

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GCSE**

**J567/03**

**MATHEMATICS B**

**Paper 3 (Higher Tier)**

**MONDAY 9 JUNE 2014: Morning**  
**DURATION: 1 hour 45 minutes**  
**plus your additional time allowance**  
**MODIFIED ENLARGED 24pt**

<b>Candidate forename</b>		<b>Candidate surname</b>	
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<b>Centre number</b>						<b>Candidate number</b>				
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**Candidates answer on the Question Paper.**

**OCR SUPPLIED MATERIALS:**

**None**

**OTHER MATERIALS REQUIRED:**

**Geometrical instruments**

**Tracing paper (optional)**

<p><b>WARNING</b> <b>NO CALCULATOR CAN BE USED FOR</b> <b>THIS PAPER</b></p>
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**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

**Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**

**Use black ink. HB pencil may be used for graphs and diagrams only.**

**Answer ALL the questions.**

**Read each question carefully. Make sure you know what you have to do before starting your answer.**

**Your answers should be supported with appropriate 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 necessary but you must clearly show your candidate number, centre number and question number(s).**

## **INFORMATION FOR CANDIDATES**

**The number of marks is given in brackets [ ] at the end of each question or part question.**

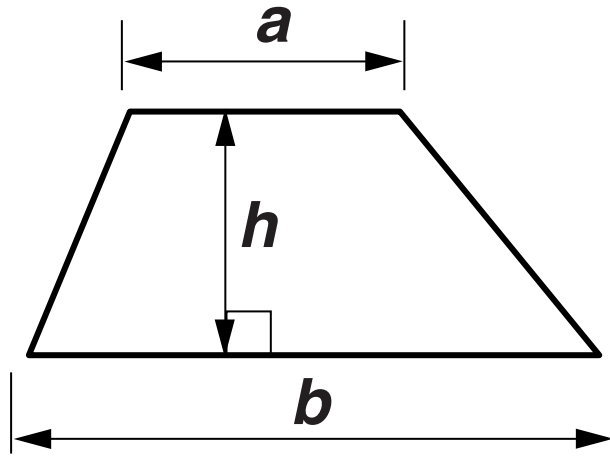
**The quality of written communication is assessed in questions marked with an asterisk (\*).**

**The total number of marks for this paper is 100.**

**Any blank pages are indicated.**

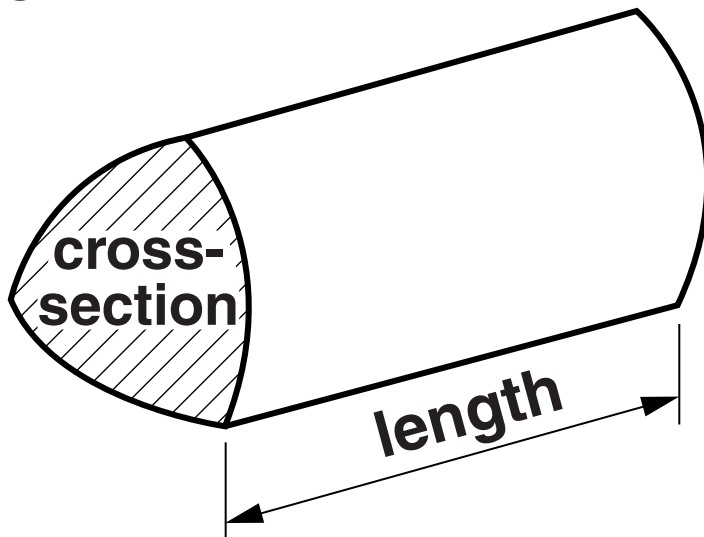
# FORMULAE SHEET: HIGHER TIER

## Trapezium



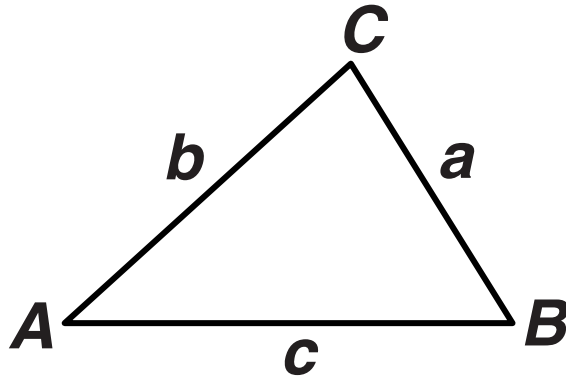
$$\text{Area of trapezium} = \frac{1}{2} (a + b)h$$

## Prism



$$\begin{aligned} \text{Volume of prism} \\ = (\text{area of cross-section}) \times \text{length} \end{aligned}$$

In any triangle  $ABC$

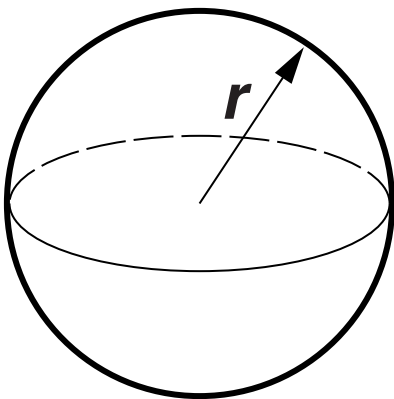


Sine rule  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

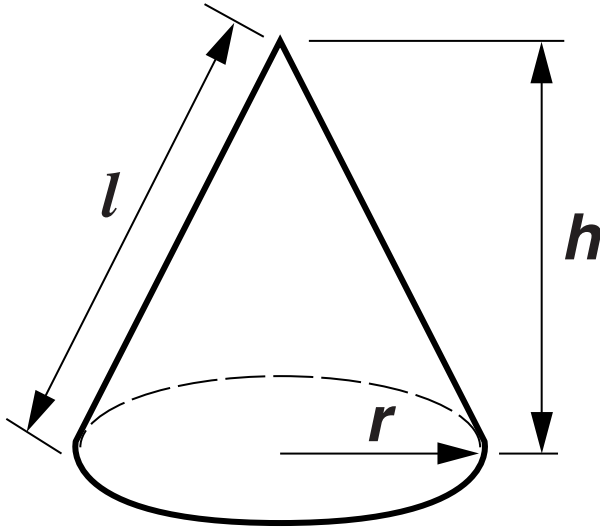
Sphere



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

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

## Cone



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

$$\text{Curved surface area of cone} = \pi r l$$

## The Quadratic Equation

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

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

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**Answer ALL the questions.**

**1 Students at a sports college choose activities for games.**

**(a) In Year 7 they chose between rounders and athletics in the ratio 1 : 4.**

**There are 60 students in Year 7.**

**Work out how many chose athletics.**

**(a) \_\_\_\_\_ [2]**



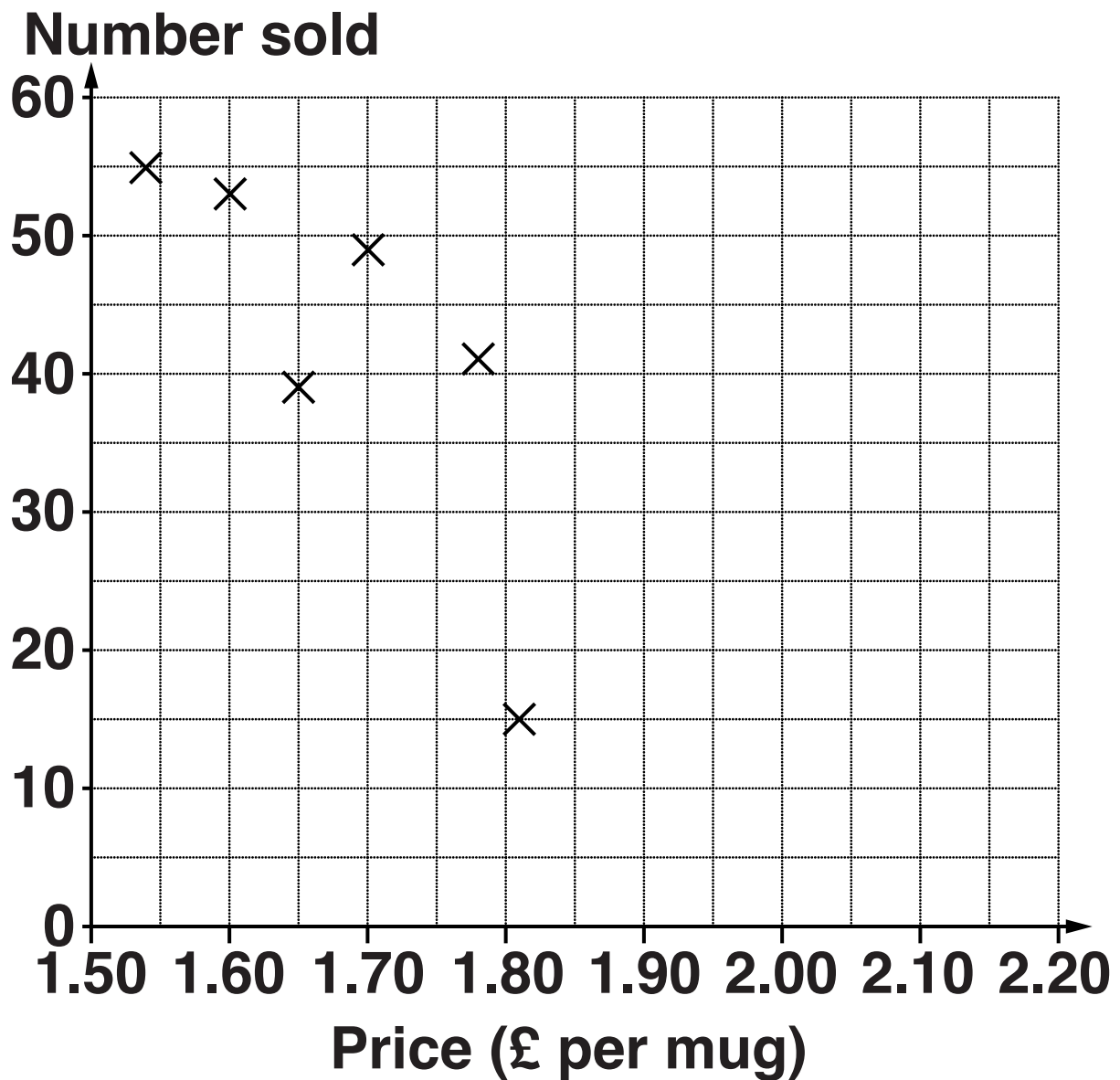
**(b) In Year 8 they chose between badminton and swimming in the ratio 3 : 5.**

**If 42 students chose badminton, work out how many chose swimming.**

**(b) \_\_\_\_\_ [2]**

- 2 Chico sells coffee in his café.  
He changes the price of a mug of coffee every day.  
The table below shows the number of mugs of coffee he sells and the price on each of ten days.**

	<b>Price (£ per mug)</b>	<b>Number sold</b>
<b>Day 1</b>	<b>1.54</b>	<b>55</b>
<b>Day 2</b>	<b>1.60</b>	<b>53</b>
<b>Day 3</b>	<b>1.65</b>	<b>39</b>
<b>Day 4</b>	<b>1.70</b>	<b>49</b>
<b>Day 5</b>	<b>1.78</b>	<b>41</b>
<b>Day 6</b>	<b>1.81</b>	<b>15</b>
<b>Day 7</b>	<b>1.88</b>	<b>40</b>
<b>Day 8</b>	<b>2.05</b>	<b>25</b>
<b>Day 9</b>	<b>2.14</b>	<b>28</b>
<b>Day 10</b>	<b>2.20</b>	<b>21</b>



**(a) The first six points have been plotted on the scatter diagram above.**

**Complete the scatter diagram by plotting the last four points. [2]**

**(b) Describe the correlation shown.**

**(b) \_\_\_\_\_ [1]**

**(c) Draw a line of best fit on the diagram. [1]**

**(d) The café closed early one day.**

**Put a ring around the cross that shows this day. [1]**

**(e) One day Chico charges £2.00 per mug of coffee.**

**Use the diagram to estimate how much money IN TOTAL Chico takes this day on coffee.**

**(e) £ \_\_\_\_\_ [2]**

- 3 (a) Work out the value of  $5x^2 + 2x$  when  $x = 3$ .**

**(a) \_\_\_\_\_ [2]**

- (b) Work out the value of  $3a - 5b$  when  $a = 6$  and  $b = -2$ .**

**(b) \_\_\_\_\_ [2]**

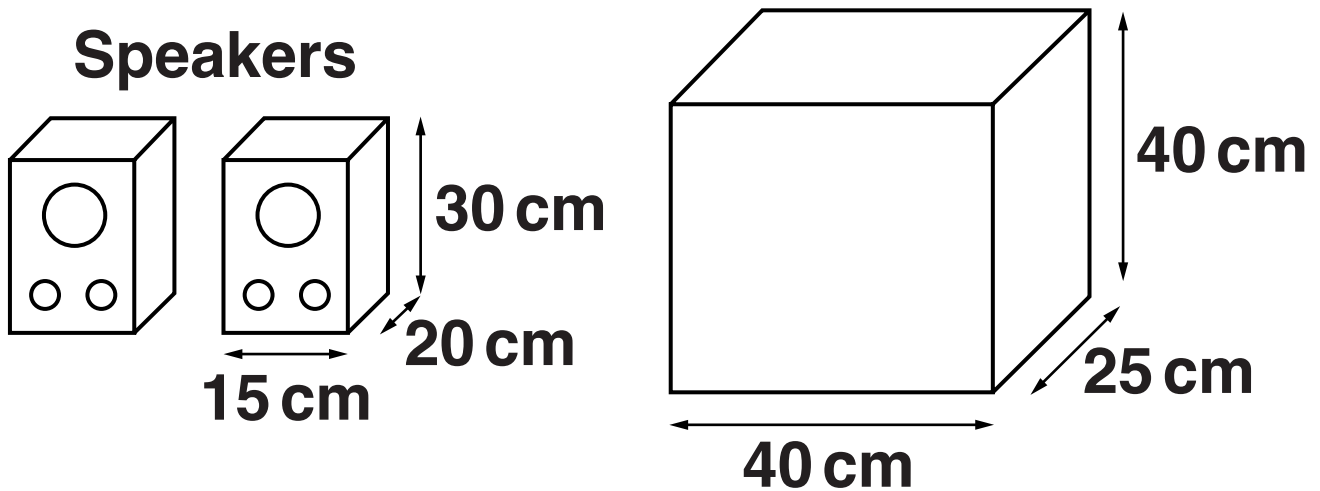
**4 Work out.**

$$5\frac{3}{5} - 2\frac{1}{6}$$

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**[3]**

- 5 (a) A hi-fi speaker is a cuboid measuring 15 cm by 20 cm by 30 cm. TWO of these speakers are packed into a box with internal measurements 40 cm by 25 cm by 40 cm.**



**The rest of the space inside the box is filled with polystyrene.**



**Calculate the volume of polystyrene.**

**(a)** \_\_\_\_\_ **cm<sup>3</sup> [4]**

**(b) An amplifier is packed into a box measuring 20 cm by 15 cm by 10 cm.**

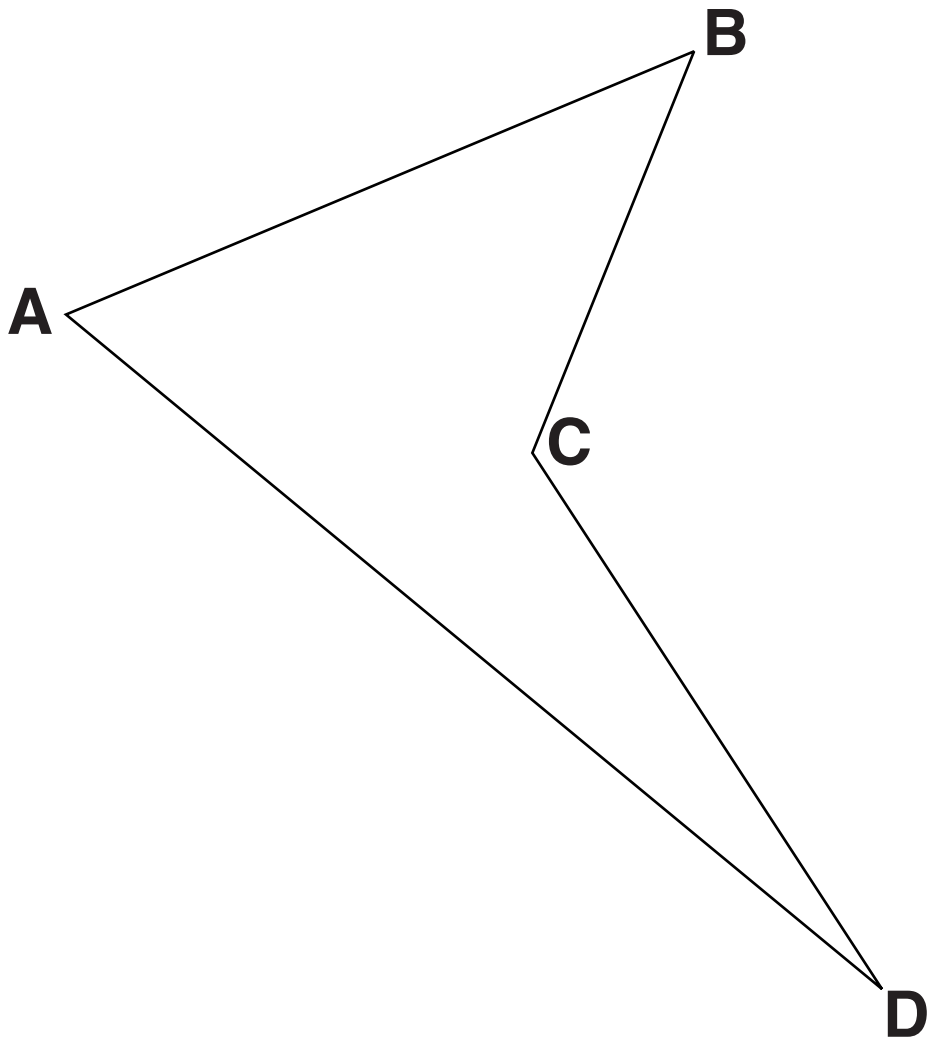
**Calculate the surface area of the box.**

**(b) \_\_\_\_\_ cm<sup>2</sup> [3]**

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**TURN OVER FOR QUESTION 6**

- 6 The scale diagram below shows a park ABCD.**



**Scale: 1 cm represents 100 m**

**The council want to put a shed inside the park and it must be**

**nearer to AB than AD**

**less than 400 m from C.**

**Shade the region where they can put the shed.**

**You must show all your construction arcs.**

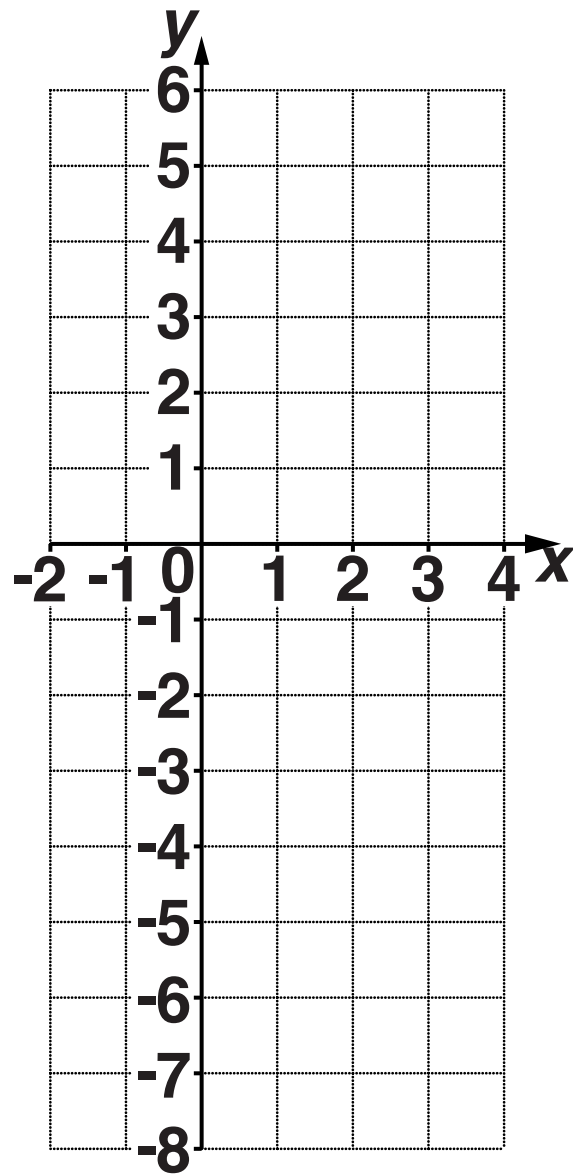
**[4]**

- 7 (a) Complete the table below for  $y = 2x - 3$  by filling in the three missing numbers.

x	-2	-1	0	1	2	3	4
y	-7	-5		-1			5

[1]

**(b) On the grid below draw the graph of  $y = 2x - 3$  for values of  $x$  from -2 to 4.**



**[2]**

**(c) Write down the gradient of the line  
 $y = 2x - 3$ .**

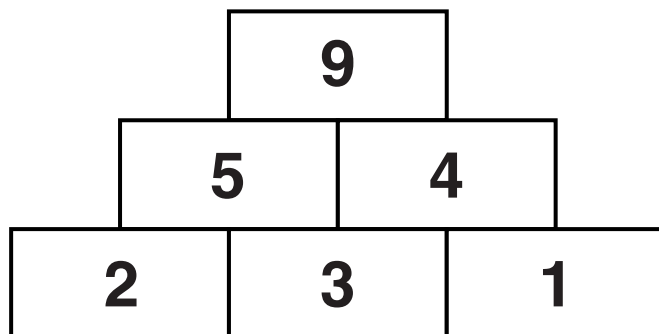
**(c) \_\_\_\_\_ [1]**



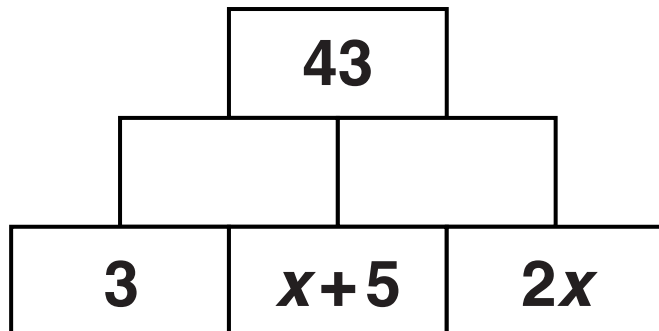
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**TURN OVER FOR QUESTION 8**

- 8 Here is a number pyramid.**  
**The value in each cell is found by**  
**adding the values in the two cells**  
**beneath it.**



In the number pyramid below, find the value of  $x$ .  
Show all your working.



$x =$  \_\_\_\_\_ [4]

**9 Winnie drives 184 miles.  
She drives 60 miles on ordinary roads  
and the rest on a motorway.**

**She completes the journey in  $3\frac{1}{2}$  hours.**

**She drives at an average speed of  
40 mph on ordinary roads.**

**Work out her average speed on the motorway.**

\_\_\_\_\_ **mph [4]**

**10 (a) Multiply out.**

$$5(3x - y)$$

**(a) \_\_\_\_\_ [1]**

**(b) Solve.**

$$5x + 17 = x + 3$$

**(b)  $x =$  \_\_\_\_\_ [3]**

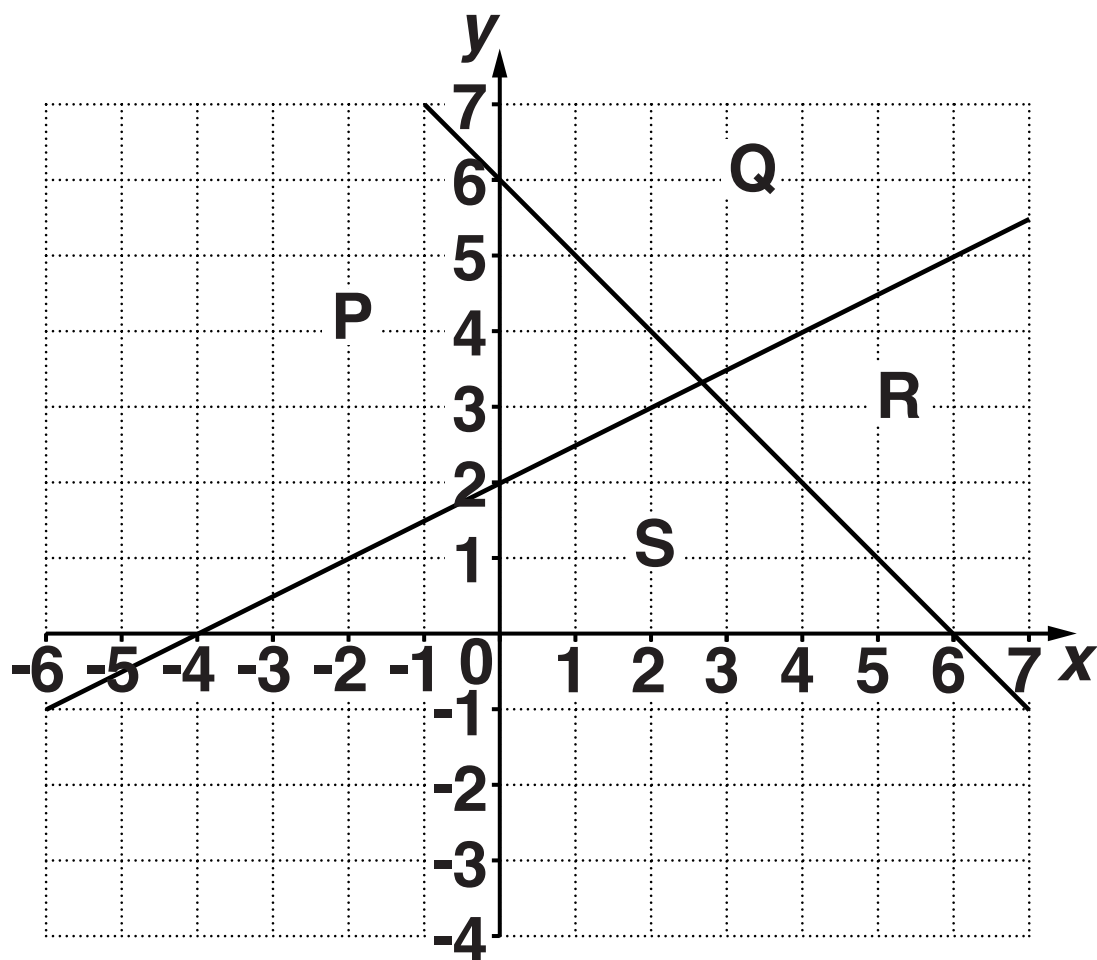
**(c) Rearrange  $y = 2x - 3$  to make  $x$  the subject.**

**(c)  $x =$  \_\_\_\_\_ [2]**

**(d) Rearrange  $u = 5t^2$  to make  $t$  the subject.**

**(d)  $t =$  \_\_\_\_\_ [2]**

- 11 The coordinate grid below is divided into four regions, P, Q, R and S.





**Choose the correct regions to complete these sentences.**

**Regions \_\_\_\_\_ and \_\_\_\_\_ satisfy the inequality  $x + y \geq 6$ .**

**Region \_\_\_\_\_ satisfies the inequalities  $x + y \leq 6$  and  $y \geq \frac{1}{2}x + 2$ .**

**[2]**

**12 (a) (i) Write 5 400 000 in standard form.**

**(a)(i) \_\_\_\_\_ [1]**

**(ii) Write  $4.63 \times 10^{-4}$  as an ordinary number.**

**(ii) \_\_\_\_\_ [1]**

**(b) The UK's Gross Domestic Product (GDP) in 1987 was  $\$7 \times 10^{11}$  and in 2007 it was  $\$2.8 \times 10^{12}$ .**

**Work out the increase in GDP between 1987 and 2007.**

**Write your answer in standard form.**

**(b) \$ \_\_\_\_\_ [2]**

**13 Pet insurance costs £180 each year.  
There is a discount of 5% if it is bought  
online.**

**Calculate the cost of one year's pet  
insurance after the discount.**

**£ \_\_\_\_\_**

**[3]**

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**TURN OVER FOR QUESTION 14**

**14 Imogen went fishing and recorded the weight of each fish she caught. The table below shows her results.**

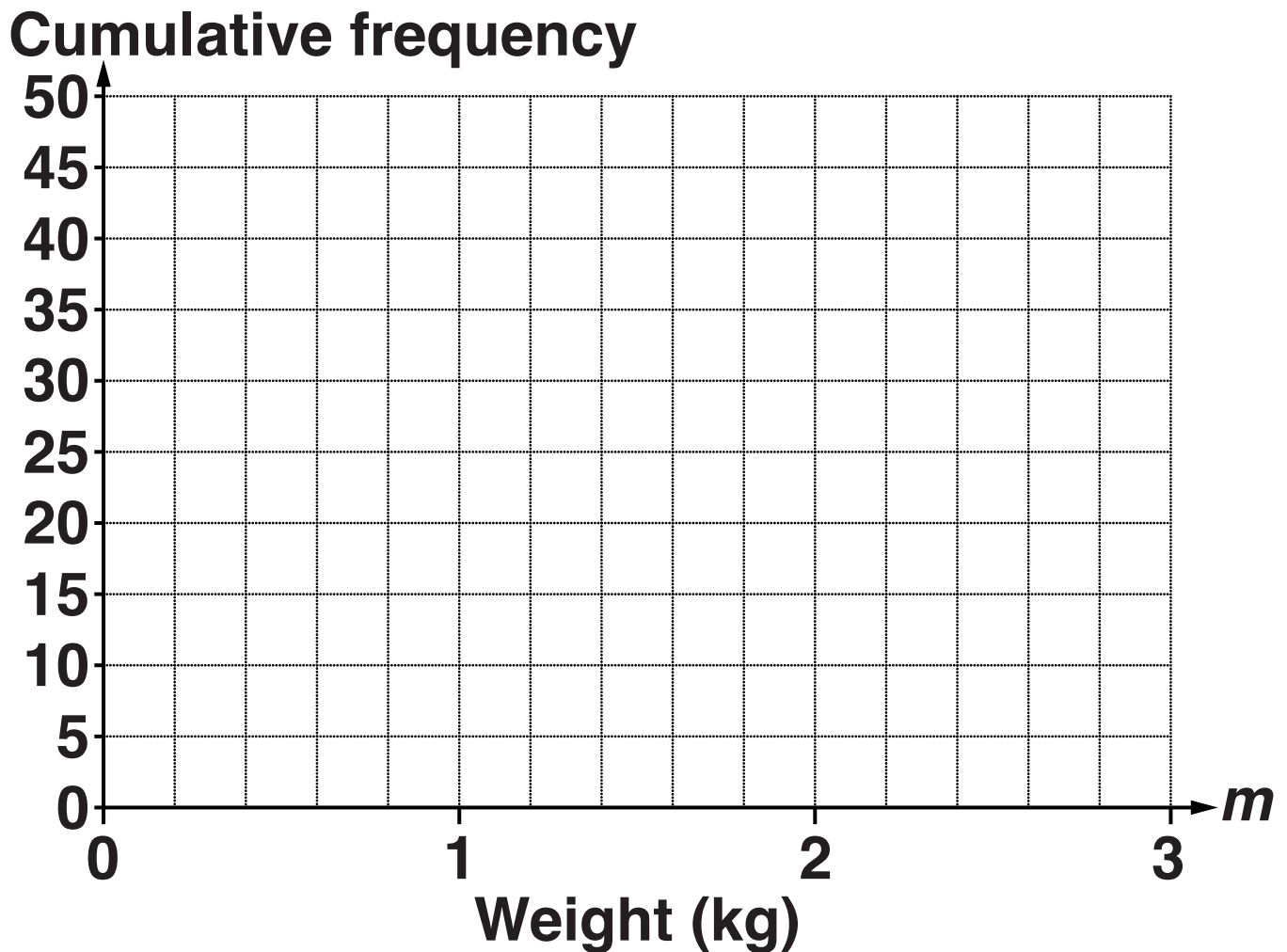
<b>Weight (<math>m</math> kg)</b>	<b>Number of fish</b>
<b><math>0 &lt; m \leq 0.5</math></b>	<b>10</b>
<b><math>0.5 &lt; m \leq 1</math></b>	<b>5</b>
<b><math>1 &lt; m \leq 1.5</math></b>	<b>15</b>
<b><math>1.5 &lt; m \leq 2</math></b>	<b>16</b>
<b><math>2 &lt; m \leq 3</math></b>	<b>4</b>

**(a) Complete the following cumulative frequency table for Imogen's results.**

<b>Weight (<math>m</math> kg)</b>	<b>Cumulative frequency</b>
<b><math>m \leq 0.5</math></b>	
<b><math>m \leq 1</math></b>	
<b><math>m \leq 1.5</math></b>	
<b><math>m \leq 2</math></b>	
<b><math>m \leq 3</math></b>	

**[2]**

**(b) On the grid below draw the cumulative frequency graph for her results.**



**[2]**



**(c) The median weight of fish Ruth caught is 1.2 kg.**

**Is Imogen's median higher or lower than Ruth's?  
Show how you decide.**

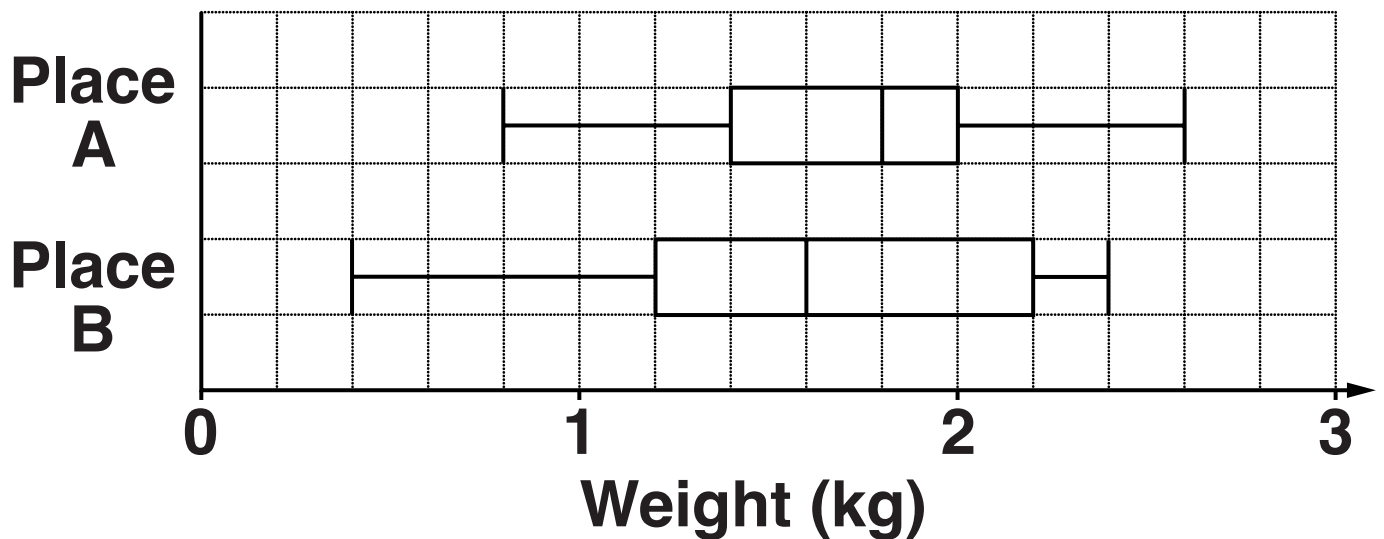
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**[1]**

**(d) Use your graph to work out the percentage of fish Imogen caught that were over 1.8 kg.**

**(d) \_\_\_\_\_ % [3]**

(e) The box plots below summarise the weights of fish that Calvin caught at place A and place B.



Write TWO different comments comparing the weights of fish caught at the two places.

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

[2]

**15 (a) Write  $y = x^2 + 12x + 24$  in the form  $y = (x + p)^2 + q$ .**

**(a) \_\_\_\_\_ [3]**

**(b) Hence state**

**(i) the minimum value of  $y = x^2 + 12x + 24$ ,**

**(b)(i) \_\_\_\_\_ [1]**

**(ii) the value of  $x$  at which this minimum occurs.**

**(ii) \_\_\_\_\_ [1]**

**16 (a) Expand and simplify.**

$$(1 + \sqrt{3})(4 + 2\sqrt{3})$$

**(a) \_\_\_\_\_ [2]**

**(b) Rationalise the denominator in this expression.**

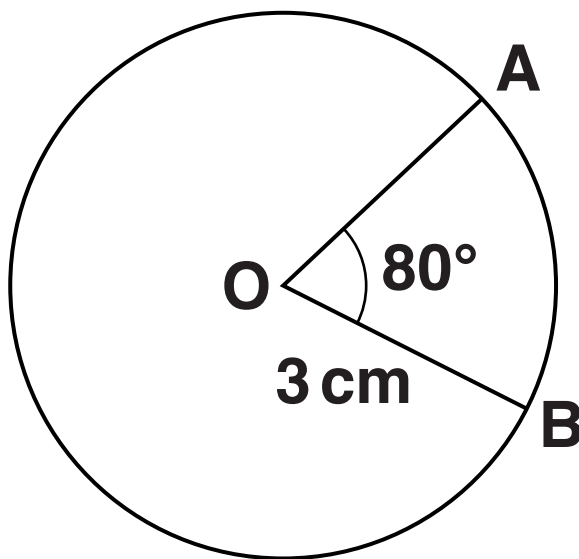
$$\frac{3 + \sqrt{2}}{\sqrt{2}}$$

**(b) \_\_\_\_\_ [2]**

(c) The diagram below shows a circle, centre O.

Find the area of the sector OAB in terms of  $\pi$ .

Write your answer in its simplest form.



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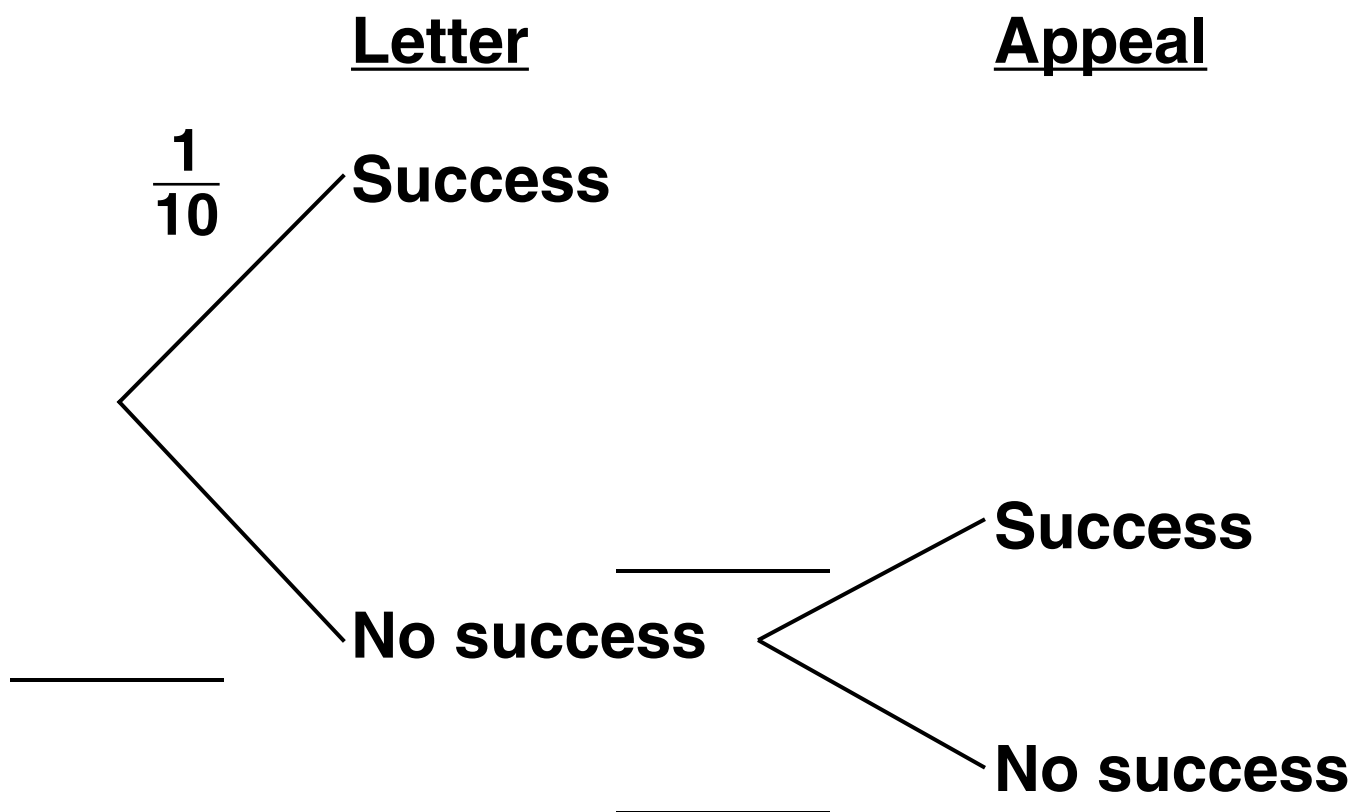
(c) \_\_\_\_\_  $\text{cm}^2$  [3]

**17 Terry applies for funding to set up a community skatepark.  
He writes a letter of application.**

**The probability of this being successful  
is  $\frac{1}{10}$ .**

**If his letter is unsuccessful, he can  
appeal. The probability of success at  
the appeal is  $\frac{1}{3}$ .**

**(a) Complete the following tree diagram  
by filling in the three missing items.**



**[2]**



**(b) Work out the probability that he is successful in getting funding.**

**(b) \_\_\_\_\_ [3]**

**18**  $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

**(a) Work out  $3\overrightarrow{PQ}$ .**

**(a) \_\_\_\_\_ [1]**

**(b) If  $Q = (7, -5)$ , write down the coordinates of  $P$ .**

**(b) (\_\_\_\_\_, \_\_\_\_\_) [1]**

**19 Write  $0.\dot{7}\dot{2}$  as a fraction in its simplest terms.**

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**[3]**

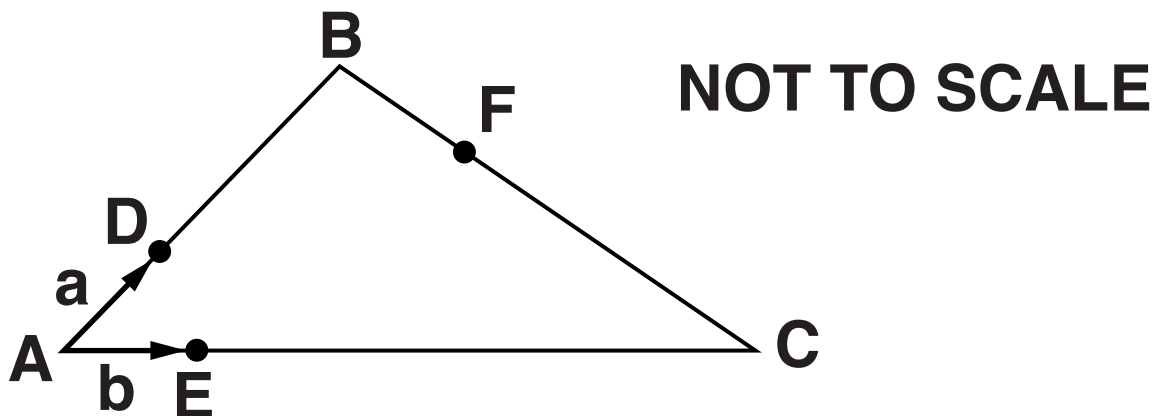
20 (a) In the diagram below,  $ABC$  is a triangle.

$$\overrightarrow{AD} = a \text{ and } \overrightarrow{AE} = b$$

$D$  is a point on  $AB$  such that  
 $AB = 4AD$

$E$  is a point on  $AC$  such that  
 $AC = 4AE$

$F$  is a point on  $BC$  such that  
 $BC = 4BF$



**Write these vectors in terms of a and b in their simplest form.**

**(i)  $\overrightarrow{AB}$**

**(a)(i) \_\_\_\_\_ [1]**

**(ii)  $\overrightarrow{BC}$**

**(ii) \_\_\_\_\_ [1]**

**(iii)  $\overrightarrow{EF}$**

**(iii) \_\_\_\_\_ [2]**

**(b) What do your answers from (a)(i) and (a)(iii) tell you about AB and EF?**

**\_\_\_\_\_ [1]**

**21\* At The Oval Theatre there are three different ticket prices, adult, child and student.**

**Henri finds three receipts for tickets for the same performance.**

**Information from the three receipts is show below.**

**Ticket A:**

**5 adults and 3 children**

**Total: £85**

**Ticket B:**

**2 adults, 1 child and 3 students**

**Total: £58**

**Ticket C:**

**4 adults and 2 children**

**Total: £65**

**Work out the price for an adult and the price for a child.**

**Adult price £ \_\_\_\_\_**

**Child price £ \_\_\_\_\_ [5]**

**END OF QUESTION PAPER**



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