

# CLASS IX — MATHEMATICS

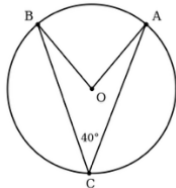
## MARKING SCHEME

Answer key and model answers · 80 marks

### 1. Answer key: Section A

| Q  | Ans | Q   | Ans | Q   | Ans | Q   | Ans |
|----|-----|-----|-----|-----|-----|-----|-----|
| Q1 | (b) | Q6  | (a) | Q11 | (a) | Q16 | (d) |
| Q2 | (c) | Q7  | (d) | Q12 | (d) | Q17 | (b) |
| Q3 | (c) | Q8  | (c) | Q13 | (b) | Q18 | (c) |
| Q4 | (a) | Q9  | (c) | Q14 | (b) | Q19 | (c) |
| Q5 | (d) | Q10 | (b) | Q15 | (a) | Q20 | (a) |

### Working for Section A, as a student may show it

| Q   | Ans | Working                                                                                                                                                                                                                                                                                |
|-----|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Q1  | (b) | $40 = 2^3 \times 5$ , so the denominator has only 2 and 5 as prime factors and $9/40$ terminates ( $9/40 = 0.225$ ). The denominators 12, 21 and 30 each have a factor 3 or 7, so those decimals do not terminate.                                                                     |
| Q2  | (c) | Numbers greater than 4 on a die: 5 and 6, so 2 favourable outcomes out of 6. Probability = $2/6 = 1/3$ .                                                                                                                                                                               |
| Q3  | (c) | Curved surface area = $2\pi rh = 2 \times (22/7) \times 7 \times 10 = 440 \text{ cm}^2$ .                                                                                                                                                                                              |
| Q4  | (a) | $p(-2) = 3(-2) - 7 = -6 - 7 = -13$ .                                                                                                                                                                                                                                                   |
| Q5  | (d) | The angle subtended by an arc at the centre is double the angle subtended at a point on the remaining part of the circle. $\angle AOB = 2 \times \angle ACB = 2 \times 40^\circ = 80^\circ$ .<br> |
| Q6  | (a) | $s = (9 + 10 + 17)/2 = 18$ . Area = $\sqrt{[18 \times (18 - 9) \times (18 - 10) \times (18 - 17)]} = \sqrt{(18 \times 9 \times 8 \times 1)} = \sqrt{1296} = 36 \text{ cm}^2$ .                                                                                                         |
| Q7  | (d) | A quadrilateral whose diagonals bisect each other is a parallelogram. Adjacent angles of a parallelogram add up to $180^\circ$ , so $\angle B = 180^\circ - 70^\circ = 110^\circ$ .                                                                                                    |
| Q8  | (c) | First term $a = 5$ , common difference $d = 3$ . nth term = $a + (n - 1)d = 5 + 3(n - 1) = 3n + 2$ .                                                                                                                                                                                   |
| Q9  | (c) | Distance from the origin = $\sqrt{(x^2 + y^2)} = \sqrt{((-6)^2 + 8^2)} = \sqrt{(36 + 64)} = \sqrt{100} = 10$ units.                                                                                                                                                                    |
| Q10 | (b) | Surface area = $4\pi r^2$ . With radius $2r$ : $4\pi(2r)^2 = 4 \times (4\pi r^2)$ , so the surface area becomes 4 times.                                                                                                                                                               |
| Q11 | (a) | Since $(x + 1/x)^2 = x^2 + 2 + 1/x^2$ , we get $5^2 = x^2 + 1/x^2 + 2$ . So $x^2 + 1/x^2 = 25 - 2 = 23$ .                                                                                                                                                                              |
| Q12 | (d) | Balls that are not blue: 3 red + 2 green = 5, out of 10 balls. Probability = $5/10 = 1/2$ .                                                                                                                                                                                            |
| Q13 | (b) | Opposite angles of a cyclic quadrilateral add up to $180^\circ$ . $\angle C = 180^\circ - \angle A = 180^\circ - 75^\circ = 105^\circ$ .                                                                                                                                               |
| Q14 | (b) | Total marks = $10 \times 70 + 30 \times 50 = 700 + 1500 = 2200$ . Average of all 40 students = $2200/40 = 55$ .                                                                                                                                                                        |
| Q15 | (a) | Arc length = $(\theta/360^\circ) \times 2\pi r = (60/360) \times 2 \times (22/7) \times 21 = (1/6) \times 132 = 22 \text{ cm}$ .                                                                                                                                                       |
| Q16 | (d) | Common ratio = $27/81 = 1/3$ (check: $9/27 = 1/3$ and $3/9 = 1/3$ ).                                                                                                                                                                                                                   |
| Q17 | (b) | D and E are the midpoints of AB and AC, so $DE = \frac{1}{2} BC$ (midpoint theorem) = $\frac{1}{2} \times 14 = 7 \text{ cm}$ .                                                                                                                                                         |
| Q18 | (c) | $6a^2 = 150$ , so $a^2 = 25$ and $a = 5 \text{ cm}$ . Volume = $a^3 = 5^3 = 125 \text{ cm}^3$ .                                                                                                                                                                                        |
| Q19 | (c) | A: $0.333... = 1/3$ , which is of the form $p/q$ , so A is true. R: a decimal that does not terminate but repeats is rational, so R is false. Answer: (c).                                                                                                                             |
| Q20 | (a) | The converse is "If a number is even, then it is divisible by 4". It is false, because 6 is even but not divisible by 4. So A is true, R is true, and R explains A. Answer: (a).                                                                                                       |

## 2. Model answers and marking scheme: Sections B to E

### Q21 (2 marks) · Ch 3 — The World of Numbers

#### Alternative (A)

Let  $x = 0.2727\ldots$  ....(1)

The block 27 has two digits, so multiply both sides by 100:  $100x = 27.2727\ldots$  ....(2) [1]

Subtracting (1) from (2):  $100x - x = 27.2727\ldots - 0.2727\ldots$ , so  $99x = 27$ .

$$x = 27/99 = 3/11$$
 [1]

Hence  $0.2727\ldots = 3/11$ , which is of the form  $p/q$  with  $p = 3$ ,  $q = 11$  and  $q \neq 0$ .

#### Alternative (B)

Write both numbers with a larger common denominator:  $2/9 = 4/18$  and  $4/9 = 8/18$ . [1]

The rational numbers between  $4/18$  and  $8/18$  include  $5/18$ ,  $6/18$  and  $7/18$ . So two rational numbers between  $2/9$  and  $4/9$  are  $5/18$  and  $7/18$  (any two of these will do). [1]

### Q22 (2 marks) · Ch 9 — Propositions and their Converses

Statement: If two angles are vertically opposite, then they are equal.

Converse: If two angles are equal, then they are vertically opposite. [1]

The converse is false.

Counterexample: all four angles of a rectangle measure  $90^\circ$ , so any two of them are equal, but no two angles of a rectangle are vertically opposite (vertically opposite angles are formed by two intersecting lines). [1]

### Q23 (2 marks) · Ch 8 — Predicting What Comes Next: Sequences and Progressions

#### Alternative (A)

Let the first term be  $a$  and the common difference be  $d$ . The  $n$ th term of an AP is  $a_n = a + (n - 1)d$ .

$$3\text{rd term: } a + 2d = 11 \quad \dots(1)$$

$$7\text{th term: } a + 6d = 27 \quad \dots(2)$$
 [1]

Subtracting (1) from (2):  $4d = 16$ , so  $d = 4$ .

Putting  $d = 4$  in (1):  $a + 8 = 11$ , so  $a = 3$ .

Hence the first term is 3 and the common difference is 4. [1]

#### Alternative (B)

Let the common ratio be  $r$ . The  $n$ th term of a GP is  $a_n = a r^{n-1}$ , so the third term is  $5r^2 = 45$ . Then  $r^2 = 9$  and  $r = 3$ , as  $r$  is positive. [1]

$$\text{Fourth term} = 5 \times 3^3 = 5 \times 27 = 135.$$
 [1]

### Q24 (2 marks) · Ch 13 — Two Variables, One Line

Compare  $2x + 3y - 7 = 0$  and  $6x + 9y - 20 = 0$  with  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$ .

$$a_1/a_2 = 2/6 = 1/3, \quad b_1/b_2 = 3/9 = 1/3, \quad c_1/c_2 = (-7)/(-20) = 7/20$$
 [1]

Here  $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ , since  $1/3 \neq 7/20$ .

Therefore the pair of equations has no solution (the two lines are parallel). [1]

### Q25 (2 marks) · Ch 9 — Propositions and their Converses

To show the statement is false, we need one pair of irrational numbers whose sum is rational.

Take  $\sqrt{2}$  and  $-\sqrt{2}$ . Both are irrational numbers. [1]

Their sum is  $\sqrt{2} + (-\sqrt{2}) = 0$ , which is rational ( $0 = 0/1$ ).

So the sum of two irrational numbers need not be irrational. Hence the statement is false. [1]

### Q26 (3 marks) · Ch 1 — Orienting Yourself: The Use of Coordinates

#### Alternative (A)

Using the distance formula  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ :

$$AB = \sqrt{[(4 - 1)^2 + (6 - 2)^2]} = \sqrt{(9 + 16)} = 5$$

$$BC = \sqrt{[(-4 - 4)^2 + (12 - 6)^2]} = \sqrt{(64 + 36)} = 10$$

$$AC = \sqrt{[(-4 - 1)^2 + (12 - 2)^2]} = \sqrt{(25 + 100)} = \sqrt{125}$$

[1]

$$AB^2 + BC^2 = 25 + 100 = 125 = AC^2$$

By the converse of the Baudhāyana–Pythagoras theorem,  $\triangle ABC$  is right-angled at B, and AC is the hypotenuse.

[1]

$$\text{Midpoint of AC} = ((1 + (-4))/2, (2 + 12)/2) = (-3/2, 7).$$

[1]

**Alternative (B)**

$$AB = \sqrt{[(1 + 2)^2 + (0 - 3)^2]} = \sqrt{18} = 3\sqrt{2}, BC = \sqrt{[(4 - 1)^2 + (-3 - 0)^2]} = \sqrt{18} = 3\sqrt{2}, AC = \sqrt{[(4 + 2)^2 + (-3 - 3)^2]} = \sqrt{72} = 6\sqrt{2}.$$

[1]

$AB + BC = 3\sqrt{2} + 3\sqrt{2} = 6\sqrt{2} = AC$ , so A, B and C lie on a straight line.

[1]

$$\text{Midpoint of AC} = ((-2 + 4)/2, (3 - 3)/2) = (1, 0), \text{ which is the point B.}$$

[1]

### Q27 (3 marks) · Ch 2 — Introduction to Linear Polynomials

(i) The fixed fare is ₹40 and the charge is ₹12 per km, so the fare for d km is  $40 + 12d$  rupees. This is a linear polynomial in d.

[1]

(ii) Put  $d = 9$ : fare =  $40 + 12 \times 9 = 40 + 108 = ₹148$ .

[1]

(iii) Let  $40 + 12d = 136$ . Then  $12d = 96$ , so  $d = 8$ . The fare is ₹136 for a ride of 8 km.

[1]

### Q28 (3 marks) · Ch 3 — The World of Numbers

**Proof by contradiction.**

Assume that  $\sqrt{7}$  is rational. Then  $\sqrt{7} = p/q$ , where p and q are co-prime integers and  $q \neq 0$ .

Squaring both sides:  $7 = p^2/q^2$ , so  $p^2 = 7q^2$  ... (1)

[1]

From (1), 7 divides  $p^2$ . Since 7 is a prime number, 7 divides p. So  $p = 7k$  for some integer k.

[1]

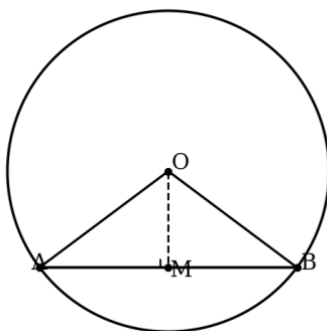
Putting  $p = 7k$  in (1):  $49k^2 = 7q^2$ , so  $q^2 = 7k^2$ . Hence 7 divides  $q^2$  and so 7 divides q.

Thus 7 is a common factor of p and q, which contradicts our assumption that p and q are co-prime.

[1]

So our assumption is wrong. Hence  $\sqrt{7}$  is irrational.

### Q29 (3 marks) · Ch 5 — I'm Up and Down, and Round and Round (Circles)



**Alternative (A)**

Let  $AB = 16$  cm be the chord and let  $OM \perp AB$ , so  $OM = 6$  cm. Join OA.

The perpendicular from the centre to a chord bisects the chord, so  $AM = \frac{1}{2} \times 16 = 8$  cm.

[1]

In right-angled  $\triangle OMA$ :  $OA^2 = OM^2 + AM^2 = 6^2 + 8^2$

[1]

$OA^2 = 36 + 64 = 100$ , so  $OA = 10$  cm. The radius of the circle is 10 cm.

[1]

**Alternative (B)**

Let O be the centre, AB the chord, and  $OM \perp AB$  with  $OM = 12$  cm and  $OA = 13$  cm. The perpendicular from the centre to a chord bisects the chord, so  $AB = 2 \times AM$ .

[1]

In right-angled  $\triangle OMA$ :  $AM^2 = OA^2 - OM^2 = 13^2 - 12^2 = 169 - 144 = 25$ .

[1]

So  $AM = 5$  cm and  $AB = 2 \times 5 = 10$  cm.

[1]

**Q30 (3 marks) · Ch 7 — The Mathematics of Maybe: Probability**

The spinner has 8 equally likely outcomes: 1, 2, 3, 4, 5, 6, 7, 8. Probability = (favourable outcomes)/8.

(i) Even numbers: 2, 4, 6, 8 (4 outcomes).  $P(\text{even}) = 4/8 = 1/2$ .

[1]

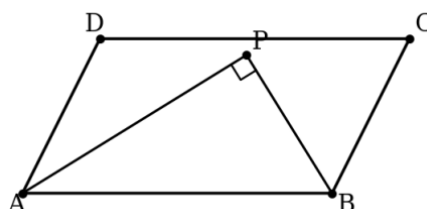
(ii) Prime numbers: 2, 3, 5, 7 (4 outcomes).  $P(\text{prime}) = 4/8 = 1/2$ .

[1]

(iii) Numbers greater than 5: 6, 7, 8 (3 outcomes).  $P(\text{greater than 5}) = 3/8$ .

[1]

**Q31 (3 marks) · Ch 12 — Quadrilaterals**



**Given:** ABCD is a parallelogram. AP and BP are the bisectors of  $\angle A$  and  $\angle B$  and they meet at P.

**To prove:**  $\angle APB = 90^\circ$ .

**Proof:**  $AD \parallel BC$  and  $AB$  is a transversal, so  $\angle A + \angle B = 180^\circ$  (interior angles on the same side of the transversal).

[1]

AP bisects  $\angle A$ , so  $\angle PAB = \frac{1}{2}\angle A$ . BP bisects  $\angle B$ , so  $\angle PBA = \frac{1}{2}\angle B$ .

$\angle PAB + \angle PBA = \frac{1}{2}(\angle A + \angle B) = \frac{1}{2} \times 180^\circ = 90^\circ$

[1]

In  $\triangle APB$ :  $\angle APB = 180^\circ - (\angle PAB + \angle PBA) = 180^\circ - 90^\circ = 90^\circ$ . Hence  $\angle APB = 90^\circ$ .

[1]

**Q32 (5 marks) · Ch 4 — Exploring Algebraic Identities**

**Alternative (A)**

(a)  $16x^2 + 40x + 25$

$16x^2 = (4x)^2$ ,  $25 = 5^2$  and  $40x = 2 \times (4x) \times 5$ , so the expression has the form  $a^2 + 2ab + b^2$  with  $a = 4x$  and  $b = 5$ .

[1]

Hence  $16x^2 + 40x + 25 = (4x + 5)^2 = (4x + 5)(4x + 5)$ .

[1]

(b) We know  $(x + y)^3 = x^3 + y^3 + 3xy(x + y)$ , so  $x^3 + y^3 = (x + y)^3 - 3xy(x + y)$ .

[1]

Putting  $x + y = 7$  and  $xy = 10$ :  $x^3 + y^3 = 7^3 - 3 \times 10 \times 7$

[1]

$= 343 - 210 = 133$

[1]

**Alternative (B)**

(a)  $25p^2 - 20p + 4$

$25p^2 = (5p)^2$ ,  $4 = 2^2$  and  $20p = 2 \times (5p) \times 2$ , so the expression has the form  $a^2 - 2ab + b^2$  with  $a = 5p$  and  $b = 2$ .

[1]

Hence  $25p^2 - 20p + 4 = (5p - 2)^2 = (5p - 2)(5p - 2)$ .

[1]

(b) We know  $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$ , so  $a^3 - b^3 = (a - b)^3 + 3ab(a - b)$ .

[1]

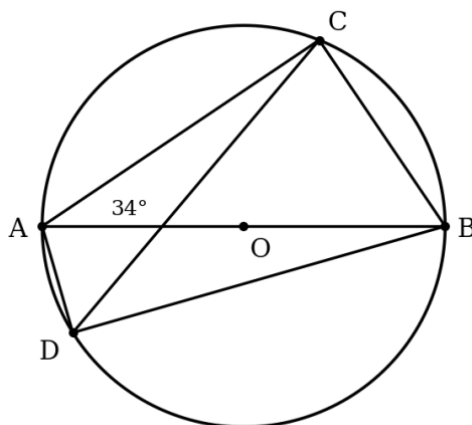
Putting  $a - b = 3$  and  $ab = 10$ :  $a^3 - b^3 = 3^3 + 3 \times 10 \times 3$

[1]

$= 27 + 90 = 117$

[1]

**Q33 (5 marks) · Ch 5 — I'm Up and Down, and Round and Round (Circles)**



(i) AB is a diameter, so  $\angle ACB$  is an angle in a semicircle. Hence  $\angle ACB = 90^\circ$ . [1]

(ii) In  $\triangle ABC$ ,  $\angle CAB + \angle ACB + \angle ABC = 180^\circ$  (angle sum of a triangle).  
 $34^\circ + 90^\circ + \angle ABC = 180^\circ$ , so  $\angle ABC = 56^\circ$ . [1]

(iii)  $\angle ADC$  and  $\angle ABC$  are angles in the same segment (D and B lie on the same side of chord AC), so they are equal.  
 $\angle ADC = \angle ABC = 56^\circ$ . [1]

(iv)  $\angle CDB$  and  $\angle CAB$  are angles in the same segment on chord CB, so  $\angle CDB = \angle CAB = 34^\circ$ . [1]  
 Now  $\angle ADB = \angle ADC + \angle CDB = 56^\circ + 34^\circ = 90^\circ$ .

This agrees with the fact that  $\angle ADB$  is an angle in a semicircle (AB is a diameter), so it must be  $90^\circ$ . Verified. [1]

**Q34 (5 marks) · Ch 6 — Measuring Space: Perimeter and Area**

*Alternative (A)*

(i) Let  $a = 17$  m,  $b = 25$  m and  $c = 26$  m. Semi-perimeter  $s = (17 + 25 + 26)/2 = 34$  m. [1]

Area  $= \sqrt{[s(s-a)(s-b)(s-c)]} = \sqrt{[34 \times 17 \times 9 \times 8]} = \sqrt{41616} = 204$  m<sup>2</sup> [1]

(ii) Area of a triangle  $= \frac{1}{2} \times \text{base} \times \text{height}$ . Take the side of 17 m as the base and let the perpendicular be  $h$ .

$\frac{1}{2} \times 17 \times h = 204$ , so  $h = 408/17 = 24$  m. [1]

(iii) Area of the flower bed  $= \pi r^2 = (22/7) \times 3.5 \times 3.5 = 38.5$  m<sup>2</sup>.

Area covered with grass  $= 204 - 38.5 = 165.5$  m<sup>2</sup> [1]

Cost of grass  $= 165.5 \times 20 = ₹3310$  [1]

*Alternative (B)*

(i) Let  $a = 13$  m,  $b = 20$  m and  $c = 21$  m. Semi-perimeter  $s = (13 + 20 + 21)/2 = 27$  m. [1]

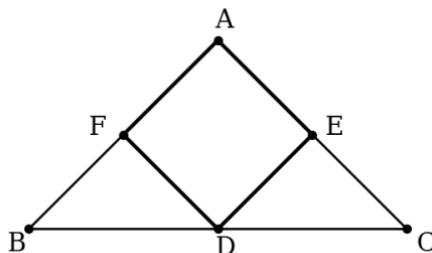
Area  $= \sqrt{[s(s-a)(s-b)(s-c)]} = \sqrt{[27 \times 14 \times 7 \times 6]} = \sqrt{15876} = 126$  m<sup>2</sup> [1]

(ii)  $\frac{1}{2} \times 21 \times h = 126$ , so  $h = 252/21 = 12$  m. [1]

(iii) Area of the pond  $= \pi r^2 = (22/7) \times 3.5 \times 3.5 = 38.5$  m<sup>2</sup>. Area to be turfed  $= 126 - 38.5 = 87.5$  m<sup>2</sup> [1]

Cost of turfing  $= 87.5 \times 30 = ₹2625$  [1]

**Q35 (5 marks) · Ch 12 — Quadrilaterals**



**Given:** In  $\triangle ABC$ , D, E and F are the midpoints of BC, CA and AB respectively.

(i) To prove: AFDE is a parallelogram.

In  $\triangle ABC$ , F and D are the midpoints of AB and BC. By the midpoint theorem,  $FD \parallel AC$ , that is,  $FD \parallel AE$ .

In  $\triangle ABC$ , E and D are the midpoints of CA and BC. By the midpoint theorem,  $ED \parallel AB$ , that is,  $ED \parallel AF$ .

[1]

Both pairs of opposite sides of AFDE are parallel, so AFDE is a parallelogram.

[1]

(ii) F and E are the midpoints of AB and AC, so  $AF = \frac{1}{2}AB$  and  $AE = \frac{1}{2}AC$ . If  $AB = AC$ , then  $AF = AE$ .

A parallelogram with two adjacent sides equal is a rhombus. Hence AFDE is a rhombus.

[1]

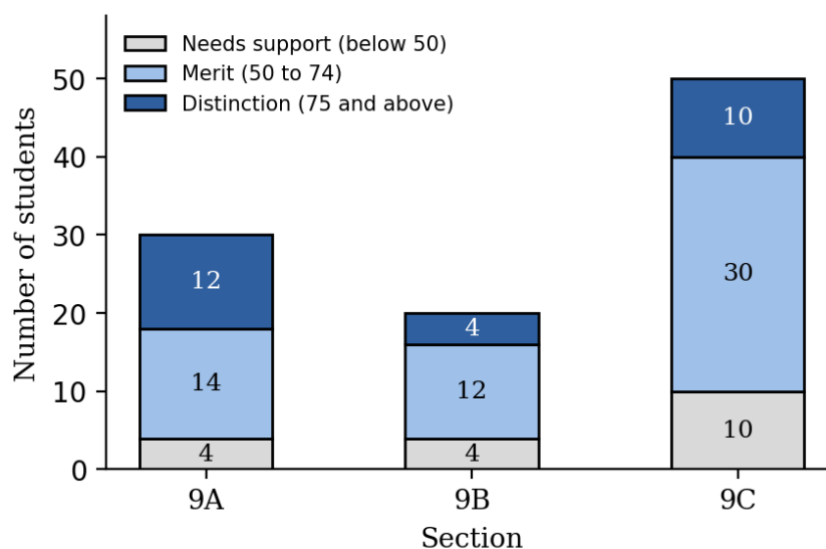
(iii) Let  $AB = AC$  and  $\angle A = 90^\circ$ . Then AFDE is a rhombus, by (ii), and  $\angle FAE = \angle A = 90^\circ$ .

[1]

A rhombus with one right angle has all four angles equal to  $90^\circ$  (adjacent angles are supplementary and opposite angles are equal) and all four sides equal. So AFDE is a square.

[1]

**Q36 (4 marks) · Ch 10 — How Quantities Combine: Understanding Data**



(i) Number of students in section 9C =  $10 + 30 + 10 = 50$ .

[1]

(ii) Section 9A has 12 students in the Distinction band out of 30 students. Percentage =  $(12/30) \times 100 = 40\%$ .

[1]

(iii) The three sections have different numbers of students (30, 20 and 50), so we find the weighted average, counting each section's average according to its number of students.

Overall average =  $(30 \times 72 + 20 \times 60 + 50 \times 66)/(30 + 20 + 50) = (2160 + 1200 + 3300)/100 = 6660/100 = 66.6$

[1]

$(72 + 60 + 66) \div 3 = 66$  gives the same weight to every section, as if each section had the same number of students. The sections have 30, 20 and 50 students, so each average must be counted according to the number of students behind it.

[1]

**Part (iii), alternative (B)**

Percentage in the Distinction band:  $9A = (12/30) \times 100 = 40\%$ ,  $9B = (4/20) \times 100 = 20\%$ ,  $9C = (10/50) \times 100 = 20\%$ . Section 9A has the highest percentage.

[1]

Yes. The sections have different numbers of students (30, 20 and 50), so bars of different heights are hard to compare. A 100% stacked bar chart makes every bar the same height and shows each band as a share of its section, so the percentages can be compared directly.

[1]

**Q37 (4 marks) · Ch 13 — Two Variables, One Line**

Let  $y$  be the fare in rupees for a ride of  $x$  km.

(i) Swift:  $y = 30 + 12x$ , that is,  $12x - y + 30 = 0$ . Rapid:  $y = 10 + 14x$ , that is,  $14x - y + 10 = 0$ .

[1]

(ii) For  $x = 6$ : Swift fare =  $30 + 12 \times 6 = ₹102$  and Rapid fare =  $10 + 14 \times 6 = ₹94$ . Rapid is cheaper by  $102 - 94 = ₹8$ .

[1]

(iii) The fares are equal when  $30 + 12x = 10 + 14x$ . Then  $30 - 10 = 14x - 12x$ , so  $2x = 20$  and  $x = 10$ .

The two fares are equal for a ride of 10 km (each fare is  $30 + 12 \times 10 = ₹150$ ).

[1]

For rides longer than 10 km Swift is cheaper. Reason: Swift's charge per km (₹12) is less than Rapid's (₹14), so beyond 10 km Rapid's fare grows faster and its lower fixed charge no longer makes up for it.

[1]

**Part (iii), alternative (B)**

Zippy:  $y = 15 + 13x$ . Swift:  $y = 30 + 12x$ . The fares are equal when  $15 + 13x = 30 + 12x$ , so  $x = 15$ . The fares are equal for a ride of 15 km (each fare is ₹210).

[1]

For  $x = 5$ : Zippy =  $15 + 13 \times 5 = ₹80$  and Swift =  $30 + 12 \times 5 = ₹90$ , so Zippy is cheaper for a 5 km ride. Reason: for rides shorter than 15 km, Zippy's lower fixed charge (₹15 against ₹30) outweighs its higher rate per km.

[1]

**Q38 (4 marks) · Ch 14 — Math of Space: Surface Area and Volume**

**Given:**  $r = 3.5$  cm,  $h = 12$  cm and  $\pi = 22/7$ .

(i) Slant height  $l = \sqrt{r^2 + h^2} = \sqrt{3.5^2 + 12^2} = \sqrt{12.25 + 144} = \sqrt{156.25} = 12.5$  cm.

[1]

(ii) Volume of the cone =  $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times (22/7) \times 3.5 \times 3.5 \times 12$ . Now  $(22/7) \times 3.5 \times 3.5 \times 12 = 462$ , so volume =  $462/3 = 154$  cm<sup>3</sup>.

[1]

(iii) Curved surface area of the cone =  $\pi r l = (22/7) \times 3.5 \times 12.5 = 137.5$  cm<sup>2</sup>.

[1]

Curved surface area of the hemispherical scoop =  $2\pi r^2 = 2 \times (22/7) \times 3.5 \times 3.5 = 77$  cm<sup>2</sup>. Area of wrapper =  $137.5 + 77 = 214.5$  cm<sup>2</sup>.

[1]

**Part (iii), alternative (B)**

Volume of the tub =  $\pi r^2 h = (22/7) \times 7 \times 7 \times 10 = 1540$  cm<sup>3</sup>.

[1]

Volume of ice cream in one cone = 154 cm<sup>3</sup>, from (ii). Number of cones =  $1540 \div 154 = 10$ .

Twelve cones would need  $12 \times 154 = 1848$  cm<sup>3</sup>, which is more than 1540 cm<sup>3</sup>. So the tub fills only 10 cones and the owner is not correct.

[1]

— End —