Rewarding Learning

General Certificate of Secondary Education
2006

Mathematics

Paper 5
(Non-calculator)
Higher Tier

[G6005]

MONDAY 5 JUNE, AFTERNOON

G6005

Centre Number	
71	

Candidate Number

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
Total Marks	

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all twenty-one** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses, set-square and protractor.
A Formulae Sheet is provided.

Examiner Only	
Marks	Remark

1 Form 5A raised £735 for charity. They divided it between Oxfam and Save the Children in the ratio 4 : 3

(a) How much did each charity get?

Answer: Oxfam £ _____

Save the Children £ _____ [2]

(b) What simple check might show if you have made a mistake?

_____ [1]

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2 Triangle T_1 is plotted on the grid opposite.

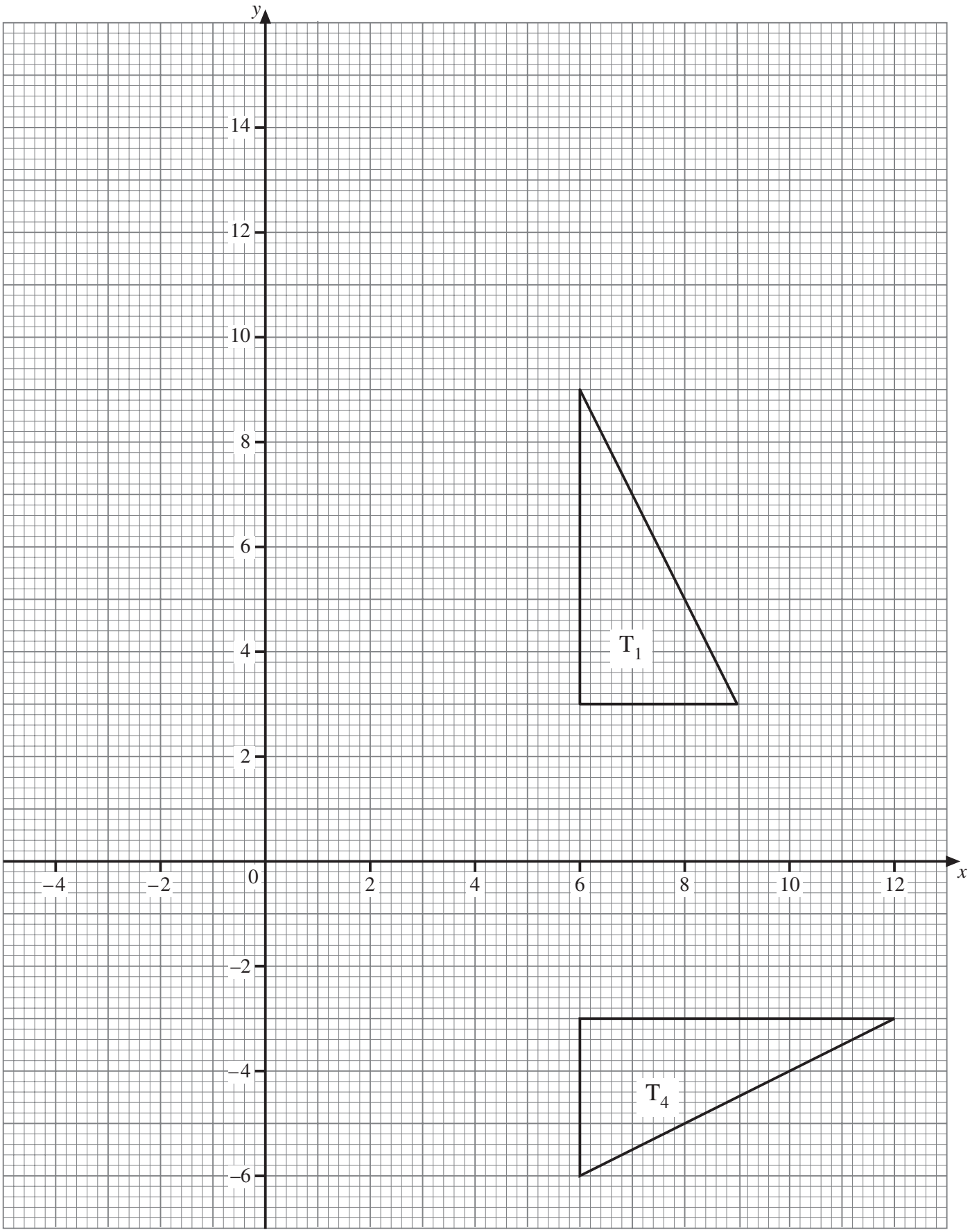
(a) Translate triangle T_1 by $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$ and label the new triangle T_2. [2]

(b) Enlarge triangle T_1 by scale factor $\frac{1}{3}$ and centre (0, 0) and label the new triangle T_3. [2]

(c) Triangle T_1 is transformed to triangle T_4 by a single transformation. Describe fully the single transformation.

Answer _____

_____ [3]


y
x
14
12
10
8
6
4
2
0
−2
−4
−6
−4
−2
2
4
6
8
10
12
T1
T4

Examiner Only	
Marks	Remark

3 **(a)** A spinner can land on one of five different colours. The probability of landing on each colour is given in the table.

Colour	Red	Green	Yellow	Blue	Purple
Probability	0.3	0.25	0.15	0.2	0.1

(i) What is the probability of landing on green or blue?

Answer _____ [2]

(ii) If the spinner is spun twice, what is the probability of landing on purple both times?

Answer _____ [2]

(b) In a city of 120 000 inhabitants, 85 000 are fluent French speakers. What is the probability that one of these inhabitants, selected at random, is **not** a fluent French speaker?

Answer _____ [1]

---

4 **(a)** Solve the inequality

$$4x < 2x + 7$$

Answer _____ [2]

(b) Solve the inequality

$$7 < 3n \leqslant 15$$

where n is an integer

Answer _____ [3]

Examiner Only	
Marks	Remark

5 Find the nth term for each of these sequences

(a) 11, 22, 33, 44, . . .

Answer _____ [1]

(b) 2, 7, 12, 17, . . .

Answer _____ [2]

---

6 All the children in a primary school were surveyed about the number of hours spent watching television over a weekend.

Number of hours, N	Frequency
$0 \leqslant N < 4$	18
$4 \leqslant N < 8$	40
$8 \leqslant N < 12$	20
$12 \leqslant N < 16$	14
$16 \leqslant N < 20$	5
$20 \leqslant N < 24$	3

(a) Calculate an estimate for the mean number of hours spent watching television.

Answer _____ [4]

(b) In which class interval does the median lie?

Answer _____ [1]

7 **(a)** Find the lowest common multiple of 25 and 35

Answer _____ [2]

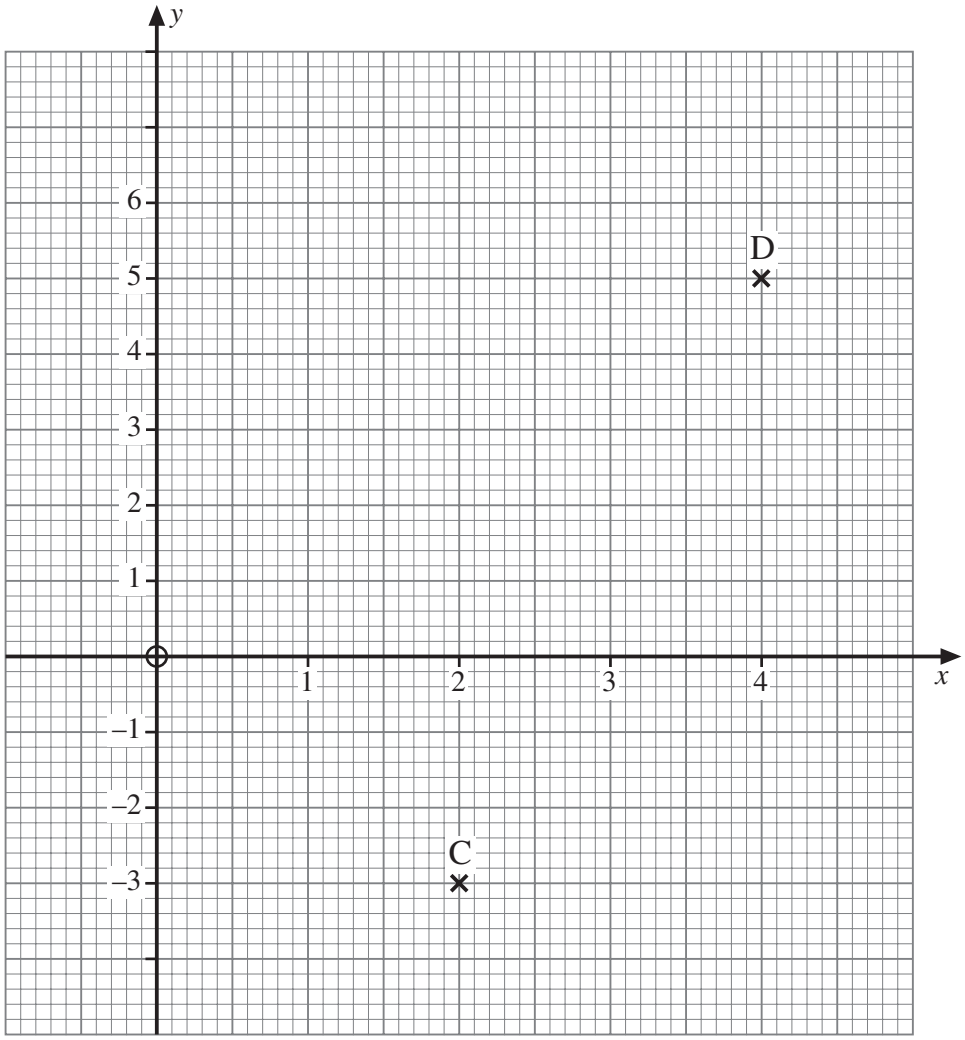
(b) At Walton Castle Theme Park, the Rocky Adventure starts every 25 minutes and the River Adventure starts every 35 minutes.

They start together at 10 a.m. When will be the next time they start together?

Answer _____ p.m. [1]

Examiner Only	
Marks	Remark

8 C is the point with co-ordinates (2, –3) and D is the point with co-ordinates (4, 5).



Calculate the exact length of CD, giving your answer as a surd in its simplest form.

Answer _____ [4]

Examiner Only	
Marks	Remark

9 **(a)** Expand

$$4x(x^2 - 3)$$

Answer _____ [2]

(b) Simplify

$$5(2c + 3) - 4(3c - 2)$$

Answer _____ [2]

Examiner Only	
Marks	Remark

10 The cumulative frequency graph gives information about the percentage marks obtained by 300 candidates in an examination.

Examiner Only	
Marks	Remark

Use the graph to estimate

(a) the median percentage mark,

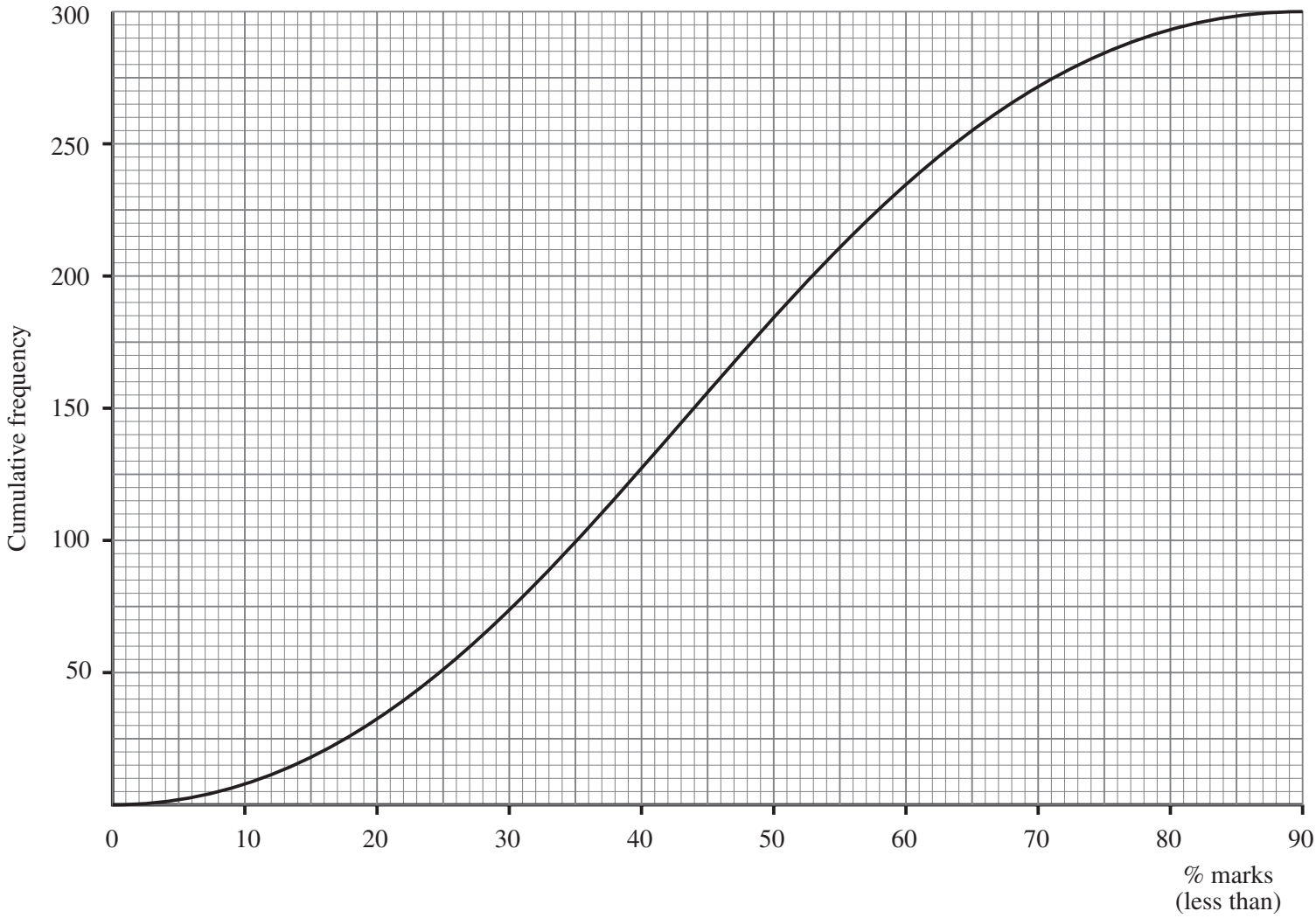
Answer _____ [1]

(b) the interquartile range,

Answer _____ [2]

(c) the percentage mark separating the top 20 candidates from the others.

Answer _____ [2]



Examiner Only	
Marks	Remark

11 x, y and z represent lengths.

By considering dimensions, complete the table to show which of these expressions could represent length, area or volume.

$\pi x^2 y$ $\quad 3x^2 + 2xy$ $\quad 4(x + y^2)$ $\quad x(y - z)$ $\quad \frac{\pi}{3}(y^3 + xz)$

Length	
Area	
Volume	

[3]

12 Simplify

(a) $b^7 \times b^2$

Answer _____ [1]

(b) $p^3 \div p^7$

Answer _____ [1]

(c) $\dfrac{r^4 \times r^6}{r^{10}}$

Answer _____ [1]

(d) $(3xy^2)^3$

Answer _____ [2]

13 Evaluate

Examiner Only	
Marks	Remark

(a) 6^0

Answer _____ [1]

(b) $36^{\frac{1}{2}}$

Answer _____ [1]

(c) $32^{0.2}$

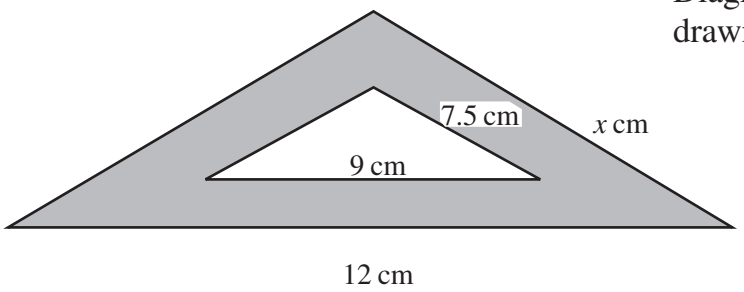
Answer _____ [1]

(d) $16^{\frac{3}{4}}$

Answer _____ [2]

14 The two triangles shown are similar.

Diagram not drawn accurately



(a) Calculate the length of the side marked x.

Answer _____cm [2]

(b) Given that the area of the small triangle is 22.5 cm^2, calculate the shaded area between the two triangles.

Answer _____cm^2 [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

15 Factorise fully

(a) $6cd - 9c^2$

Answer _____ [2]

(b) $3a^2 - 27d^2$

Answer _____ [3]

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16 **(a)** A is (0, 4). B is (3, 13)
Find the equation of the line AB.

Answer _____ [3]

(b) Find the equation of the line parallel to the line AB and passing through (0, 8).

Answer _____ [2]

17 The table gives information about the increase in heights of plants over a period of time.

Increase in height (i cm)	$0 < i \leqslant 6$	$6 < i \leqslant 8$	$8 < i \leqslant 10$	$10 < i \leqslant 15$	$15 < i \leqslant 20$
Frequency	12	32	26	15	5

Examiner Only	
Marks	Remark

Show this information on a histogram. [3]

Examiner Only	
Marks	Remark

18 **(a)** Rationalise the denominator of $\frac{15}{\sqrt{3}}$, giving the answer in its simplest form.

Answer _____ [2]

(b) Expand and simplify $(\sqrt{5} - 2)(\sqrt{5} + 3)$

Answer _____ [2]

(c) a and b are two positive rational numbers.

Explain why $(\sqrt{a} - \sqrt{b})(\sqrt{a} + \sqrt{b})$ is always rational.

[3]

(d) a and b are two positive numbers.

Give an example to disprove the statement "$(\sqrt{a} - \sqrt{b})(\sqrt{a} + \sqrt{b})$ is always rational."

[1]

19 In the triangle WXY, Z is the midpoint of XY and Q is the midpoint of WY.
$\overrightarrow{WX} = 6\mathbf{u}$ and $\overrightarrow{WY} = 6\mathbf{v}$.

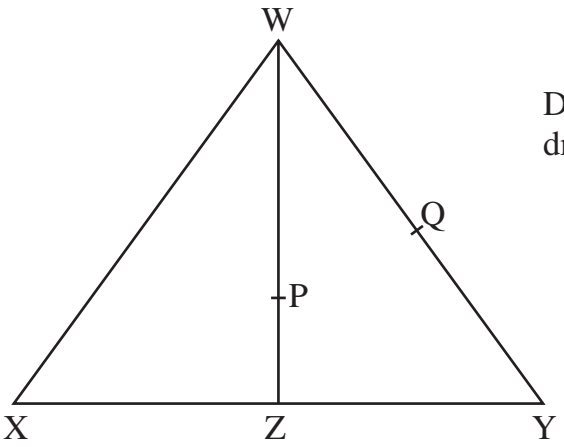

Diagram not drawn accurately

(a) Find in terms of **u** and **v**, in their simplest form:

(i) $\overrightarrow{XY}$

Answer _____ [1]

(ii) $\overrightarrow{WZ}$

Answer _____ [1]

(iii) $\overrightarrow{XQ}$

Answer _____ [1]

Examiner Only	
Marks	Remark

(b) P is a point on the line WZ such that $\overrightarrow{WP} = 2\overrightarrow{PZ}$.
Show that $\overrightarrow{QP} = 2\mathbf{u} - \mathbf{v}$.

[2]

(c) Prove that QPX is a straight line.

[2]

Examiner Only	
Marks	Remark

20 Solve the equation

$$\frac{4}{(x-3)} + \frac{9}{(2x-1)} = 3$$

Show your working.

Answer _____ [7]

Examiner Only	
Marks	Remark

21 A sphere fits exactly into a cylinder as shown.

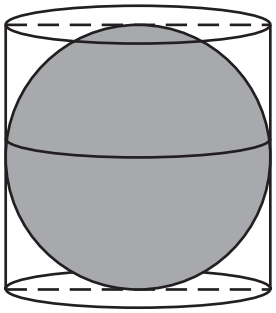

Diagram not drawn accurately

Show that the ratio

volume of cylinder : volume of sphere is 3:2

[3]

Examiner Only	
Marks	Remark

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