Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number	Candidate Number

Mathematics A

Paper 4HR

Higher Tier

Tuesday 16 January 2018 – Morning
Time: 2 hours

Paper Reference
4MA0/4HR

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. 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.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – there may be more space than you need.
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
  Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- 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.
- Check your answers if you have time at the end.

Turn over ▶

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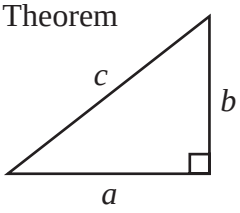
P 5 3 3 0 1 A 0 1 2 4

Pearson

International GCSE MATHEMATICS
FORMULAE SHEET – HIGHER TIER

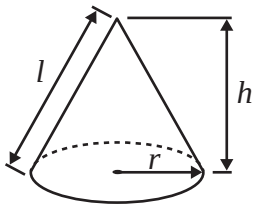
Pythagoras' Theorem



$a^2 + b^2 = c^2$

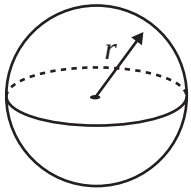
Volume of cone = $\frac{1}{3}\pi r^2 h$

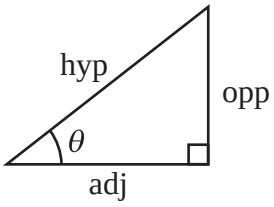
Curved surface area of cone = $\pi r l$



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

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





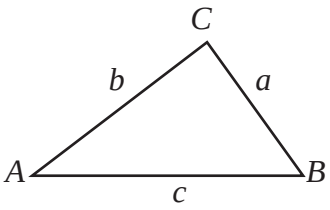
adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

or $\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\cos\theta = \frac{\text{adj}}{\text{hyp}}$

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

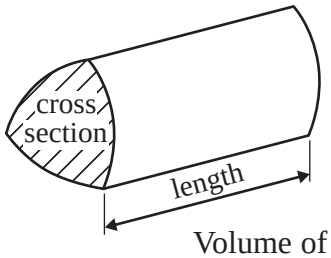
In any triangle ABC



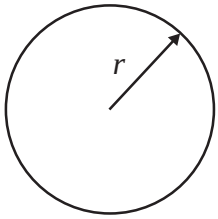
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$



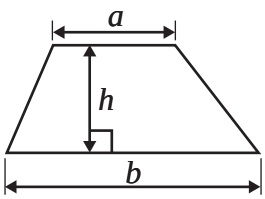
Volume of prism = area of cross section × length

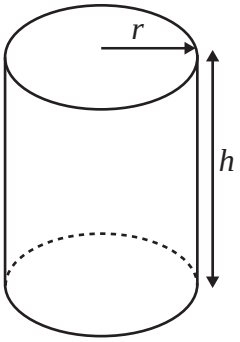


Circumference of circle = $2\pi r$

Area of circle = πr^2

Area of a trapezium = $\frac{1}{2}(a + b)h$





Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Answer ALL NINETEEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 In a sale, normal prices are reduced by 12%

The normal price of a shirt is \$36

(a) Work out the sale price of the shirt.

\$.....

(3)

180 items were sold in the sale.
81 of these items were shirts.

(b) Express the number of shirts sold as a percentage of the number of items sold in the sale.

.....%

(2)

(Total for Question 1 is 5 marks)

2 The diagram shows shape **A**.

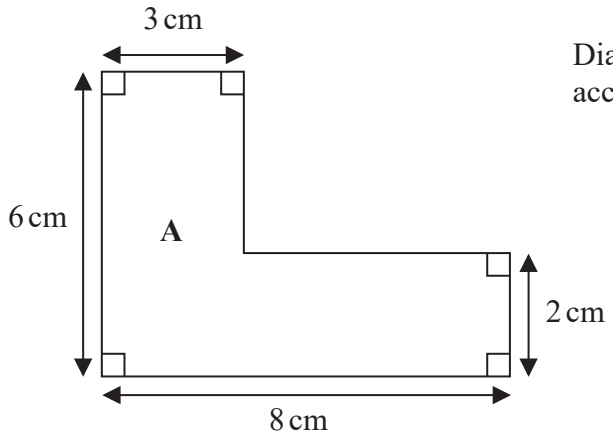


Diagram **NOT** accurately drawn

(a) Work out the area of shape **A**.

.....cm^2

(3)

Here is a prism with shape **A** as its cross section.

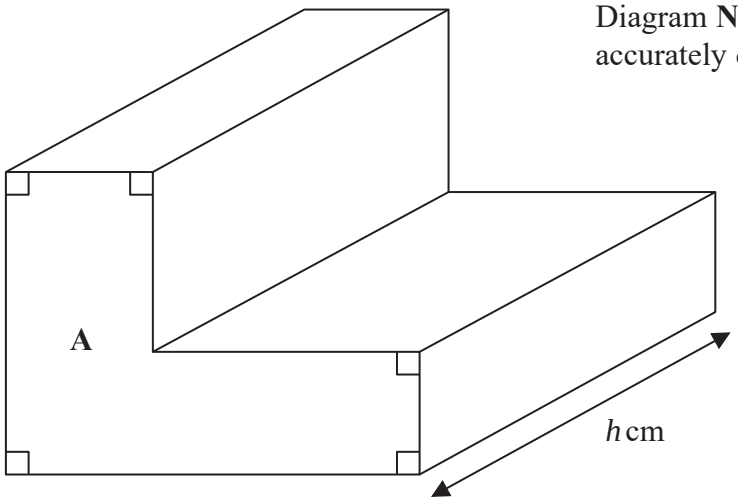


Diagram **NOT** accurately drawn

The volume of the prism is 350 cm^3
The length of the prism is h cm.

(b) Work out the value of h.

.....

(2)

(Total for Question 2 is 5 marks)

3 *A* is the point with coordinates (1, 3)
B is the point with coordinates (7, 8)

Find the coordinates of the midpoint of the line segment *AB*.

(..... , ...)

(Total for Question 3 is 2 marks)

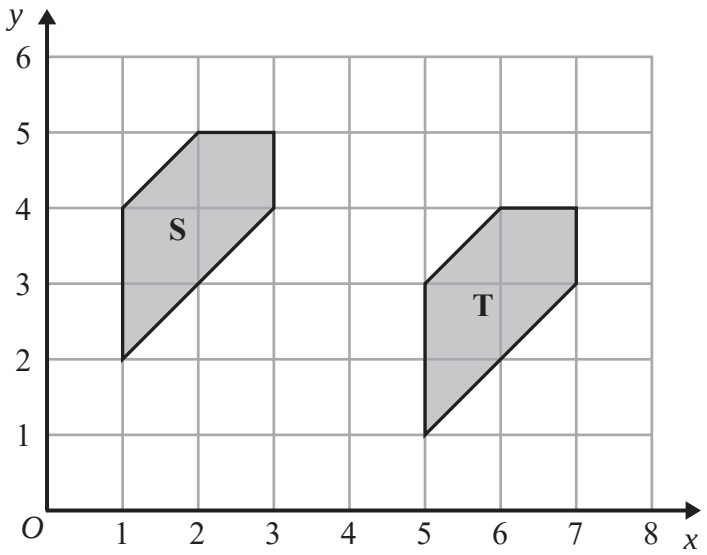
4 A bag contains only red marbles and green marbles.
The bag contains a total of 400 marbles.
The ratio of the number of red marbles to the number of green marbles is 5 : 3

How many more red marbles are there than green marbles in the bag?

.....

(Total for Question 4 is 3 marks)

5 The diagram shows shape **S** and shape **T** on a centimetre grid.



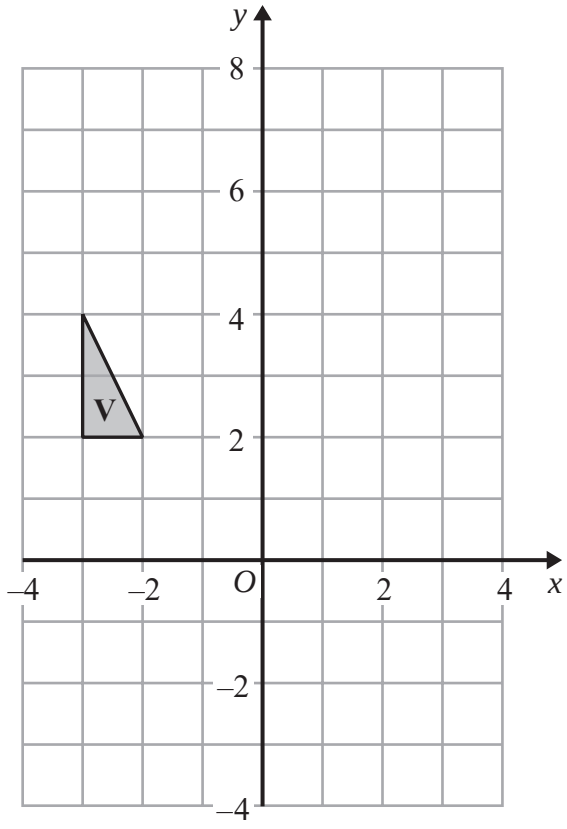
(a) Describe fully the single transformation that maps shape **S** onto shape **T**.

.....

.....

(2)

(b) On the grid, rotate triangle **V** 90° anticlockwise about the point (2, 2)



(2)

(Total for Question 5 is 4 marks)

6 The table gives information about the number of goals scored in each of 40 European Championship football matches.

Number of goals scored	Frequency
0	1
1	8
2	12
3	15
4	4

(a) Find the mean number of goals scored.

.....

(3)

(b) Work out the interquartile range of the number of goals scored.

.....

(2)

Francois has a recording of each of the 40 matches.
He is going to choose at random one of these matches to watch.

(c) Work out the probability that in this match more than 2 goals were scored.

.....

(2)

(Total for Question 6 is 7 marks)

7 (a) Factorise $4ab + 7a^2 - a$

.....

(2)

(b) Solve the inequality $4 - 8p > 11$

.....

(2)

(c) Expand and simplify $(x + 3)(x - 6)$

.....

(2)

(d) Simplify $\frac{y^{12}}{y^4}$

.....

(1)

(e) Simplify $(3e)^2$

.....

(2)

(Total for Question 7 is 9 marks)

8 Here is a right-angled triangle.

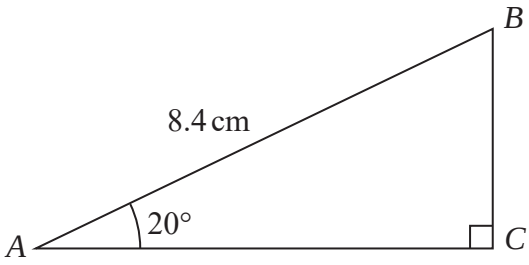


Diagram **NOT** accurately drawn

Calculate the length of *BC*.
Give your answer correct to 3 significant figures.

.....cm

(Total for Question 8 is 3 marks)

9 $1426 = 2 \times 23 \times 31$

(i) Find all the factors of 1426

.....

(3)

(ii) Write 713 as a product of its prime factors.

.....

(1)

(Total for Question 9 is 4 marks)

10 The table gives information about the population of four countries in 2016

Country	Population
China	1.38×10^9
India	1.32×10^9
United Kingdom	6.50×10^7
United States	3.24×10^8

(a) Write 3.24×10^8 as an ordinary number.

.....

(1)

(b) Which of the four countries had the least population in 2016?

.....

(1)

(c) Work out the total population of all four countries.
Give your answer in standard form.

.....

(2)

The population of Delhi in 2016 was 1.87×10^7
In 2016, the ratio of the population of Delhi to the population of India was $1 : n$

(d) Find the value of n.
Give your answer correct to 2 significant figures.

.....

(2)

(Total for Question 10 is 6 marks)

11 (a) Simplify $2a^3b^4 \times 4a^2b^5$

.....

(2)

$$c^k = \frac{1}{\sqrt[4]{c^2}}$$

(b) Work out the value of k

.....

(2)

(c) Simplify fully $\dfrac{4(x+2)^2}{6(x+2)}$

.....

(2)

(d) Factorise completely $3x^2 - 75y^2$

.....

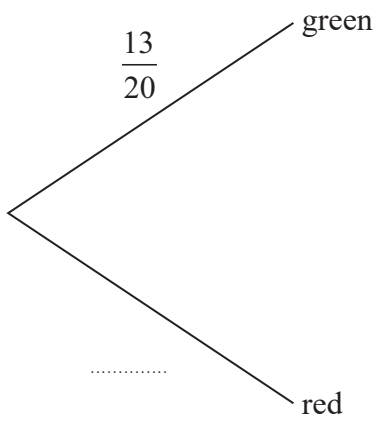
(2)

(Total for Question 11 is 8 marks)

12 In a bowl, there are 20 grapes.
13 of these grapes are green and 7 of these grapes are red.

Jayesh takes at random a grape from the bowl and eats the grape.
He then takes at random another grape from the bowl and eats the grape.

(a) Complete the probability tree diagram.



(3)

(b) Work out the probability that Jayesh eats two green grapes.

.....

(2)

Jayesh takes at random a third grape from the bowl and eats this grape.

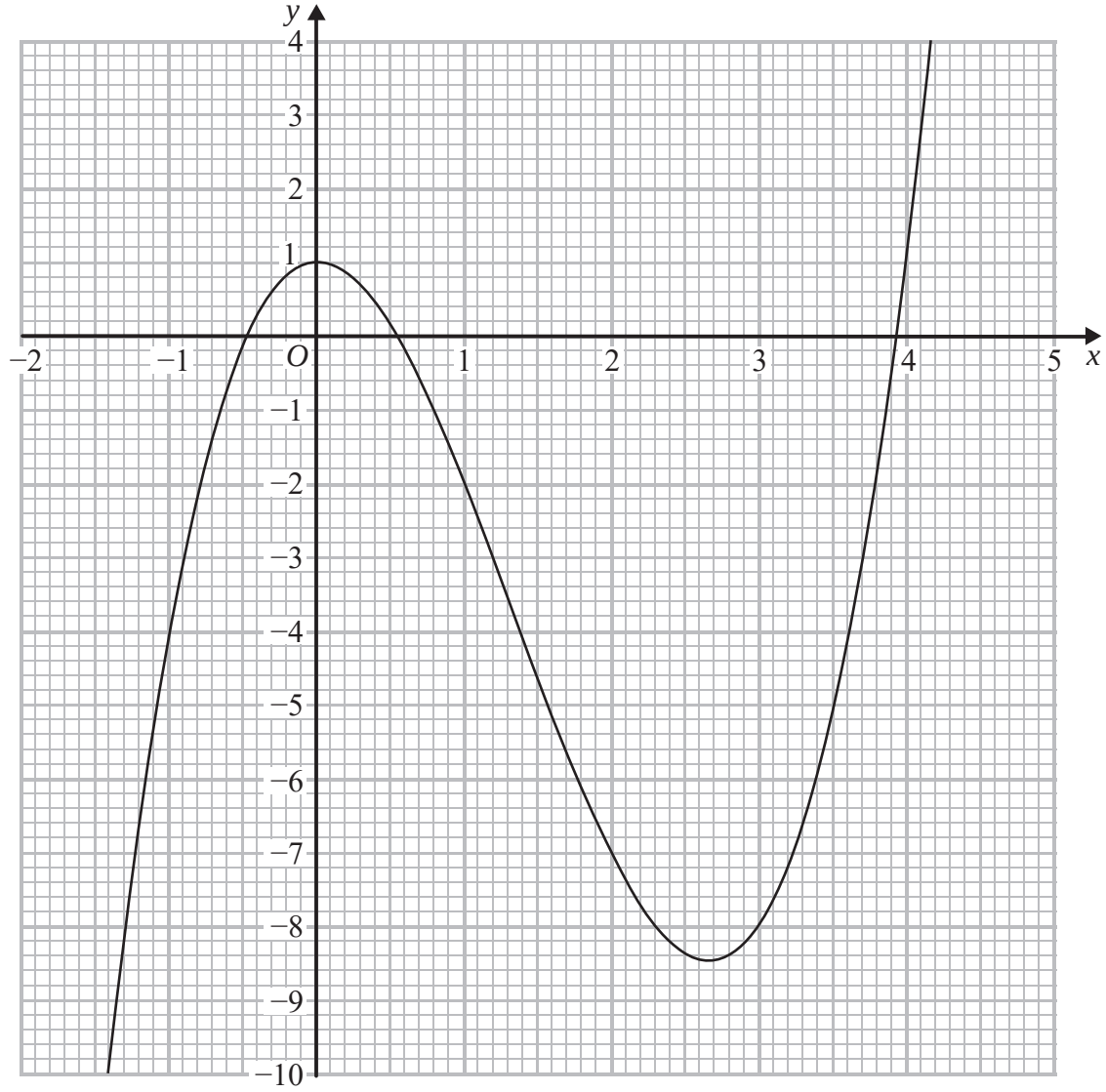
(c) Work out the probability that there are now 11 green grapes in the bowl.

.....

(3)

(Total for Question 12 is 8 marks)

13 Here is the graph of $y = x^3 - 4x^2 + 1$



(a) Use the graph to solve the equation $x^3 - 4x^2 + 1 = 2$

$x =$ .....

(1)

(b) For which values of k does the equation $x^3 - 4x^2 + 1 = k$ have exactly two solutions.

$k =$ ..... or .....

(2)

The equation $x^3 - 4x^2 + x - 2 = 0$ can be solved by finding the point of intersection of the line **L** with the graph of $y = x^3 - 4x^2 + 1$

(c) Find an equation of **L**.

.....

(2)

(Total for Question 13 is 5 marks)

14 P is directly proportional to the square of Q.
$P = 180$ when $Q = 12$

(a) Find a formula for P in terms of Q.

.....

(3)

(b) Find the value of P when $Q = 30$

$P =$ .....

(1)

(Total for Question 14 is 4 marks)

15

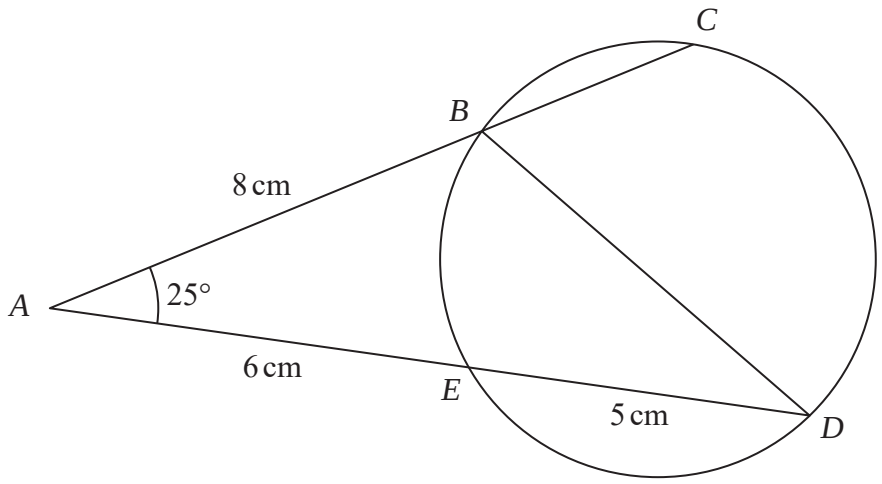


Diagram **NOT** accurately drawn

B, *C*, *D* and *E* are points on a circle.

ABC and *AED* are straight lines.
AB = 8 cm, *AE* = 6 cm and *ED* = 5 cm.
Angle *BAE* = 25°

(a) Calculate the length of *BD*.
Give your answer correct to 3 significant figures.

..... cm

(3)

(b) Calculate the length of *AC*.

..... cm

(2)

(Total for Question 15 is 5 marks)

16 $y = 2x^3 - 9x^2 + 31$

(a) Find $\frac{dy}{dx}$

$\frac{dy}{dx} =$ .....

(2)

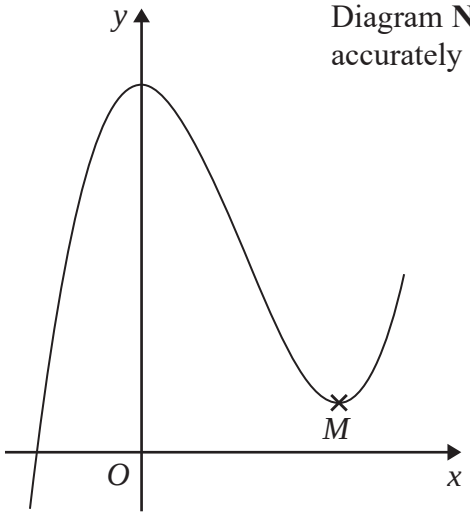


Diagram **NOT** accurately drawn

The diagram shows a sketch of the curve with equation $y = 2x^3 - 9x^2 + 31$
The point M is a turning point on the curve.

(b) Work out the gradient of the line OM.
Show clear algebraic working.

.....

(4)

(Total for Question 16 is 6 marks)

17 *PQRS* is a quadrilateral.

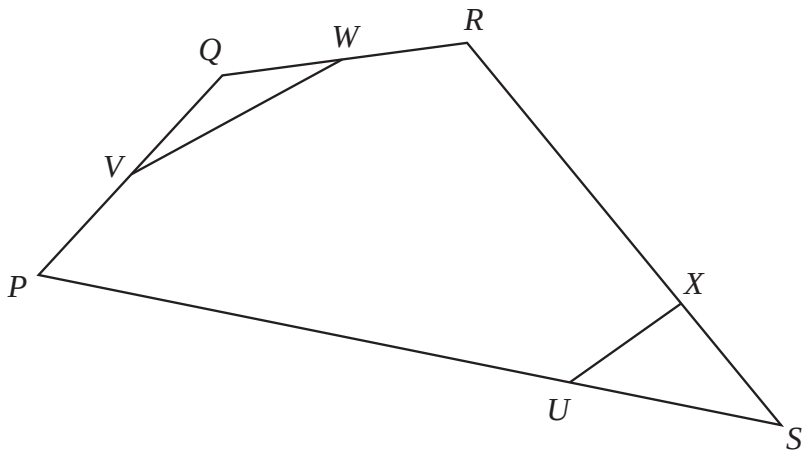


Diagram **NOT** accurately drawn

$\overrightarrow{PQ} = 6\mathbf{a}$ $\overrightarrow{QR} = 4\mathbf{b}$ $\overrightarrow{RS} = 2\mathbf{c}$

V is the midpoint of *PQ*.
W is the midpoint of *QR*.

X is the point on *RS* such that $RX = \frac{3}{4}RS$.

U is the point on *PS* such that $PU = \frac{3}{4}PS$.

(a) (i) Find $\overrightarrow{PS}$ in terms of **a**, **b** and **c**

.....

(ii) Find $\overrightarrow{VW}$ in terms of **a** and **b**

.....

(2)

(b) Show, by a vector method, that *VW* is parallel to *UX*.

(3)

Given that $\overrightarrow{RS} = \begin{pmatrix} 6 \\ -5 \end{pmatrix}$

(c) calculate the magnitude of $\overrightarrow{RS}$.
Give your answer as a surd.

.....

(2)

(Total for Question 17 is 7 marks)

18 *ABCD* is a rectangle.

The perimeter of *ABCD* is 64 cm, correct to the nearest centimetre.
AB = 17 cm, correct to the nearest centimetre.

Calculate the lower bound of the length of *AD*.
Show your working clearly.

..... cm

(Total for Question 18 is 3 marks)

19 The four angles, in degrees, of quadrilateral *ABCD* are

angle $A = (x^2 - 105)$

angle $B = (x^2 - 65)$

angle $C = (470 - 30x)$

angle $D = (510 - 30x)$

Show that *ABCD* is a trapezium.
Show clear algebraic working.

(Total for Question 19 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

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