer correct to 1 decimal place.  
You must show all your working.



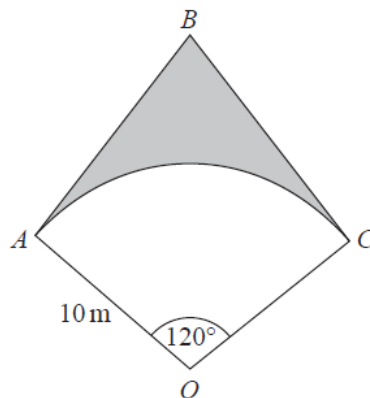
098.6°

Answer

..... 5 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Circle Sectors with Trigonometry



$OAC$  is a sector of a circle, centre  $O$ , radius  $10\text{ m}$ .

$BA$  is the tangent to the circle at point  $A$ .

$BC$  is the tangent to the circle at point  $C$ .

Angle  $AOC = 120^\circ$

Calculate the area of the shaded region.

Give your answer correct to 3 significant figures.

Full  
Lesson  
Here



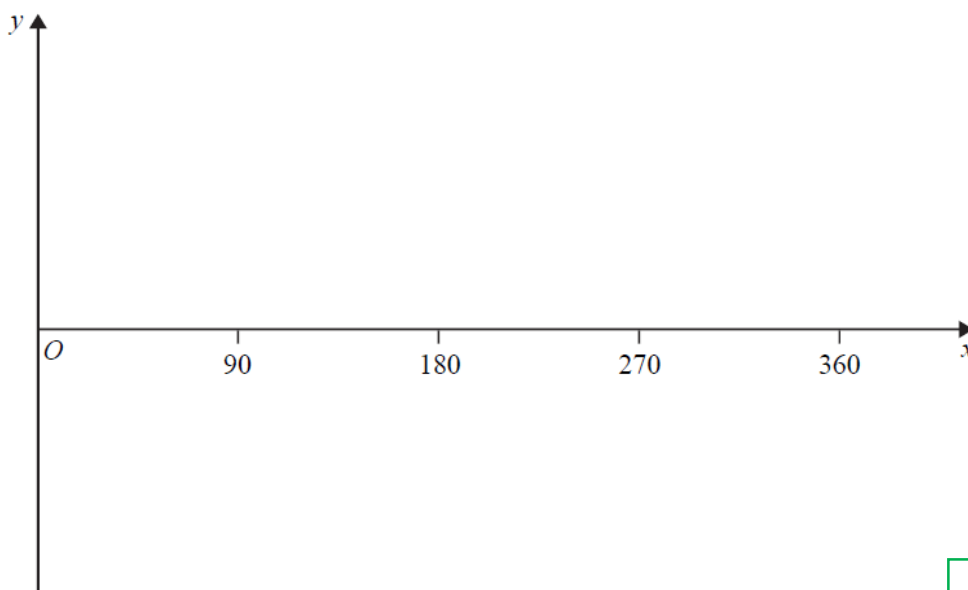
68.5m<sup>2</sup>

Answer

5 marks

## Trigonometric Graphs

Sketch the graph of  $y = \cos x^\circ$  for  $0 \leq x \leq 360$



Full  
Lesson  
Here



Sketch Drawn

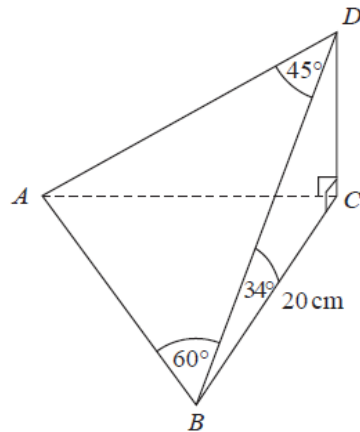
Answer

2 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## 3D Trigonometry

The diagram shows a pyramid with base  $ABC$ .



$CD$  is perpendicular to both  $CA$  and  $CB$ .

Angle  $CBD = 34^\circ$       Angle  $ADB = 45^\circ$       Angle  $DBA = 60^\circ$   
 $BC = 20$  cm.

Calculate the size of the angle between the line  $AD$  and the plane  $ABC$ .  
 Give your answer correct to 1 decimal place.

..... **5 marks**

Full  
Lesson  
Here

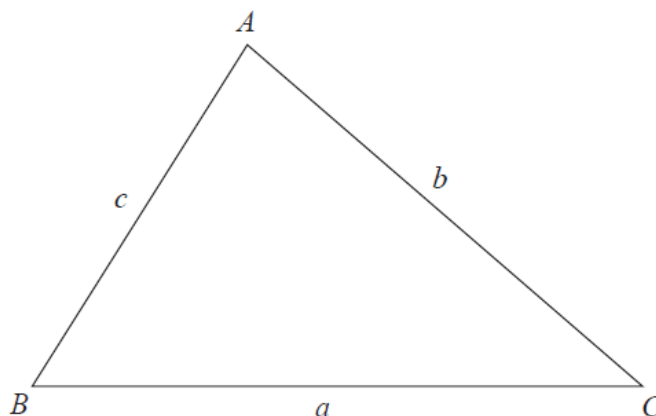


38.6°

Answer

## Proving the Trigonometric Formulas

The diagram shows an acute-angled triangle  $ABC$ .



Prove that      area of triangle  $ABC = \frac{1}{2}ab \sin C$

..... **3 marks**

Full  
Lesson  
Here



Proof Shown

Answer

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 14: Statistics, Sampling, Cumulative Frequency and Histograms

### Sampling and Bias

Hannah is planning a day trip for 195 students.

She asks a sample of 30 students where they want to go.  
Each student chooses one place.

The table shows information about her results.

Place	Number of students
Theme Park	10
Theatre	5
Sports Centre	8
Seaside	7

- (i) Work out how many of the 195 students you think will want to go to the Theme Park.
- (ii) State any assumption you made **and** explain how this may affect your answer.



Answer  
a) 65  
b) The sample is representative  
it could be more or less.

..... 3 marks

### Capture Recapture

Alex wants to find out how many ducks there are in a park.

One day he puts a tag on each of 30 of the ducks.  
The next day he catches 40 ducks.  
8 of these ducks have tags on them.

- (i) Work out an estimate for the number of ducks in the park.

Alex assumed that none of the tags fell off during the night.

- (ii) If Alex's assumption is wrong, explain how this could affect your answer to part (i).



Answer  
a) 150  
b) Overestimated

..... 4 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

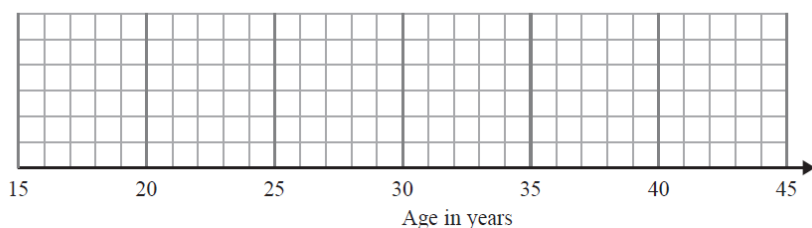
## Box Plots

The stem and leaf diagram shows the ages, in years, of 25 people.

1	7 7 8 9
2	1 2 4 4 5 5 6 7 8 9 9
3	0 1 2 2 3 4 5 6
4	0 1

Key: 1|7 represents 17 years

(a) (i) On the grid, draw a box plot for this information.



One of these people is chosen at random.

(ii) What is the probability that this person is 30 years of age or older?

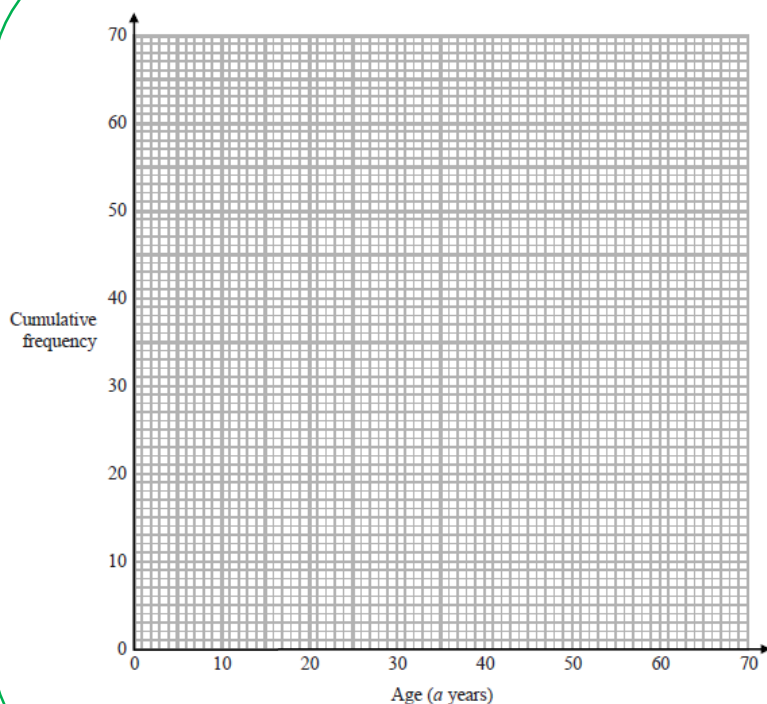
**5 marks**

Full  
Lesson  
Here



**Answer**  
a) LO: 23, Med: 28, UQ: 32.5  
b)  $\frac{25}{10}$  or equivalent

## Cumulative Frequency



Francesco carried out a survey about the ages of the people in his office.

The table shows information about his results.

Age ( $a$ years)	Cumulative frequency
$20 < a \leq 30$	10
$20 < a \leq 40$	26
$20 < a \leq 50$	58
$20 < a \leq 60$	66
$20 < a \leq 70$	70

(a) On the grid opposite, draw a cumulative frequency graph for this information.

(b) Use your graph to find an estimate for the median age.

**3 marks**

Full  
Lesson  
Here



**Answer**  
a) correct graph drawn  
b) 41 - 45

# Everything You Need to Pass GCSE Maths Higher Revision Guide

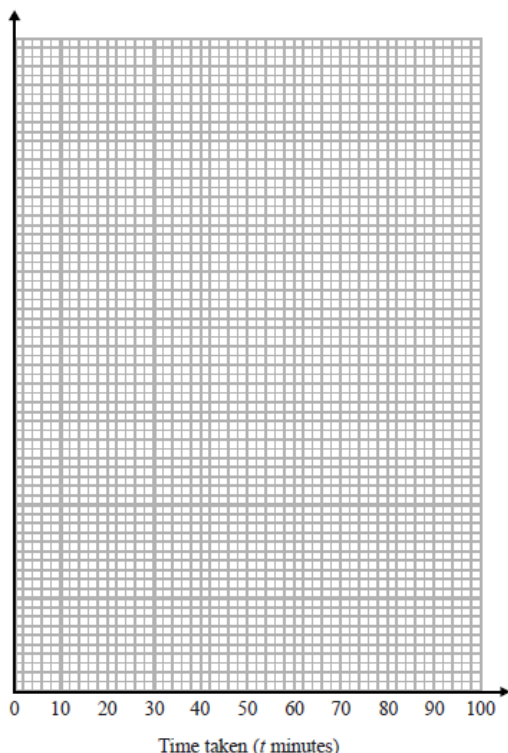
## Histograms

The table shows information about the times a group of students took to do a park run.

Time taken ( $t$ minutes)	Frequency
$0 < t \leq 25$	20
$25 < t \leq 45$	35
$45 < t \leq 60$	45
$60 < t \leq 75$	87
$75 < t \leq 85$	10
$85 < t \leq 95$	8

Draw a histogram for this information.

Frequency  
density



Full  
Lesson  
Here



Correct graph drawn

Answer

3 marks

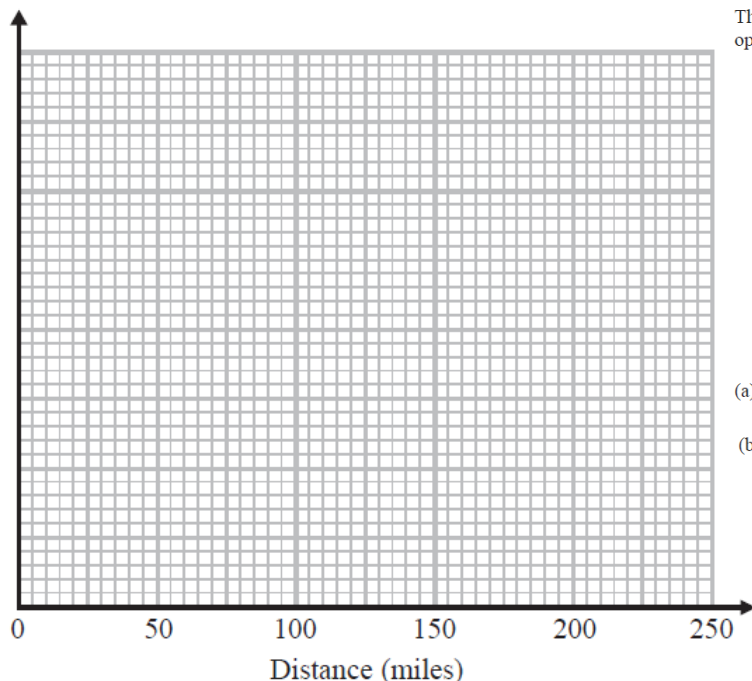
## Averages from a Histogram

The table shows information about the distances 570 students travelled to a university open day.

Distance ( $d$ miles)	Frequency
$0 < d \leq 20$	120
$20 < d \leq 50$	90
$50 < d \leq 80$	120
$80 < d \leq 150$	140
$150 < d \leq 200$	100

(a) Draw a histogram for the information in the table.

(b) Estimate the median distance.



Full  
Lesson  
Here



a) Histogram drawn and  
labelled b) 66.71

Answer

5 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 15: Further Quadratics, Cubics, Inequalities and Graphs

### Expanding Triple Brackets


Show that

$$(3x - 1)(x + 5)(4x - 3) = 12x^3 + 47x^2 - 62x + 15$$

for all values of  $x$ .

..... **3 marks**

Full Lesson Here



Answer  
Correct expansion shown

### Completing the Square to find Turning Points


Given that  $x^2 - 6x + 1 = (x - a)^2 - b$  for all values of  $x$ ,

(i) find the value of  $a$  and the value of  $b$ .

(ii) Hence write down the coordinates of the turning point on the graph of  $y = x^2 - 6x + 1$

..... **3 marks**

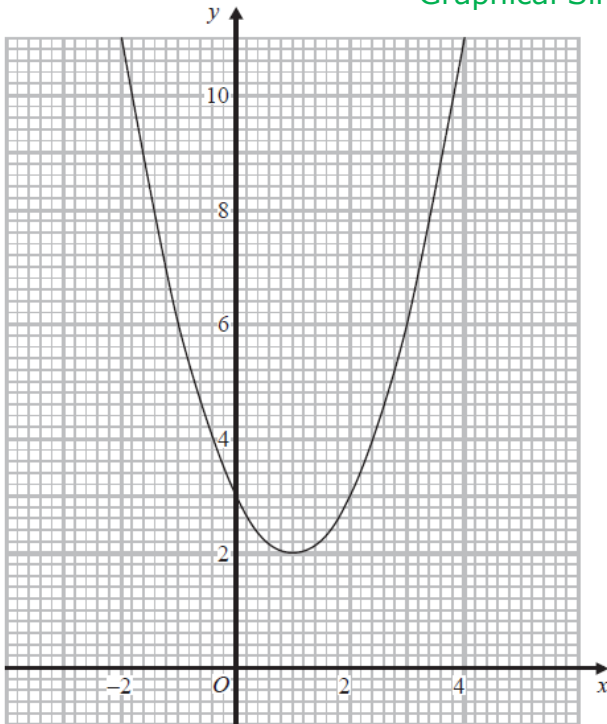
Full Lesson Here



Answer  
a)  $a=3$   $b=8$   
b)  $(3, -8)$

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Graphical Simultaneous Equations



The diagram shows part of the graph of  $y = x^2 - 2x + 3$

By drawing a suitable straight line, use your graph to find estimates for the solutions of  $x^2 - 3x - 1 = 0$

Full  
Lesson  
Here



3.2 to 3.4  
-0.4 to -0.2 and

Answer

..... 2 marks

## Quadratic Simultaneous Equations

Solve algebraically the simultaneous equations

$$x^2 + y^2 = 25$$

$$y - 3x = 13$$

Full  
Lesson  
Here



$x = -\frac{5}{7}$   $y = -\frac{24}{7}$

Answer  $x = -3$   $y = 4$

..... 5 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Iterations

(a) Show that the equation  $x^3 + 5x - 4 = 0$  has a solution between  $x = 0$  and  $x = 1$

(b) Show that the equation  $x^3 + 5x - 4 = 0$  can be arranged to give  $x = \frac{4}{x^2 + 5}$

(c) Starting with  $x_0 = 0$ , use the iteration formula  $x_{n+1} = \frac{4}{x_n^2 + 5}$  twice, to find an estimate for the solution of  $x^3 + 5x - 4 = 0$

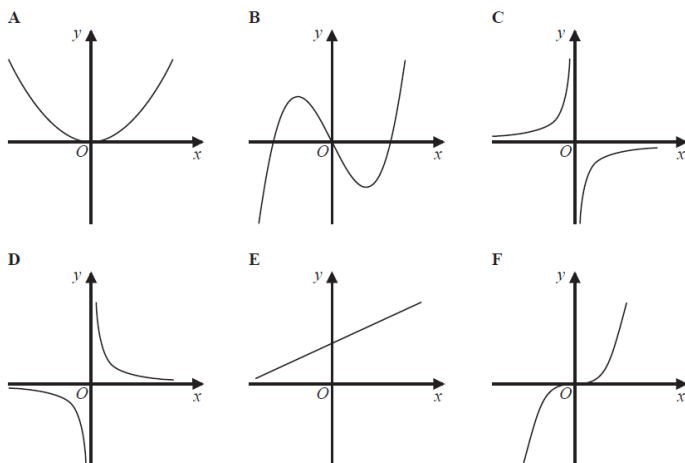
Full  
Lesson  
Here



Answer  
a) 0 and 1 substituted in.  
b) Rearrangement shown.  
c) 0.709 or 100/141

..... 7 marks

## Recognising Different Graphs



Write down the letter of the graph that could have the equation

(a)  $y = x^3$

(b)  $y = \frac{1}{x}$

Full  
Lesson  
Here



Answer  
a) F  
b) D

..... 2 marks

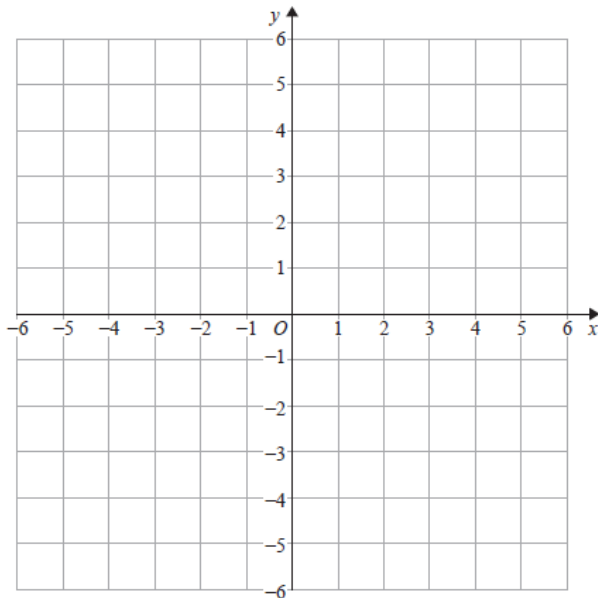
# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Graphical Inequalities and Regions

On the grid, shade the region that satisfies all these inequalities.

$$y > 1 \quad x + y < 5 \quad y > 2x$$

Label the region R.



Full  
Lesson  
Here



Region R shaded

Answer

..... 3 marks

## Quadratic Inequalities

Solve  $2x^2 + 3x - 2 > 0$

Full  
Lesson  
Here



$x < -2, x > \frac{1}{2}$

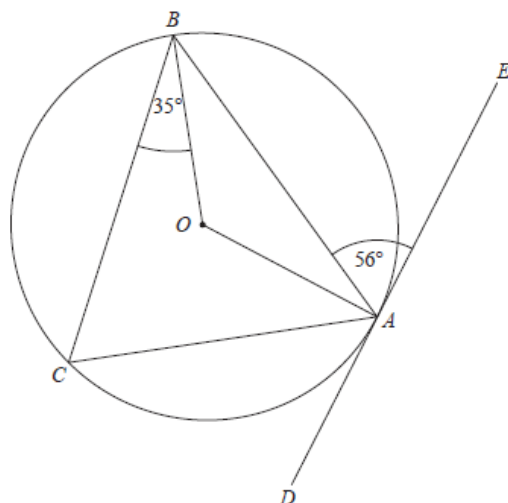
Answer

..... 3 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 16: Circle Theorems and Circle Geometry

### Circle Theorems 1



$A, B$  and  $C$  are points on the circumference of a circle, centre  $O$ .  
 $DAE$  is the tangent to the circle at  $A$ .

Angle  $BAE = 56^\circ$   
Angle  $CBO = 35^\circ$

Work out the size of angle  $CAO$ .  
You must show all your working.

..... **3 marks**

Full  
Lesson  
Here

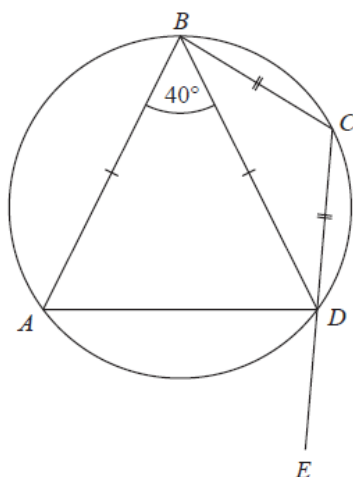


Region R shaded

Answer

### Circle Theorems 2

The points  $A, B, C$  and  $D$  lie on a circle.  
 $CDE$  is a straight line.



$BA = BD$   
 $CB = CD$   
Angle  $ABD = 40^\circ$

Work out the size of angle  $ADE$ .  
You must give a reason for each stage of your working.

..... **5 marks**

Full  
Lesson  
Here



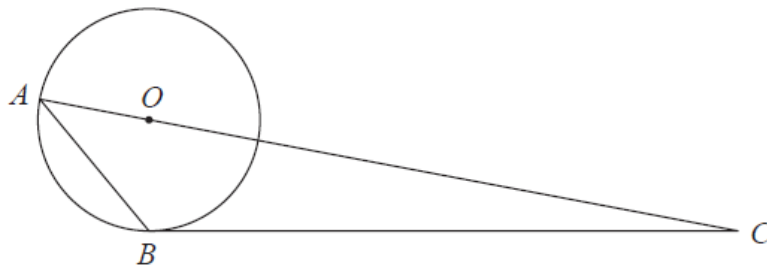
Reasons given

75°

Answer

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Difficult Circle Theorems



$A$  and  $B$  are points on a circle, centre  $O$ .

$BC$  is a tangent to the circle.

$AOC$  is a straight line.

Angle  $ABO = x^\circ$ .

Find the size of angle  $ACB$ , in terms of  $x$ .

Give your answer in its simplest form.

Give reasons for each stage of your working.

Full  
Lesson  
Here

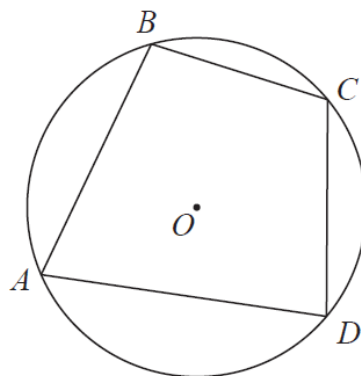


Answer  
90 - 2x  
Reasons given

..... **5 marks**

## Circle Theorem Proof

$A$ ,  $B$ ,  $C$  and  $D$  are points on the circumference of a circle, centre  $O$ .



Prove that the sum of angle  $ABC$  and angle  $ADC$  is  $180^\circ$

Full  
Lesson  
Here

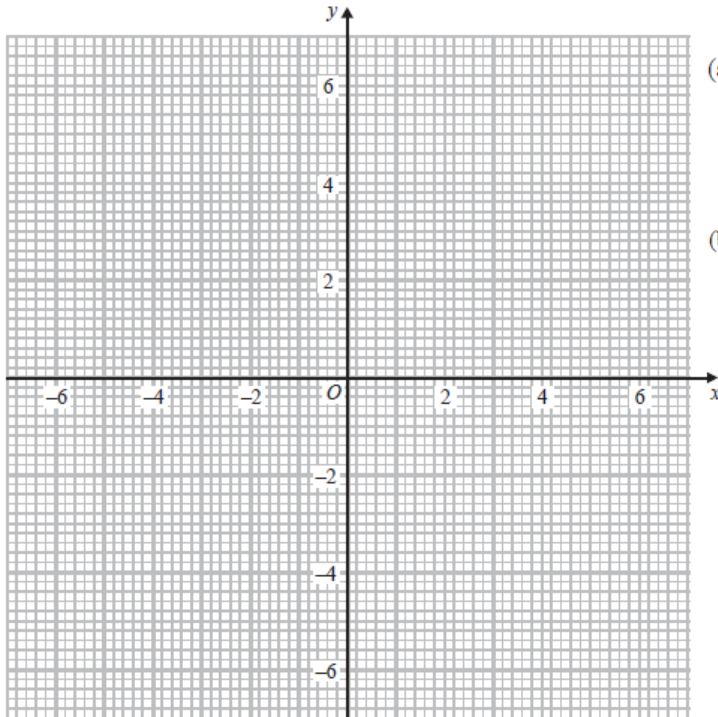


Answer  
Proof shown

..... **4 marks**

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Equation of a Circle




(a) On the grid, draw the graph of  $x^2 + y^2 = 12.25$



(b) Hence find estimates for the solutions of the simultaneous equations

$$\begin{aligned}x^2 + y^2 &= 12.25 \\ 2x + y &= 1\end{aligned}$$

Full Lesson Here

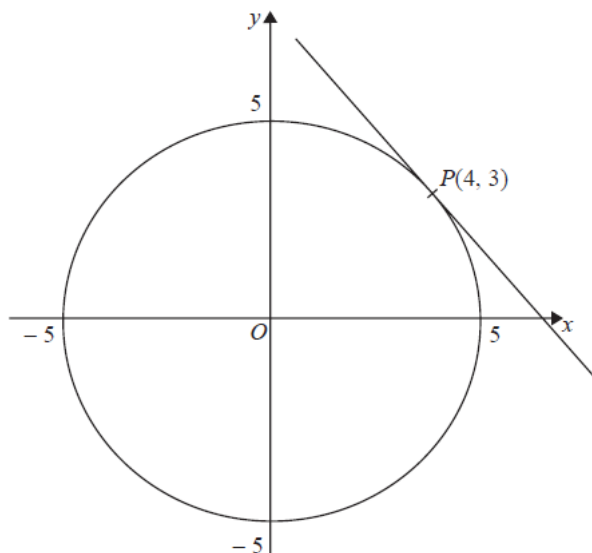


Answer  
a) radius 3.5 centre 0  
b)  $x=2, y=-2.9$  and  $x=-1.2, y=3.3$

5 marks


## Equation of a Tangent to a Circle

Here is a circle, centre  $O$ , and the tangent to the circle at the point  $P(4, 3)$  on the circle.



Find an equation of the tangent at the point  $P$ .

Full Lesson Here



Answer  
 $y = -\frac{3}{4}x + \frac{3}{25}$

3 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

Unit 17: Subject of a Formula, Algebraic Fractions, Rationalising Surds, Algebraic Proof

## Changing the Subject with Factorising

Make  $t$  the subject of the formula  $k = \frac{2(t + 3)}{t - 3}$



Answer  
 $t = \frac{6+3k}{k-2}$  or equivalent

..... 4 marks

## Simplifying Algebraic Fractions

Simplify  $\frac{x^2 - 16}{2x^2 - 5x - 12}$



Answer  
 $\frac{x + 4}{2x + 3}$

..... 3 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Algebraic Fraction Calculations

Write

$$4 - \left[ (x + 3) \div \frac{x^2 + 5x + 6}{x - 2} \right]$$

as a single fraction in its simplest form.  
You must show your working.

Full  
Lesson  
Here



$$\frac{x + 2}{3x + 10}$$

Answer

..... **4 marks**

## Solve Algebraic Fraction Equations

Given that

$$2x - 1 : x - 4 = 16x + 1 : 2x - 1$$

find the possible values of  $x$ .

Full  
Lesson  
Here



$$x = -\frac{1}{12}, x = 5$$

Answer

..... **5 marks**

## Rationalising Harder Fractions

Show that  $\frac{1}{1 + \frac{1}{\sqrt{2}}}$  can be written as  $2 - \sqrt{2}$

Full  
Lesson  
Here



Answer given result shown

Answer

..... 3 marks

## Algebraic Proof

Prove that the sum of the squares of any three consecutive odd numbers is always 11 more than a multiple of 12

Full  
Lesson  
Here



Answer  $12(n^2 + 3n + 2) + 11$

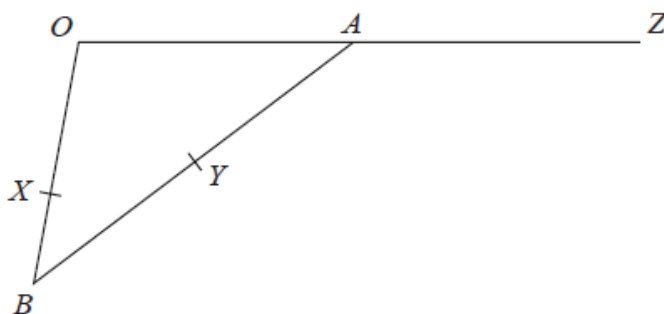
Answer

..... 3 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Unit 18: Vector Proof and Geometric Proof

### Vector Proof



$OAB$  is a triangle.

$A$  is the midpoint of  $OZ$

$Y$  is the midpoint of  $AB$

$X$  is a point on  $OB$

$$\vec{OA} = \mathbf{a} \quad \vec{OX} = 2\mathbf{b} \quad \vec{XB} = \mathbf{b}$$

Prove that  $XYZ$  is a straight line.

..... 5 marks

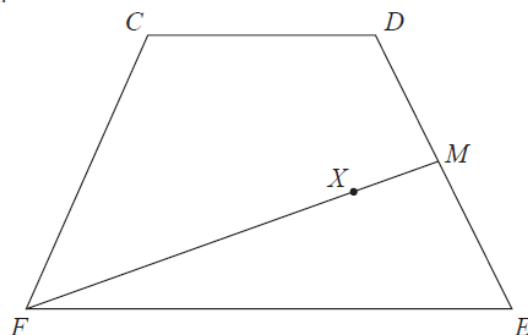
Full  
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Answer 2 of:  $\frac{2}{1}(a-b)$ ,  
 $\frac{2}{3}(a-b)$ ,  $(q-v)z$ ,  $(q-v)\frac{z}{3}$

### Vector Proof with Ratios

$CDEF$  is a quadrilateral.



$$\vec{CD} = \mathbf{a}, \vec{DE} = \mathbf{b} \text{ and } \vec{FC} = \mathbf{a} - \mathbf{b}.$$

- (a) Express  $\vec{FE}$  in terms of  $\mathbf{a}$  and/or  $\mathbf{b}$ .  
Give your answer in its simplest form.

$M$  is the midpoint of  $DE$ .

$X$  is the point on  $FM$  such that  $FX:XM = n:1$

$CXE$  is a straight line.

- (b) Work out the value of  $n$ .

..... 6 marks

Full  
Lesson  
Here

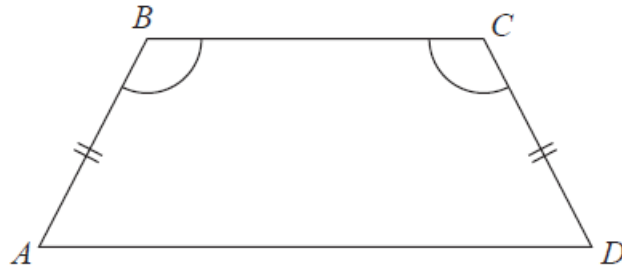


Answer a)  $2\mathbf{a}$   
b) 4

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Geometric Proof 1

$ABCD$  is a quadrilateral.



$AB = CD$ .

Angle  $ABC =$  angle  $BCD$ .

Prove that  $AC = BD$ .



Full Lesson Here

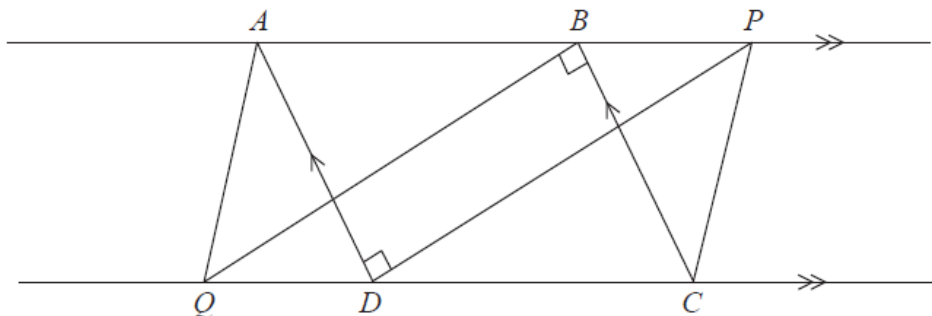


BC=BC (4) SAS Triangles AC=BD  
(1) ABC=BCD (2) AC=BD (3)

Answer

..... 4 marks

## Geometric Proof 2



$ABCD$  is a parallelogram.

$ABP$  and  $QDC$  are straight lines.

Angle  $ADP =$  angle  $CBQ = 90^\circ$

(a) Prove that triangle  $ADP$  is congruent to triangle  $CBQ$ .

(b) Explain why  $AQ$  is parallel to  $PC$ .



Full Lesson Here



ADP is congruent to CBQ. Opposite sides of a parallelogram are equal  
(4) ASA Triangles (b) AP=QC since triangle ADP is congruent to CBQ  
(a) (1) AD=BC (2) PAD=QCB (3) ADP=CBQ

Answer

..... 5 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

Unit 19: Exponentials, Velocity-Time Graphs, Proportion, Functions, Graph Transformations

## Direct Proportion

$y$  is directly proportional to  $\sqrt[3]{x}$

$$y = 1\frac{1}{6} \text{ when } x = 8$$

Find the value of  $y$  when  $x = 64$

Full  
Lesson  
Here



$\frac{3}{7}$

Answer

3 marks

## Inverse Proportion

$T$  is inversely proportional to the cube of  $u$ .

$$\text{When } u = 5, T = 0.0096$$

Find the value of  $u$  when  $T = 0.15$

Full  
Lesson  
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2

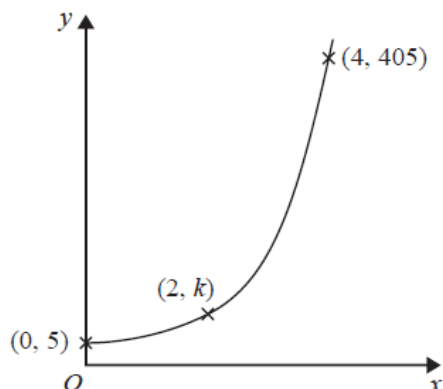
Answer

3 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Exponential Graphs

Here is a sketch of part of the graph of  $y = pq^x$  where  $q > 0$



The points  $(0, 5)$ ,  $(2, k)$  and  $(4, 405)$  are all on the graph of  $y = pq^x$

Find the value of  $k$ .

Full  
Lesson  
Here



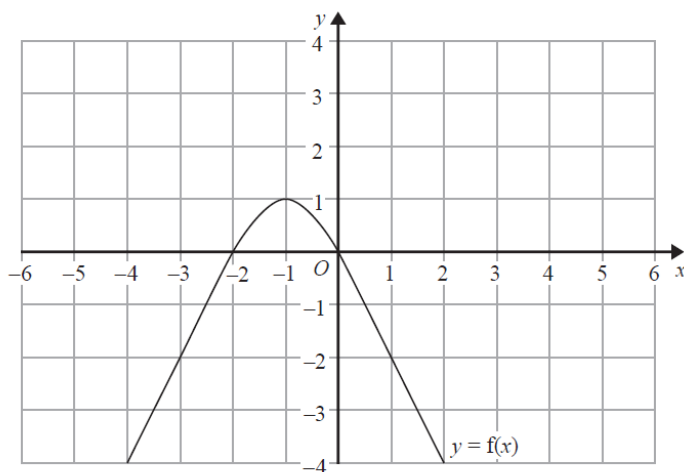
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Answer

4 marks

## Graph Transformations

The graph of  $y = f(x)$  is shown on the grid.



(a) On the grid, sketch the graph of  $y = f(x - 1)$

The graph of  $y = f(x)$  has a turning point at the point  $(-1, 1)$

(b) Write down the coordinates of the turning point of the graph of  $y = f(-x) + 2$

Full  
Lesson  
Here



$x < -2, x > \frac{1}{2}$

Answer

2 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

## Composite Functions

For all values of  $x$

$$f(x) = 2x - 3 \quad \text{and} \quad g(x) = x^2 + 2$$

(a) Find  $g(-4)$

(b) Show that  $gf(x) = 4x^2 - 12x + 11$

(c) Solve  $fg(x) = gf(x)$

Full  
Lesson  
Here



Answer  
a) 18 b) Shown  
c)  $x=1$  and  $x=5$

..... 7 marks

## Inverse Functions

The functions  $f$  and  $g$  are such that

$$f(x) = 3(x - 4) \quad \text{and} \quad g(x) = \frac{x}{5} + 1$$

(a) Find the value of  $f(10)$

(b) Find  $g^{-1}(x)$

(c) Show that  $ff(x) = 9x - 48$

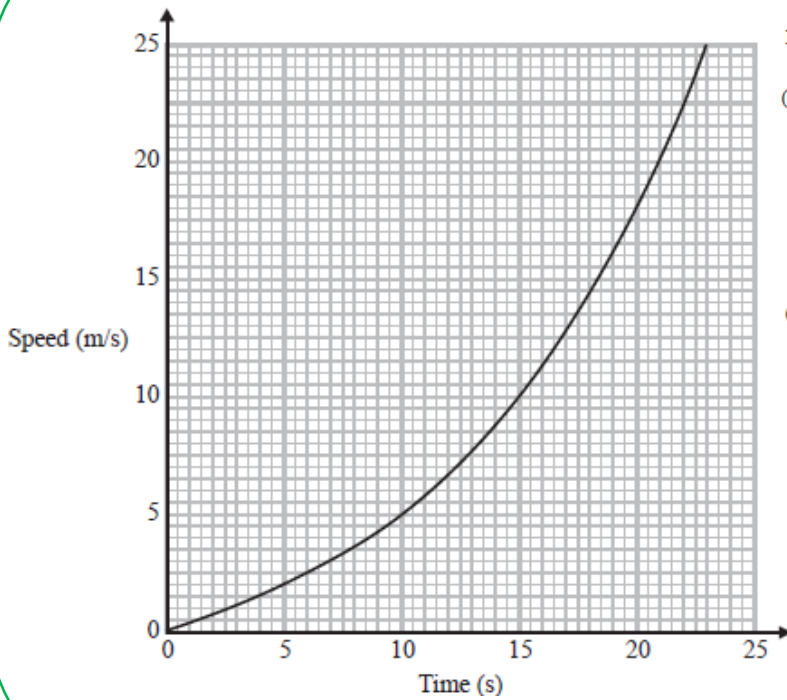
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Answer  
 $x > -2, x > \frac{1}{2}$

..... 5 marks

## Area Under a Curve



Here is a speed-time graph for a train.

- (a) Work out an estimate for the distance the train travelled in the first 20 seconds. Use 4 strips of equal width.
- (b) Is your answer to (a) an underestimate or an overestimate of the actual distance the train travelled? Give a reason for your answer.

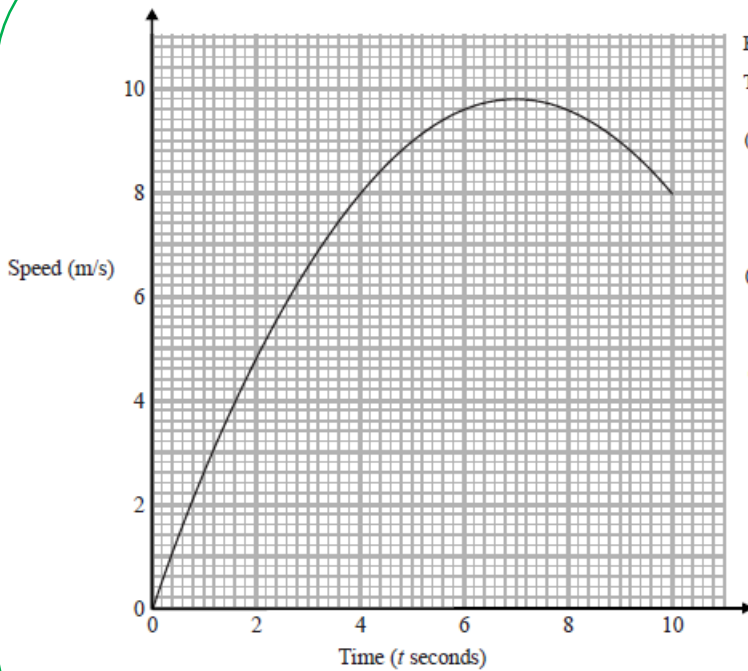
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Answer  
a) 130m  
b) Overestimate, area between curves and trapeziums included.

..... 4 marks

## Gradient of a Curve



Karol runs in a race.

The graph shows her speed, in metres per second,  $t$  seconds after the start of the race.

- (a) Calculate an estimate for the gradient of the graph when  $t = 4$ . You must show how you get your answer.
- (b) Describe fully what your answer to part (a) represents.
- (c) Explain why your answer to part (a) is only an estimate.

Full  
Lesson  
Here



Answer  
a) 1.0 - 1.3  
b) The acceleration at 4 seconds in  $m/s^2$   
c) Dependent on accuracy of the tangent

..... 6 marks

# Everything You Need to Pass GCSE Maths Higher Revision Guide

**Bonus:** Direct and Inverse Proportion, Bounds with Compound Measures

## Direct and Inverse Proportion

$y$  is inversely proportional to  $d^2$

When  $d = 10$ ,  $y = 4$

$d$  is directly proportional to  $x^2$

When  $x = 2$ ,  $d = 24$

Find a formula for  $y$  in terms of  $x$ .

Give your answer in its simplest form.

Full  
Lesson  
Here



Answer

$$y = \frac{9x^6}{100}$$

..... 5 marks

## Bounds with Compound Measures

A high speed train travels a distance of 487 km in 3 hours.

The distance is measured correct to the nearest kilometre.

The time is measured correct to the nearest minute.

By considering bounds, work out the average speed, in km/minute, of the train to a suitable degree of accuracy.

You must show all your working and give a reason for your answer.

Full  
Lesson  
Here



Answer

2.7 km/minute (1dp)

..... 5 marks