

Section A [50 marks]

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

- 1 Express, correct to 2 significant figures,
(a) 237.135,
(b) 0.005193.

Answer : (a) [1]

(b) [1]

- 2 Using as much of the information given below as is necessary, find

(a) $\sqrt{36700}$,

(b) $\sqrt{0.367}$.

[$\sqrt{3.67} = 1.92$, $\sqrt{36.7} = 6.06$.]

Answer : (a) [1]

(b) [1]

3 (a) Simplify $\frac{a^4}{b^3} \times \left(\frac{b}{2a}\right)^2 \div b^0$.

(b) Evaluate $\frac{11}{4} - 2\frac{2}{5} \times \left(\frac{1}{2} - \frac{2}{3}\right)$.

Answer : (a) [2]

(b) [2]

4 A length of 2 cm on a map represents an actual distance of 6 000 m. Calculate

(a) the R. F. of the map,

(b) the actual area represented by 10 cm^2 on the map, giving your answer in square kilometres.

Answer : (a) [1]

(b) [2]

- 5 Factorise completely
- (a) $5x - 3xy + 6ay - 10a$,
- (b) $9n^4 - 81n^2$.

Answer : (a) [2]

(b) [2]

-
- 6 (a) Simplify $n^2 - (n - 2a)(n + 2a)$.
- (b) Hence, write down the value of $12735^2 - 12731 \times 12739$.

Answer : (a) [2]

(b) [2]

7 Solve the equation

(a) $\frac{16}{u} - \frac{u}{4} = 0,$

(b) $\frac{1}{(t+2)} = \frac{2t-1}{3}.$

Answer : (a) [2]

(b) [3]

8 Express as a single fraction in its simplest form

$$\frac{x}{2x^2 - 8} + \frac{x+1}{x-2} - \frac{x-1}{x+2}.$$

Answer : [3]

9 Solve the simultaneous equations

$$\frac{1}{u+v} - \frac{1}{u-v} = -4,$$

$$\frac{1}{u+v} + \frac{1}{u-v} = 12.$$

Answer : [4]

- 10 The variables x and y are connected by the equation $x = ay^b$, where a and b are constants. Pairs of corresponding values of x and y are given in the table below.

y	0	1	2	3
x	0	2	16	c

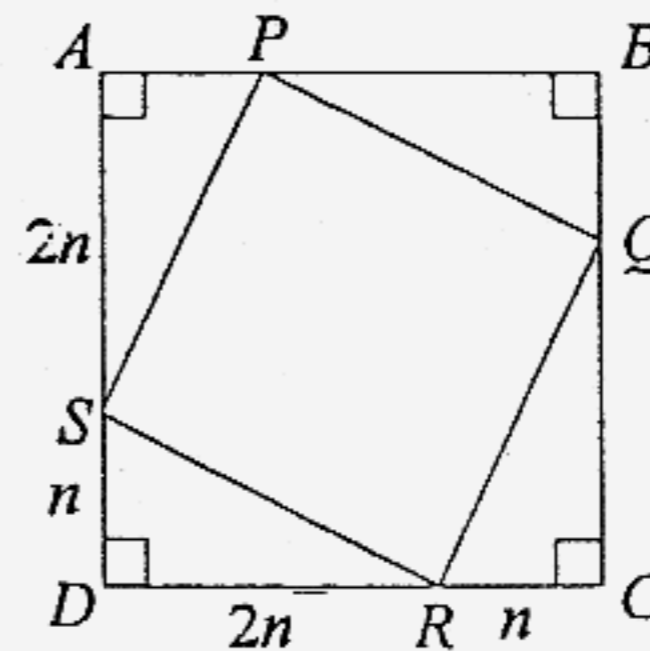
Find the values of a , b and c .

Answer : [4]

- 11 $ABCD$ is a square in which $AS = DR = 2n$ cm and $SD = RC = n$ cm. The area of the square $PQRS$ is 400 cm².

Calculate

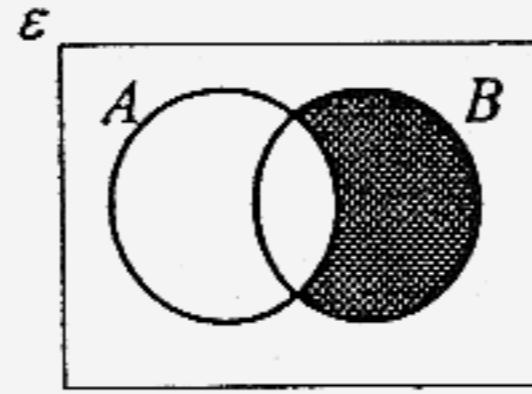
- (a) the value of n^2 ,
(b) the area of square $ABCD$.



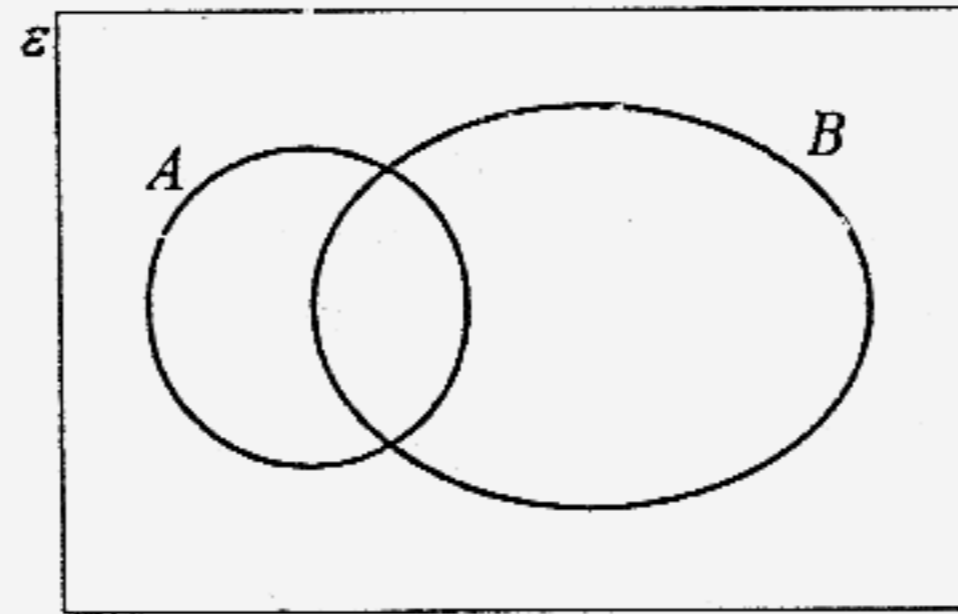
Answer : (a) [2]

(b) [2]

- 12 (a) For the Venn diagram below, express the shaded region in set notation.



- (b) In the Venn diagram shown below,
 $\epsilon = \{x : 4 \leq x \leq 20, x \in \mathbb{Z}\}$,
 $A = \{x : x \text{ is a multiple of } 3\}$,
 $B = \{x : x \text{ is an odd number}\}$.



- (i) Add the set C to the Venn diagram where
 $C = \{x : x \text{ is a prime number}\}$. [1]
- (ii) Find $n(A \cup B)'$.
- (iii) Find $(A \cap B) \cap C$.

Answer : (a) [1]

(b) (ii) [1]

(b) (iii) [1]

- 13 In a class of 40 pupils, 25 of them have been to China and 17 of them have been to Japan. Find the smallest and largest possible number of pupils who have been to both countries.

Answer : [2]

- 14 A six-faced die was thrown 20 times. The table shows the number of times that each possible score occurred.

Score	1	2	3	4	5	6
Frequency	2	x	4	4	4	y

- (a) Find the value of $x + y$.
- (b) If the modal score was 2, find the largest possible value of y .
- (c) After the 19th throw, the median score was 3. Find the largest possible value of x .
- (d) The mean score of all 20 throws was 3.5, find the values of x and y .

Answer : (a) [1]

(b) [1]

(c) [1]

(d) [2]

End of Section A

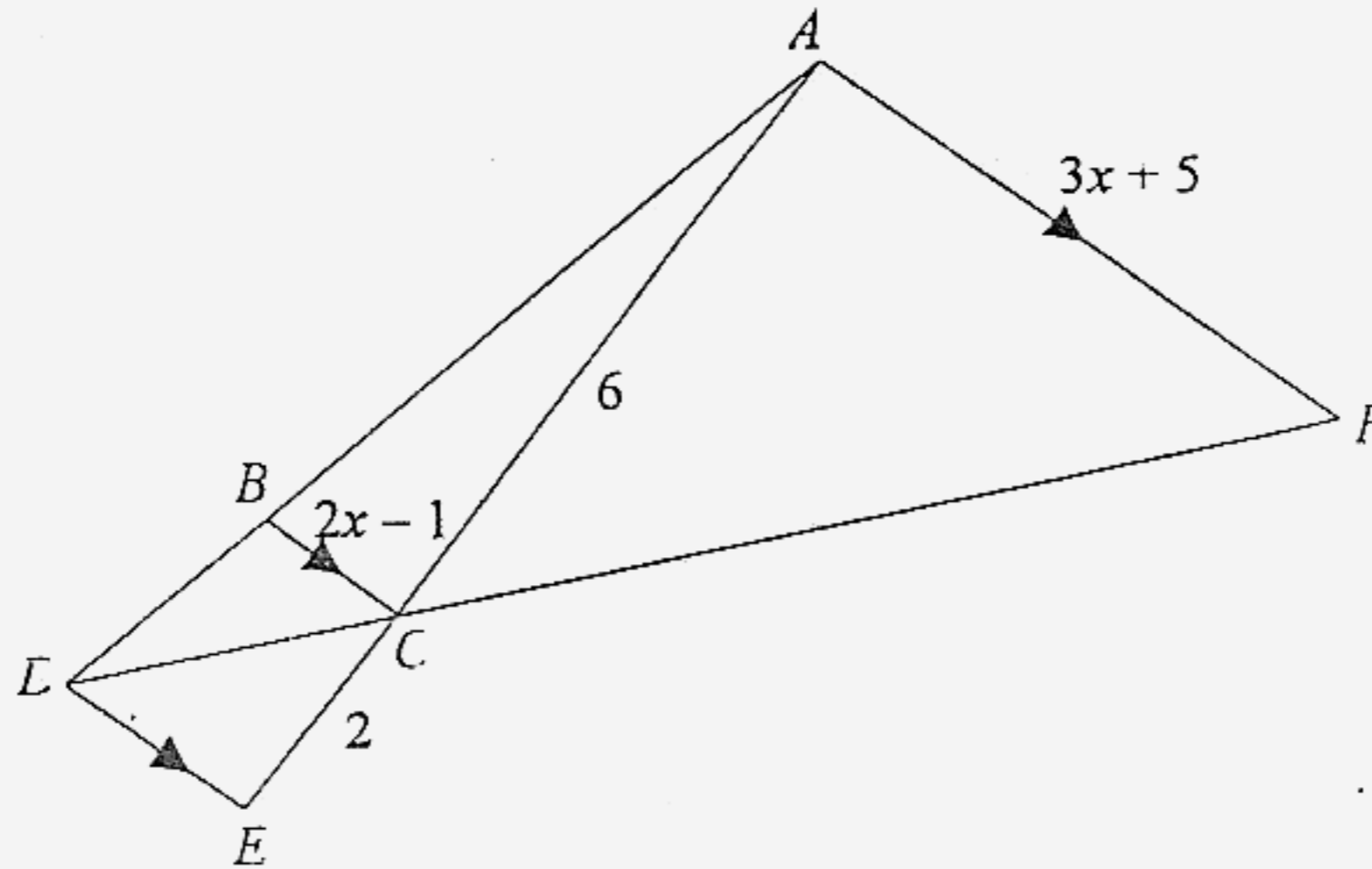
Section B [50 marks]
Answer **ALL** questions.
Calculators may be used for this section.

- 15 The daily distances, in kilometres, travelled by a salesman in 30 days are shown below in the stem-and-leaf diagram.

1		2	4	9		
2		0	1	3	8	
3		0	0	1	7	
4		3	6	6	6	9
5		0	1	2	8	
6		4	5	7		
7		6	7	8		
8		5	8	9	9	

- (a) Construct a grouped frequency table for the data above using the class intervals of $11 \leq d \leq 30$, $31 \leq d \leq 50$, $51 \leq d \leq 70$ and $71 \leq d \leq 90$, where d is the distance travelled in kilometres. [2]
- (b) Using the table that you have constructed in (a) above,
- (i) state the modal class, [1]
- (ii) find the median distance travelled, [2]
- (iii) find the estimated mean distance travelled. [2]
- (c) If a distance is chosen at random from the 30 days, find the probability that the distance travelled by the salesman is
- (i) less than 35 km, [1]
- (ii) between 45 km and 65 km, [1]
- (iii) at least 85 km. [1]
- 16 In the diagram below, DE is parallel to BC and AF .
 $AC = 6$ cm, $CE = 2$ cm, $BC = (2x - 1)$ cm and $AF = (3x + 5)$ cm.

Triangle BCD is similar to triangle AFD .

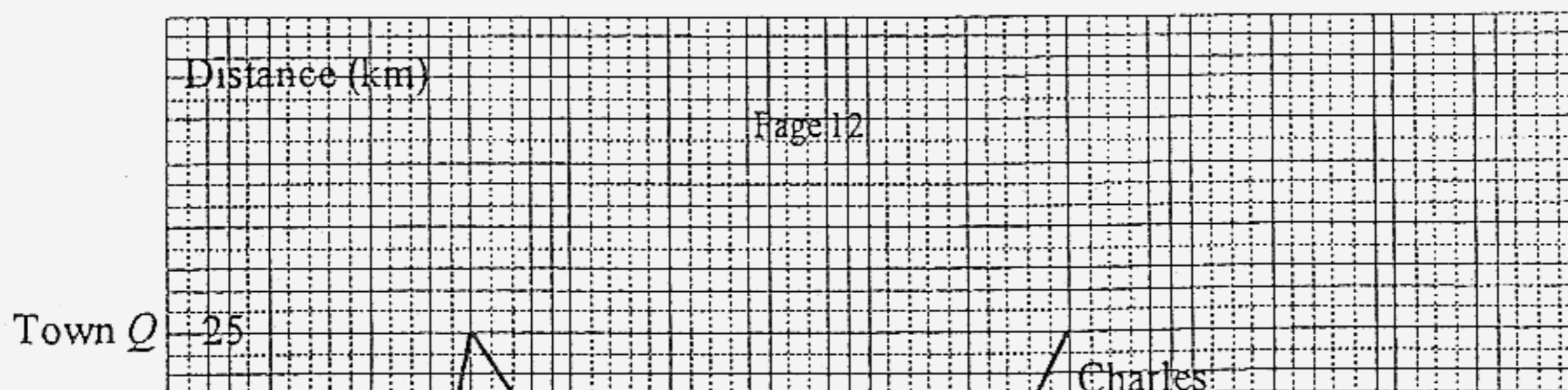


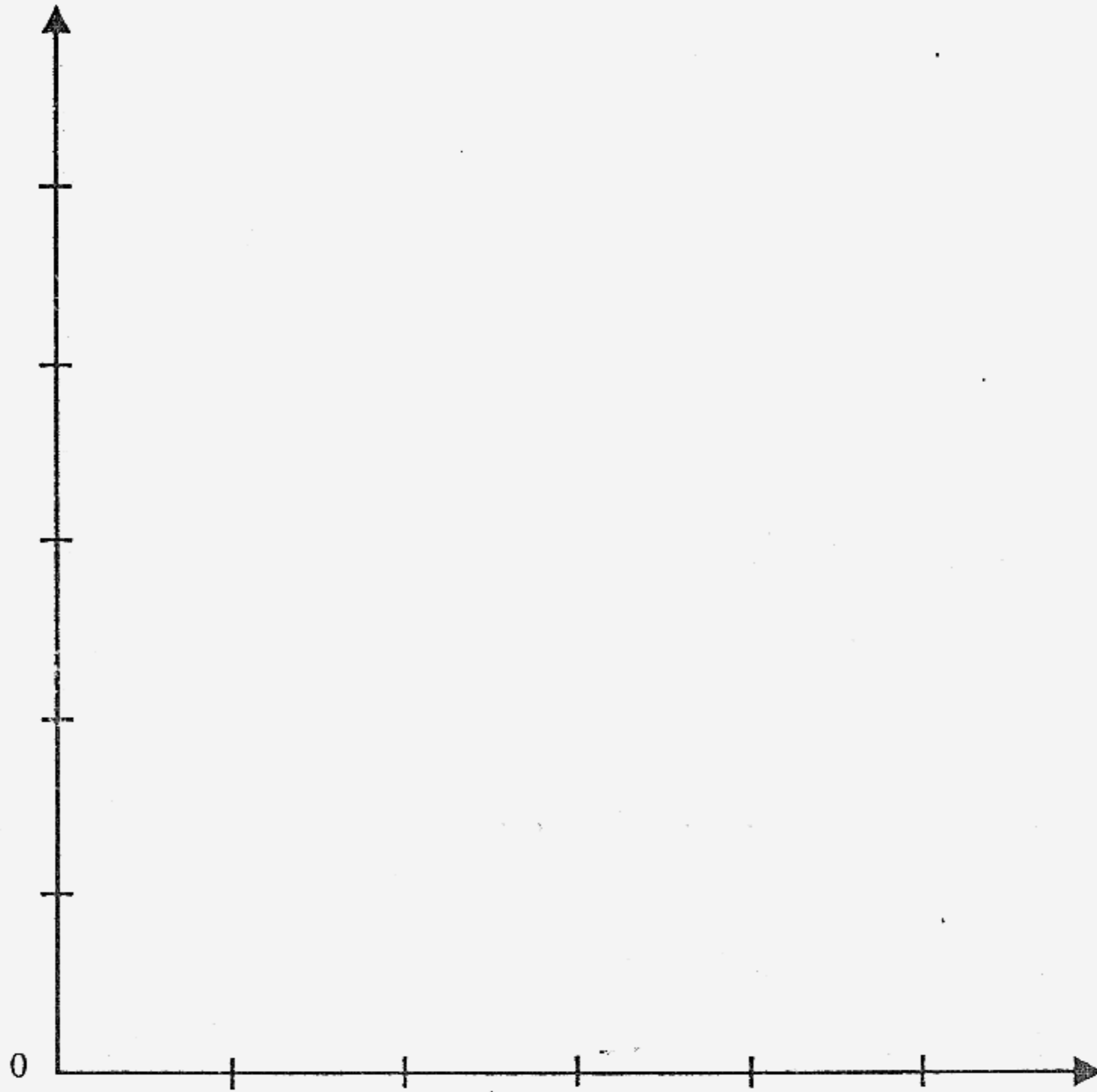
- (a) Name another pair of similar triangles. [1]
- (b) Find the ratios $\frac{BC}{DE}$ and $\frac{DE}{AF}$. Hence, find the value of x . [4]
- (c) If the area of triangle $DEC = 5.6 \text{ cm}^2$, calculate the area of triangle ACD . [1]
- (d) Write down the ratio

height of triangle DEC : height of triangle FAC .

Hence, find the value of $\frac{\text{Area of Triangle } DEC}{\text{Area of Triangle } FAC}$. [2]

- 17 The graph below shows the journeys of two cyclists, Charles and Keith, between Town P and Town Q.

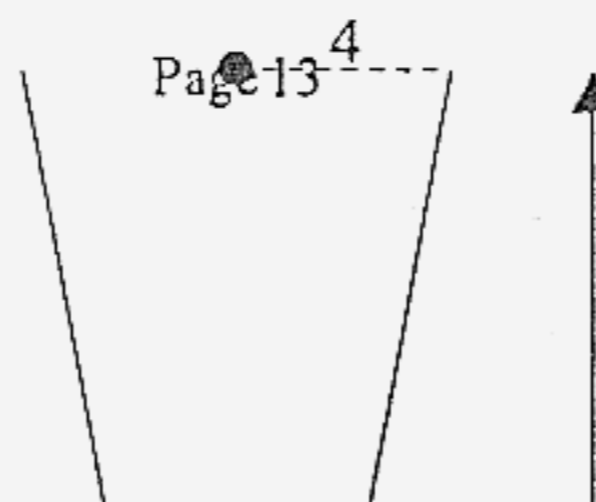




- (a) When did Charles begin his journey? [1]
- (b) How long did Charles rest? [1]
- (c) When and where did the two cyclists meet each other? [2]
- (d) What distance did Keith cover while Charles was resting? [1]
- (e) Calculate Keith's average speed for his return journey. [2]
- (f) If Charles had travelled at the initial constant speed throughout his journey, at what time would he reach Town Q? [1]

18 [The value of π is 3.142, correct to three decimal places.]

A drinking glass is made up of a hollow cone attached to a solid hemispherical base



as shown in the diagram below.



The hemisphere has a radius of 3 cm.

The radius of the top of the cone is 4 cm and the height of the cone is 30 cm.

- (a) Write down the overall height of the drinking glass. [1]
- (b) Calculate the total surface area of the solid hemispherical base. [2]
- (c) Calculate the exterior curved surface area of the cone. [2]
- (d) (i) The cone contains liquid to a depth of h cm.
Show that the radius of the surface of the liquid is $\frac{2}{15}h$ cm. [1]
- (ii) The cone is completely filled with liquid.
Calculate the volume of the liquid in the cone. [1]
- (iii) One-third of the volume of liquid from the full cone is now poured out.
Using the answers to parts (i) and (ii), find the depth of the liquid that remains in the cone. [2]
- (e) Given that the density of material used to make the solid hemispherical base is 6 g/cm^3 . Find the mass, in kilograms, of the material. [2]

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

Section A

Section A

Section B

- 1(a) 240
1(b) 0.0052

- 2(a) 192
2(b) 0.606

- 3(a) $\frac{a^2}{4b}$, for your info: $b^0 = 1$

- 3(b) $3\frac{3}{20}$

- 4(a) R.F. = $\frac{1}{300000}$

- 4(b) 90 km²

- 5(a) $(x - 2a)(5 - 3y)$
5(b) $9n^2(n + 3)(n - 3)$

- 6(a) $4a^2$

- 6(b) 16, for your info: hence means using $4a^2$, $a = 2$

- 7(a) $u = \pm 8$

- 7(b) $r = -2\frac{1}{2}$ or 1

8 $\frac{13x}{2(x+2)(x-2)}$

9 $u = \frac{3}{16}$ $v = \frac{1}{16}$

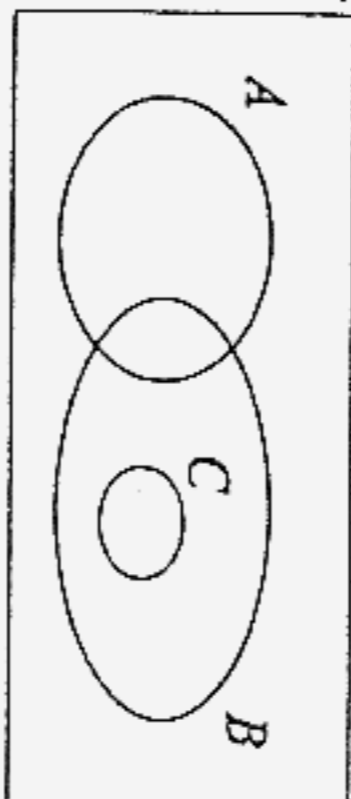
10 $a = 2, b = 3, c = 54$

11(a) $n^2 = 80$

11(b) 720 cm²

12(a) $A' \cap B$

12(b)(i) ϕ



12(b)(ii) 6

12(b)(iii) ϕ

13 2, 17

14(a) $x + y = 6$

14(b) 1

14(c) 5

14(d) $x = 4, y = 2$

15(a)

Dist. Traveled (km)	Frequency
$11 \leq d \leq 30$	9
$31 \leq d \leq 50$	8
$51 \leq d \leq 70$	6
$71 \leq d \leq 90$	7

15(b)(i) $11 \leq d \leq 30$ (ii) 47.5 km (iii) 47.8 km

15(c)(i) $\frac{1}{3}$ (ii) $\frac{3}{10}$ (iii) $\frac{2}{15}$

16(a) $\triangle ABC$ & $\triangle ADE$ ($\triangle ACF$ & $\triangle ECD$)

16(b) $\frac{BC}{DE} = \frac{3}{4}, \frac{DE}{AF} = \frac{1}{3}, x = 1.8$ (c) 16.8 cm²

(d) 1 : 3, $\frac{1}{9}$

17(a) 09 30 hours (b) 1.5 hours

17(c) 11 18-11 21 h, 15 km away from Town P
(or: 10 km away from Town Q)

17(d) 11-11.5km (e) 6.25 km/h
(f) 11 10-11 12 h

18(a) 33 cm (b) 84.8 cm² (c) 381 cm²

18(d)(ii) 503 cm³ (iii) 26.2 cm

18(e) 0.340 kg

19(b)(i) $y = 1 (\pm 0.2)$ (ii) $x = 0.85$ or 4.15 (± 0.2)

19(c) $k = 2.5$ (d)(ii) $A = 5, B = -1$