

Name _____

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Class 4 _____



**ANGLICAN HIGH SCHOOL
Preliminary Examination
Secondary Four
MATHEMATICS (SYLLABUS D)
4017/01**

Tuesday

19 September 2006

2 hours

Candidates answer on the question paper.

INSTRUCTIONS TO CANDIDATES

Answer all questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question it must be shown below that question.

Omission of essential working will result in loss of marks.

**NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES
MAY BE USED IN THIS PAPER.**

INFORMATION FOR CANDIDATES

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

The total of the marks for this section is 80.

For Examiner's Use

This question paper consists of 14 printed pages.

NO CALCULATOR IS ALLOWED IN THIS PAPER.

1. Find the exact value of

(a) $0.3 - 0.003$

(b) $2.5 \times 0.15 \div 5$

Answer (a) _____ [1]

(b) _____ [1]

2. Express

(a) $\frac{2}{7}$ as a decimal, giving your answer to 2 decimal places,

(b) 15 grams as a percentage of 3 kilograms.

Answer (a) _____ [1]

(b) _____ % [1]

3. Given $540 = 2^2 \times 3^3 \times 5$ and $1050 = 2 \times 3 \times 5^2 \times 7$, find

(a) the highest common factor of 540 and 1050,

(b) the smallest integer m such that $540m$ is a perfect square.

Answer (a) _____ [1]

(b) $m =$ _____ [1]

4. (a) Given that $p : 3 = 7 : 9$, find the value of p .
 (b) A wheelbarrow can hold 25 litres of sand. How many times must the wheelbarrow be filled to deliver 1.5 cubic metres of sand.

Answer (a) $p =$ _____ [

(b) _____ [

5. Estimate, correct to 1 significant figure, the value of 0.0124×5036 .

Answer _____ [

6. Given that $-1 \leq a \leq 4$, $3 \leq b \leq 7$ and $0.5 \leq c \leq 3$. Calculate the

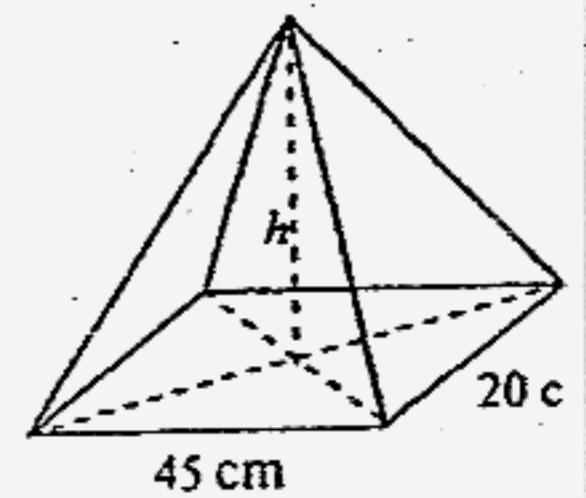
- (a) smallest value of ac ,
 (b) largest value of $\frac{b}{c}$,
 (c) largest value of $b - a$.

Answer (a) _____ [

(b) _____ [

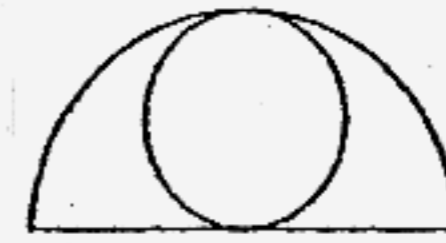
(c) _____ [

7. Given that the volume of the pyramid, with a base $20 \text{ cm} \times 45 \text{ cm}$, is $18\,000 \text{ cm}^3$. Find the height, h , of the pyramid.



Answer $h =$ _____ cm

8. Given that the area of the semicircle is 364 cm^2 , find the area of the inscribed circle.



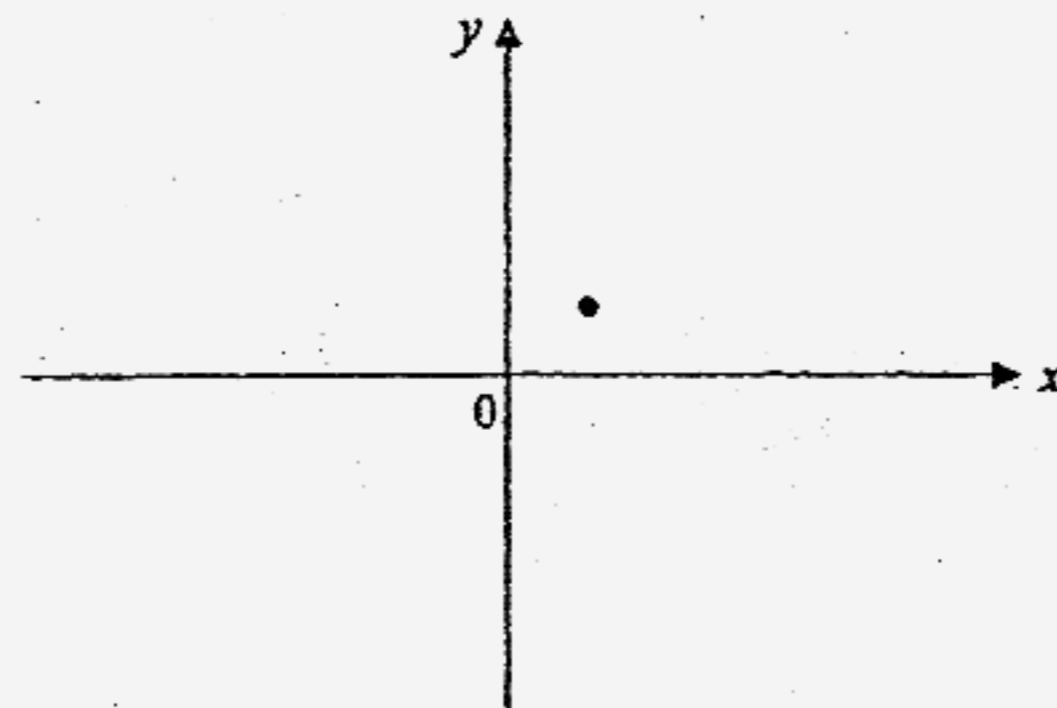
Answer _____ cm^2 [3]

9. The point $(1, 1)$ is marked on each diagram in the answer space.
On these diagrams, sketch the graphs of

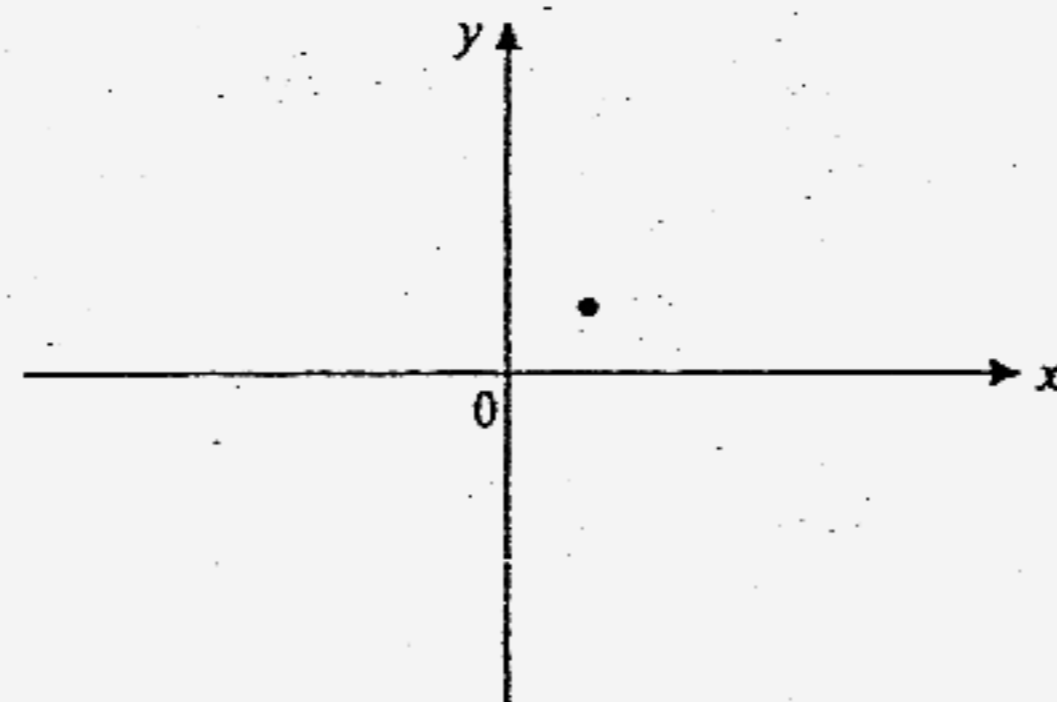
(a) $y = 1 - x^2$ (b) $y = 4x - 3$ (c) $y = \frac{2}{x^2}$ [3]

Answer

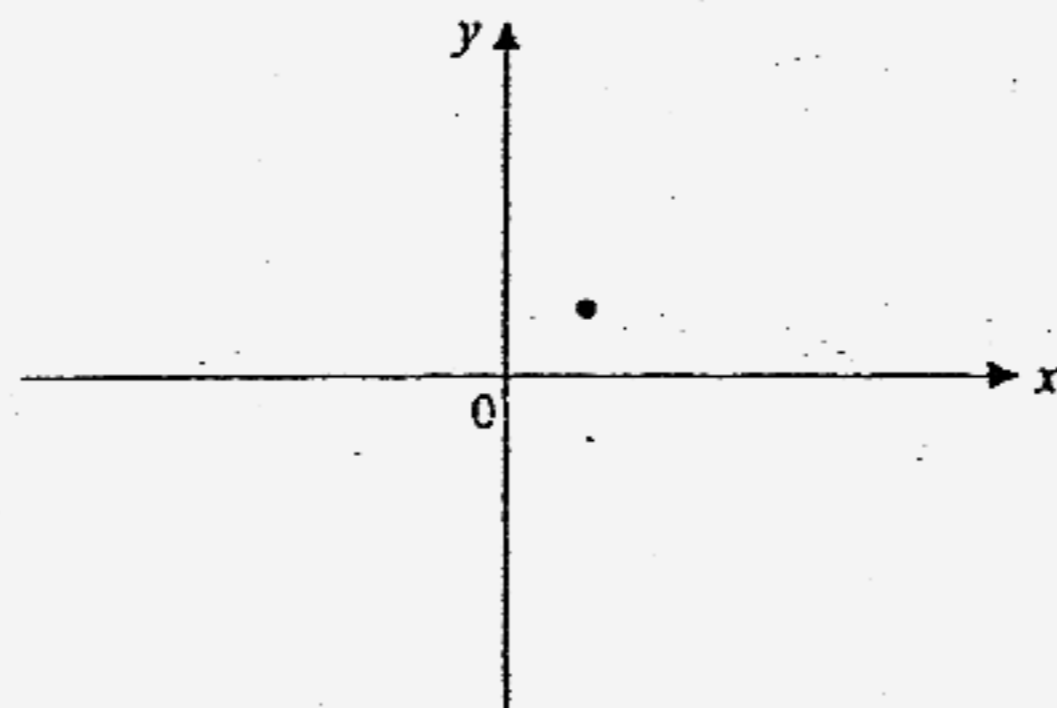
(a)



(b)



(c)



10. Given that the interior angle of a regular polygon is 135° , find
- (a) the size of an exterior angle of the polygon
 - (b) the number of sides on the polygon.

Answer (a) _____ $^\circ$ [1]

(b) _____ [2]

11. (a) Factorize completely $2a^2b - 6b$.
- (b) Solve $\frac{1}{2x} - 1 = \frac{3}{x} + 4$
- (c) Solve $x(x^3 + 8) = 0$

Answer (a) _____ [1]

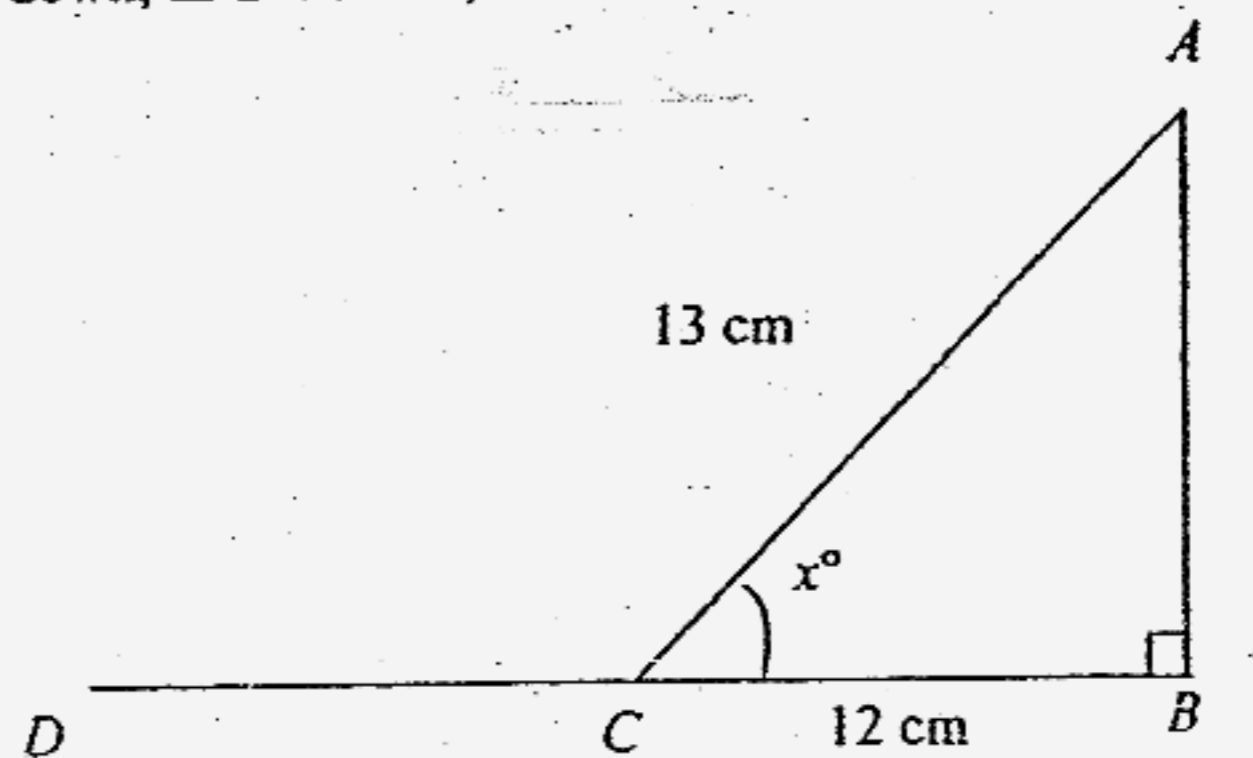
(b) $x =$ _____ [1]

(c) $x =$ _____ [1]

12. ABC is a right-angled triangle in which $\angle ABC = 90^\circ$, $BC = 12$ cm and $AC = 13$ cm.

The point D lies on BC produced. Write down, as a fraction, the value of

- (a) $\sin x^\circ$
 (b) $\cos \hat{ACD}$
 (c) $\tan(90 - x^\circ)$



Answer (a) _____ [1]

(b) _____ [1]

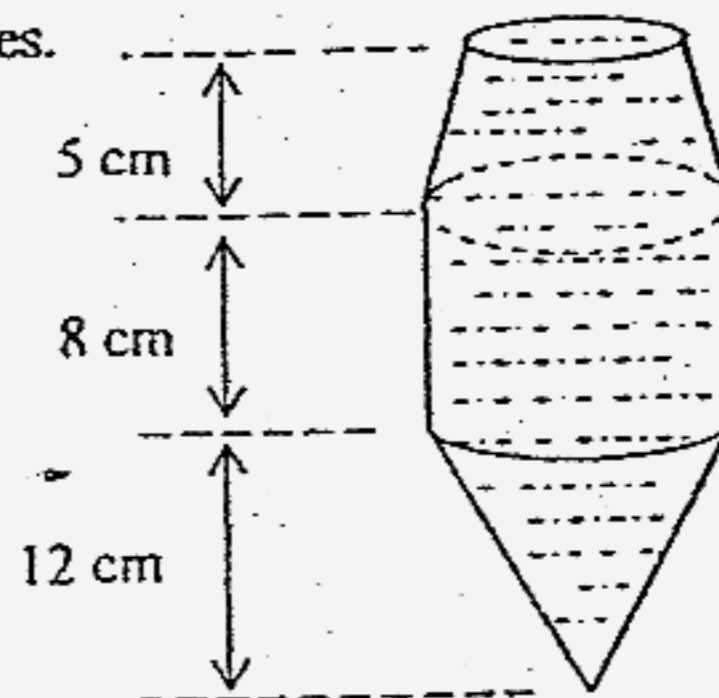
(c) _____ [1]

13. (a) Given that $p = 4 \times 10^5$ and $q = 8 \times 10^3$, find the value of $p \times q$. Express your answer in standard form.
 (b) It takes 16 workers to erect a wall in 25 days. How many workers are needed if the wall is to be built in 10 days?

Answer (a) _____ [1]

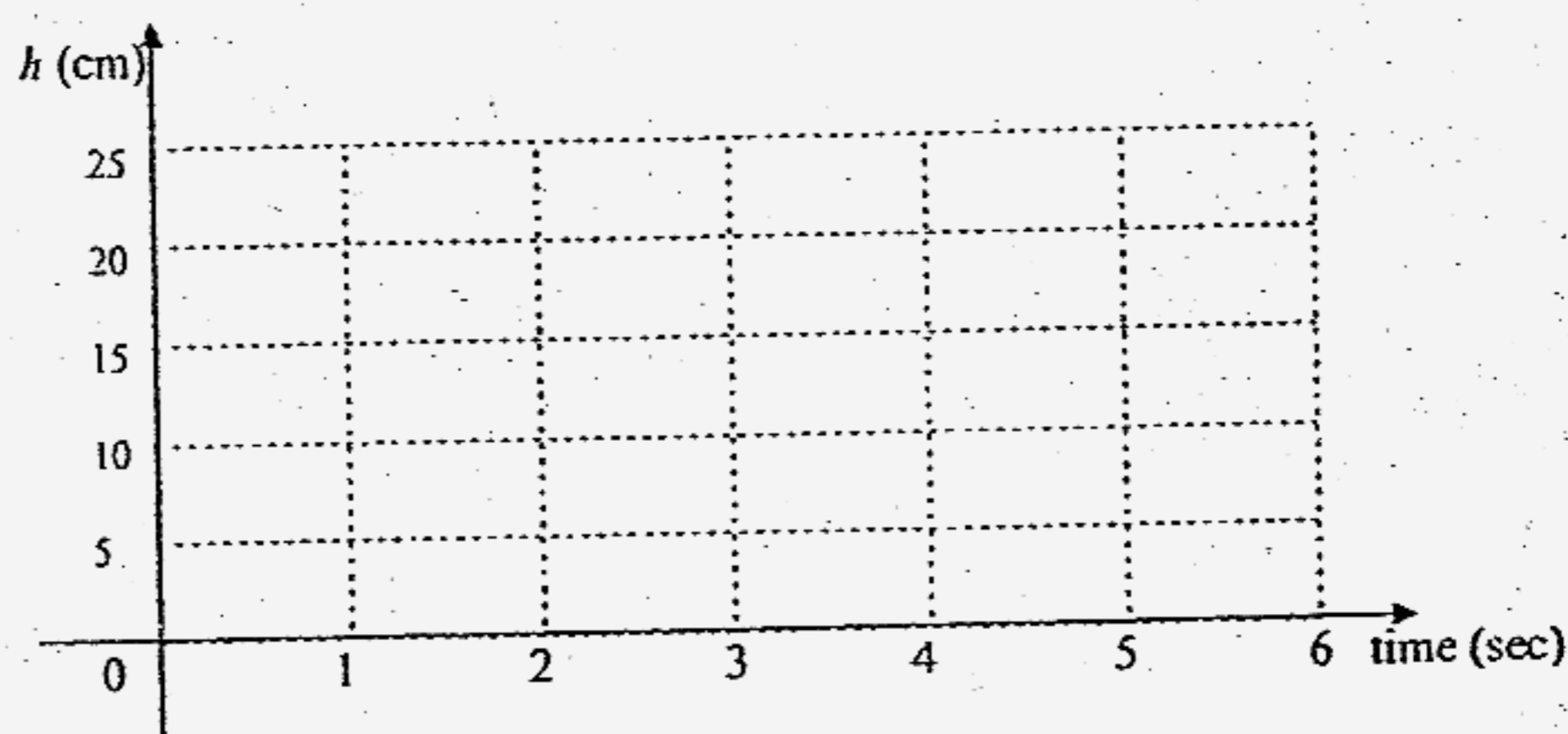
(b) _____ [1]

14. The container, shown in the diagram, initially is full of water. There is a hole at the bottom and water is leaking through the hole at a constant rate. It takes 1 minute, 3 minutes and 2 minutes for the water level to drop a depth of 5 cm, 8 cm and 12 cm respectively. On the axes in the answer space, sketch the graph showing the depth of the water, h cm, in the container varying over the 6 minutes.



Answer

[3]



15. (a) Solve the equation $(3x - 5)^2 = 49$.
 (b) Evaluate
 (i) $8^3 - 8^0 + 8^{\frac{1}{3}}$
 (ii) $(\frac{1}{32})^{-\frac{2}{5}}$

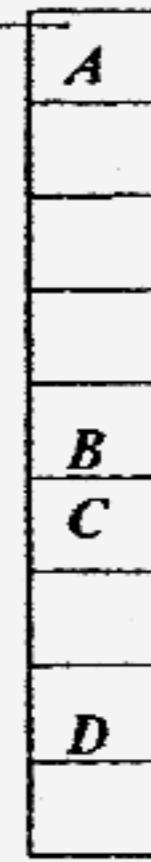
Answer (a) $x =$ _____ [2]

(b)(i) _____ [1]

(ii) _____ [1]

16. In a particular board game, a counter is placed on one of the boxes and a fair die is thrown. The counter will be moved up one box if the die shows 1, 2, 3 or 4. If 5 or 6 is thrown, the counter is moved down one box. On one occasion, the counter is placed at C. The die is thrown once and the counter is moved. The die is thrown a second time and the counter is moved again. What is the probability that the counter finishes at

- (a) D,
 (b) B,
 (c) C?

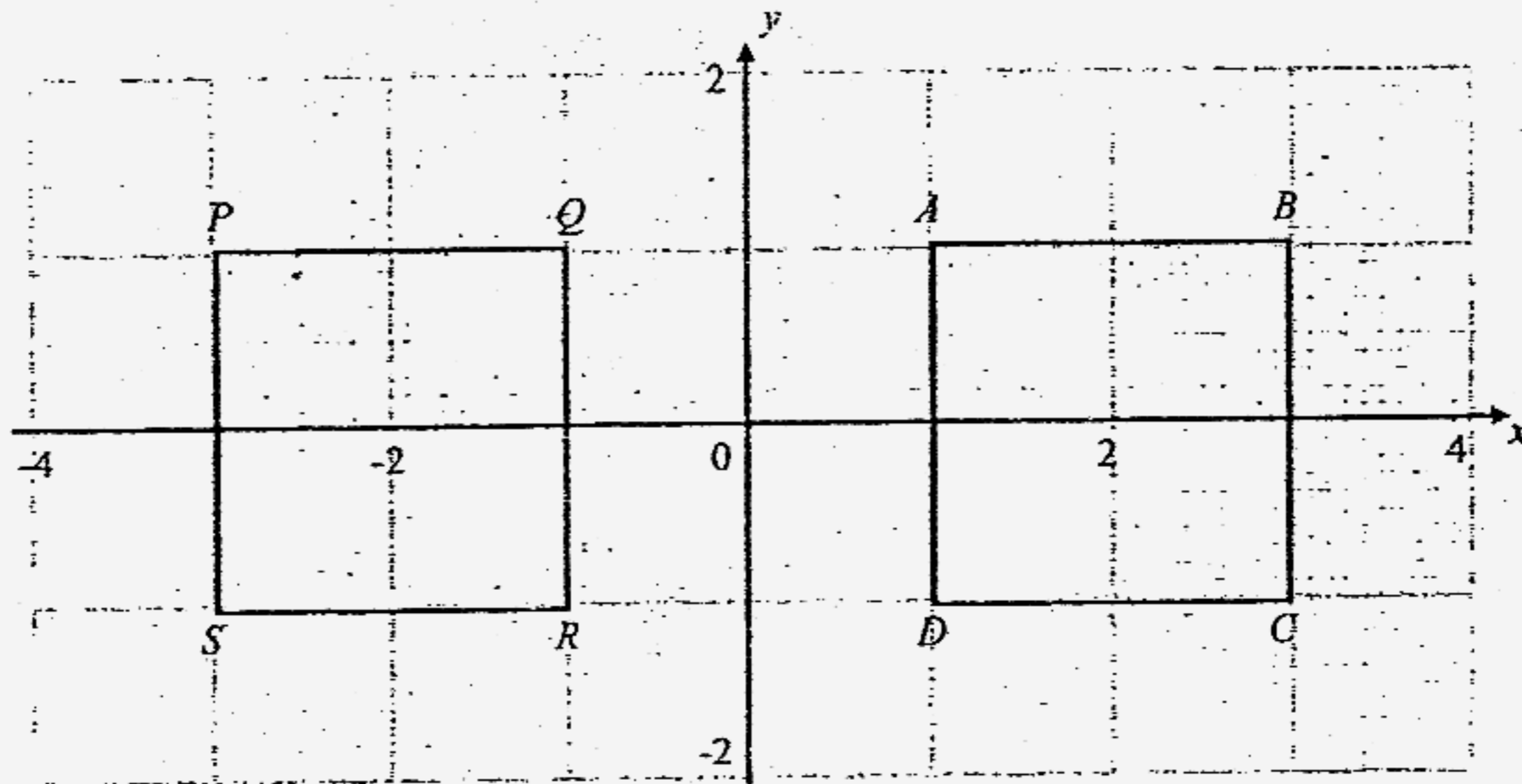


Answer (a) _____ [1]

(b) _____ [1]

(c) _____ [2]

17.



With reference to the diagram above, describe completely the single transformation which maps

- (a) ABCD onto PQRS,
 (b) ABCD onto QPSR,
 (c) ABCD onto RSPQ,
 (d) ABCD onto SPQR.

Answer

- (a) [1]
- (b) [1]
- (c) [1]
- (d) [1]

18. The frequency table below shows the marks obtained by some students in a test.

Class	Mid-point	Frequency
$0 < x \leq 40$	20	5
$40 < x \leq 55$	47.5	10
$55 < x \leq 75$		y
$75 < x \leq 100$		12

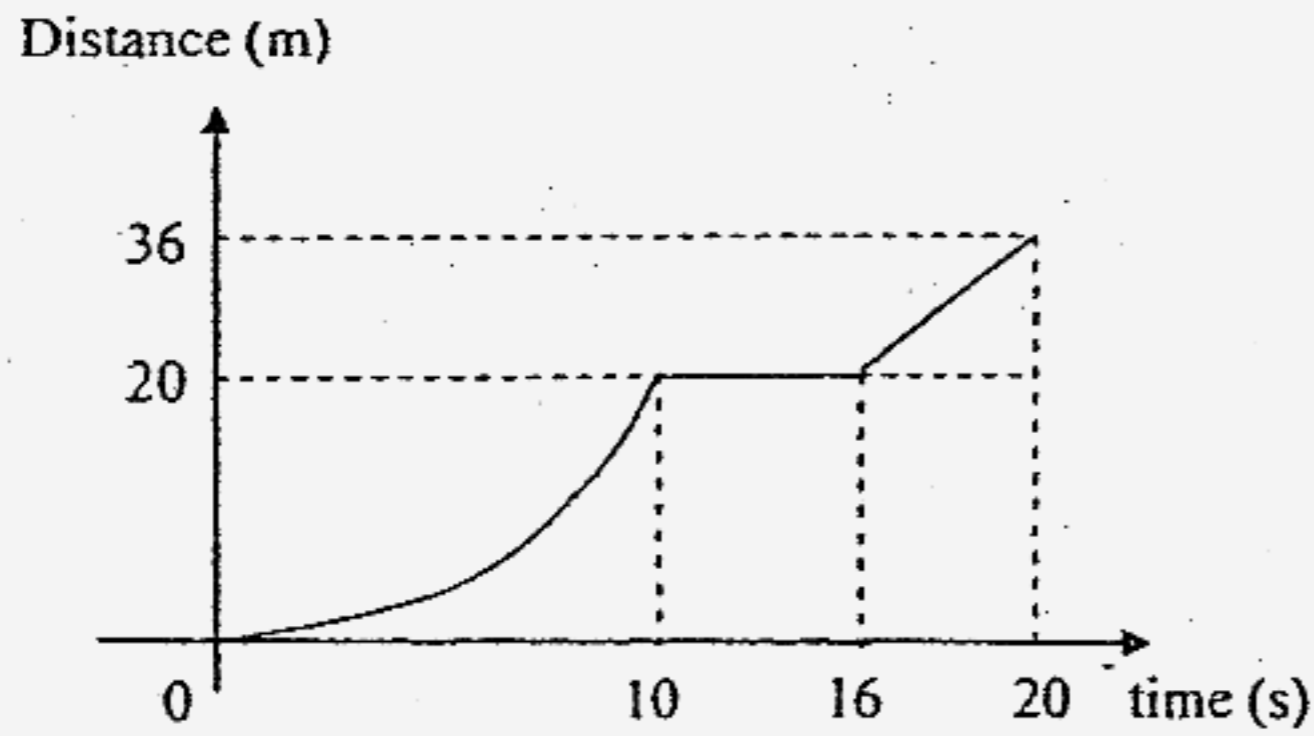
- (a) Fill in the blanks in the table. [1]
- (b) If the modal class is $75 < x \leq 100$, write down the minimum and the maximum value of y .
- (c) If the estimated value for the mean is $60\frac{2}{3}$, calculate the value of y .

Answer (b) Minimum value = [2]

Maximum value =

(c) $y =$ [3]

19. The diagram is the distance-time graph for the first 20 seconds of a journey.
- Find the average speed during the first 10 seconds.
 - What is the acceleration when $t = 17$?
 - Find the speed from $t = 16$ to $t = 20$.
 - The speed increases uniformly for the first 10 seconds.
Sketch the speed-time graph for the first 20 seconds on the answer space.



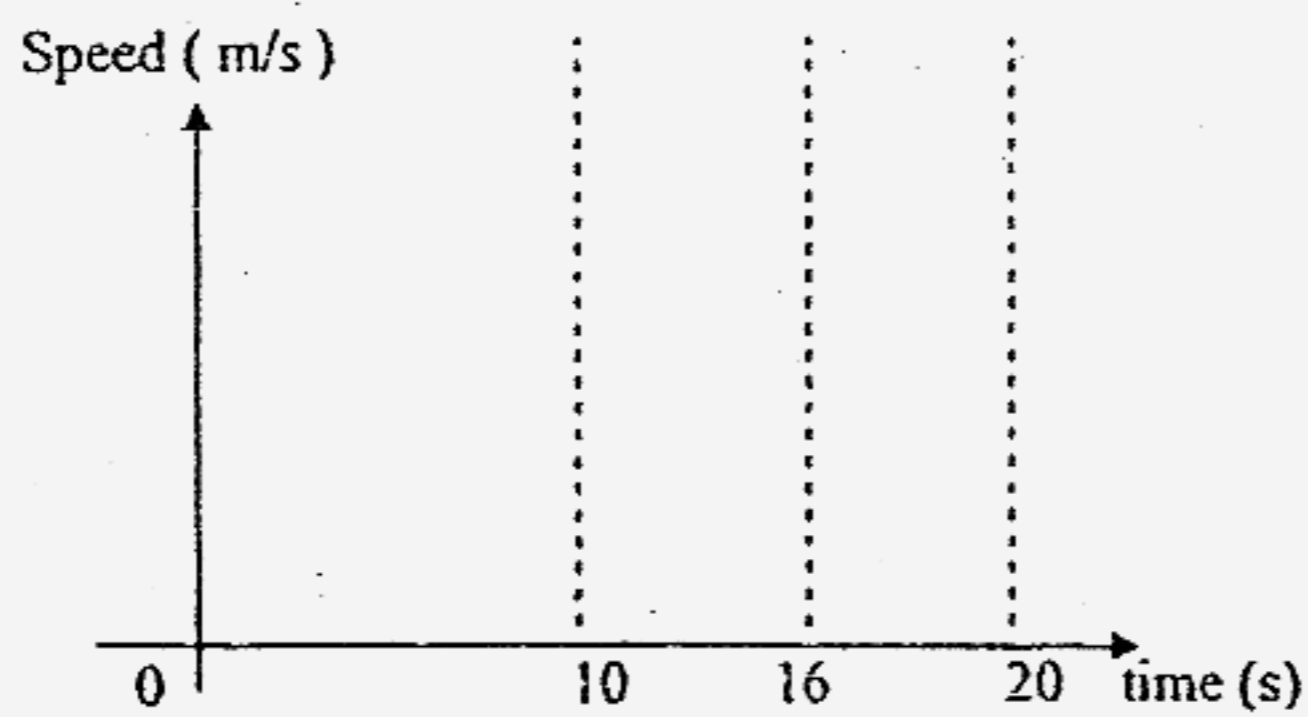
Answer (a) _____ m/s [1]

(b) _____ m/s² [1]

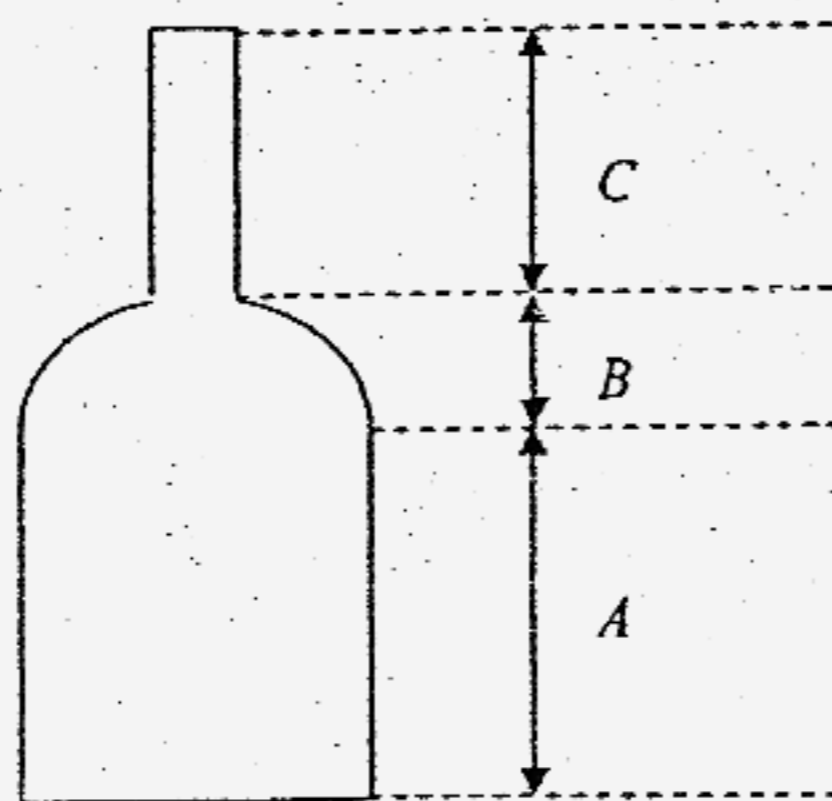
(c) _____ m/s [1]

(d)

[3]



20. The diagram, not to scale, shows the vertical internal cross-section of a bottle. The thickness of the walls will be ignored.



Section *A* of the bottle can be modeled by a cylinder of diameter 8 cm, section *B* is a hemisphere with the same diameter and section *C* is modeled by another cylinder with 2 cm diameter. The opening of the bottle is at the top of section *C*. Section *A* is 12 cm tall, and section *C* is 8 cm tall.

- (a) Calculate the volume of each of the 3 sections, in terms of π .
- (b) The bottle manufacturer is asked to make smaller bottles as samples. These bottles would be similar to the original bottle but have a height of 6 cm, and a base of 2 cm in diameter. Calculate the volume of one of these small bottles. Leave your answer in terms of π .

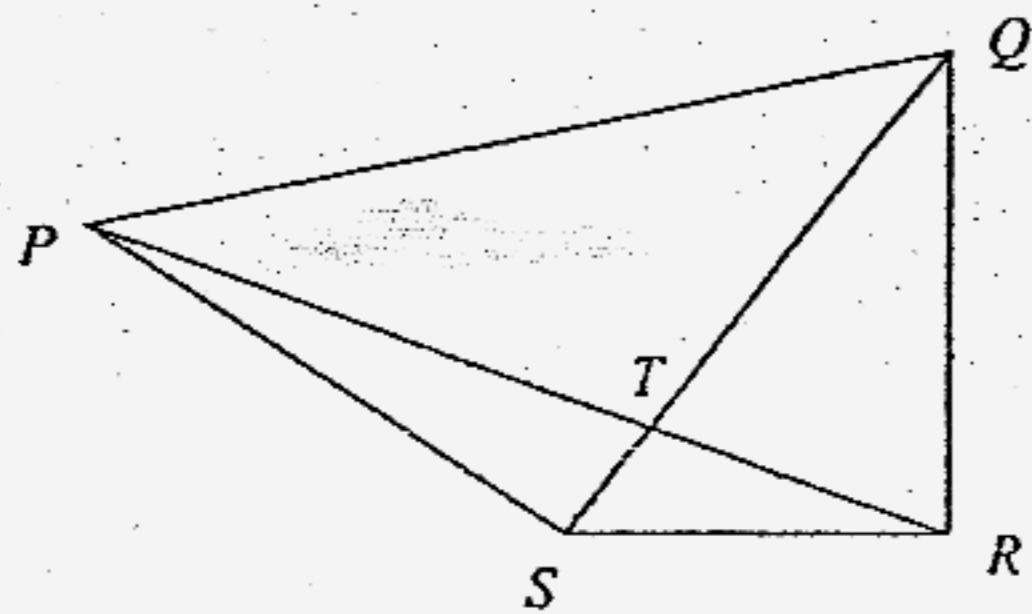
Answer (a) Volume of *A* = _____ cm^3 [3]

Volume of *B* = _____ cm^3

Volume of *C* = _____ cm^3

(b) _____ cm^3 [3]

21. In the diagram, $\overline{PQ} = 2\mathbf{b}$, $\overline{PS} = 4\mathbf{a}$, and $\overline{SR} = 2\mathbf{a} + \mathbf{b}$.



- (a) Express as simply as possible, in terms of \mathbf{a} and/or \mathbf{b} ,
- (i) \overline{SQ} (ii) \overline{QR}
- (b) If $\overline{PT} = h\overline{PR}$, express \overline{PT} in terms of h , \mathbf{a} and \mathbf{b} .
- (c) Given that $4\overline{ST} = \overline{SQ}$, calculate the value of h .

Answer (a)(i) _____ [2]

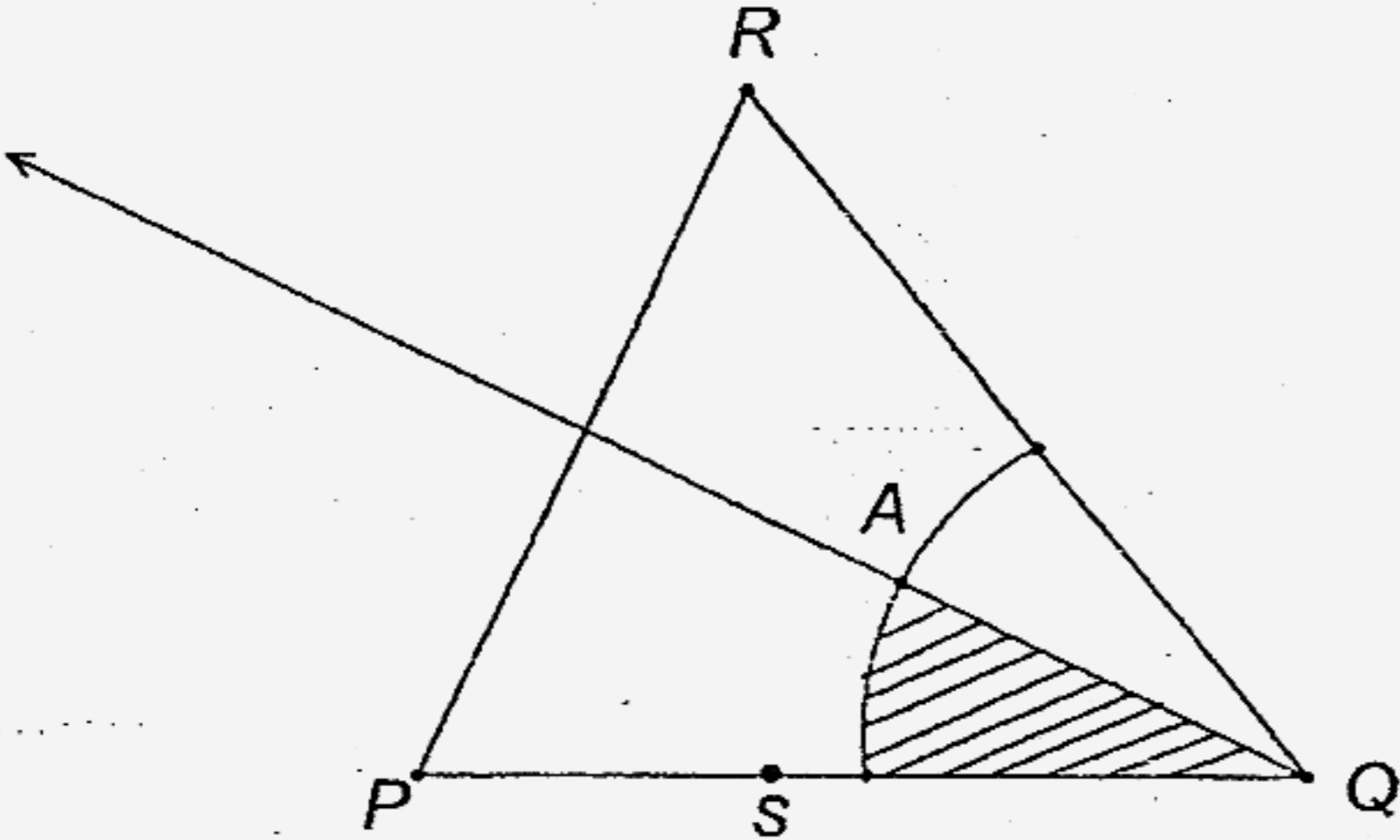
(ii) _____

(b) _____ [1]

(c) $h =$ _____ [3]

Answer Key

1. (a)(i)	\$2050	
(ii)	\$2562.50	
1 (b)	\$15985	
1 (c)	\$953 (correct to the nearest dollar)	
2(a) (i)	$\angle AEB = 53^\circ$	
2(a) (ii)	$\angle DBE = 67^\circ$ (Angle at centre = 2 x Angle at circumference)	
2(a) (iii)	$\angle BAE = 180^\circ - 76^\circ = 104^\circ$ (Opposite angles, cyclic quad)	
2 (b)	If DO produced passes through A which is on the circumference, then $\angle BDO = \angle BEA$, angles in the same segment $\angle BDO = \angle BDE - \angle ODE$ $\angle BDO = (180^\circ - 104^\circ) - \frac{180^\circ - 134^\circ}{2} = 53^\circ = \angle BEA$	
2 (c)	Distance btw chords AE and $CD = \underline{18.4 \text{ cm}}$	
3 (a)	$\frac{6x-3}{(3x-1)(3x+1)}$ OR $\frac{3(2x-1)}{(3x-1)(3x+1)}$	
3 (b)	$b = \pm 42$	
3 (c)(i)	Area of $ABCD = 25x^2$ Area of triangle $BAE = \frac{1}{2} [2(x+1)](5x) = 5x(x+1)$ $CG = \sqrt{(5x^2) - (3x^2)} = 4x$ Area of triangle $BGC = \frac{1}{2} (3x)(4x) = 6x^2$ $25x^2 - 5x(x+1) - 6x^2 = 12$ $25x^2 - 5x^2 - 5x - 6x^2 = 12$ $14x^2 - 5x - 12 = 0$	
3 (c)(ii)	$x = 1.12$ or -0.76	

3 (c)(iii)	$GE = \underline{3.66 \text{ cm}}$	
4 (a)	$r = 1\frac{1}{2} \text{ cm}, \quad h = 7 \text{ cm}$	
4 (b)	Volume of water = $14\frac{5}{8}\pi \text{ cm}^3$	
4 (c)	Height of water level in the cone, $d = \underline{4.86 \text{ cm}}$	
4 (d)	2.16 cm	
5 (a)(i)	$AC = 134 \text{ km}$	
5 (a)(ii)	$\angle ACB = 24.7^\circ$	
5 (a)(iii)	Bearing of A from C = 236.3°	
5 (b)	Angle of elevation of the mountain from E = 20.6°	
6		
6 (a)	$PR = 8.5 \text{ cm } (\pm 0.1 \text{ cm})$	
6 (b)	$RS = 7.6 \text{ cm } (\pm 0.1 \text{ cm})$ Actual distance = 760 m	
6 (c)(i)	Arc of radius 5 cm, centre Q	
6 (c)(ii)	Angle bisector of angle PQR	
6 (d)(i)	As shown in the diagram	

Answers

1a) 0.297 1b) 0.075

2a) 0.285 2b) 0.5%

3a) 30 3b) 15

4a) $\frac{7}{3}$ 4b) 60

5) 60

6a) -3 6b) 14 6c) 8

7) $h = 60\text{cm}$

8) 182cm^3

9a) When $x = 0, y = 1$

9b) When $x = 0, y = -3$
 $x = -1, y = 1$

9c) When $x = 1, y = 2$

10 a) 45° 10b) 8

11a) $2b(a + \sqrt{3})(a - \sqrt{3})$ 11b) $-\frac{1}{2}$

11c) $x = 0, -2$

12a) $\frac{5}{13}$ 12b) $-\frac{12}{13}$ 12c) $\frac{12}{5}$

13a) 3.2×10^4 13b) 40

15a) $x = 4$ or $-\frac{2}{3}$ 15bi) 513 15bii) 4

16a) $\frac{1}{9}$ 16b) 0 16c) $\frac{4}{9}$

17a) A translation of $\begin{pmatrix} -4 \\ 0 \end{pmatrix}$.

17b) A reflection in the y-axis.

17c) A rotation of 180° about (0,0) OR
 An enlargement of scale factors centre (0,0)

17d) An anticlockwise rotation of 90°
 about (0,-2).

18a) 65 and 87.5

18b) Min = 0
 Max = 11

18c) $y = 3$

19a) 2 m/s 19b) 0m/s^2 19c) 4 m/s

20a) $192\pi\text{cm}^3, 42\frac{2}{3}\pi\text{cm}^3, 8\pi\text{cm}^3$

20b) $3\frac{19}{24}\pi\text{cm}^3$

21ai) $2b - 4a$ 21aii) $6a - b$

21b) $h(6a + b)$ 21c) $h = \frac{1}{2}$

22ai) 160° 22aii) 240° 22b) $\sqrt{21}m$

23a) 8cm : 56km

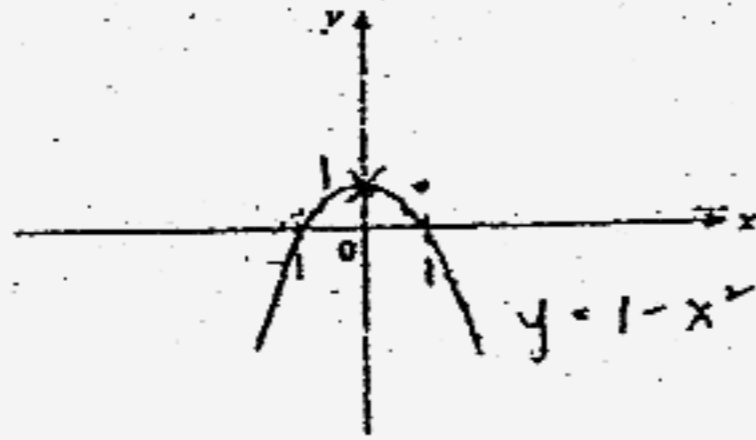
23b) 10.5km : 1.5cm

23d) 52.5km : 7.5cm

9)

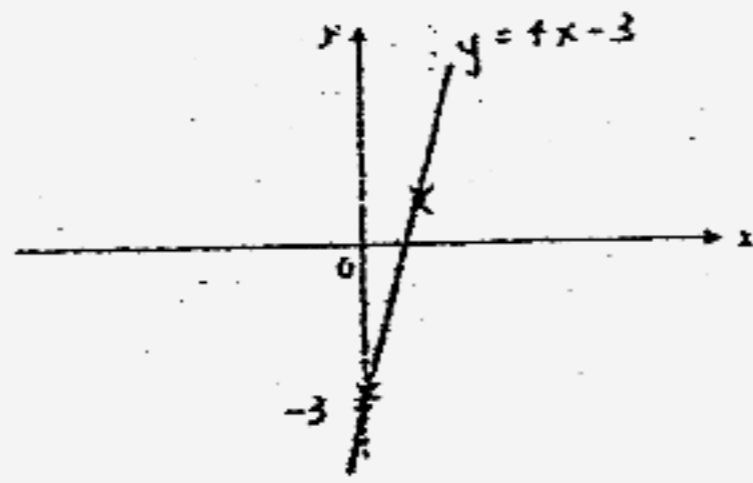
Answer

(a)



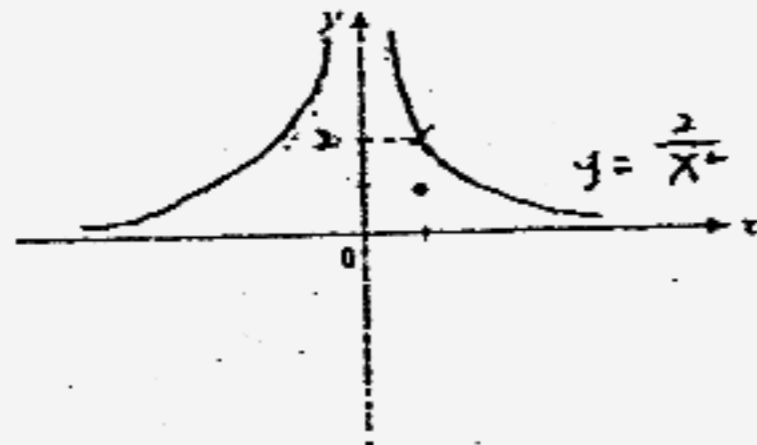
when $x = 0, y = 1$

(b)



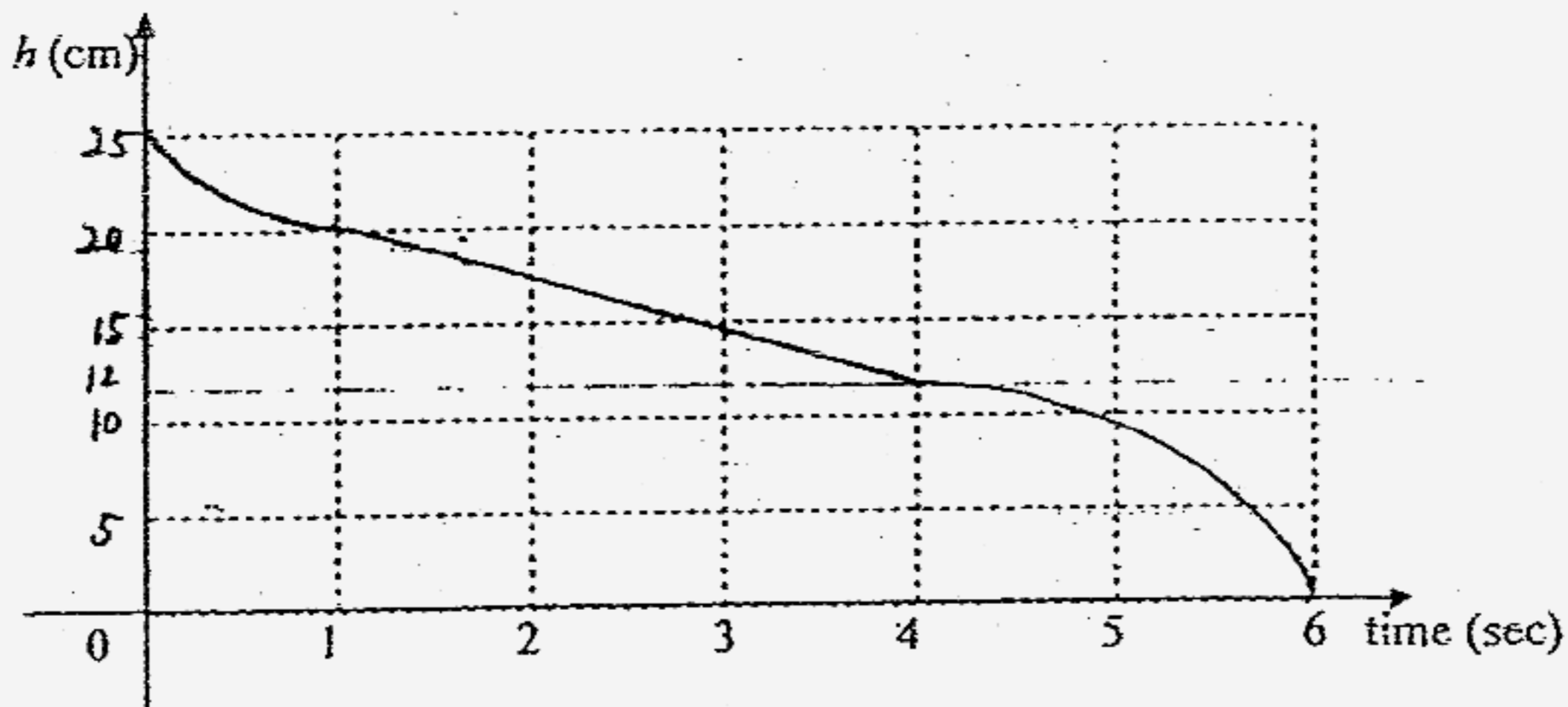
when $x = 0, y = -3$
 $x = 1, y = 4(1) - 3 = 1$

(c)



when $x = 1, y = \frac{2}{1} = 2$

14)



19d)

Name _____

Class 4 _____



**ANGLICAN HIGH SCHOOL
Preliminary Examination
Secondary Four
MATHEMATICS (SYLLABUS D)
4017/2**

Friday

15 September 2006

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Answer all questions in Section A.

Answer any one question from Section B.

Show all your working on the same page as the rest of the answer.

Omission of essential working will result in loss of marks.

You are expected to use an electronic calculator to evaluate explicit numerical expressions.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

INFORMATION FOR CANDIDATES

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

The total of the marks for this section is 100.

For Examiner's Use

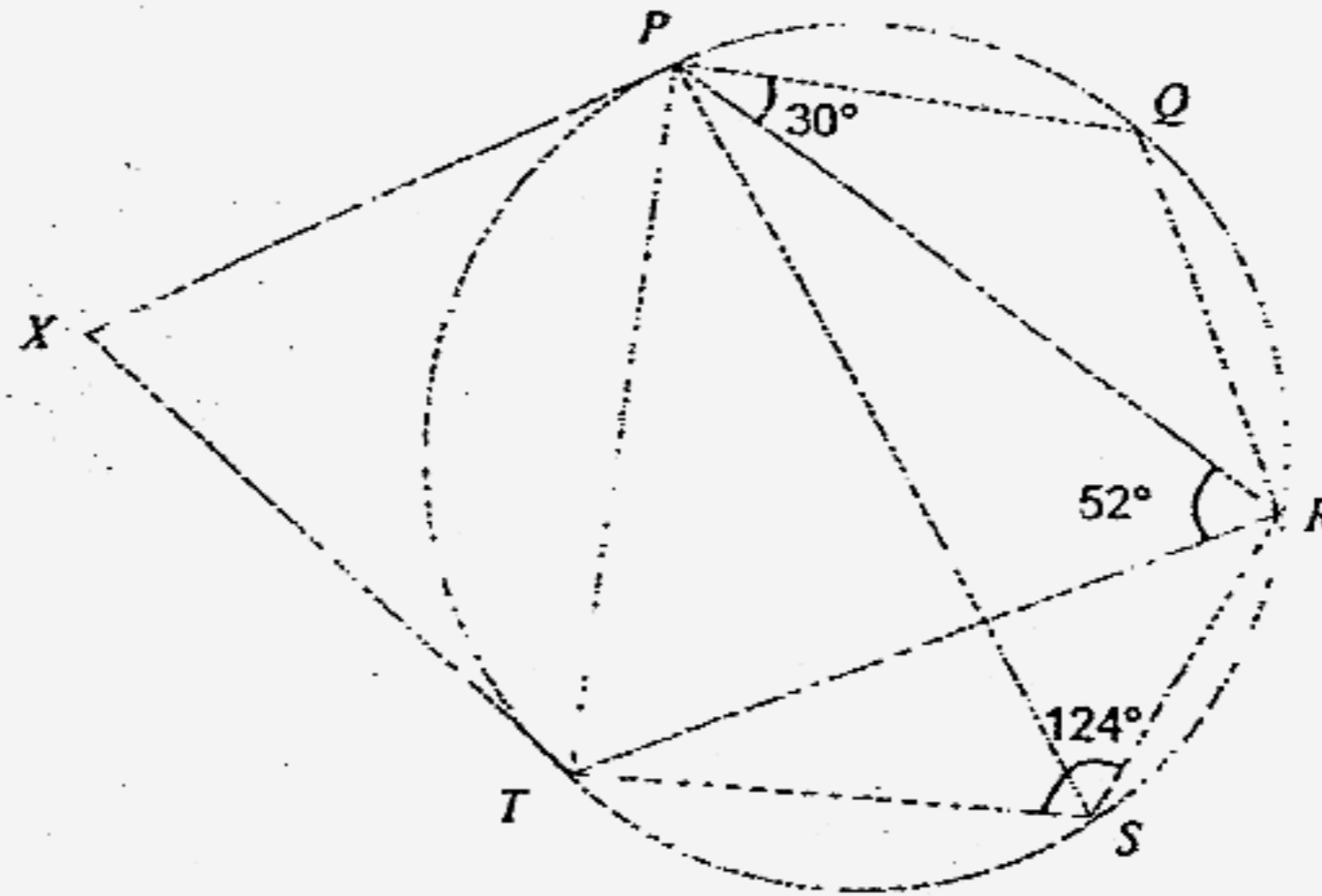
This question paper consists of 10 printed pages.

Section A [88 marks]

Answer all questions in this section.

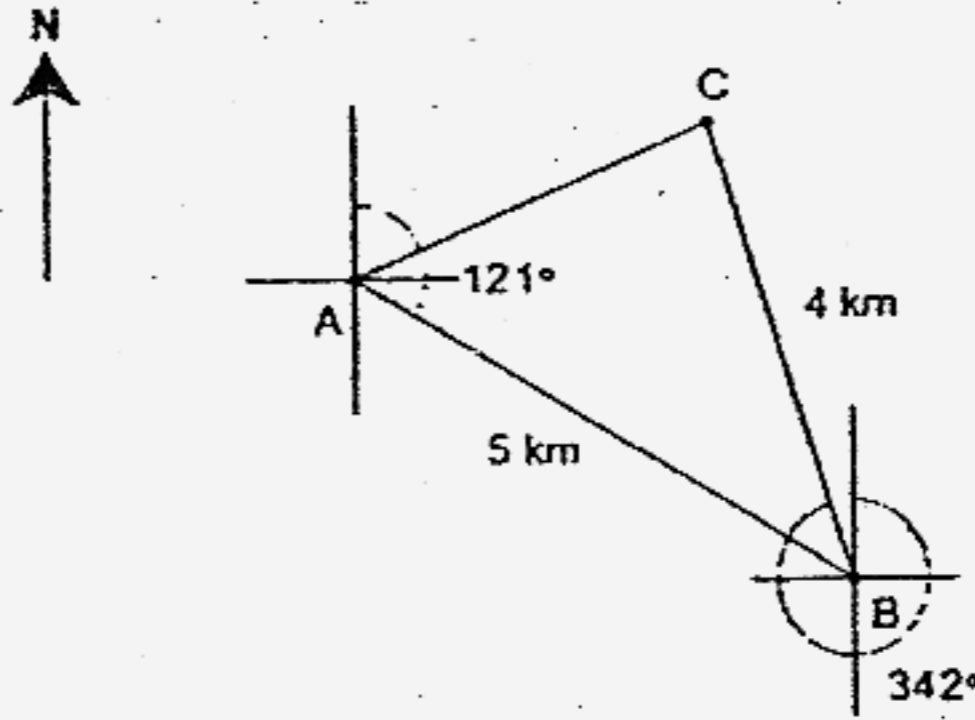
1. In the diagram given, XP and XT are tangents to the circle. P, Q, R, S and T are points on the circle such that $\angle QPR = 30^\circ$, $\angle PRT = 52^\circ$ and $\angle RST = 124^\circ$. Calculate, and writing down all the reasons,

- (a) $\angle PSR$, [2]
 (b) $\angle PRQ$, [3]
 (c) $\angle PXT$. [2]



-
2. (a) Solve the equation $\frac{4}{2n-1} = \frac{3}{n}$ [2]
 (b) Solve the simultaneous equations. [2]
 $3x - y = 7$
 $2y + 5x = 8$
 (c) Simplify $\frac{3s^2 + 2st - t^2}{t^2 - s^2}$. [3]
 (d) Given that $\frac{a-3r}{2a+s} = \frac{5r}{s}$, express a in terms of r and s . [3]

3. During a fund raising walk, students walked from the school, A , to the Simei Care Centre, B , 5 km away on a bearing of 121° .



They then walked from B to Fengshan Food Centre, C , on a bearing of 342° , which is 4 km away from B before returning to school.

Calculate

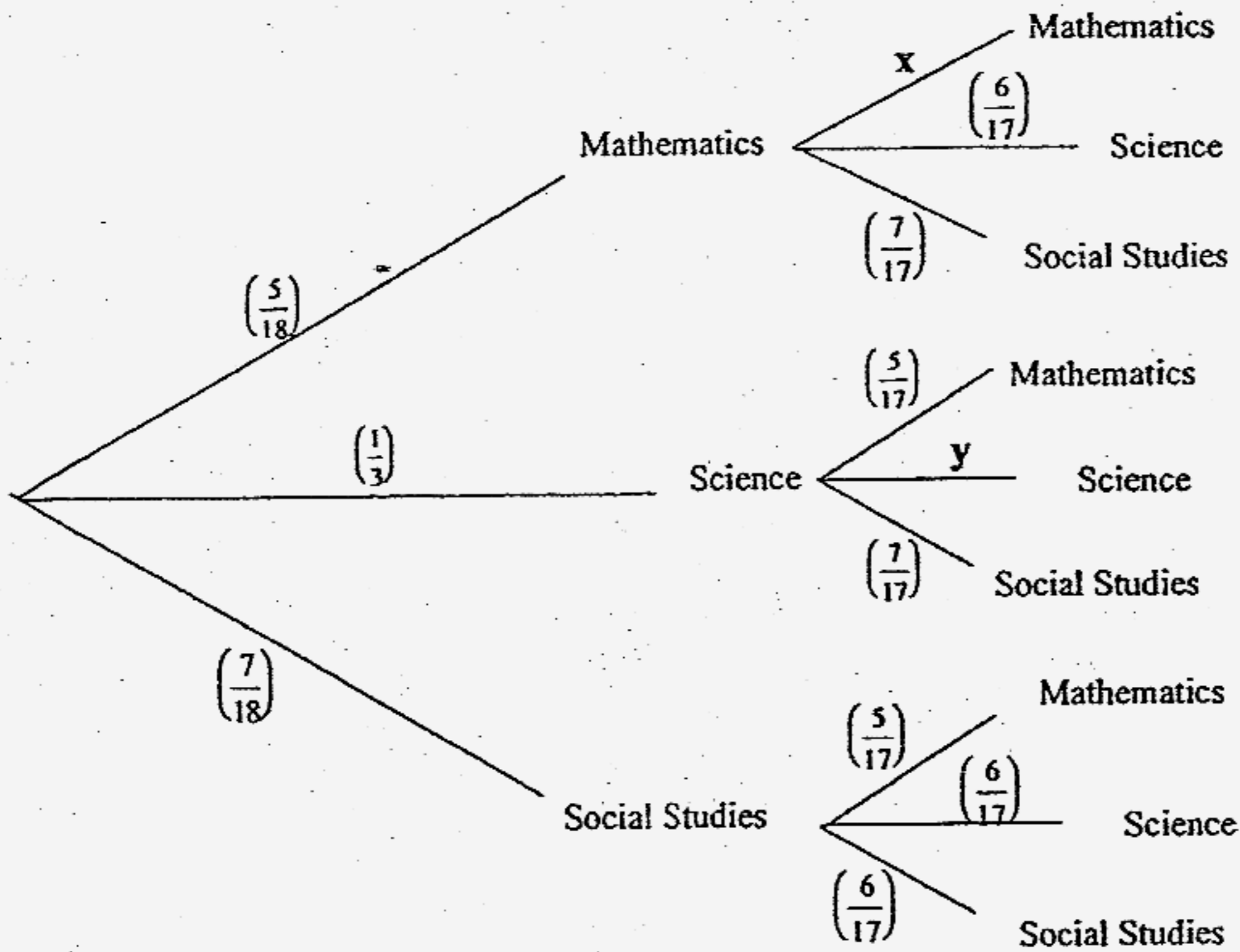
- (a) $\angle ABC$, [1]
- (b) the distance AC , [2]
- (c) the bearing of B from C . [1]

D is a point on the path BC which is nearest to A .

- (d) Calculate the distance AD . [2]
- (e) A helicopter H is hovering at a distance 500 m vertically above A . Find the angle of elevation of H from D . [2]

4. (a) A bag contains 18 cards. Written on each card is a question on either Mathematics, Science or Social Studies. A student is to pick two cards from the bag, one after another without replacement.

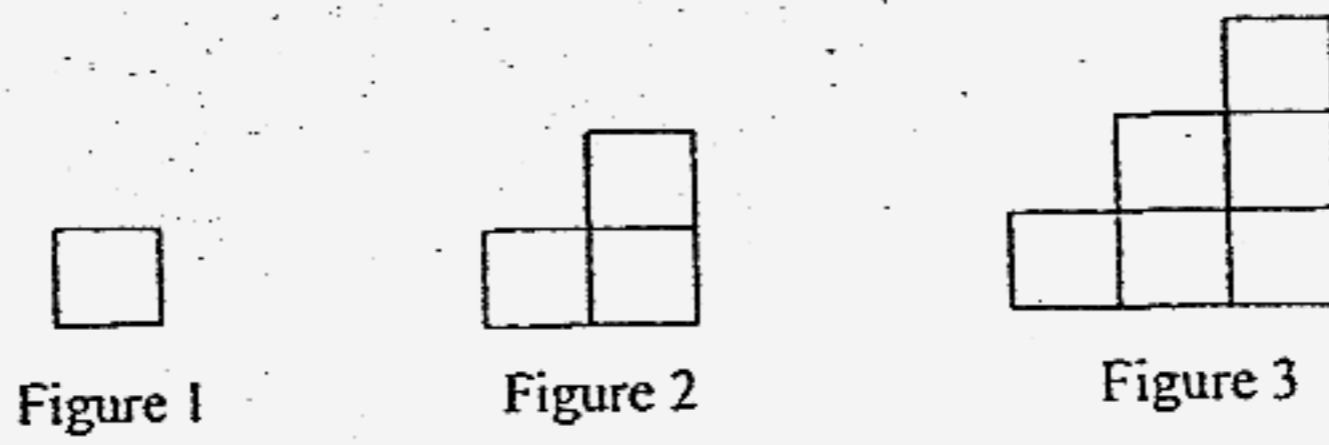
- (i) Find the values of x and y on the branches of the tree diagram below. [2]



Calculate the probability that the two cards picked are

- (ii) exactly one of Mathematics and one of Social Studies. [2]
 (iii) of the same subject. [2]
- (b) Two unbiased dice are thrown together. Find the probability that
- (i) the difference between the two numbers is 3. [1]
 (ii) at least one of the two numbers is 6. [1]
 (iii) the product of the two numbers is an even number. [2]

5. The diagram shows the first three of a sequence of figures that are formed by squares of the same size.



The number of vertical sides (V) and the total number of sides (S) are recorded in the table below.

Figure Number (n)	Number of vertical sides (V)	Total number of sides (S)
1	2	4
2	5	10
3	9	18
\vdots	\vdots	\vdots
6	x	y

- (a) Find the value of x and y . [2]
- (b) Write down a formula that shows the relationship between S and n . [1]
- (c) If the total number of sides is 460, find the value of n . [2]
- (d) Give a simple reason why the value of S cannot be a prime number. [1]

6. Answer the whole of this question on a sheet of graph paper.

300 pupils took an Elementary Mathematics test.

The table below is the cumulative frequency table for their scores.

Scores (s)	≤ 30	≤ 40	≤ 50	≤ 60	≤ 70	≤ 80
Frequency (f)	25	63	140	234	285	300

(a) Using a scale of 2 cm to represent to 10 marks, draw a horizontal s -axis for $0 \leq s \leq 80$.
Using a scale of 2 cm to represent to 50 pupils, draw a vertical f -axis for values from 0 to 300.
On your axes, draw a smooth cumulative frequency curve to illustrate this information. [3]

(b) Use your graph to find
(i) the median score, [1]

(ii) the interquartile range of the scores, [2]

(iii) the least mark for scoring Grade A, if there are only 10% of the pupils awarded Grade A. [2]

(c) Copy and complete the frequency distribution table below. [1]

Scores (s)	Frequency (f)
$0 \leq s \leq 30$	
$30 \leq s \leq 40$	
$40 \leq s \leq 60$	
$60 \leq s \leq 80$	
Total	

Calculate an estimate of the mean scores. [2]

(d) Using the table in (c), draw a histogram to represent the data. [3]

7. The price plans for mobile phone services offered by two companies are as follows.

	Plan A	Plan B
Monthly Subscription	\$ 25.20	\$ 29.40
Incoming Calls	Free for 1 st 5 mins of each call, thereafter 15.75¢/min.	Free for 50 mins, thereafter 23¢/min.
Outgoing Calls	Free calls for 3 selected numbers. Calls to other numbers charged 10.5¢/min.	Free for 80 mins, thereafter 10¢/min.
Exclusive Benefits for 3G Customers	31.5¢/kb (first 30 kb), thereafter a flat rate of 30¢/kb.	Flat rate of 33¢/kb.

Crystal subscribed to Plan A in 2005.

- (a) In the month of April, Crystal received 66 minutes of incoming calls, of which 25 minutes were free. She made a total of 3 hours 12 minutes of phone calls to her friends, of which 90 minutes were for the 3 selected numbers. Calculate the total amount she had to pay for her calls. [3]

Albert subscribed to Plan B in 2005.

- (b) With the same number of hours of usage, how much would Albert have to pay under Plan B. [3]
- (c) In the same month, Albert downloaded 45 kb of 3G data. Calculate the amount he had to pay for the download if he was given a 20% discount on the flat rate. [2]
- (d) Calculate the total phone bill of Albert in the month of April. [2]
- (e) If Albert's phone bill is three-quarters that of Crystal's in April, how much was Crystal's bill? [2]

8. Answer the whole of this question on a sheet of graph paper.

The vertices of $\triangle ABC$ are $A(-4, 2)$, $B(-2, 4)$ and $C(-1, 1)$.

The vertices of $\triangle DEF$ are $D(1, -5)$, $E(-1, -3)$ and $F(2, -2)$.

The vertices of $\triangle JKL$ are $J(-1, 2)$, $K(5, 4)$ and $L(0, 1)$.

- (a) Using a scale of 1 cm to represent 1 unit on the x and y axes, draw x and y axes for $-11 \leq x \leq 6$ and $-9 \leq y \leq 5$. Draw and label $\triangle ABC$, $\triangle DEF$ and $\triangle JKL$. [2]
- (b) Describe fully the single transformation that maps $\triangle DEF$ onto $\triangle ABC$. [2]
- (c) Describe fully, also, the single transformation that maps $\triangle ABC$ onto $\triangle JKL$. [2]
- (d) $\triangle ABC$ is enlarged by a factor of -2 with the centre of enlargement at $(-4, 0)$. The resulting image is mapped onto $\triangle PQR$ whose coordinates are $P(-8, -4)$, $Q(-4, -8)$ and $R(-2, -2)$. Describe the second transformation fully. [3]

9. Diagram I shows a tent comprising a cylindrical side with a conical roof. The tent is secured to the ground by ropes. Diagram II, not to scale, is a vertical cross section of the tent. P, E, D, C and Q lie on horizontal ground. AD is a vertical pole that supports the tent, the ropes at B and F are taut and secured to the ground at Q and P respectively. ABF forms an isosceles triangle and $BCEF$ forms a rectangle.

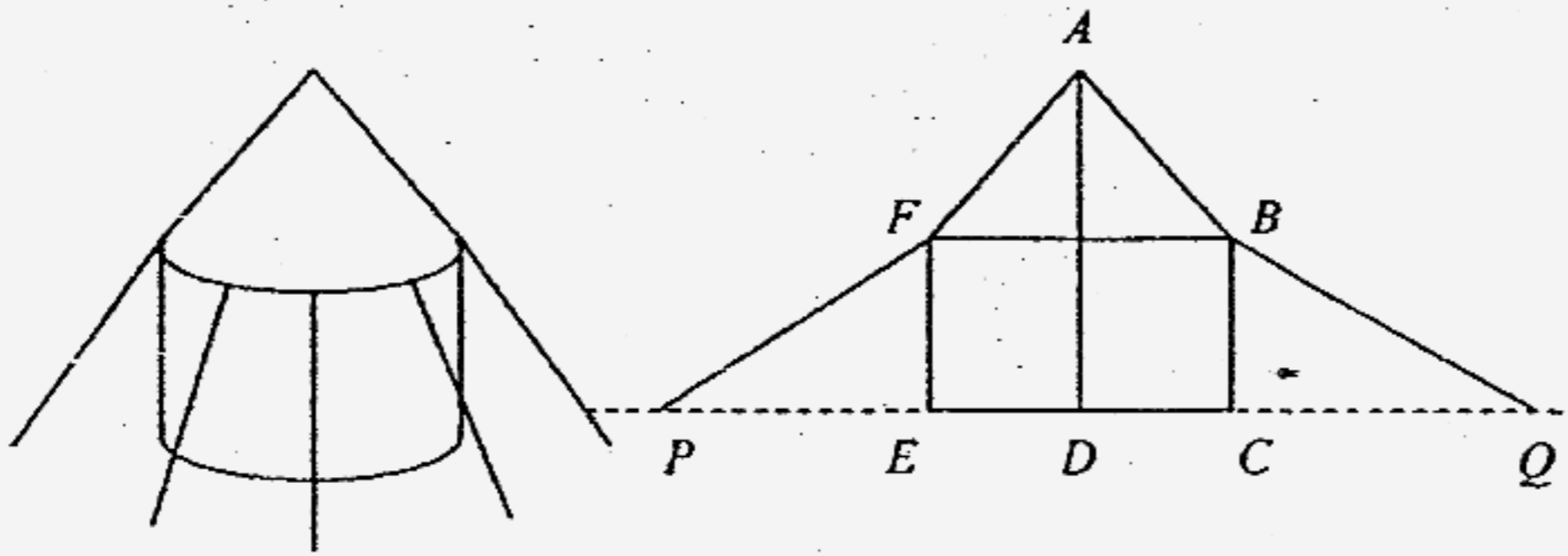


Diagram I

Diagram II

Given that $\angle AFB = 30^\circ$, $EF = 2.6$ m, $AD = 4.9$ m, $EC = 8$ m and $FP = BQ = 8.5$ m,

- (a) Calculate
- (i) the length of AF , [2]
 - (ii) the total curved surface area of the roof and the walls, [3]
 - (iii) the internal volume of the tent. [3]
- (b) BF forms the diameter of a circle. Ropes, such as FP and BQ are attached to holes on its circumference. For two particular holes, the distance apart, along the circumference, is 90 cm.
- Calculate
- (i) the angle subtended at the centre of the circle by these two holes, and [2]
 - (ii) the shortest distance between these two holes. [2]

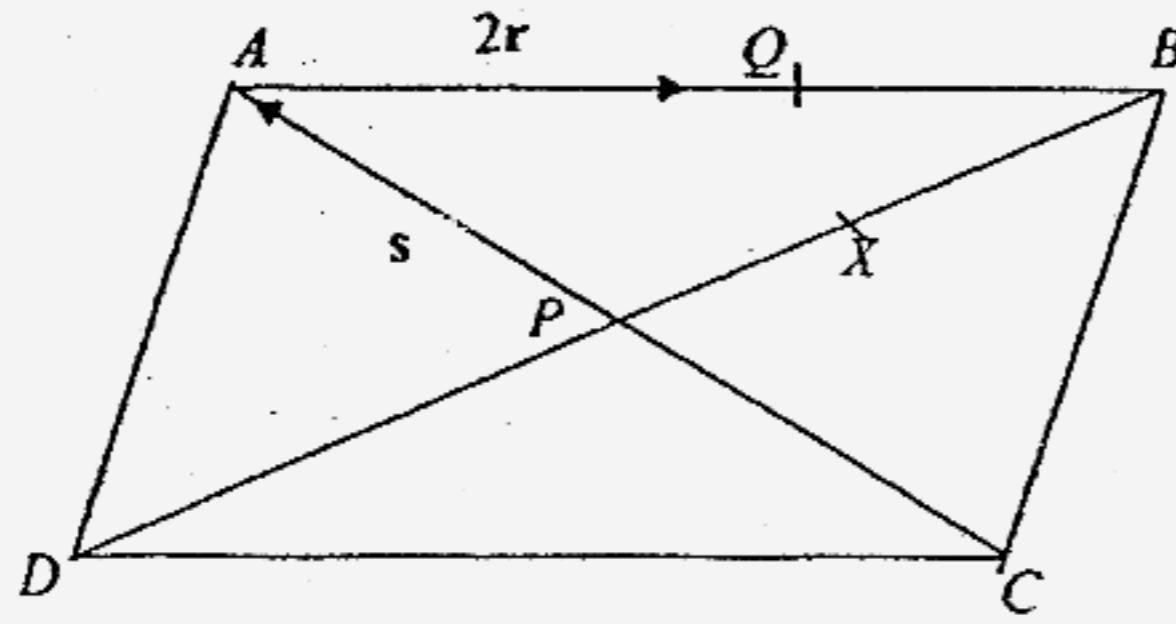
6
Section B [12 marks]
Answer one question from this section.

10. **Answer the whole of this question on a sheet of graph paper.**
The table gives some values of x and the corresponding values of y , correct to one decimal place, where $y = x^3 - 3x^2 - x + 8$.

x	-2	-1	-0.5	0	0.5	1	1.5	2	2.5	3	4
y	-10	5	7.6	8	p	5	3.1	2	2.4	5	20

- (a) Find the value of p . [1]
- (b) Using a scale of 2 cm to represent 1 unit, draw a horizontal x -axis for $-2 \leq x \leq 4$.
Using a scale of 4 cm to represent 10 units, draw a vertical y -axis for $-10 \leq y \leq 20$.
On your axes, plot the points given in the table and join them with a smooth curve. [3]
- (c) By drawing a tangent, find the gradient of the curve at the point where $x = 3$. [2]
- (d) Use your graph to find
- (i) the value of x , when $y = -2$ [1]
- (ii) the solution of $x^3 - 3x^2 - x + 8 = 4x - 1$ for $-2 \leq x \leq 4$ [2]
- (iii) the range of values of k , if the equation $x^3 - 3x^2 - x + 8 = k$ has 3 roots. [3]

11. In the diagram $ABCD$ is a parallelogram. The diagonals AC and BD intersect at P . Q is a point on AB such that $AB = 3QB$. X is the mid-point of PB . $\overrightarrow{AQ} = 2r$ and $\overrightarrow{PA} = s$.



- (a) Express, as simply as possible, in terms of r and s ,
- (i) \overrightarrow{AB} [1]
 - (ii) \overrightarrow{BC} [1]
 - (iii) \overrightarrow{BX} [1]
 - (iv) \overrightarrow{QC} [1]
- (b) Show that $\overrightarrow{XC} = -\frac{3}{2}(r + s)$. [2]
- (c) Use the results of \overrightarrow{XC} and \overrightarrow{QC} to show that Q , X and C lie on a straight line. [2]
- (d) Calculate the value of
- (i) $\frac{\text{area of } \triangle BCX}{\text{area of } \triangle BCQ}$ [2]
 - (ii) $\frac{\text{area of } \triangle BCX}{\text{area of } ABCD}$ [2]

End of paper.

Answers

Paper 2

1a) 72° b) 42° c) 76°

2a) $n = \frac{3}{2}$ or $1\frac{1}{2}$ 2b) $x = 2, y = -1$

2c) $\frac{3s-t}{t-s}$ 2d) $a = \frac{8rs}{s-10r}$

3a) 41° 3b) 3.29m 3c) 162°

3d) 3.28m 3e) 89.6°

4ai) $x = \frac{4}{17}, y = \frac{5}{17}$ 4aii) $\frac{35}{153}$

4aiii) $\frac{46}{153}$ 4bi) $\frac{1}{6}$ 4bii) $\frac{11}{36}$ 4biii) $\frac{3}{4}$

5a) $x = 27, y = 54$ 5b) $s = n(n+3)$

5c) $n = 20$ or -23 (rejected)

5d) S is always even and therefore cannot be a prime nos.

6bi) 51 6bii) 17 6biii) 66.5

6c)

Scores(s)	Frequency(f)	Mid-point(x)	fx
$0 \leq s \leq 30$	25	15	375
$30 \leq s \leq 40$	38	35	1330
$40 \leq s \leq 60$	171	50	8550
$60 \leq s \leq 80$	66	70	4620

Scores(s)	Freq Density
$0 \leq s \leq 30$	$\frac{25}{30} = 0.83$
$30 \leq s \leq 40$	$\frac{38}{10} = 3.8$
$40 \leq s \leq 60$	$\frac{171}{20} = 8.55$
$60 \leq s \leq 80$	$\frac{66}{20}$

7a) \$17.17 7b) \$14.88 7c) \$11.88

7d) \$56.16 7e) \$74.88

8b) A clockwise rotation of 90° about (2,1).

Construction to find the centre, \angle

8c) A shear with invariant line $y = \frac{1}{2}$,

shear factor = $\frac{1}{\frac{1}{2}} = 2$. Construction to find the invariant line.

8d) A reflection in the line $x = -6$.

Construction to find $\Delta A'B'C'$

9ai) 4.62m 9aii) 123cm^2 9aiii) 169m^3

9bi) 12.9° 9bii) 0.898m

10c) 8.41 10di) $x \approx -1.6$

10dii) $y = 4x-1, x \approx -1.95, 1.25$ or 3.7

10diii) $2 < k < 8.3$ Lines on graph

11ai) $3r$ 11aii) $-2s-3r$

11aiii) $BX = -\frac{1}{2}(s+3r)$

11aiv) $-2(s+r)$ 11b) $-\frac{3}{2}(r+s)$

11c) Q, X and C lie on a str line.

11di) $\frac{3}{4}$ 11dii) $\frac{1}{8}$

$\frac{66}{20} = 3.3$

6)