

Name: \_\_\_\_\_



# Spaced Maths

## Mathematics GCSE (Higher)

## Mixed Mock

## Autumn 2016

### Instructions

Use **black** ink or ball-point pen.

**Fill in the box** at the top of this page with your **name**.

Answer **all** questions.

Answer the questions in the spaces provided – *there may be more space than you need.*

**Calculators may be used on questions that are marked with:**



If your calculator does not have a  $\pi$  button, take the value of  $\pi$  to be 3.142 unless the question instructs otherwise.

Diagrams are **NOT** accurately drawn, unless otherwise indicated.

You must **show all of your working out**.

### Information

The total mark for this paper is 80.

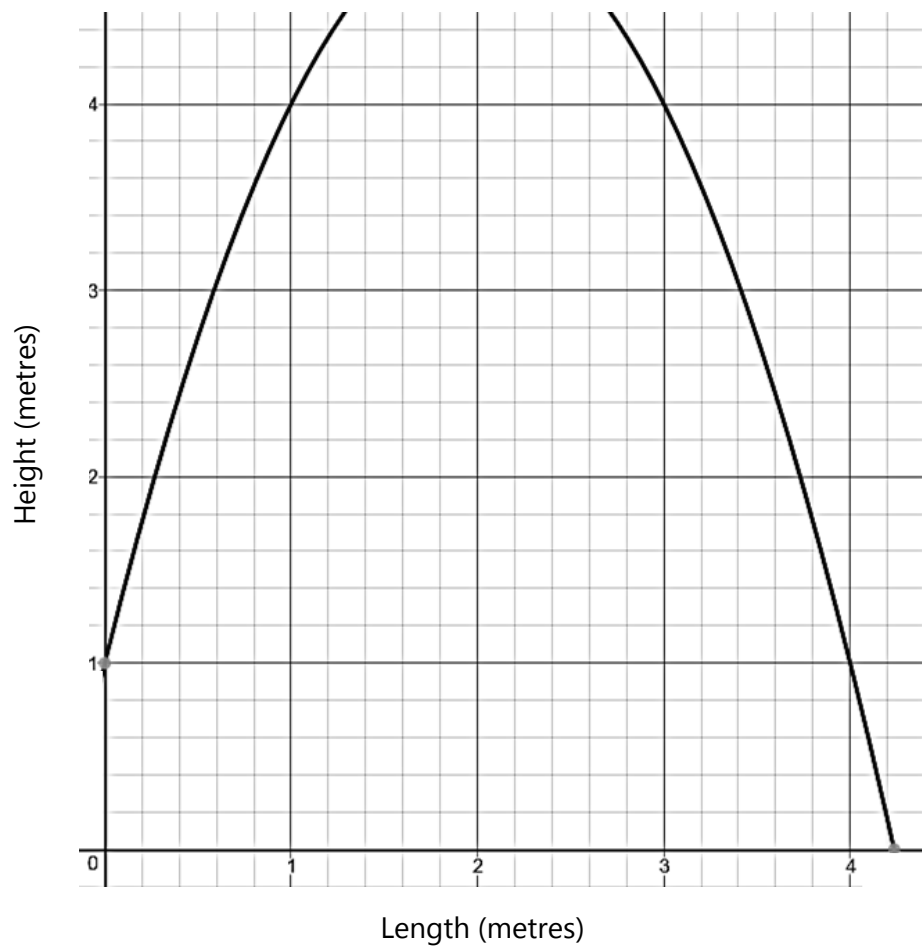
The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

### Equipment needed

Ruler (centimetres and millimetres), protractor, pair of compasses, pen, HB pencil, eraser, calculator (for marked questions).

Tracing paper may be used.

**Q1)** Below is the trajectory of a tennis ball thrown into the air.



(a) Give an interpretation of the y intercept.

.....  
.....

**[1]**

(b) Given that the equation of the parabola is  $-x^2 + 4x + 1$  find the peak height of the ball.

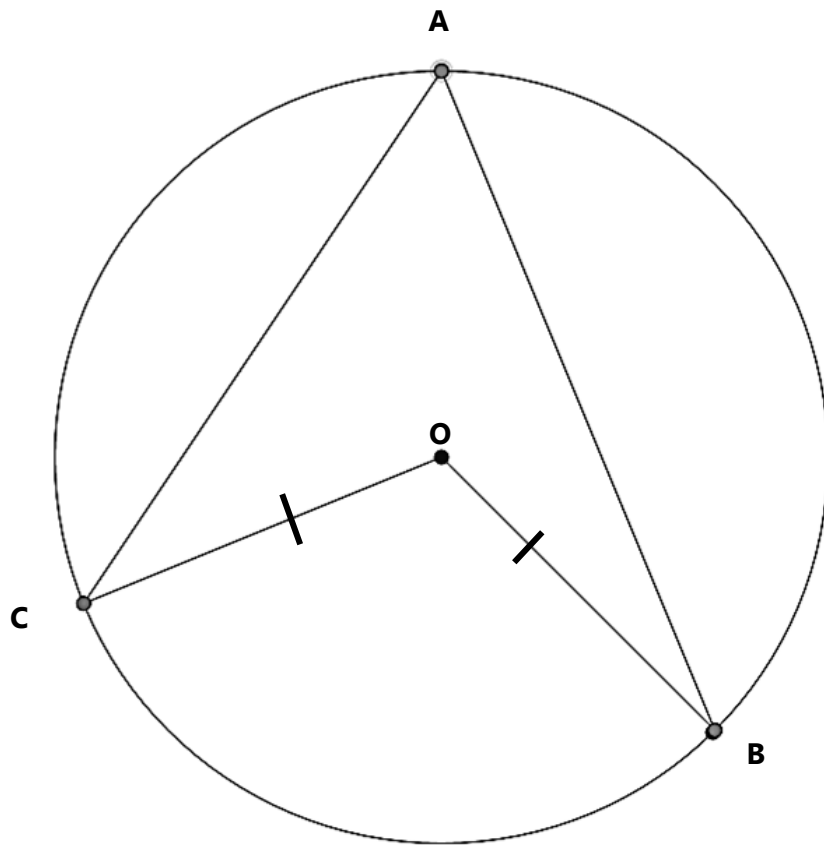
**[3]**

(c) Hence or otherwise, find how far away the ball lands from its starting point. Leave your answer in surd form.

**[3]**

**Q2)** Show that  $\frac{1}{3+\sqrt{2}} + \frac{\sqrt{8}}{14}$  is equivalent to  $\frac{3}{7}$

**[5]**



**Q3)** Prove that the angle at the centre (angle  $COB$ ) is double that of the angle at the circumference (angle  $CAB$ ).

**Q4)** ABC is a triangle and CDEF is a rectangle.

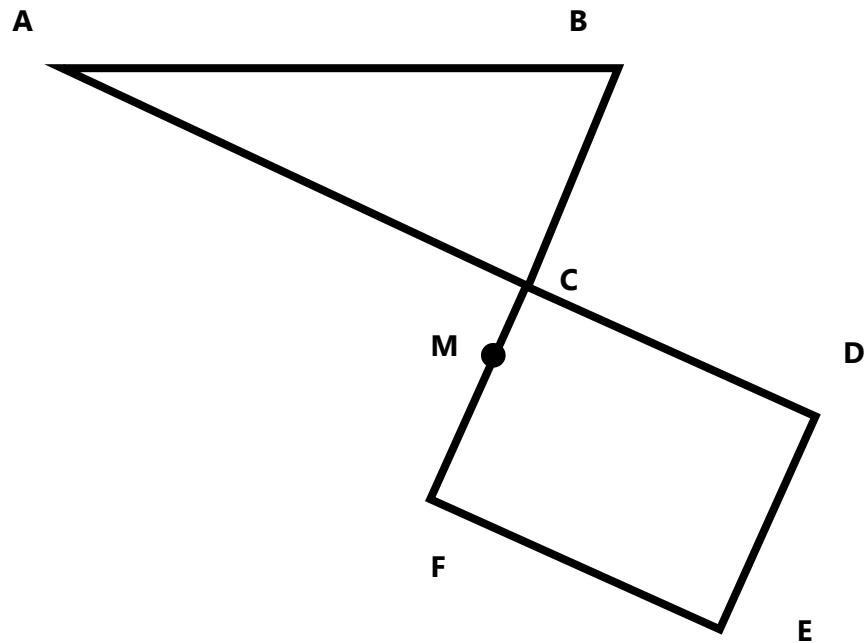
M is a point on the line CF such that  $CM : MF$  is 1 : 2

$$\vec{MC} = a$$

$$\vec{CD} = 2b$$

$$\vec{AB} = 6a + 2b$$

$$\vec{CD} = \frac{2}{3} \vec{AC}$$

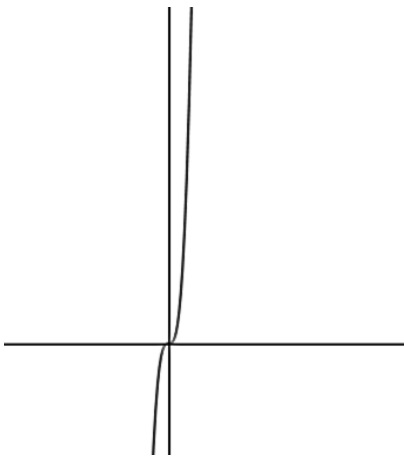


The point X is on the line AB such that XCE is a straight line. How far along the line AB is point X?

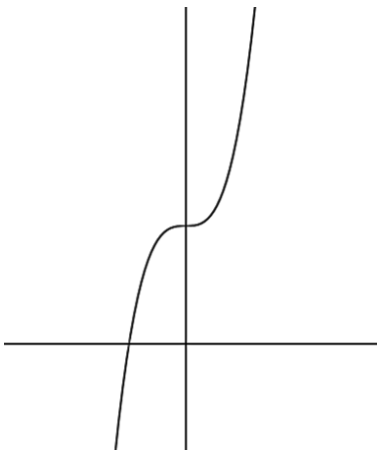
Q5) (a) Match the graphs to the equations in the table below:

[5]

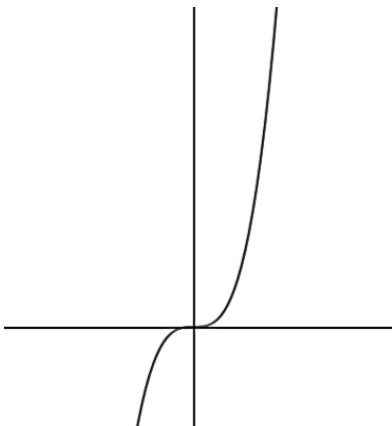
A



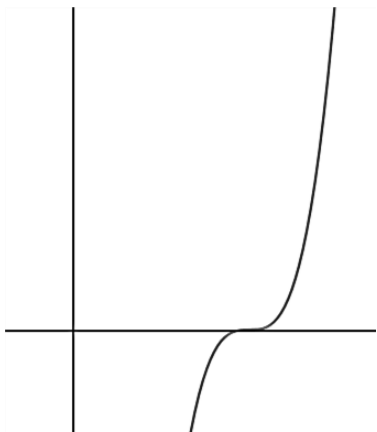
B



C



D



Equation	Graph
$y = (x - 4)^3$	
$y = x^3$	
$y = (7x)^3$	
$y = x^3 + 5$	

[2]

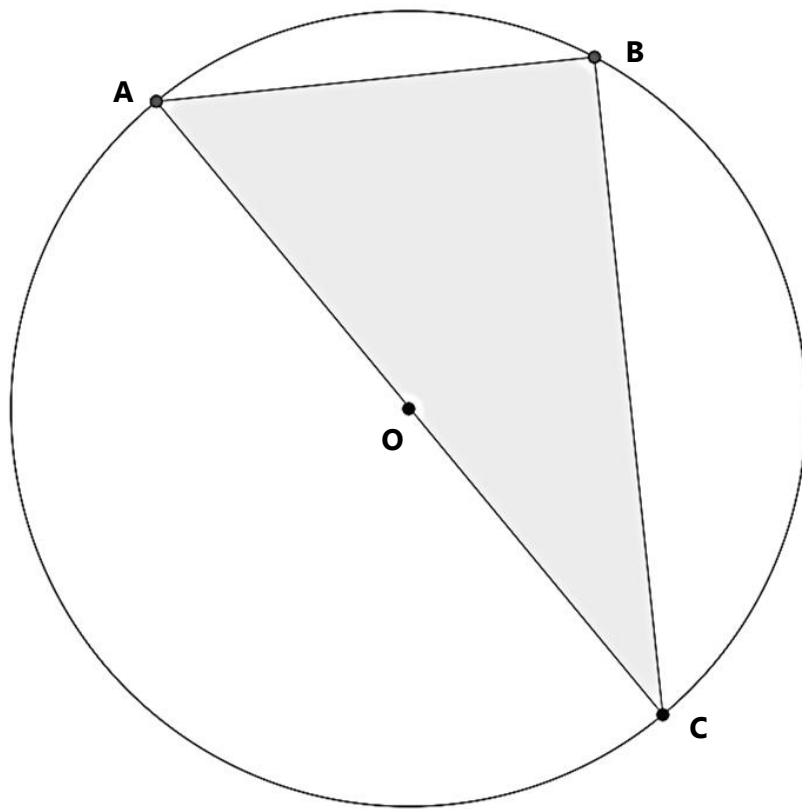
(b) Given that  $f(x) = x^3$ , re-write the remaining equations using function notation.

- 1 .....
- 2 .....
- 3 .....

[3]



Q6)



The diameter of the circle is  $10\sqrt{2}$  cm. Angle  $AOB = 71^\circ$ .

Show that the unshaded region of the circle is  $109.80\text{cm}^2$  (to 2dp).

**Q7)** Here is a quadratic sequence and John's workings to find the nth term of the sequence. [4]

<b>9</b>	<b>12</b>	<b>17</b>	<b>24</b>	<b>33</b>
9	12	17	24	33
3	5	7	9	
	2	2	2	$2n^2$

When  $n=1$ ,  $2n^2 = 2$  and the first term of the sequence is 9 so it's  $2n^2 + 7$

$$\underline{2n^2 + 7}$$

(a) Evaluate John's method.

.....

.....

.....

.....

[2]

(b) Find the nth term of the sequence

4	14	30	52	80
---	----	----	----	----

[3]



**Q8)** Below is information from a sample of 100 people in a data collection, taken by a mobile phone company, Tele-connect. It details the number of people in specified age groups who own and use a mobile phone purchased from their company.

Age group	Number of people
$0 < x \leq 15$	8
$15 < x \leq 18$	17
$18 < x \leq 25$	13
$25 < x \leq 50$	42
$50 < x \leq 80$	19
$80 < x$	1

(a) Only 8 people in the sample are aged between 0 and 15. Suggest a reason why people of that age group have less mobile phones compared to some of the other age groups in the sample.

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

(b) Suggest a method the phone company may have used to collect their sample. Give a reason for your answer.

.....  
 .....  
 .....  
 ..... [2]

(c) Suggest a suitable type of chart for presenting this data. Give a reason for your answer.

.....  
 .....  
 .....  
 ..... [2]

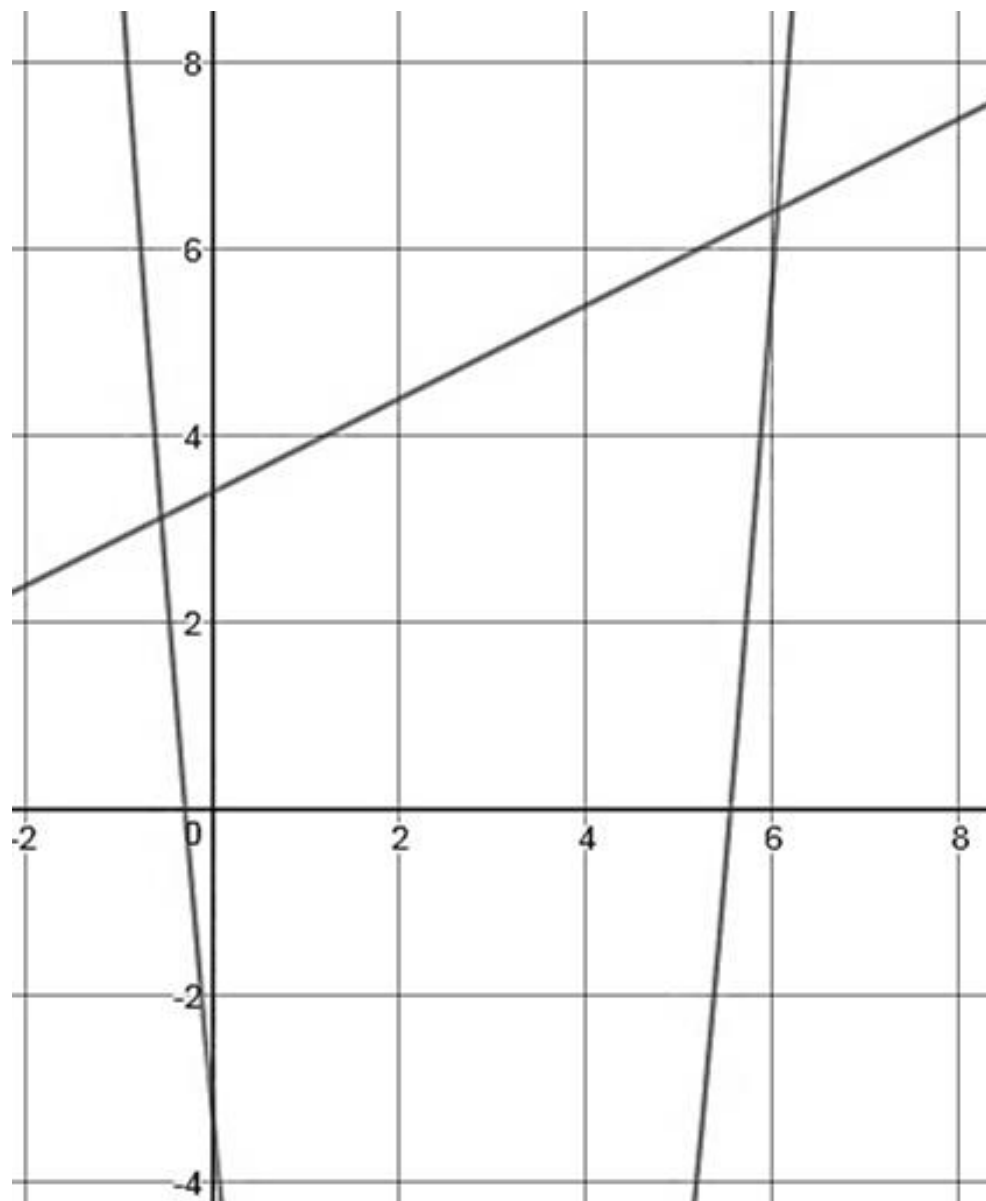
**Q9)** The ratio of satsumas to mangos in a bowl of fruit was 3:4.

7 satsumas and 8 mangos were then added to the bowl.

The ratio of satsumas to mangos was then 4:5. How many pieces of fruit were there to begin with?

**Q10)** Below are the graphs of  $y = 2x^2 - 10.5x - 3.3$  and  $y = 0.5x + 3.4$

Use the graph to find an estimate for the solutions to  $2x^2 - 10.5x - 3.3 = 0.5x + 3.4$



.....

.....

[2]



**Q11)** (a) Solve the simultaneous equations

$$x^2 + y^2 = 25$$

$$5x + 4y = 8$$

**[6]**

(b) Given that a circle has the equation  $x^2 + y^2 = 25$ , state the centre and radius of the circle.

Centre (..... , .....)

Radius = .....

**[2]**

**Q12)** Jane thinks that when  $x = -2$

$$x^3 + 2x^2 - 5x + 11 = 5$$

Is Jane right? You must show how you got your answer.

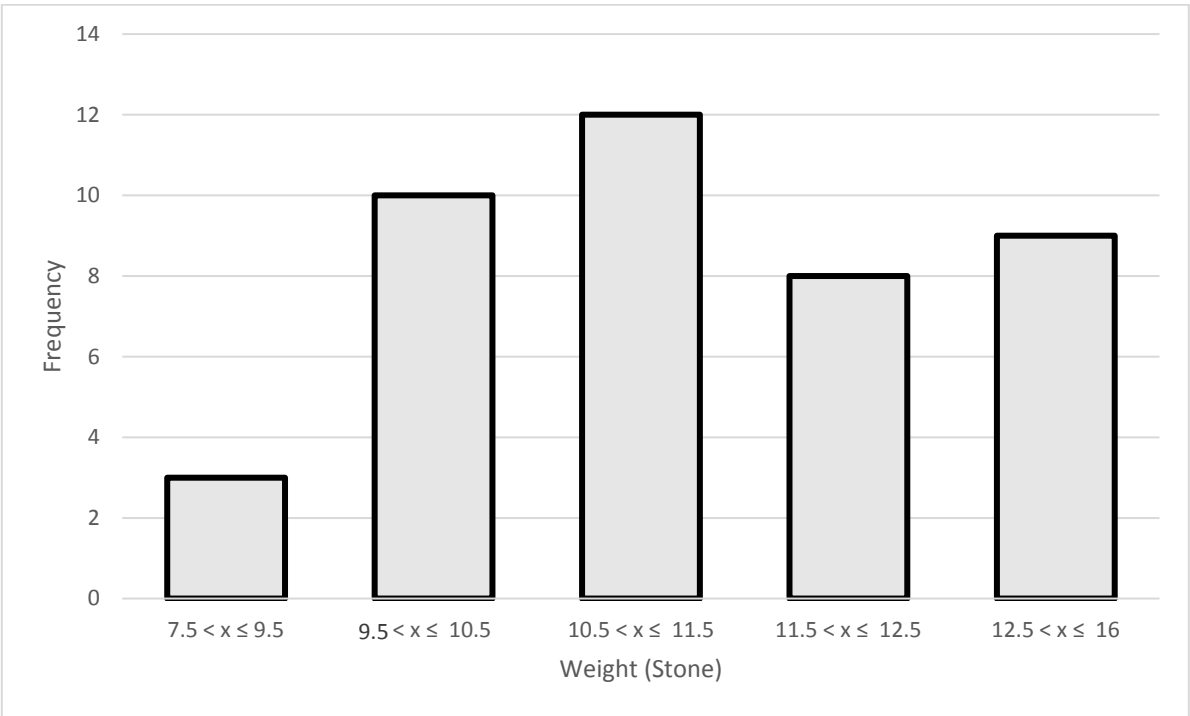
**[1]**

**Q13)** Make  $e$  the subject of:  $d = \frac{3ef}{17-e}$

**[4]**

**Q14)** Kari is asked to present some data in a histogram. Below is the data given to her and the histogram she produced.

Weight (Stone)	Frequency
$7.5 < x \leq 9.5$	3
$9.5 < x \leq 10.5$	10
$10.5 < x \leq 11.5$	12
$11.5 < x \leq 12.5$	8
$12.5 < x \leq 16$	9



Write down **two** things that are wrong with this histogram.

- 1 .....
- 2 .....

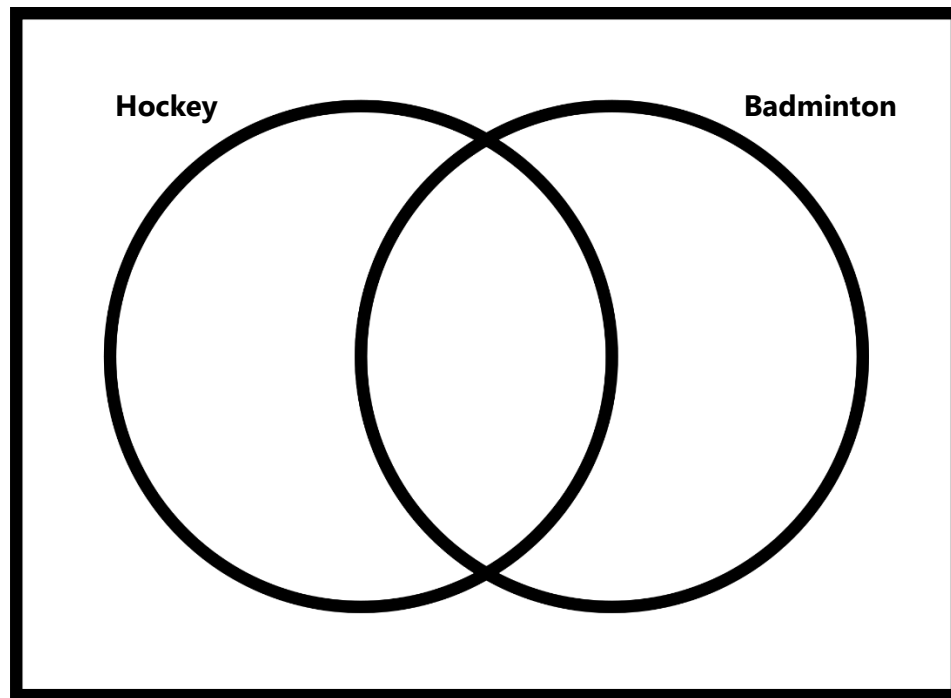
**Q15)** There are 80 students at a school.

34 students play hockey but not badminton.

31 students play badminton but not hockey.

8 students play neither sport.

(a) Complete the Venn diagram for this information.



[2]

(b) Write down the probability that a student chosen at random plays badminton.

[1]



(c) Two students are chosen at random. Calculate the probability that both of the students play hockey.

[2]

(d) Given that a student plays badminton. What is the probability that they also play hockey?

[1]

(e) Calculate  $P(H \cap B')$ .

[1]

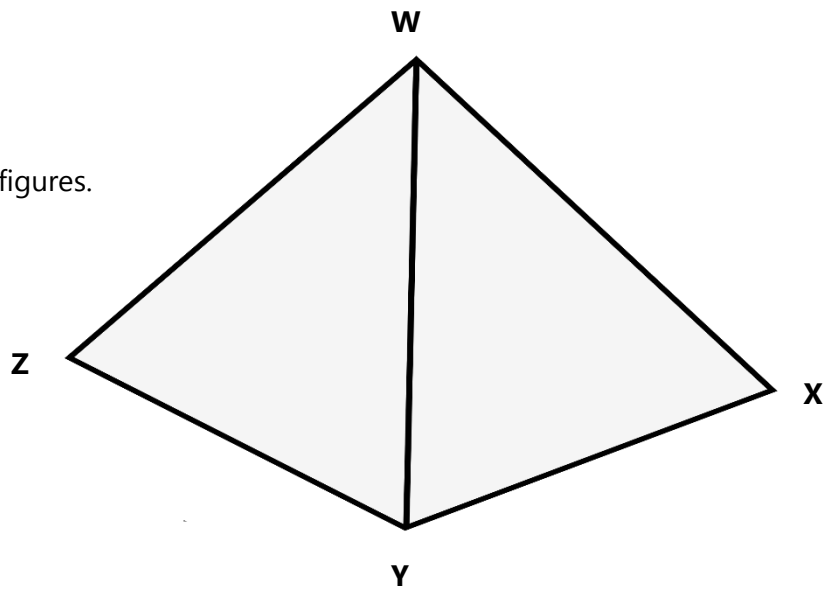


**Q16)** The shape below is a square based pyramid with P being the point directly under the peak of the pyramid. Given that:

$$ZX = 21.4\text{cm}$$

$$\text{Angle WYP} = 56^\circ$$

Find the height of the pyramid,  
give your answer to 3 significant figures.







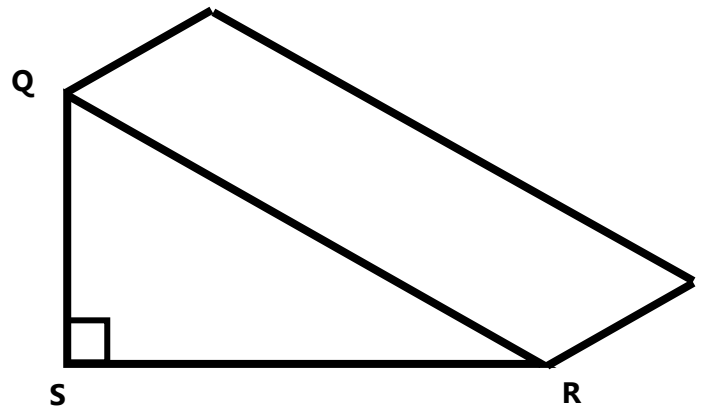
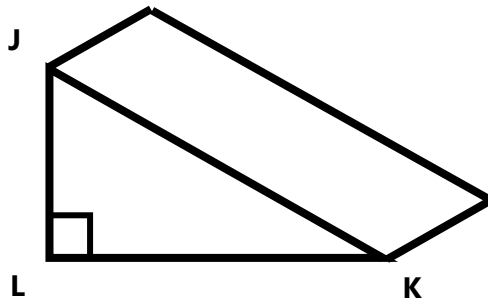
**Q17)** These two shapes are mathematically similar. Given that:

$$JK = 58.2\text{cm}$$

$$QS = 72\text{cm}$$

$$SR = 65\text{cm}$$

and that the volume of the larger shape is  $7020\text{cm}^3$  find the volume of the smaller shape.





**Q18)** The length of a football pitch can be calculated using the formula:

$$Length = \frac{Area}{Width}$$

The widths of the pitches have been rounded to 1 decimal place.

The area of the pitches has been rounded to 3 significant figures.

Here is statistical information on two football pitches:

Location	Area	Width
Sphere Stadium	7140	68.5
Irregular Pitch	8700	82.1

Which pitch is potentially the longest?