OCR
Oxford Cambridge and RSA

F

GCSE (9–1) Mathematics

J560/03 Paper 3 (Foundation Tier)

Tuesday 12 June 2018 – Morning

Time allowed: 1 hour 30 minutes

You may use:
- a scientific or graphical calculator
- geometrical instruments
- tracing paper

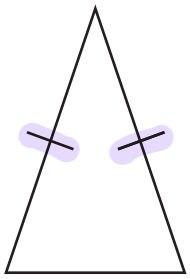
First name									
Last name									
Centre number						Candidate number				

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Read each question carefully before you start your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- This document consists of **20** pages.

Answer **all** the questions.

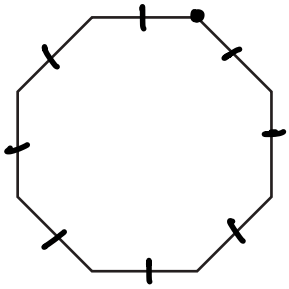
1 **(a)** Write down the mathematical name of this triangle.
Choose from the list in the box.



isosceles	equilateral	right-angled	scalene

(a) .....isosceles.....triangle **[1]**

(b) Write down the order of rotation symmetry of this regular octagon.



(b) ..... 8 ..... **[1]**

2 **(a)** Write down.

(i) 3091 rounded to the nearest hundred

↑ 50

(a)(i) ..... 3100 ..... **[1]**

(ii) 3% as a decimal

% $\xrightarrow{\div 100}$ decimal

3 ÷ 100

(ii) ..... 0.03 ..... **[1]**

(iii) the cube root of 27

$\sqrt[3]{27}$

(iii) ..... 3 ..... **[1]**

(b) Complete the statement below using a number from this list.

-2 0 -6 6

$-5 >$ ..-6.. **[1]**

(c) Write the following numbers in order of size, smallest first.

0.4 0.5 0.06 0.444 0.46

2 0.400
5 0.500
1 0.060
3 0.444
4 0.460

..0.06.. ..0.4.. ..0.444.. ..0.46.. ..0.5.. **[2]**

smallest

3 Calculate.

(a) $\frac{3.6}{1.2 - 0.3}$

(a) ..4.. **[1]**

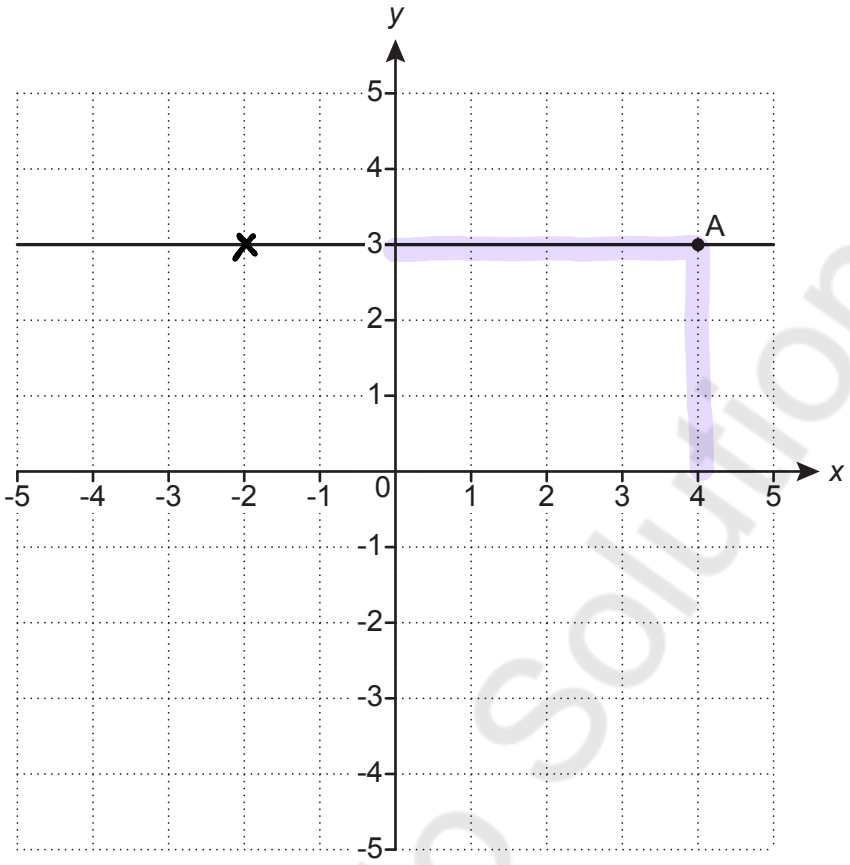
(b) $\sqrt{12.25^3}$

Give your answer correct to 1 decimal place.

42.875

(b) ..42.9.. **[2]**

4 This grid shows a horizontal line going through the point A.



(a) (i) Write down the coordinates of point A.

(a)(i) (4 , 3) **[1]**

(ii) Plot the point ($^{-}$2, 3). **[1]**

(b) Write down the equation of the horizontal line going through point A.

(b) y = 3 **[1]**

5 *Tea Biscuits* can be bought in packets of 20 or packets of 24.
All biscuits are identical in size and quality.

20 *Tea Biscuits* for £1.50	24 *Tea Biscuits* for £1.80

Nada says

The packet of 24 biscuits is better value.

Is Nada correct?
Show how you decide.

Pack of 20
1 biscuit = £1.50 ÷ 20
= £0.075

Pack of 24
1 biscuit = £1.80 ÷ 20
= £0.075

Nada is wrong because the cost of 1 biscuit in each pack is the same. **[3]**

6 You are given that $5y = 4x$.

(a) Find the value of y when $x = 10$.

$5y = 4(10)$
$5y = 40$
$\div 5 \quad \div 5$
$y = 8$

(a) $y =$ 8 **[2]**

(b) Write y in terms of x.

$5y = 4x$
$\div 5 \quad \div 5$
$y = \frac{4x}{5}$

(b) $y =$ $\frac{4x}{5}$ **[1]**

7 **(a)** Frances has three cards: Ace (A), King (K) and Queen (Q).
She shuffles these cards and deals them one at a time.

(i) List all the different orders in which she can deal the cards.
One possible order is already shown in the table.
You may not need to use all the rows.

First card	Second card	Third card
A	K	Q
A	Q	K
K	A	Q
K	Q	A
Q	A	K
Q	K	A

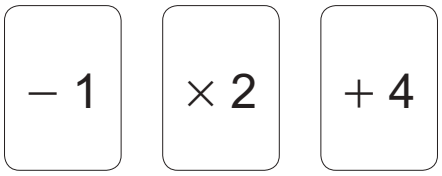
[2]

(ii) Find the probability that, in the three cards Frances deals, the King (K) is dealt **immediately** after the Queen (Q).

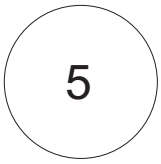
2 out of 6

(ii) $\frac{2}{6}$ ..... **[1]**

(b) A counter has 3 on one side and 5 on the other.
Lena flips the counter.
She then picks one of these three cards at random.



Lena puts the card next to the counter and works out the answer.

For example 

gives the answer 10.

Find the probability that Lena gets an answer **less than 8**.
You must show your working.

Counter	Card	Answer
3	−1	2
3	x 2	6
3	+ 4	7
5	−1	4
5	x 2	10
5	+ 4	9

4 out of 6 less than 8

(b) $\frac{4}{6}$ ..... **[4]**

8 Two groups of students go on a water sport holiday.
Each student chooses one activity.

Students in **Group A** choose from Diving, Swimming, Paddleboarding and Kayaking.
Their choices are to be shown in a pie chart.

(a) Complete this table for Group A.

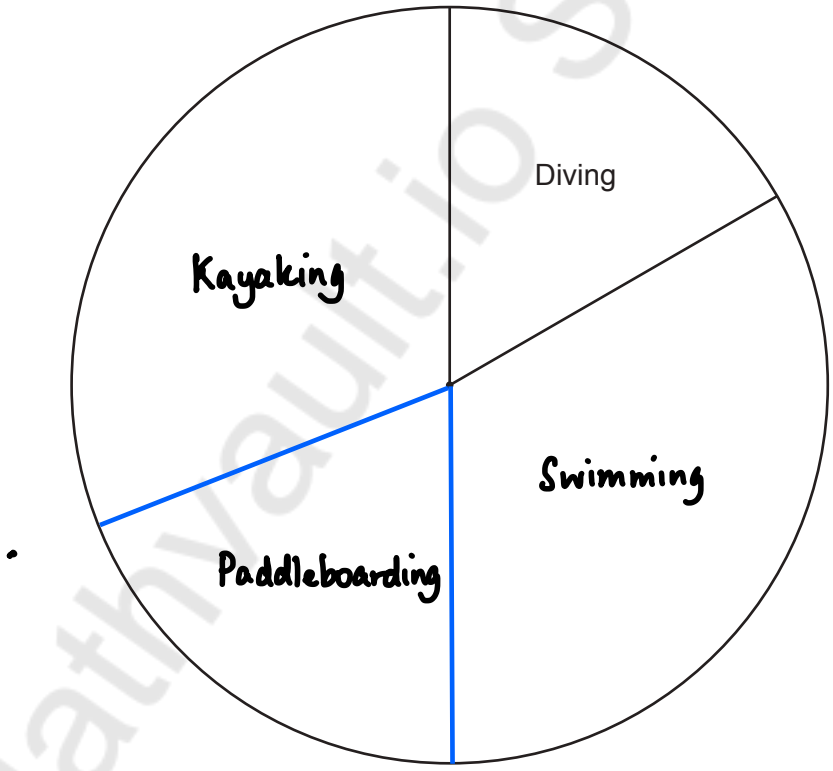
Activity	Number of students	Angle of sector
Diving	5	60°
Swimming	10	120°
Paddleboarding	6	72°
Kayaking	9	108°

×12 ÷12 ÷12

360 - 60 - 120 - 108

[4]

(b) Complete the pie chart for Group A.



[2]

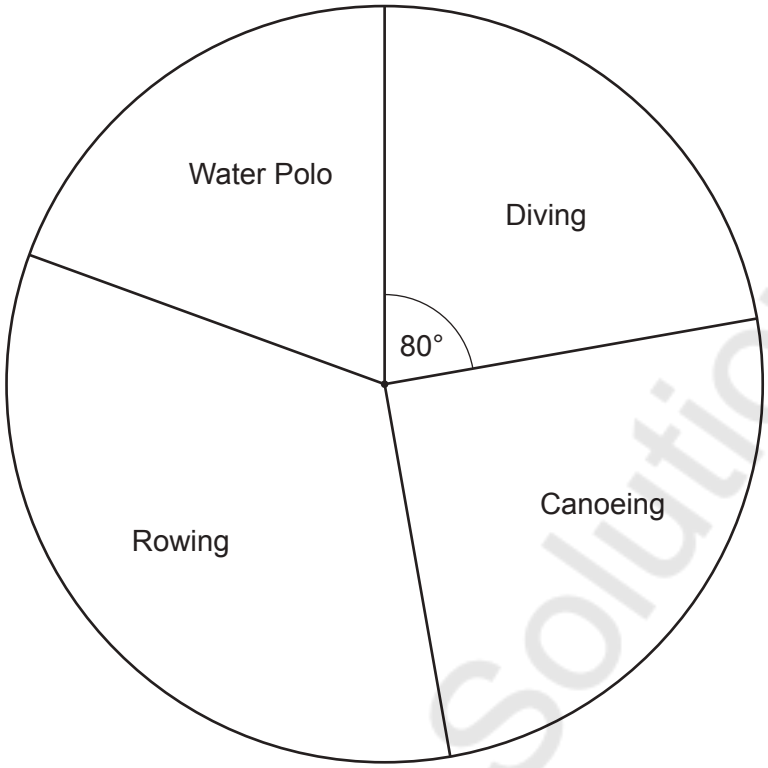
(c) One student in Group A changes activity.
There is now a new modal activity for Group A.

Write down the student's original activity and new activity.

original activity..... Swimming .....

new activity..... Kayaking ..... **[1]**

(d) The choices made by **Group B** are shown in this pie chart.



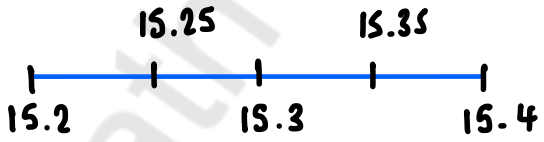
A teacher thinks more students chose Diving in Group B than in Group A.

Give a reason why the teacher may be wrong.

There may be different numbers of students in the two groups [1]

9 The length, a, of a pencil is 15.3 cm, correct to 1 decimal place.

Complete the error interval for the length of the pencil.



15.25 $\leqslant a <$ 15.35 [2]

10 4 people take 3 hours to paint a fence.

Assume that all people paint at the same rate.

(a) How long would it take one of these people to paint the same fence?

4 people = 3 hours

÷4 ×4

1 person = 12 hours

(a) 12 hours **[1]**

(b) How long would it take 5 people to paint the same fence?
Give your answer in hours and minutes.

1 person = 12 hours

×5 ÷5

5 people = 2.4 hours

0.4 × 60 = 24 mins

(b) 2 hours 24 minutes **[4]**

11 A recipe for flapjacks uses only oats, butter and syrup, in the ratio 3 : 2 : 1.

(a) Pirin makes 1.5 kg of flapjacks.
He uses 600 g of butter.

Has Pirin followed this recipe?
Show how you decide.

kg $\xrightarrow{\times 1000}$ g

1.5 × 1000 = 1500g

O : B : S

3 : 2 : 1

Total 6 parts

1500g ÷ 6 = 250g

Butter = 2 × 250g = 500g

No, he should use 500g butter.

[4]

(b) Using this recipe, 200 g of syrup are needed to make 10 flapjacks.
Find the mass of **oats** needed to make **15** of these flapjacks.

O : B : S

3 : 2 : 1

×200

600g 400g 200g

600g oats = 10 flapjacks

×1.5 ×1.5

900g oats 15 flapjacks

(b) 900 g **[3]**

12 **(a)** $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ ×5 ×5

Work out $5\overrightarrow{PQ}$.

(a) $\begin{pmatrix} 15 \\ 20 \end{pmatrix}$ **[1]**

(b) Find the values of h and k.

$$\begin{pmatrix} h \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ k \end{pmatrix} - \begin{pmatrix} 3 \\ 3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$h + 2 - 3 = 0$

$h - 1 = 0$

$+1 \quad +1$

$h = 1$

$5 + k - 3 = 0$

$k + 2 = 0$

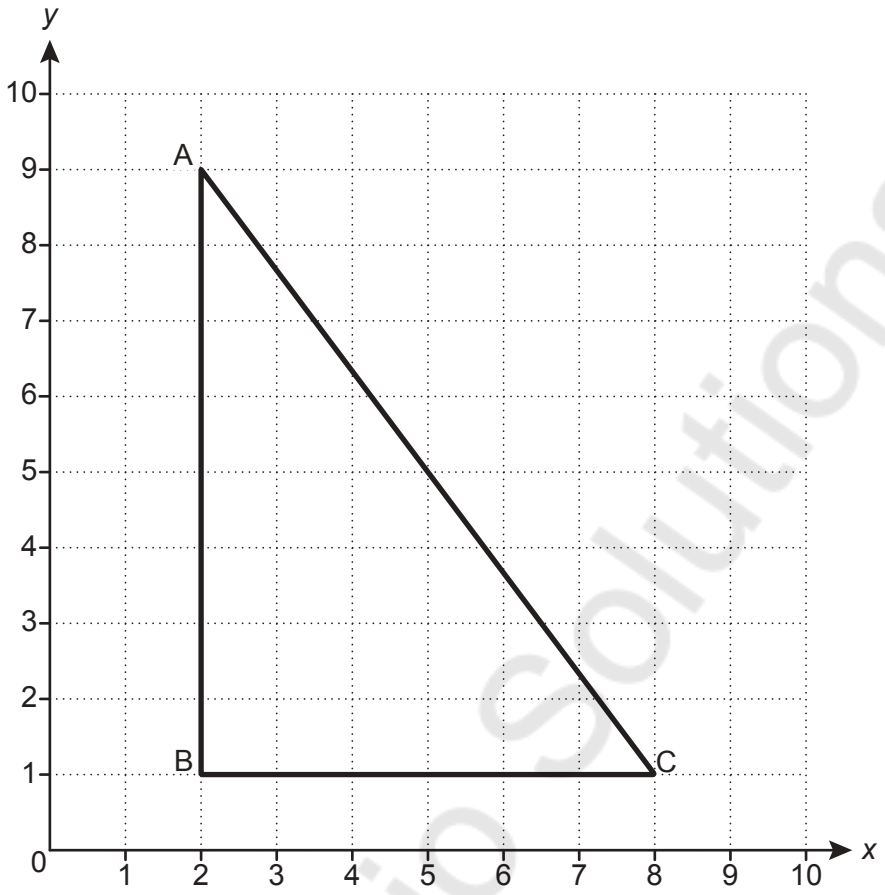
$-2 \quad -2$

$k = -2$

(b) $h =$ 1

$k =$ -2 **[2]**

(c) Triangle ABC is drawn on a coordinate grid.



$\overrightarrow{AB} = \begin{pmatrix} 0 \\ -8 \end{pmatrix}$

(i) Use the diagram to complete this vector sum.

$$\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA} = \begin{pmatrix} 0 \\ -8 \end{pmatrix} + \begin{pmatrix} 6 \\ 0 \end{pmatrix} + \begin{pmatrix} -6 \\ 8 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

[2]

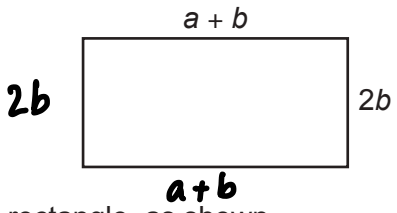
(ii) Give a reason why the answer to the sum could be written down **without doing any working**.

Returning to the starting point (A).

..... **[1]**

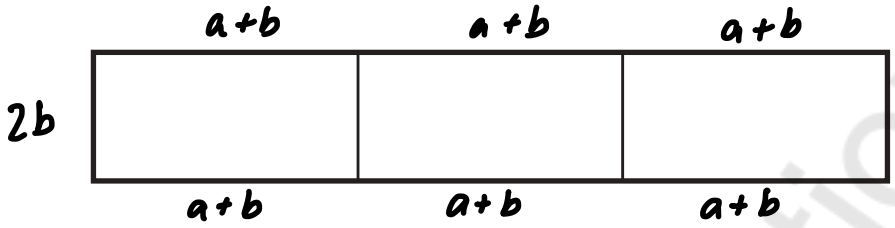
13 In this question, assume all dimensions are in centimetres.

Jess and Pete have many rectangular tiles.
Each tile has length $a + b$ and width $2b$.



Not to scale

(a) Jess joins three tiles together to make a larger rectangle, as shown.



Not to scale

(i) Write an expression for the perimeter of her rectangle.
Give your answer in its simplest form.

$2(2b) + 6(a+b)$

$4b + 6a + 6b$

(a)(i) ..... $6a + 10b$ ..... **[2]**

(ii) An expression for the **area** of her rectangle is $6ab + 6b^2$.

Factorise this expression fully.

(ii) ..... $6b(a + b)$ ..... **[2]**

(b) Pete joins some tiles together to make a different rectangle.
The area of his rectangle is $8ab + 8b^2$.

Draw a possible arrangement of tiles for Pete's rectangle.
Write down expressions for the length and for the width of the rectangle.

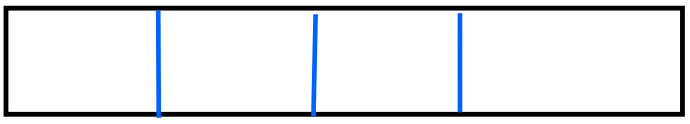
$A = l \times w \quad w = 2b$

$8ab + 8b^2 = l \times 2b$

$\frac{8ab + 8b^2}{2b} = l$

$4a + 4b = l$

$4(a+b)$



length = ... $4a + 4b$ .....

width = ... $2b$ ..... **[5]**

14 Here are the first four terms of a sequence.

2 , 6 , 10 , 14 , 18

+4 +4 +4 +4

(a) Write down the next term.

(a) 22 **[1]**

(b) Write an expression for the *n*th term.

$4n + 2$

(b) $4n+2$ **[2]**

(c) Explain why 511 is **not** a term in the sequence.

511 is odd.

[1]

(d) Find the term in the sequence that is nearest to 511.

$4n + 2 = 511$

$-2 \quad -2$

$4n = 509$

$\div 4 \quad \div 4$

$n = 127.25$

127th term is nearest to 511

$4(127) + 2 = 510$

(d) 510 **[3]**

15 In July the price of a holiday is £500.
In August the price increases by 25%.
In September the price drops to £500 again.

Work out the percentage decrease from the August price to the September price.

August

100% + 25% = 125%

125% $\xrightarrow{\div 100}$ 1.25

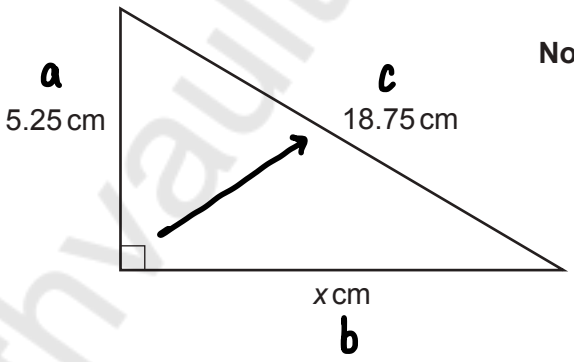
1.25 x £500 = £625

September
£500

Percentage Decrease $\quad \frac{625 - 500}{625} \times 100 = 20$

20 ..... % **[4]**

16 Here is a right-angled triangle.



Not to scale

Work out the value of x.

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

$5.25^2 + x^2 = 18.75^2$

$-5.25^2 \qquad -5.25^2$

$x^2 = 18.75^2 - 5.25^2$

$\sqrt{\quad} \qquad \sqrt{\quad}$

$x = \sqrt{18.75^2 - 5.25^2}$

$x =$ 18 ..... **[3]**

17 Ping chooses four numbers.

The mode of these four numbers is 8, the range is 7 and the mean is 11.

Find Ping's four numbers.

8 8 13 15

Range = largest − smallest

7 = largest − 8

+8 +8

15 = largest

$\text{mean} = \frac{8+8+?+15}{4} = 11$

$\frac{31+?}{4} = 11$

$31 + ? = 44$

$-31 \quad -31$

$? = 13$

8 , 8 , 13 , 15 [3]

18 A box contains only red, blue and green pens.
The ratio of red pens to blue pens is 5 : 9.
The ratio of blue pens to green pens is 1 : 4.

Calculate the percentage of pens that are blue.

R : B B : G

5 : 9 1 : 4

×9

5 : 9 9 : 36

R : B : G

5 : 9 : 36

Blue = 9

Total = 5 + 9 + 36

= 50

$\text{Blue} = \frac{9}{50} \times 100$

= 18%

18 % [4]

19 Asha worked out $\dfrac{326.8 \times (6.94 - 3.4)}{59.4}$.

She got an answer of 19.5, correct to 3 significant figures.

Write each number correct to 1 significant figure to decide if Asha's answer is reasonable.

$326.8 \approx 300$

$6.94 \approx 7$

$3.4 \approx 3$

$59.4 \approx 60$

$\dfrac{300 \times (7 - 3)}{60}$

$= 20$

Yes, as 19.5 is close to 20.

.....

..... **[3]**

20 **(a)** Show that $a^5 \times (a^3)^2$ can be expressed as a^{11}. **[2]**

$a^{3 \times 2}$

$= a^6$

$a^5 \times a^6 = a^{5+6}$

$= a^{11}$

(b) Write $\dfrac{1}{125} \times 25^9$ as a power of 5.

$125 = 5^3$

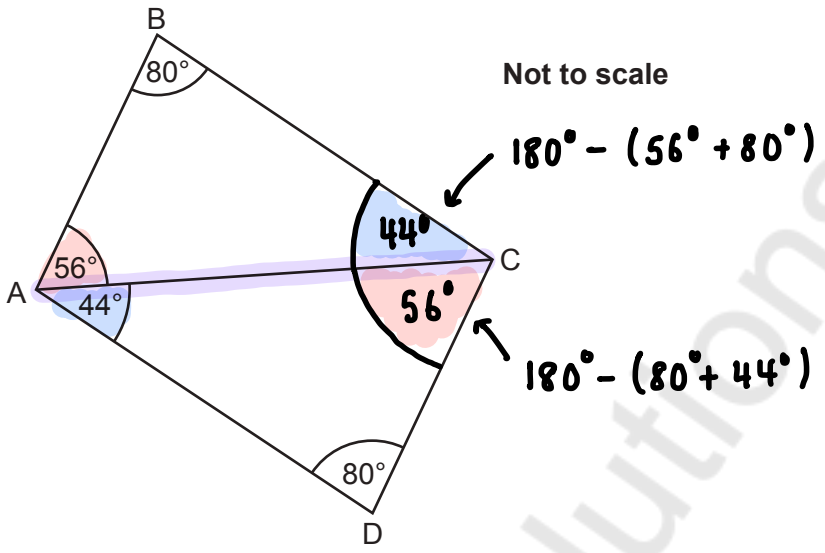
$25 = 5^2$

$\dfrac{1}{5^3} \times (5^2)^9$

$5^{-3} \times 5^{18} = 5^{-3+18}$

(b) 5^{15} **[3]**

21 The diagram below shows two triangles.



Prove that triangle ABC is congruent to triangle ACD.

AC is common

Angle BCA = Angle CAD = 44°

Angle BAC = Angle ACD = 56°

Congruent because ASA

.....

.....

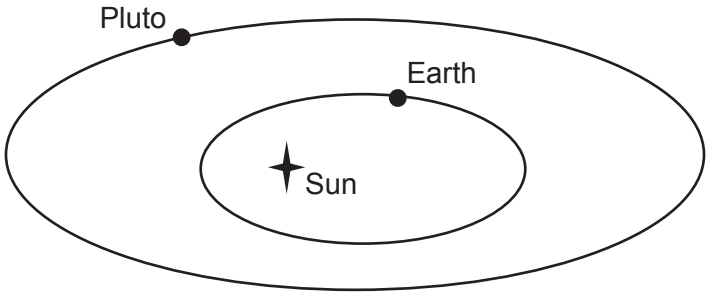
.....

.....

.....

..... **[4]**

22 Earth and Pluto go around the Sun.
Their distance to the Sun varies.



Not to scale

The table shows the closest distance that Earth and Pluto get to the Sun.

	Closest distance to the Sun (km)
Earth	1.47×10^8
Pluto	4.44×10^9

(a) Show that the closest distance of Pluto to the Sun is roughly 30 times the closest distance of Earth to the Sun. **[2]**

$(4.44 \times 10^9) \div (1.47 \times 10^8)$

$= 30.204...$

(b) Give a reason why we **cannot** use this information to say

The distance of Pluto to the Sun is always
30 times the distance of Earth to the Sun.

Orbits are elliptical so other distances to the Sun are possible. **[1]**

END OF QUESTION PAPER