INFINITY THINK BEYOND...........

AN EDUCATIONAL INSTITUTE

Practice Paper – Five (Set 5) — ANSWER KEY

Step-by-Step Solutions by Deepika Bhati

Class: IX Subject: Mathematics Syllabus: NCERT Ganita Manjari, Part 1

Maximum Marks: 80

Q. No.	Step-by-Step Solution	Marks
	SECTION – A (Objective Type — Q1 to Q20, 1 mark each)	**Marks**
1	Distance from the x-axis $= \|y\| = \|3\| = 3$. **Answer:** (b) 3	1
2	$x + y = 3 + 2 = 5$ and $u + v = -9 + 13 = 4$. The point $(5, 4)$ has both coordinates positive, so it lies in Quadrant I. **Answer:** (a) Ist	1
3	Reflection in the x-axis sends $(0, 5) \to (0, -5)$. **Answer:** (a) x-axis	1
4	The highest power of y in $y^3 - 2y - 6$ is 3. A degree-3 polynomial is called cubic. **Answer:** (a) cubic	1
5	$\sqrt{7} \approx 2.646$ is irrational and lies between 2 and 3.5. $\sqrt{22.5} \approx 4.74$ and $\sqrt{15.5} \approx 3.94$ both lie outside this range, and 2 is not irrational. **Answer:** (a) $\sqrt{7}$	1
6	Between any two distinct rationals there are infinitely many rationals. **Answer:** (a) infinitely many	1
7	$\sqrt{2}$ is irrational since 2 is not a perfect square. $\sqrt{4} = 2,\ \sqrt{9} = 3,\ \sqrt{25} = 5$ are all rational. **Answer:** (a) $\sqrt{2}$	1
8	By Brahmagupta's rule, fortune (positive) $\times$ fortune (positive) $=$ fortune. $12 \times 5 = 60$, a fortune. **Answer:** (a) 60 (fortune)	1
9	$(25x^2 - 1) + (1 + 5x)^2 = 25x^2 - 1 + 1 + 10x + 25x^2 = 50x^2 + 10x$. $= 10x(5x + 1)$, so $10x$ is a factor. **Answer:** (d) $10x$	1

Q. No.	Step-by-Step Solution	Marks
10	$(x^2-5)(7+3x^2) = 7x^2+3x^4-35-15x^2 = 3x^4-8x^2-35$. Coefficient of x^2 is -8. **Answer:** (c) -8	1
11	$\frac{x}{y}+\frac{y}{x} = -1 \Rightarrow x^2+y^2 = -xy \Rightarrow x^2+xy+y^2 = 0$. $x^3-y^3 = (x-y)(x^2+xy+y^2) = (x-y)(0) = 0$. **Answer:** (a) 0	1
12	Perimeter = (half the circumference) + diameter = $\pi r + 2r = 22+14 = 36$ cm. **Answer:** (c) 36 cm	1
13	$9x^2-16 = (3x)^2-4^2 = (3x-4)(3x+4)$ (difference of squares). **Answer:** (a) $(3x+4)$ and $(3x-4)$	1
14	$2\pi r = 132 \Rightarrow r = \frac{132\times 7}{2\times 22} = \frac{924}{44} = 21$ m. **Answer:** (a) 21 m	1
15	The angle at any point on the major arc is half the central angle for the same arc. $= \frac{70^\circ}{2} = 35^\circ$. **Answer:** (a) 35°	1
16	Probability must always lie between 0 and 1 (inclusive). -1.5 is negative, so it cannot be a probability. **Answer:** (d) -1.5	1
17	5th term $= \frac{\text{8th term}}{r^3} = \frac{192}{2^3} = \frac{192}{8} = 24$. **Answer:** (a) 24	1
18	For an AP, twice the middle term equals the sum of the outer terms: $2(6m-2) = (8m+4)+(2m+7)$. $12m-4 = 10m+11 \Rightarrow 2m = 15 \Rightarrow m = \frac{15}{2}$. **Answer:** (a) $\frac{15}{2}$	1
19	$\sqrt{9} = 3$, a rational number — Assertion (A) is true. But $\sqrt{9} = 3$ is itself a counter-example to Reason (R): not every square root of a positive integer is irrational. So (R) is false. **Answer:** (c)	1
20	A point on the x-axis is equidistant from every point of a circle centred at the origin only if that point IS the origin itself — in general this is false, so Assertion (A) is false. Every point on a circle is, by definition, equidistant from its centre — Reason (R) is true. **Answer:** (d)	1

Q. No.	Step-by-Step Solution	Marks
SECTION – B (Very Short Answer — Q21 to Q25, 2 marks each)		**Marks**
21	By the mid-point formula: $k = \frac{-2+6}{2} = \frac{4}{2} = 2$. **Answer:** $k = 2$	2
22	$p(x) = 50x + 200$ is linear, so its degree is 1. $p(3) = 50(3) + 200 = 150 + 200 = 350$. **Answer:** Degree 1; $p(3) = \text{Rs.}\,350$	2
23	(i) $\sqrt{2}$ and $-\sqrt{2}$ are both irrational, and their sum $\sqrt{2} + (-\sqrt{2}) = 0$ is rational. (ii) $\sqrt{2}$ and $\sqrt{3}$ are both irrational, and their product $\sqrt{2} \times \sqrt{3} = \sqrt{6}$ is irrational. **Answer:** Sum: $\sqrt{2}, -\sqrt{2}$; Product: $\sqrt{2}, \sqrt{3}$ (many other answers possible) **OR** 2.1452 and 2.1453 differ in the 4th decimal place, so insert numbers with a 5th decimal digit. E.g. 2.14521, 2.14522, 2.14523, 2.14524. **Answer:** 2.14521, 2.14522, 2.14523, 2.14524	2
24	Check: is $49x^2 + 36y^2 - 84xy = (7x - 6y)^2$? $(7x - 6y)^2 = 49x^2 - 84xy + 36y^2$ — yes, matches exactly. **Answer:** $(7x - 6y)^2$	2
25	$\angle BDC$ and $\angle BAC$ both stand on the same arc BC, on the same side. Angles in the same segment are equal, so $\angle BAC = \angle BDC = 72°$. **Answer:** $\angle BAC = 72°$	2
SECTION – C (Short Answer — Q26 to Q31, 3 marks each)		**Marks**

Q. No.	Step-by-Step Solution	Marks
26	$AB = \sqrt{(7-(-2))^2 + (10-5)^2} = \sqrt{81+25} = \sqrt{106}$. $BC = \sqrt{(-2-3)^2 + (5-(-4))^2} = \sqrt{25+81} = \sqrt{106}$. $AC = \sqrt{(7-3)^2 + (10-(-4))^2} = \sqrt{16+196} = \sqrt{212}$. Since $AB = BC$, the triangle is isosceles. $AB^2 + BC^2 = 106 + 106 = 212 = AC^2$, so $\angle B = 90°$ (converse of Pythagoras). Hence $\triangle ABC$ is an isosceles right triangle. **Answer:** Isosceles right triangle, right angle at B. **OR** $AB^2 = (5-2)^2 + (2-(-2))^2 = 9 + 16 = 25$. $BC^2 = (2-(-2))^2 + (-2-t)^2 = 16 + (t+2)^2$. $AC^2 = (5-(-2))^2 + (2-t)^2 = 49 + (2-t)^2$. Since $\angle B = 90°$: $AB^2 + BC^2 = AC^2$. $25 + 16 + (t+2)^2 = 49 + (2-t)^2$. $t^2 + 4t + 45 = t^2 - 4t + 53$. $8t = 8 \Rightarrow t = 1$. **Answer:** $t = 1$	3
27	$AB = \sqrt{(3-6)^2 + (5-0)^2} = \sqrt{9+25} = \sqrt{34}$. $BC = \sqrt{(6-1)^2 + (0-(-3))^2} = \sqrt{25+9} = \sqrt{34}$. $CD = \sqrt{(1-(-2))^2 + (-3-2)^2} = \sqrt{9+25} = \sqrt{34}$. $DA = \sqrt{(-2-3)^2 + (2-5)^2} = \sqrt{25+9} = \sqrt{34}$. All four sides are equal. $AC = \sqrt{(3-1)^2 + (5-(-3))^2} = \sqrt{4+64} = \sqrt{68}$, and $BD = \sqrt{(6-(-2))^2 + (0-2)^2} = \sqrt{64+4} = \sqrt{68}$. Both diagonals are equal too, so $ABCD$ is a square. **Answer:** $ABCD$ is a square (all sides $= \sqrt{34}$, both diagonals $= \sqrt{68}$).	3
28	$y = 30(12) + 500 = 360 + 500 = 860$. **Answer:** Rs. 860 **OR** Total amount $= 200 + 50x$ (for x matches). For $x = 12$: $200 + 50(12) = 200 + 600 = 800$. **Answer:** $p(x) = 200 + 50x$; Rs. 800 for 12 matches	3

Q. No.	Step-by-Step Solution	Marks
29	Perimeter $= 2[(x+5)+(x+2)] = 2(2x+7) = 4x+14$. Area $= (x+5)(x+2) = x^2+7x+10$. At $x=5$: Area $= 25+35+10 = 70$. **Answer:** Perimeter $= 4x+14$; Area $= x^2+7x+10$; at $x=5$, Area $= 70$ sq. units	3
30	In 35 minutes, the minute hand sweeps $\frac{35}{60} \times 360^\circ = 210^\circ$. Area $= \frac{210}{360} \times \frac{22}{7} \times 12^2 = \frac{7}{12} \times \frac{22}{7} \times 144 = 264 \text{ cm}^2$. **Answer:** 264 cm^2 **OR** Area of $\triangle LMN = \frac{\sqrt{3}}{4}(14)^2 = 49\sqrt{3} \approx 84.77 \text{ cm}^2$. Each of the 3 sectors at the vertices has angle 60° (equilateral triangle) and radius 7 cm. Total sector area $= 3 \times \frac{60}{360} \times \frac{22}{7} \times 49 = 3 \times \frac{11 \times 7}{6} = 77 \text{ cm}^2$. Shaded area $= 49\sqrt{3} - 77 \approx 84.77 - 77 = 7.77 \text{ cm}^2$. **Answer:** $\approx 7.77 \text{ cm}^2$	3
31	Two-digit multiples of 4: from 12 to 96. Count $= \frac{96-12}{4} + 1 = 22$. $P = \frac{22}{90} = \frac{11}{45}$ (there are 90 two-digit numbers in total). **Answer:** 22 numbers; $P = \frac{11}{45}$	3
	SECTION – D (Long Answer — Q32 to Q35, 5 marks each)	**Marks**
32	Using $A^3 - B^3 = (A-B)(A^2+AB+B^2)$ with $A = 2x-5y,\ B = 2x+5y$: $A - B = -10y$. $A^2+AB+B^2 = (4x^2-20xy+25y^2)+(4x^2-25y^2)+(4x^2+20xy+25y^2) = 12x^2+25y^2$. Product $= -10y(12x^2+25y^2) = -120x^2y - 250y^3$. **Answer:** $-120x^2y - 250y^3$ **OR** Let the number be n: $n + \frac{1}{n} = \frac{10}{3}$. $3n^2 - 10n + 3 = 0 \Rightarrow (3n-1)(n-3) = 0$. $n = 3$ or $n = \frac{1}{3}$. **Answer:** $n = 3$ or $\frac{1}{3}$	5

Q. No.	Step-by-Step Solution	Marks
33	Let O_1, O_2 be the centres, $O_1O_2 = 15$ cm. Let the common chord meet O_1O_2 at M, with $O_1M = x$. The line joining the centres is the perpendicular bisector of the common chord — proved using congruent triangles ($\triangle O_1PO_2 \cong \triangle O_1QO_2$ by SSS, giving equal angles and hence perpendicularity/bisection). Half-chord^2: $13^2 - x^2 = 10^2 - (15-x)^2$. $169 - x^2 = 100 - 225 + 30x - x^2 \Rightarrow 169 = -125 + 30x \Rightarrow x = \dfrac{294}{30} = 9.8$. Half-chord $= \sqrt{169 - 9.8^2} = \sqrt{72.96} = \dfrac{4\sqrt{114}}{5}$. Common chord $= \dfrac{8\sqrt{114}}{5} \approx 17.08$ cm. **Answer:** Common chord $= \dfrac{8\sqrt{114}}{5} \approx 17.08$ cm **OR** The angle in a semicircle is always 90° (standard theorem, proved using the exterior angle property of the two isosceles triangles OAC and OBC) — so $\angle ACB = 90°$. In $\triangle ABC$: $\angle BAC = 180° - 90° - 35° = 55°$. **Answer:** $\angle ACB = 90°$, $\angle BAC = 55°$	5
34	At the corner of the rectangle, the cow can graze a sector of angle $360° - 90° = 270°$ (i.e. $\frac{3}{4}$ of a full circle), radius 14 m. Since the rope (14 m) is shorter than both adjacent sides (30 m, 20 m), no extra wrap-around area is gained at the far corners. Grazing area $= \dfrac{3}{4} \times \dfrac{22}{7} \times 14^2 = \dfrac{3}{4} \times 616 = 462$ m^2. **Answer:** 462 m^2 **OR** Let the sides be $2k, 3k, 4k$: $2k + 3k + 4k = 54 \Rightarrow 9k = 54 \Rightarrow k = 6$. Sides: $12, 18, 24$ cm; $s = 27$. Area $= \sqrt{27 \times 15 \times 9 \times 3} = \sqrt{10935} = 27\sqrt{15} \approx 104.6$ cm^2. **Answer:** ≈ 104.6 cm^2	5

Q. No.	Step-by-Step Solution	Marks
35	(i) Over 50, Train $= 180$ out of 2000: $P = \dfrac{180}{2000} = \dfrac{9}{100}$. (ii) Under 30 total $= 150 + 250 + 300 + 100 = 800$; excluding Private Car (150): 650. $P = \dfrac{650}{2000} = \dfrac{13}{40}$. (iii) 30–50, Train or Bus $= 200 + 100 = 300$: $P = \dfrac{300}{2000} = \dfrac{3}{20}$. **Answer:** (i) $\dfrac{9}{100}$ (ii) $\dfrac{13}{40}$ (iii) $\dfrac{3}{20}$ **OR** Over 50, Aeroplane or Private Car $= 20 + 100 = 120$. $P = \dfrac{120}{2000} = \dfrac{3}{50}$. **Answer:** $\dfrac{3}{50}$	5
	SECTION – E (Case-Study Based — Q36 to Q38, 4 marks each)	**Marks**
36	(i) $AB = \sqrt{(-2-4)^2 + (3-3)^2} = \sqrt{36} = 6$ units. **Answer:** $AB = 6$ units (ii) $0.101001000100001\ldots$ never terminates and never settles into a repeating block. So it is a non-terminating, non-repeating decimal — irrational. **Answer:** Irrational (iii) $\sqrt{2} \approx 1.414$ and $\sqrt{11} \approx 3.317$. An irrational number between them: e.g. $\sqrt{5} \approx 2.236$. **Answer:** $\sqrt{5}$ (many other answers possible) **OR** $\dfrac{7}{5} = 1.4$ and $\dfrac{17}{35} \approx 0.486$; note $\dfrac{17}{35} < \dfrac{7}{5}$. Six rationals in between: 0.6, 0.7, 0.8, 0.9, 1.0, 1.1. **Answer:** $0.6, 0.7, 0.8, 0.9, 1.0, 1.1$ (many other answers possible)	4

Q. No.	Step-by-Step Solution	Marks
37	(i) 4th day $= 50 \times 2^3 = 50 \times 8 = 400$. **Answer:** 400 views (ii) Views double each day — a constant ratio, so this is a GP (common ratio 2). **Answer:** GP, common ratio 2 (iii) $50 \times 2^{n-1} = 1600 \Rightarrow 2^{n-1} = 32 = 2^5 \Rightarrow n - 1 = 5 \Rightarrow n = 6$. **Answer:** Day 6 **OR** 6th day $= 50 \times 2^5 = 1600$; 9th day $= 50 \times 2^8 = 12800$. Increase $= 12800 - 1600 = 11200$. Ratio $= \dfrac{12800}{1600} = 8$ times. **Answer:** Increase $= 11200$ views; 9th day is 8 times the 6th day	4
38	(i) After 6 years: $750 + 6 \times 50 = 750 + 300 = 1050$. **Answer:** 1050 (ii) The population increases by a constant 50 each year, so this is an AP — this constant year-on-year addition is exactly what "linear growth" means. **Answer:** AP; linear growth (constant addition per year) (iii) $P = 750 + 50t$; table: $t = 0{:}750,\ 1{:}800,\ 2{:}850,\ 3{:}900,\ 4{:}950,\ 5{:}1000$. **Answer:** $P = 750 + 50t$ **OR** $750 + 50t > 1200 \Rightarrow 50t > 450 \Rightarrow t > 9$. So after $t = 10$ years, the population first exceeds 1200. **Answer:** After 10 years	4

Answer Key By Deepika Bhati

Teaching Maths Passionately Since 2009

Infinity Think Beyond – An Educational Institute, New Delhi