

OXFORD
INTERNATIONAL
AQA EXAMINATIONS

Please write clearly in block capitals.

Centre number

9 | b | 2 | 4 | 2

Candidate number /

5 | 7 | 6 | 8

Surname

Shi

Forename(s)

Hongbin

Candidate signature

John Shih Hongbin Shi

INTERNATIONAL GCSE

MATHEMATICS EXTENSION

E

Paper 2E

Wednesday 13 November 2019

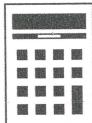
07:00 GMT

Time allowed: 2 hours

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.
- If your calculator does not have a π button, take the value of π to be 3.142

Advice

- Show all necessary working; otherwise marks for method may be lost.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26–27	
28	
TOTAL	



Answer all questions in the spaces provided.

Do not write
outside the
box

- 1 Circle the expression equivalent to $(5x^3)^2$

[1 mark]

$25x^5$

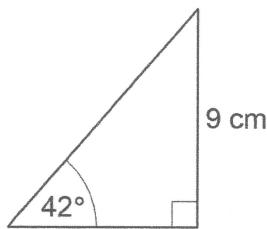
$25x^6$

$10x^5$

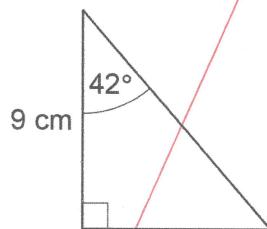
$10x^6$

- 2 Which two of these triangles are congruent?

A

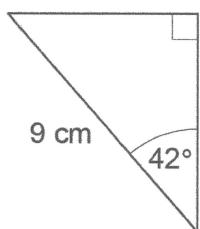


B

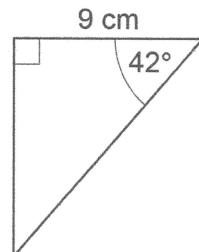


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accurately

C



D



Circle your answer.

[1 mark]

A and B

A and C

B and D

C and D



0 2

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- 3 Work out 5 as a percentage of 2
Circle your answer.

[1 mark]

2.5%

40%

150%

250%



- 4 Circle the gradient of the line $y = 5x - 7$

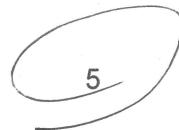
[1 mark]

-7

-5

5

7

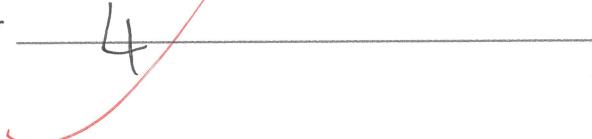


- 5 Use approximations to 1 significant figure to estimate the value of $0.192 \times \sqrt[3]{8054}$
You must show your working.

[2 marks]

4

Answer



6

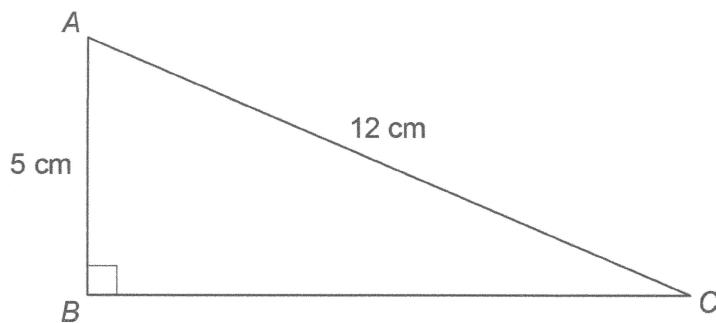
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0 3

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6



Not drawn
accurately

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outside the
box*

Use Pythagoras' theorem to work out the length BC .

Give your answer as a decimal.

[3 marks]

$$\begin{aligned} BC &= \sqrt{12^2 - 5^2} \\ &= \sqrt{144 - 25} \\ &= \sqrt{119} \end{aligned}$$

Answer

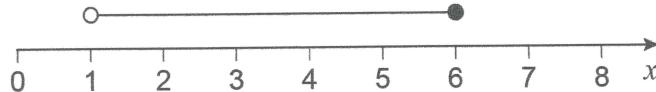
$$\cancel{+3} \sqrt{119} \quad 10.4 \text{ cm}$$



0 4

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- 7 (a) The diagram represents an inequality.



Write down the integers that satisfy the inequality.

[2 marks]

Answer

$$\begin{array}{c} \cancel{1 > 7} \\ \cancel{3 < 6} \end{array}$$

- 7 (b) c is an integer.

$$-5 < c < 3$$

Work out the smallest possible value of c^3

[1 mark]

$$\underline{-125 < c^3 < 27}$$

Answer

$$\cancel{-24} \quad \cancel{-12}$$

$$(-4)^3$$

Turn over for the next question

$$\sim -64$$



- 8 Here is some information about 80 students.

One fifth have brown eyes and dark hair.

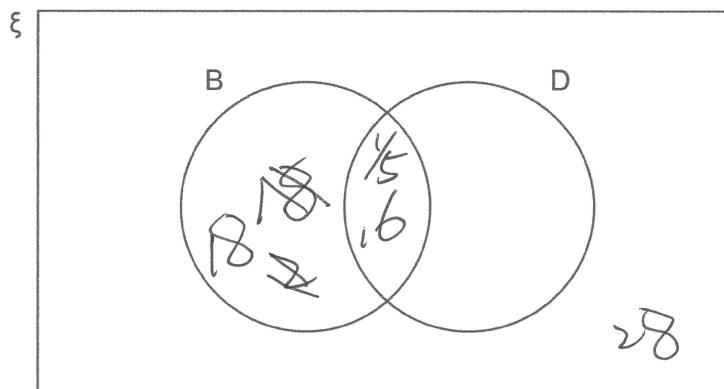
28 have neither brown eyes nor dark hair.

Half of the remaining students have brown eyes.

In total, how many students have brown eyes?

You may use the Venn diagram to help you.

[4 marks]



Answer 34



0 6



9 (a) Factorise $9 - x^2$

[1 mark]

$$(3+x)(3-x)$$

Answer $(3+x)(3-x)$

9 (b) Work out the value of $x\left(10 + \frac{1}{x}\right)$ when $x = \frac{1}{10}$

[2 marks]

$$10x + \cancel{x^2} |$$

$$x = \frac{1}{10},$$

$$\cancel{10} \quad 2$$

Answer ~~10~~ 2

9 (c) Expand $3xy(4x^2 + y^2)$

[2 marks]

$$12x^3y + 3xy^3$$

Answer $12x^3y + 3xy^3$



- 10 Some men and some women started a fitness programme.

Three samples of men were taken.

The table shows how many men in each sample completed the programme.

	Number in sample	Number completing programme
Sample A	10	3
Sample B	25	7
Sample C	200	48

- 10 (a) For Sample B, circle the relative frequency of men completing the programme.

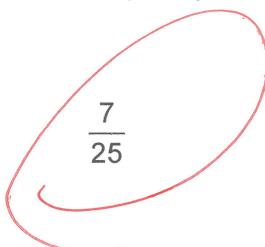
[1 mark]

$$\frac{7}{18}$$

$$\frac{7}{25}$$

$$\frac{7}{58}$$

$$\frac{7}{235}$$



- 10 (b) Of the three samples, the results for C give the best estimate of the probability of a man completing the programme.

Give a reason why this is true.

[1 mark]

① Sample size is larger
② More men in C



- 10 (c) A sample of 200 women was also taken.

The relative frequency of women completing the programme was 0.38

Based on these samples, who is more likely to complete the programme?

Tick a box.

Men

Women

Equally likely

Show working to support your answer.

[1 mark]

0.38 > 0.3 / 0.28 / 0.24

- 11 a , b and c are different numbers.

a is a factor of b .

a is a factor of c .

Tick one box for each statement.

[3 marks]

True

May be true

Not true

a is a factor of bc

a is a factor of $(b + c)$

b is a factor of c

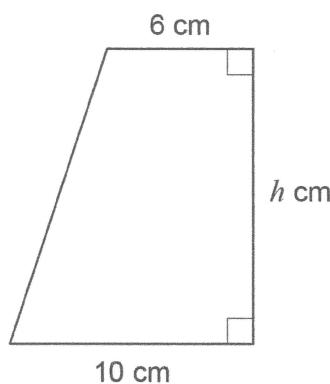
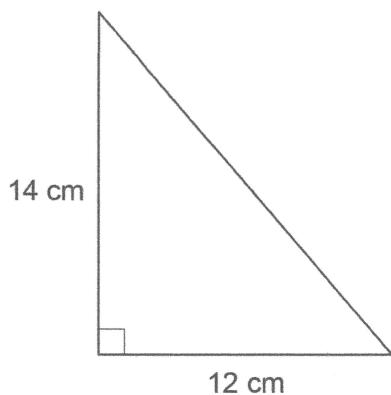
c is a factor of a



12

The area of the triangle is equal to the area of the trapezium.

Do not write outside the box



Not drawn accurately

Work out the value of h .

[4 marks]

$$\begin{aligned} 14 \times 12 \div 2 &= (6+10)h/2 \\ 84 &= 8h \\ h &= 10.5 \end{aligned}$$

Answer

10.5



1 0

13

A shop sells knives and forks.

Do not write
outside the
box

cost of a knife : cost of a fork = 3 : 2

6 knives and 6 forks cost \$22.80

Work out the cost of a knife.

[4 marks]

$$\underline{3x \times 6 + 2x \times 6 = \$22.8}$$

$$\underline{18x + 12x = 22.8}$$

$$\underline{30x = 22.8}$$

$$\underline{x = 0.76} \quad \cancel{1}$$

$$\underline{0.76 \times 3 = 6.84}$$

Answer \$

~~6.84~~ ~~2.28~~

Turn over for the next question



14

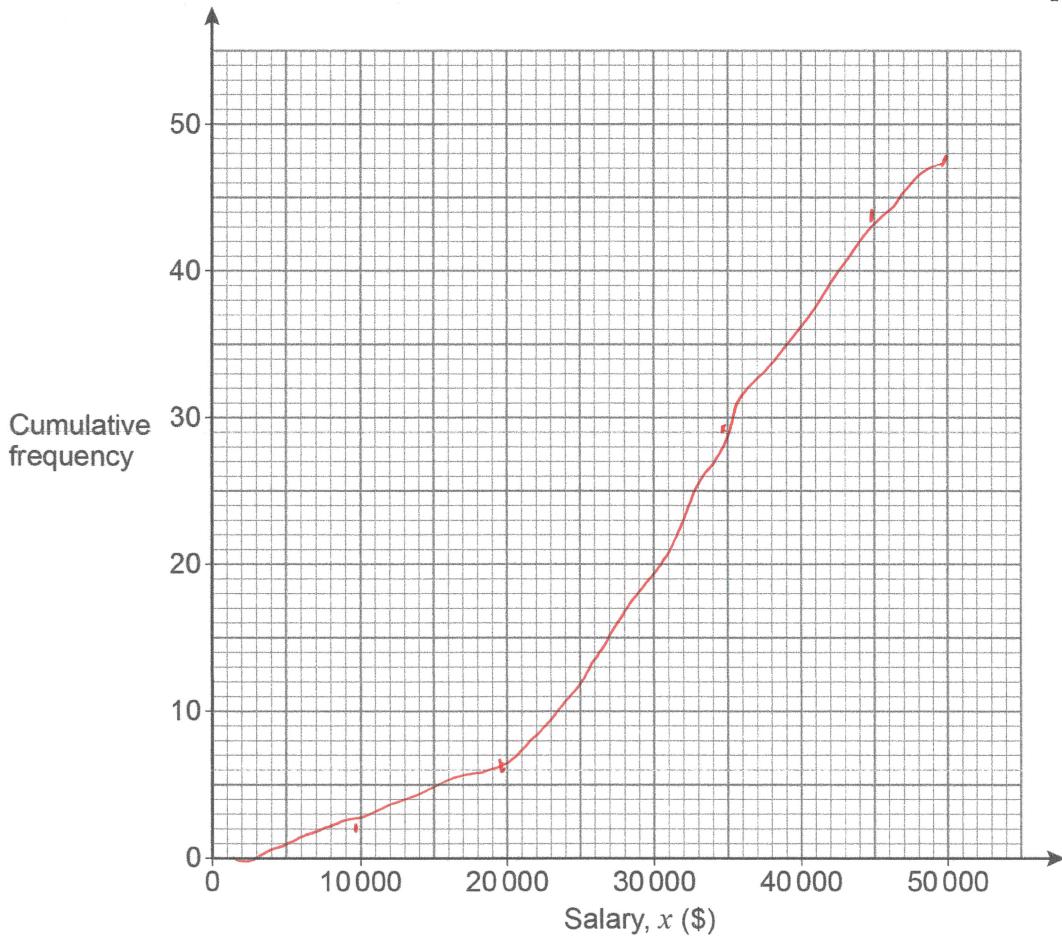
The table shows information about the salaries of 48 workers.

Do not write outside the box

Salary, x (\$)	Frequency	
$0 < x \leq 10000$	2	2
$10000 < x \leq 20000$	4	6
$20000 < x \leq 30000$	23	28
$30000 < x \leq 40000$	15	44
$40000 < x \leq 50000$	4	48

- 14 (a) Draw a cumulative frequency diagram for the data.

[3 marks]



1 2

- 14 (b) Estimate how many of the 48 workers have a salary of more than \$25 000

[2 marks]

$$48 - \frac{6-29}{2} = 30 - 31$$

Answer 30

- 15 The n th term of a sequence is $\frac{n}{n+7}$

One term has a value of $\frac{8}{9}$

Work out the value of n for this term.

[3 marks]

$$\frac{n}{n+7} = \frac{8}{9}$$

$$n = \frac{8}{9}(n+7)$$

$$n = 56$$

Answer 56



16

Ken cycles

2 km from A to B at a speed of 15 km/h

12 km from B to C at a speed of 20 km/h

Work out his average speed between A and C.

Give your answer in km/h

[3 marks]

$$\underline{2+12 / (2 \div 15 + 12 \div 20)}$$

Answer $\frac{210}{11}$ km/h

17

Circle the expression equivalent to $\frac{1}{a} - \frac{1}{b}$

$$\frac{1}{a-b}$$

$$\frac{1}{ab}$$

$$\frac{a-b}{ab}$$

[1 mark]

$$\frac{b-a}{ab}$$

$$\frac{b}{ab} - \frac{a}{ab}$$

$$\frac{b-a}{ab}$$



1 4

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outside the
box

18

A drink is made with 9 litres of juice and 28 litres of water.

Do not write outside the box

How much more juice should be added so that 30% of the drink is made of juice?

[3 marks]

$$\cancel{10} (28 \div 70\%) - 28 = 12$$

Answer

12 3 litres

Turn over for the next question



- 19 Expand and simplify fully $(x - 1)(x - 2)(x + 3)$

[4 marks]

$$= (x^2 - 3x + 2)(x + 3)$$

$$= (x^3 - 3x^2 + 2x + 3x^2 - 9x + 6)$$

$$= x^3 - 7x + 6$$

Answer $x^3 - 7x + 6$



20

Some boys and some girls take a test.

Which of these would show that the boys have more consistent scores?

Tick one box.

[1 mark]

The boys have a higher median

The boys have a lower median

The boys have a larger interquartile range

The boys have a smaller interquartile range

21Work out the gradient of the curve $y = 10 - \frac{1}{4}x^3$ at the point $(-2, 12)$ **[3 marks]**

$$y' = -\frac{3}{4}x^2$$

$$y' = -3$$

Answer



8

Turn over ►



1 7

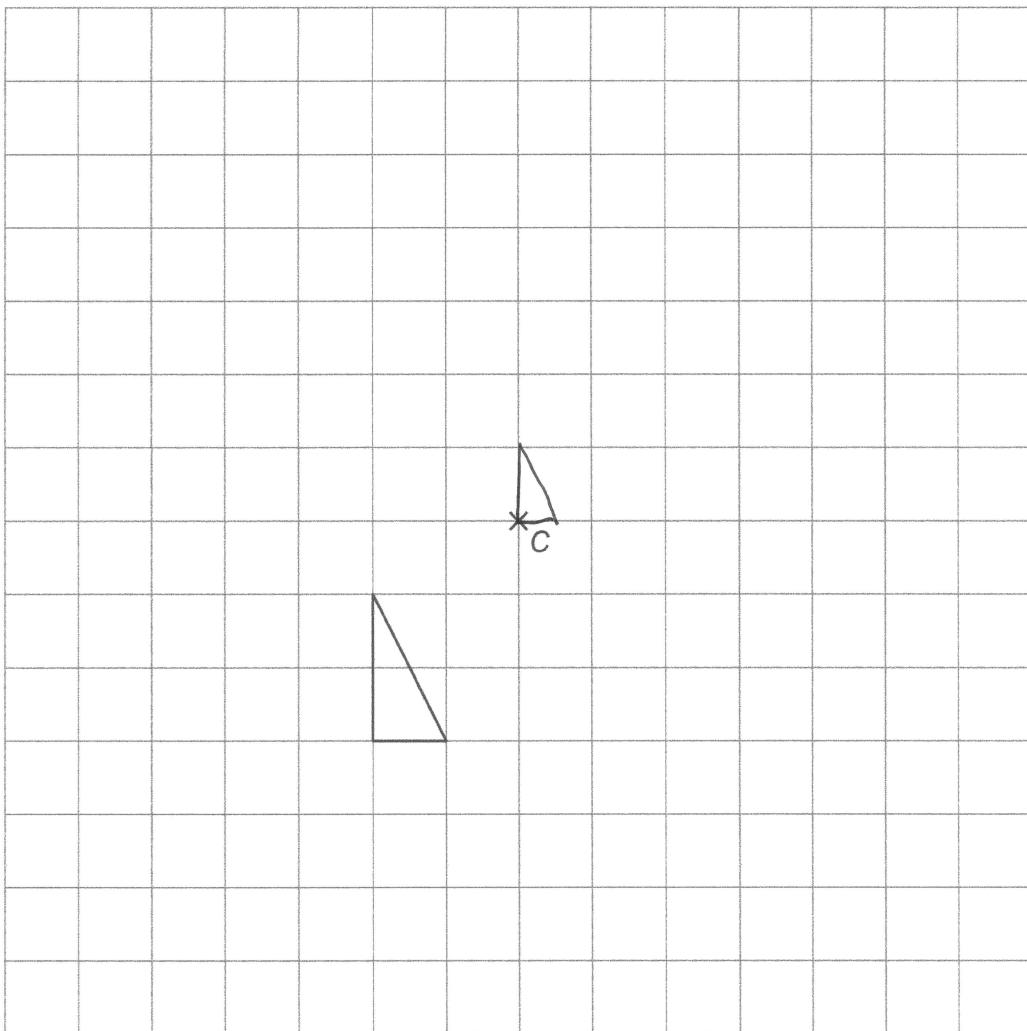
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22

Enlarge the triangle by scale factor -2, centre C.

[2 marks]

Do not write
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1 8

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- 23 Rearrange $y = \frac{3x+2}{1-x}$ to make x the subject.

[4 marks]

$$x = \frac{3y+2}{1-y}$$

$$(1-y)x = 3y+2$$

$$x - xy - 3y = 2$$

$$y(-x-3) = x-2$$

$$y = \frac{x-2}{-x-3}$$

Answer

$$y = \frac{x-2}{-x-3}$$

$$x = \frac{y-2}{3+y}$$



- 24 Show that $\sqrt{300}$ can be written as $10\sqrt{3}$

[1 mark]

$$\sqrt{3 \times 100} = 10\sqrt{3}$$

- 25 Simplify $\frac{4 \times 2^5}{8^{\frac{1}{3}}}$

Give your answer in the form 2^k where k is an integer.

You must show your working.

[3 marks]

$$2^7 \times 2^{-1} \quad \cancel{2^6} \quad 2^6$$

Answer

2⁶

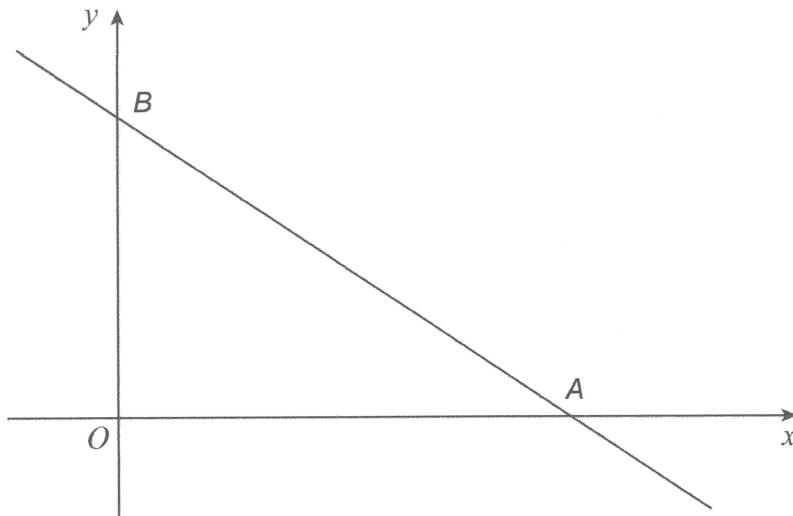


2 0

26

The line $3x + 4y - 12 = 0$ intersects the axes at A and B, as shown.

Do not write outside the box



Not drawn
accurately

Work out the equation of the perpendicular bisector of AB.

Give your answer in the form $y = mx + c$

[6 marks]

$$\begin{aligned} 4y &= 12 - 3x \\ y &= 3 - \frac{3}{4}x \end{aligned}$$

Answer

$$y = \frac{4}{3}x - \frac{7}{6}$$

10

Turn over ►

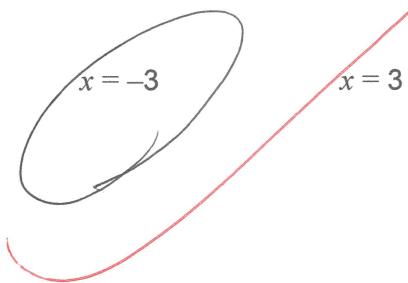


2 1

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- 27 Circle the line of symmetry of the quadratic graph $y = (x + 3)^2 - 36$

[1 mark]



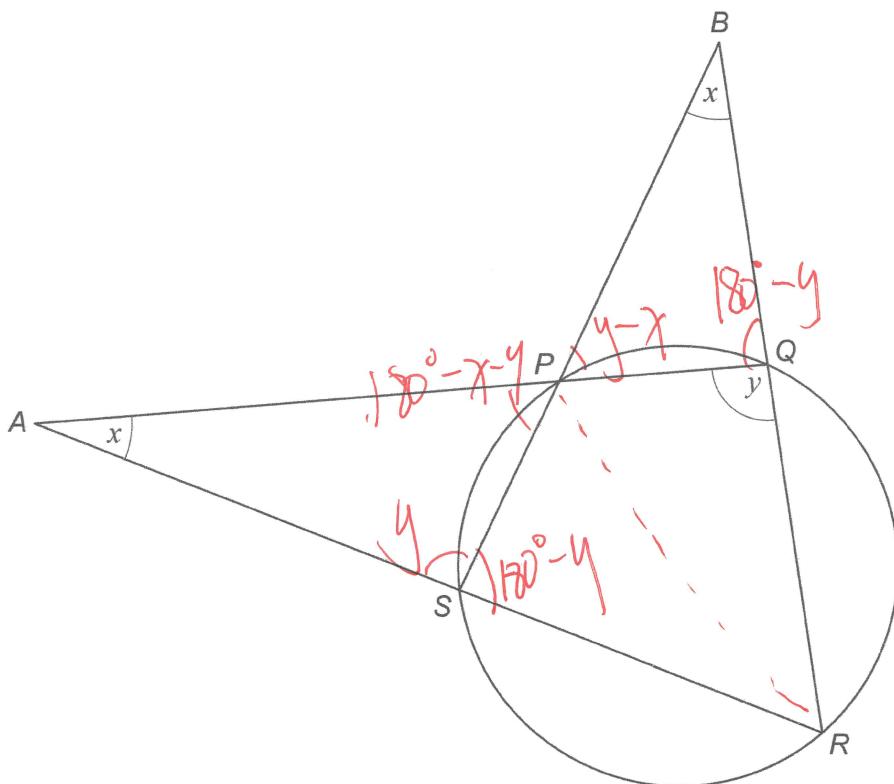
$$x = -36$$

$$x = 36$$

- 28 P, Q, R and S are points on a circle.

RSA, QPA, SPB and RQB are straight lines.

Not drawn
accurately



- 28 (a) Give a reason why $\text{angle } PSR = 180^\circ - y$

[1 mark]

Opposite

- 28 (b) Prove that PR is a diameter of the circle.

[4 marks]

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From diagram

Turn over for the next question

6

Turn over ►



2 3

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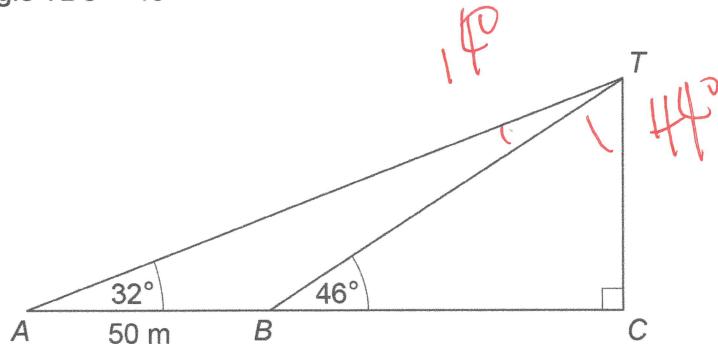
29 *CT is a vertical tower.*

A, B and C are points in a straight line on horizontal ground.

$$AB = 50 \text{ m}$$

Angle $TAB = 32^\circ$

Angle $TBC = 46^\circ$



Not drawn
accurately

Work out the height of the tower.

[5 marks]

Answer 10° m



- 30 Daniel has 13 socks in a drawer.

8 are black and 5 are red.

He takes two socks at random, without replacement.

Work out the probability that he takes two socks of the same colour.

[3 marks]

$$\frac{8}{13} \times \frac{7}{12} + \frac{5}{13} \times \frac{4}{12} = \frac{19}{39}$$

Answer

- 31 Convert $0.\overline{648}$ to a fraction in its simplest form.

You must show your working.

[3 marks]

Answer

11

Turn over ►



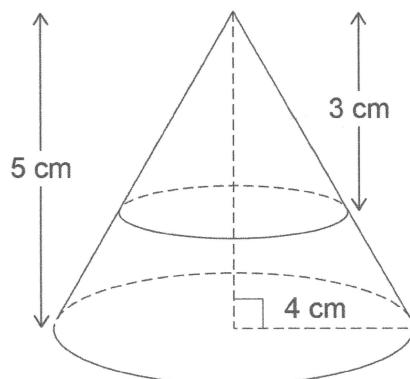
2 5

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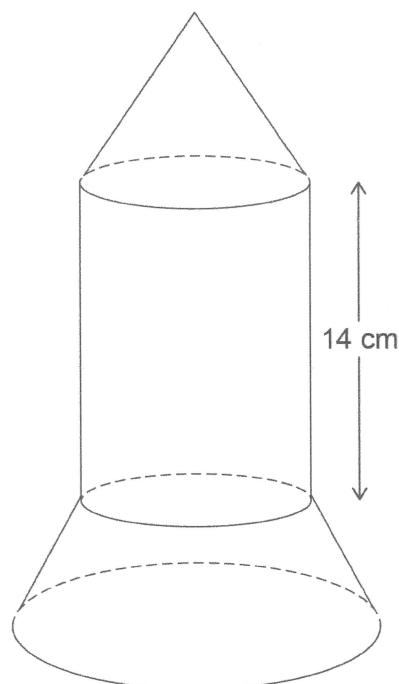
32

A cone has perpendicular height 5 cm and base radius 4 cm

The cone is cut parallel to the base, 3 cm from the top.



A toy rocket is made by putting a cylinder of height 14 cm between the two pieces as shown.



Do not write outside the box

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

where r is the base radius and h is the perpendicular height of the cone.

Work out the volume of the toy rocket.

[4 marks]

Answer 10] $\frac{23}{75}$ cu cm³

Turn over for the next question



33

Work out the coordinates of the points of intersection of the graphs

$$y = 4x^2 + 8x + 3 \quad \text{and} \quad y = x + 5$$

[5 marks]

$$4x^2 + 8x + 3 = x + 5$$

$$4x^2 + 7x - 2 = 0$$

Answer ($\frac{1}{4}$, $\frac{5}{4}$) and (-2 , 3)

END OF QUESTIONS

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