

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Time 1 hour 30 minutes

Paper
reference

1MA1/1H

Mathematics

PAPER 1 (Non-Calculator)

Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may not be used.**



Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P64630A

©2021 Pearson Education Ltd.

E:1/1/1/1/1/1/

.CG Maths.

Hints



Pearson

Please note that these worked solutions have neither been provided nor approved by Pearson Education and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Work out 3.67×4.2

$$\begin{array}{r} 3.67 \\ \times 4.2 \\ \hline \end{array}$$

There are 2 decimal places in 3.67 and 1 decimal place in 4.2. There are 3 decimal places in total therefore there should be 3 decimal places in the answer

.....
(3)

(b) Work out $59.84 \div 1.6$

$59.84/1.6 = 598.4/16$ as they are equivalent fractions. Eliminating the decimal from the denominator makes the division much easier

.....
(3)

(Total for Question 1 is 6 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



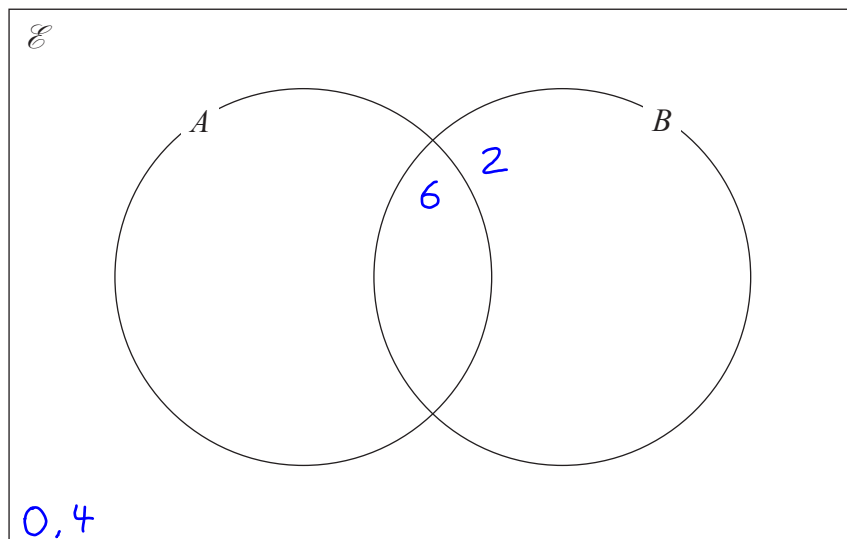
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- 2 $\mathcal{E} = \{\text{even numbers less than } 19\}$
 $A = \{6, 12, 18\}$
 $B = \{2, 6, 14, 18\}$

Complete the Venn diagram for this information.



(Total for Question 2 is 3 marks)

- 3 Work out $4\frac{1}{5} - 2\frac{2}{3}$

Give your answer as a mixed number.

Convert both into improper fractions by multiplying the whole number by the denominator then adding the result to the numerator. Make the denominators the same by finding a common multiple of 5 and 3 and multiplying the denominators to get this. Multiply each numerator by the same amount as their denominator was multiplied by to keep the fractions equivalent. Subtract the numerators and keep the denominator the same. Convert into a mixed number by dividing the numerator by the denominator to find the whole number and leave the remainder in the fraction

(Total for Question 3 is 3 marks)



- 4 At the end of 2017
the value of Tamara's house was £220 000
the value of Rahim's house was £160 000

At the end of 2019
the value of Tamara's house had decreased by 20%
the value of Rahim's house had increased by 30%

At the end of 2019, whose house had the greater value?
You must show how you get your answer.

Find the value of both houses at the end of 2019 to work out which is greater.
To decrease by 20%, find 20% then take it away from the original value. To
find 20%, work out 10% then multiply by 2. To find 10%, divide by 10

(Total for Question 4 is 4 marks)

5 Rosie, Matilda and Ibrahim collect stickers.

$$\begin{array}{l} \text{number of stickers} \\ \text{Rosie has} \end{array} : \begin{array}{l} \text{number of stickers} \\ \text{Matilda has} \end{array} : \begin{array}{l} \text{number of stickers} \\ \text{Ibrahim has} \end{array} = 4:7:15$$

Ibrahim has 24 more stickers than Matilda.

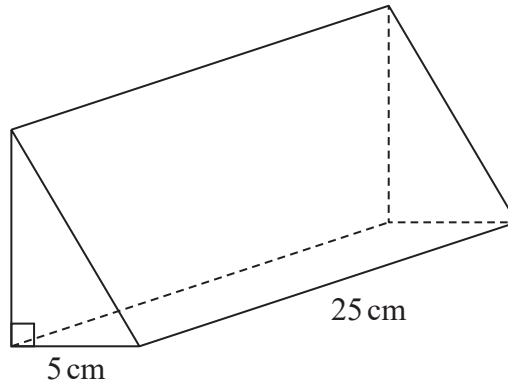
Ibrahim has more stickers than Rosie.

How many more?

- 1) Work out how many parts Ibrahim has more than Matilda. This many parts represent the 24 stickers.
- 2) Work out what 1 part of the ratio is worth.
- 3) Work out how many parts Ibrahim has more than Rosie.
- 4) Work out how many stickers these parts are worth

.....
(Total for Question 5 is 3 marks)

6 The diagram shows a prism.



The cross section of the prism is a right-angled triangle.
The base of the triangle has length 5 cm

The prism has length 25 cm
The prism has volume 750 cm^3

Work out the height of the prism.

Express the volume of the prism in terms of the height, h , then set it equal to the actual volume. Volume of prism = area of cross section \times length. The length is 25cm. The cross section is a triangle. Area of triangle = $\frac{1}{2} \times$ base \times height. The base is 5cm. The height is h . Rearrange to make h the subject by dividing both sides by everything it is multiplied by. To divide by a fraction, keep the first number, change the division to a multiplication and flip the fraction

..... cm

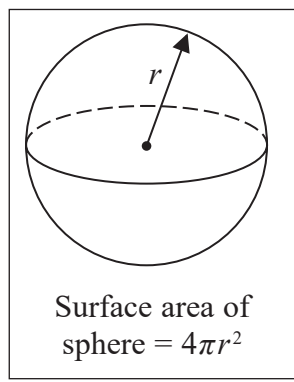
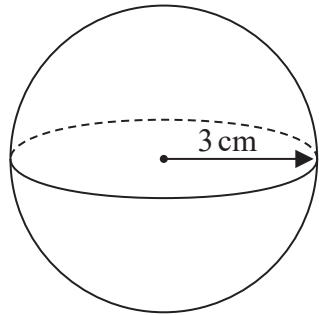
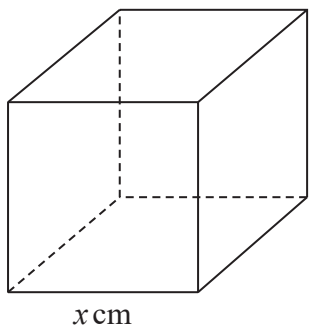
(Total for Question 6 is 3 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

7 The diagram shows a cube with edges of length x cm and a sphere of radius 3 cm.



The surface area of the cube is equal to the surface area of the sphere.

Show that $x = \sqrt{k\pi}$ where k is an integer.

The cube has 6 square faces. Area of square = length². The length is x . Express the surface area of the cube then set this equal to the surface area of the sphere, which is expressed by using the formula given and substituting in 3cm as the radius. Rearrange to make x the subject then simplify until it is in the desired form

(Total for Question 7 is 4 marks)



8 Solve $x^2 = 5x + 24$

Rearrange into the quadratic form then solve by factorisation.
The quadratic form is $ax^2 + bx + c = 0$. The factorised form will be $(x + A)(x + B)$, where A and B multiply to c and add to b

.....
(Total for Question 8 is 3 marks)

9 (a) Write down the value of 7^0

Every time 1 is taken off the power, it is divided by 7

$$7^2 = 49$$

$$7^1 = 7$$

$$7^0 = \dots$$

.....
(1)

(b) Find the value of $3 \times 3^6 \times 3^{-6}$

$$a^x \times a^y = a^{x+y}$$

.....
(1)

(c) Find the value of 2^{-4}

The negative power means to do the reciprocal

.....
(1)

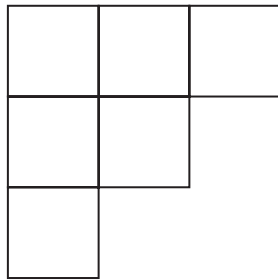
(d) Find the value of $27^{\frac{1}{3}}$

The power of $1/3$ means to do the cube root

.....
(1)

(Total for Question 9 is 4 marks)

10 The diagram shows a shape made from 6 identical squares.



The total area of the shape is 5406 cm^2

- (a) Find an estimate for the length of one side of each square.
Give your answer correct to the nearest whole number.

There are 6 identical squares so dividing the total area by 6 works out the area of one of the squares. Rounding the total area at this stage does not make the calculation any easier. Area of square = length^2 so $\text{length} = \sqrt{\text{area of square}}$. The area of one of the squares can be rounded to make it easier to square root

..... cm

(3)

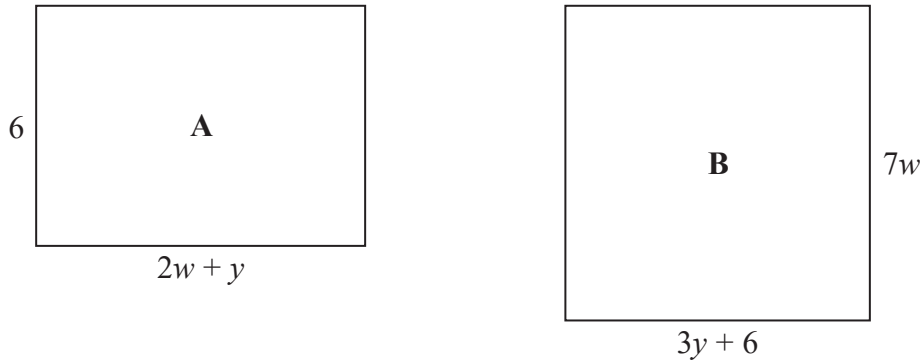
- (b) Is your answer to part (a) an underestimate or an overestimate?
You must give a reason for your answer.

There should have been some rounding in (a). This will mean that the answer isn't quite the true value as it is only an estimate

(1)

(Total for Question 10 is 4 marks)

11 The diagram shows two rectangles, **A** and **B**.



All measurements are in centimetres.

The area of rectangle **A** is equal to the area of rectangle **B**.

Find an expression for y in terms of w .

Area of rectangle = length \times width. Express the area of A and the area of B and set them equal to each other. Expand any brackets. Collect all the terms involving y to one side and all the other terms to the other side. Bring y out as a factor then divide both sides by the resulting bracket to make y the subject. The expression for y in terms of w is what y is equal to

(Total for Question 11 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

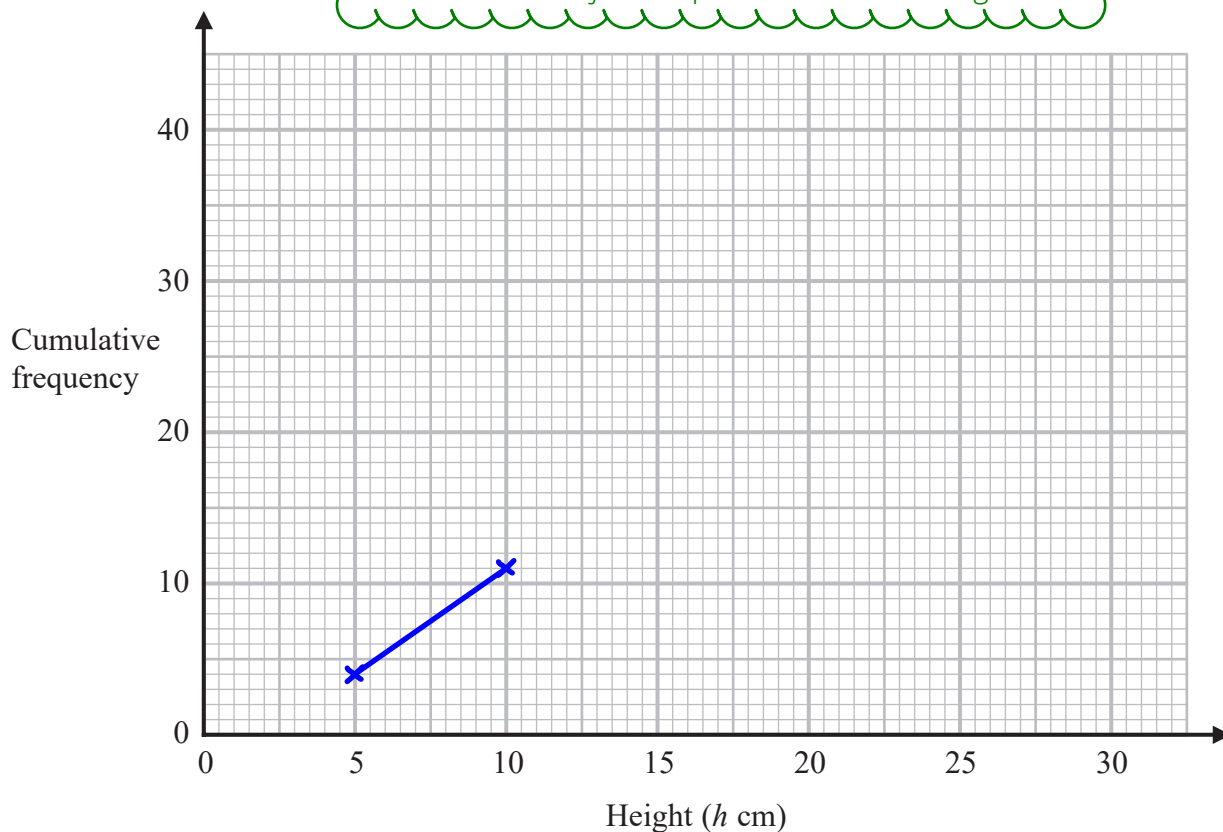
DO NOT WRITE IN THIS AREA

12 The cumulative frequency table gives information about the heights, in cm, of 40 plants.

| Height (h cm) | Cumulative Frequency |
|------------------|----------------------|
| $0 < h \leq 5$ | 4 |
| $0 < h \leq 10$ | 11 |
| $0 < h \leq 15$ | 24 |
| $0 < h \leq 20$ | 34 |
| $0 < h \leq 25$ | 38 |
| $0 < h \leq 30$ | 40 |

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

The cumulative frequencies are plotted at the end of each interval then joined up with a series of straight lines



(2)

(b) Use the graph to find an estimate for the median height of the plants.

The median is halfway through the data. $40/2 = 20$ so the median is about the 20th frequency. Reading across from 20 to the line then down works out the estimate

..... cm

(1)

(Total for Question 12 is 3 marks)



13 Ted is trying to change $0.\dot{4}\dot{3}$ to a fraction.

Here is the start of his method.

$$x = 0.\dot{4}\dot{3}$$

$$10x = 4.\dot{3}\dot{4}$$

$$10x - x = 4.\dot{3}\dot{4} - 0.\dot{4}\dot{3}$$

Try to complete his method
by doing this subtraction

Evaluate Ted's method so far.

.....

.....

.....

(Total for Question 13 is 1 mark)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

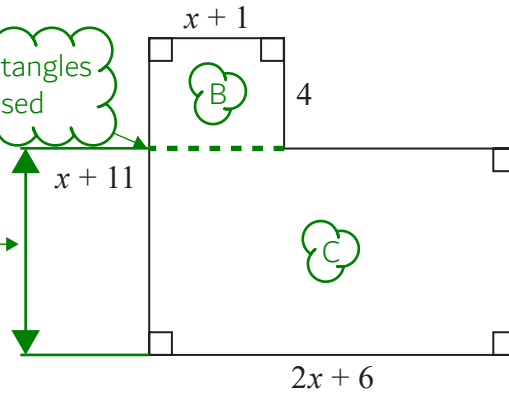
DO NOT WRITE IN THIS AREA



14 Here is a shape with all its measurements in centimetres.

Splitting the shape into two rectangles allows the area to be expressed

This width can be found



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

Show that $A = 2x^2 + 24x + 46$

The area A is equal to the area of rectangle B + the area of rectangle C. Area of rectangle = length \times width

(Total for Question 14 is 3 marks)

15 Show that $\frac{4x+3}{2x} + \frac{3}{5}$ can be written in the form $\frac{ax+b}{cx}$ where a , b and c are integers.

To add fractions to get a single fraction the denominators need to be the same. cx is a common multiple of $2x$ and 5 which can be found by multiplying them together. The numerators need to be multiplied by the same amount as the denominators to keep the fractions equivalent

(Total for Question 15 is 3 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



16 There are only 3 red counters and 5 yellow counters in a bag.

Jude takes at random 3 counters from the bag.

Work out the probability that he takes exactly one red counter.

Red AND yellow AND yellow OR yellow AND red AND yellow OR yellow AND yellow AND red.
AND means to multiply and OR means to add. There are 8 counters in total as $3 + 5 = 8$. 3 out of the 8 counters are red so the probability of the first counter being red is $\frac{3}{8}$. As the counters can be picked one at a time and there is one fewer counter after the first pick, the number of total counters goes down after each pick. There is also one fewer of the colour chosen after each pick

.....
(Total for Question 16 is 4 marks)

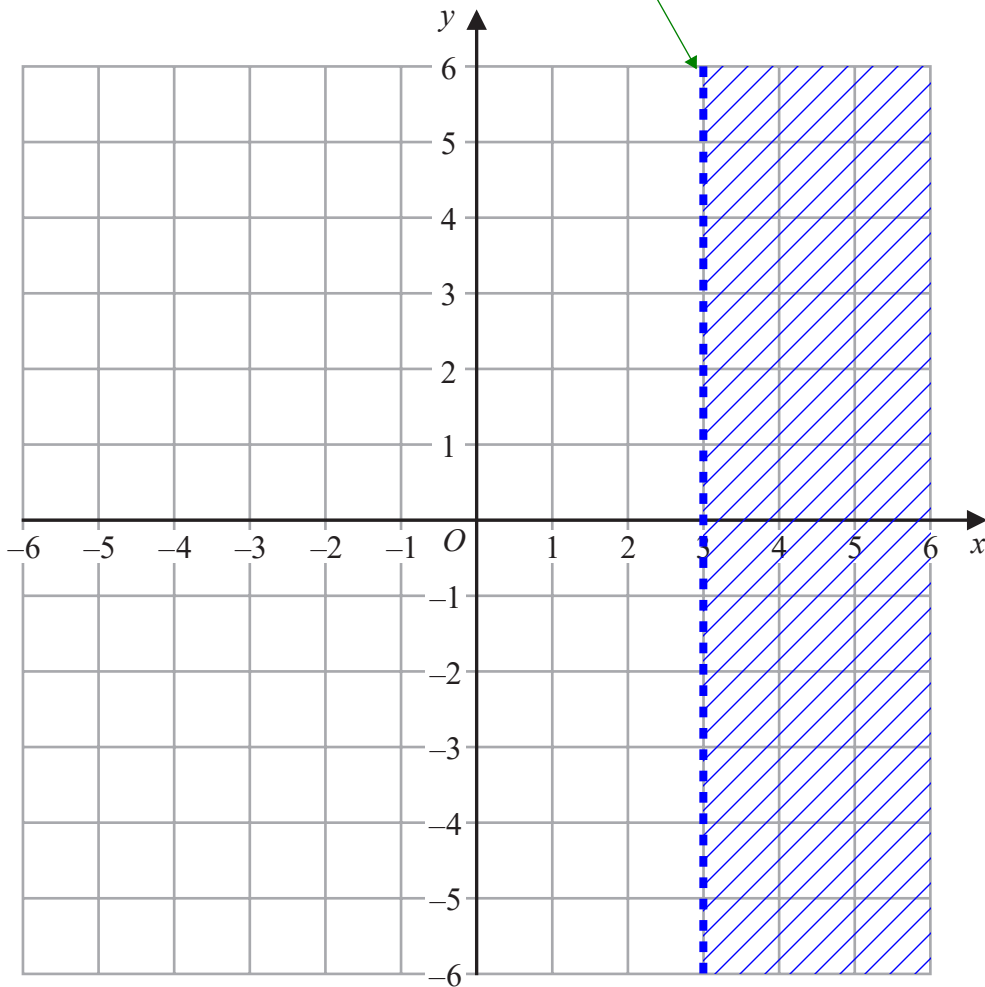
17 On the grid show, by shading, the region that satisfies all of these inequalities.

$$2y + 4 < x \quad x < 3 \quad y < 6 - 3x$$

Label the region **R**.

Rearrange to make y the subject to make the line easier to draw

The line of $x = 3$. The line is dashed as x is not equal to. As x is less, the region is on the left of this line. Crossing out everything on the right of the line



(Total for Question 17 is 3 marks)

To draw a straight line graph, substitute some x values into the equation to find what y is. The coordinate (x, y) can be plotted. Then a line can be drawn straight through the points

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

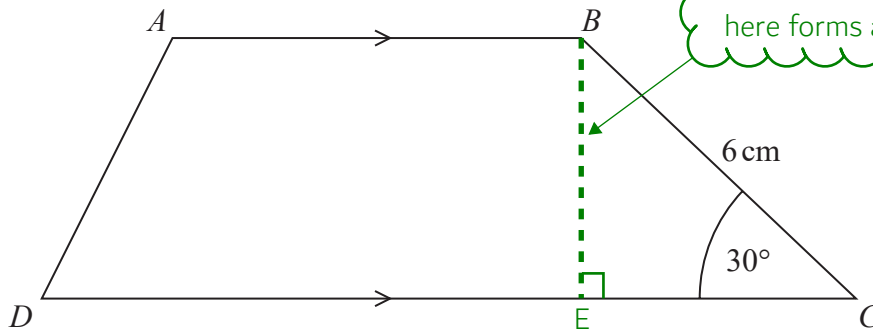


DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

18 Here is trapezium $ABCD$.



The height is needed to express the area of the trapezium. Drawing it on here forms a right angled triangle

The area of the trapezium is 66 cm^2

the length of AB : the length of $CD = 2:3$

Find the length of AB .

S^o H C A H T^o A

Right angled trigonometry can be used to work out the height of the trapezium, side BE of the right angled triangle. Tick what sides we have and are trying to find. When there are two ticks on one of the formulas, that one can be used. Covering what we are trying to find in the formula triangle shows how to find it

0 30 45 60 90

Listing out the angles needed to be memorised and then 0, 1, 2, 3, 4 under these for the sin values. Listing 4, 3, 2, 1, 0 under these for the cos values. Square rooting them and putting them over 2 finds the trig values. Dividing the sin value by the cos value finds the tan value

Area of trapezium = $\frac{1}{2} \times (a + b) \times h$, where a and b are the parallel sides and h is the distance between them. The height, h , can be found using the right angled trigonometry to find side BE . AB and CD are the parallel sides, a and b . Set AB to x as this is what we are trying to find. From the ratio, side CD can be expressed in terms of x . Set the expression of the area equal to the actual area of 66 cm^2 . Then solve for x

..... cm

(Total for Question 18 is 5 marks)



19 Show that $\frac{8 + \sqrt{12}}{5 + \sqrt{3}}$ can be written in the form $\frac{a + \sqrt{3}}{b}$, where a and b are integers.

Simplify $\sqrt{12}$ by using $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ in reverse to split it into two smaller surds which multiply to give $\sqrt{12}$. a should be a square number so it can be square rooted. Change the $+$ to a $-$ on the denominator then multiply both the numerator and denominator by this to rationalise the denominator. Expand any brackets, collect like terms then simplify the fraction into the desired form

(Total for Question 19 is 4 marks)

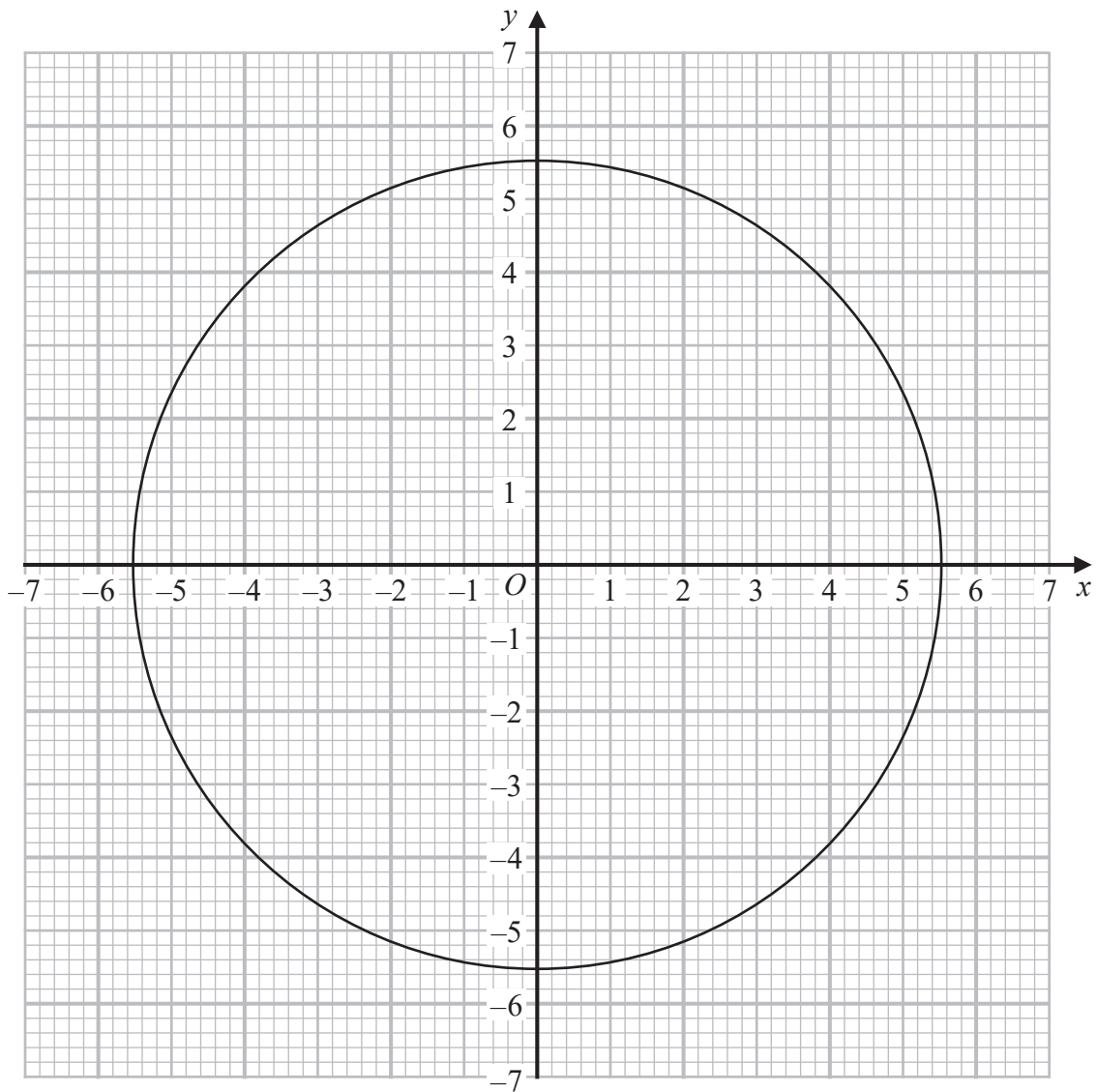
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



20 The diagram shows the graph of $x^2 + y^2 = 30.25$



Use the graph to find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 30.25$$

$$y - 2x = 1$$

Draw the graph of the second equation. Rearrange it into the form $y = mx + c$ to make it easier to draw. It is a straight line so two points can be plotted then a straight line can be drawn through them. Work out what y is when $x = 0$ and what y is when $x = 3$. The estimates for the solutions are where the two graphs cross

(Total for Question 20 is 3 marks)

21 The functions f and g are such that

$$f(x) = 3x^2 + 1 \quad \text{for } x > 0 \quad \text{and} \quad g(x) = \frac{4}{x^2} \quad \text{for } x > 0$$

(a) Work out $gf(1)$

The value of the composite function can be worked out by substituting x for 1 in $f(x)$ then substituting x for the result in $g(x)$

.....
(2)

The function h is such that $h = (fg)^{-1}$

(b) Find $h(x)$

$fg(x)$ can be found by substituting x for $g(x)$ in $f(x)$. The inverse function can be found by switching x and y then rearranging to make y the subject. $fg(x)$ is basically y . Follow BIDMAS backwards and do the opposite operations to both sides to eliminate everything apart from y on the side it is on. At one point, do the reciprocal (flip the fractions) of both sides to make y the numerator rather than denominator

.....
(4)

(Total for Question 21 is 6 marks)

- 22 Find the coordinates of the turning point on the curve with equation $y = 9 + 18x - 3x^2$
You must show all your working.

The turning point can be found by completing the square. $y = ax^2 + bx + c$ becomes $y = a(x + b/2a)^2 + c - a(b/2a)^2$. The turning point occurs when the square bracket is equal to 0. Work out what x and y are when this is the case

(..... ,)

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS