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Practice Paper – Four (Set 4) — 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	In Quadrant IV, the abscissa (x) is positive and the ordinate (y) is negative. **Answer:** (d) $(+, -)$	1
2	The highest power of x in $2x + 5$ is 1. **Answer:** (a) 1	1
3	$(2x^2 - 5)(5 + 4x^2) = 10x^2 + 8x^4 - 25 - 20x^2 = 8x^4 - 10x^2 - 25$. The coefficient of x^2 is -10. **Answer:** (a) -10	1
4	$3\sqrt{7}$ and 2 are both constants (no variable x appears). So $p(x)$ is a constant polynomial. **Answer:** (a) 0	1
5	0 is a whole number but not a natural number, so "every whole number is a natural number" is false. **Answer:** (a) Every whole number is a natural number.	1
6	Between any two rationals there always exist infinitely many rationals (density property). **Answer:** (b) infinite rational numbers	1
7	$\sqrt{3} \approx 1.732$, which lies between 1 and 2. **Answer:** (a) between 1 and 2	1
8	$99 = 100 - 1$, so $(99)^2 = (100 - 1)^2$ uses the identity $(a - b)^2$. **Answer:** (b) $(a - b)^2$	1
9	$(x + 2)(x + 3) = x^2 + 5x + 6$. Comparing with $x^2 + kx + 6$: $k = 5$. **Answer:** (a) 5	1
10	$(a + b)^2 - 4ab = a^2 + 2ab + b^2 - 4ab = a^2 - 2ab + b^2 = (a - b)^2$. **Answer:** (c) $(a - b)^2$	1
11	The identity $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$ can be rearranged as $a^3 - b^3 - 3ab(a - b)$. **Answer:** (b) $(a - b)^3$	1

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12	The line from the centre to the mid-point of a chord is always perpendicular to the chord (converse of: perpendicular from centre bisects chord). **Answer:** (b) perpendicular to the chord	1
13	Exactly one circle (the circumcircle) passes through all three vertices of a triangle. **Answer:** (d) 1	1
14	Each wiper sweeps a semicircle of radius 7 cm: area $= \frac{1}{2}\pi r^2$. Two wipers, no overlap: total $= \pi r^2 = \frac{22}{7} \times 49 = 154$ cm^2. **Answer:** (b) 154 cm^2	1
15	For a $3:4:5$ triangle, whichever side is given as the "leg," the ratio of the longest side to the perimeter is always $\frac{5}{3+4+5} = \frac{5}{12}$ (scale-invariant). **Answer:** (a) $\frac{5}{12}$	1
16	Face cards: 4 each of J, Q, K $= 12$ cards out of 52. $P = \frac{12}{52} = \frac{3}{13}$. **Answer:** (a) $\frac{3}{13}$	1
17	Multiples of 5 from 1 to 100: $5, 10, \ldots, 100$ — that is 20 numbers. $P = \frac{20}{100} = \frac{1}{5}$. **Answer:** (a) $\frac{1}{5}$	1
18	Sum of first n natural numbers $= \frac{n(n+1)}{2} = \frac{67 \times 68}{2} = 67 \times 34 = 2278$. **Answer:** (a) 2278	1
19	$2 + \sqrt{6}$ is irrational since $\sqrt{6}$ is irrational — Assertion (A) is true. A rational number plus an irrational number is always irrational — Reason (R) is true and correctly explains (A). **Answer:** (a)	1
20	This is a standard, true theorem about intersecting circles — Assertion (A) is true. The perpendicular-bisects-chord property is the key fact used in proving (A) — Reason (R) correctly explains (A). **Answer:** (a)	1
SECTION – B (Very Short Answer — Q21 to Q25, 2 marks each)		**Marks**
21	Reflection of $P(7, -2)$ in the x-axis: $M = (7, 2)$. Reflection of $M(7, 2)$ in the y-axis: $N = (-7, 2)$. **Answer:** $M = (7, 2),\ N = (-7, 2)$	2

Q. No.	Step-by-Step Solution	Marks
22	$E(d) = 850 + 18d$. $E(50) = 850 + 18(50) = 850 + 900 = 1750$. **Answer:** $E(d) = 850 + 18d$; earnings for 50 parcels $= \text{Rs. } 1750$	2
23	Let the number be n: $\frac{5}{2}n + \frac{2}{3} = -\frac{7}{12}$. $\frac{5}{2}n = -\frac{7}{12} - \frac{8}{12} = -\frac{15}{12}$. $n = -\frac{15}{12} \times \frac{2}{5} = -\frac{1}{2}$. **Answer:** $n = -\frac{1}{2}$ **OR** $\frac{5}{3}n + \frac{2}{3} = -\frac{7}{12}$. $\frac{5}{3}n = -\frac{7}{12} - \frac{8}{12} = -\frac{15}{12}$. $n = -\frac{15}{12} \times \frac{3}{5} = -\frac{3}{4}$. **Answer:** $n = -\frac{3}{4}$	2
24	$a^2 + b^2 = (a-b)^2 + 2ab = 7^2 + 2(9) = 49 + 18 = 67$. **Answer:** 67	2
25	$ABCD$ is cyclic, so opposite angles sum to $180°$. $\angle B = 180° - 100° = 80°$. **Answer:** $\angle B = 80°$	2
SECTION – C (Short Answer — Q26 to Q31, 3 marks each)		**Marks**

Q. No.	Step-by-Step Solution	Marks
26	$AB = \sqrt{(3-6)^2 + (5-0)^2} = \sqrt{9+25} = \sqrt{34}$. $BC = \sqrt{(6-1)^2 + (0-(-3))^2} = \sqrt{25+9} = \sqrt{34}$. $CD = \sqrt{(1-(-2))^2 + (-3-2)^2} = \sqrt{9+25} = \sqrt{34}$. $DA = \sqrt{(-2-3)^2 + (2-5)^2} = \sqrt{25+9} = \sqrt{34}$. 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 $= \sqrt{68}$). **OR** $AB = \sqrt{(2-(-1))^2 + (1-2)^2} = \sqrt{9+1} = \sqrt{10}$. $BC = \sqrt{(-1-(-2))^2 + (2-(-1))^2} = \sqrt{1+9} = \sqrt{10}$. Similarly $CD = DA = \sqrt{10}$, so all four sides are equal. $AC = \sqrt{(2-(-2))^2 + (1-(-1))^2} = \sqrt{16+4} = \sqrt{20} = 2\sqrt{5}$. Since $AC^2 = 20 = 2 \times 10 = 2 \times (\text{side})^2$, the diagonal-side relation of a square holds, so $ABCD$ is a square. **Answer:** Yes, $ABCD$ is a square; $AC = 2\sqrt{5}$ units.	3
27	$PR = \sqrt{(2-4)^2 + (-2-8)^2} = \sqrt{4+100} = \sqrt{104}$. $\sqrt{104} = 2\sqrt{26}$. **Answer:** $PR = 2\sqrt{26}$ units	3
28	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 **OR** (i) $y = 20(18) + 150 = 360 + 150 = 510$. (ii) $y = 20(25) + 150 = 500 + 150 = 650$. (iii) Comparing with $y = mx + c$: slope $= 20$, constant $= 150$. **Answer:** Rs. 510; Rs. 650; slope $= 20$, constant $= 150$	3
29	Zero of $P(x)$: $40x - 120 = 0 \Rightarrow x = 3$. This means the profit is zero when 3 metres of cloth A are sold (the break-even point). **Answer:** $x = 3$ metres (break-even point)	3

Q. No.	Step-by-Step Solution	Marks
30	Area of trapezium $= \frac{1}{2}(12+20)(8) = \frac{1}{2}(32)(8) = 128$ m^2. **Answer:** 128 m^2 **OR** Each semicircular arc has diameter $= 12$ cm, radius 6 cm. Perimeter of one arc $= \pi r = \frac{22}{7} \times 6 = \frac{132}{7}$ cm. Three such arcs: total $= 3 \times \frac{132}{7} = \frac{396}{7} \approx 56.57$ cm. **Answer:** ≈ 56.57 cm	3
31	Total $= 3+4+5 = 12$. (i) $P(\text{red}) = \frac{4}{12} = \frac{1}{3}$. (ii) $P(\text{not black}) = 1 - \frac{5}{12} = \frac{7}{12}$. **Answer:** (i) $\frac{1}{3}$ (ii) $\frac{7}{12}$	3
SECTION – D (Long Answer — Q32 to Q35, 5 marks each)		**Marks**
32	Try $(6x+5y-7z)^2$: $= 36x^2+25y^2+49z^2+2(6x)(5y)+2(5y)(-7z)+2(6x)(-7z)$ $= 36x^2+25y^2+49z^2+60xy-70yz-84xz$ — matches exactly. **Answer:** $(6x+5y-7z)^2$ **OR** $\left(x-\frac{1}{2}y+\frac{1}{3}z\right)^2 = x^2+\frac{1}{4}y^2+\frac{1}{9}z^2-xy+\frac{2}{3}xz-\frac{1}{3}yz.$ **Answer:** $x^2+\frac{y^2}{4}+\frac{z^2}{9}-xy-\frac{yz}{3}+\frac{2xz}{3}$	5
33	Opposite angles of a cyclic quadrilateral sum to 180°: $(2x+10)+(3x-20) = 180$. $5x-10 = 180 \Rightarrow 5x = 190 \Rightarrow x = 38$. $\angle P = 2(38)+10 = 86°$; $\angle R = 3(38)-20 = 94°$. **Answer:** $x = 38$; $\angle P = 86°$, $\angle R = 94°$ **OR** Distance of each chord from centre $= \sqrt{7.5^2-4.5^2} = 6$ cm (as before). If the chords lie on opposite sides of the centre, the shortest distance between them $= 6+6 = 12$ cm. **Answer:** 12 cm	5

Q. No.	Step-by-Step Solution	Marks
34	Rectangle area $= 30 \times 28 = 840$ m^2. Semicircle (diameter 28 m, radius 14 m) area $= \frac{1}{2} \times \frac{22}{7} \times 14^2 = 308$ m^2. Total area $= 840 + 308 = 1148$ m^2. Perimeter: two lengths (30 each) + one width (28, the other replaced by the semicircular arc). Arc length $= \pi r = \frac{22}{7} \times 14 = 44$ m. Perimeter $= 30 + 30 + 28 + 44 = 132$ m. **Answer:** Area $= 1148$ m^2; Perimeter $= 132$ m **OR** Let the sides be $3k, 5k, 7k$: $3k + 5k + 7k = 300 \Rightarrow 15k = 300 \Rightarrow k = 20$. Sides: $60, 100, 140$ m; $s = 150$. Area $= \sqrt{150 \times 90 \times 50 \times 10} = \sqrt{6750000} = 1500\sqrt{3} \approx 2598.1$ m^2. **Answer:** ≈ 2598.1 m^2	5
35	(i) $b(x) = 990 - 15x$; as x increases, $b(x)$ decreases at a constant rate, so this represents linear decay. (ii) Balance $= 0$: $990 - 15x = 0 \Rightarrow x = 66$ days. (iii) $b(1)$=975, $b(2)$=960, $b(3)$=945, $b(4)$=930, $b(5)$=915. All five values exceed Rs. 900, so the probability (out of these 5 equally-likely days) is $\frac{5}{5} = 1$. **Answer:** Runs out after 66 days; probability exceeding Rs. 900 over days 1–5 is 1 **OR** (i) $P(\text{boundary}) = \frac{15}{25} = \frac{3}{5}$. (ii) $P(\text{no boundary}) = 1 - \frac{3}{5} = \frac{2}{5}$. (iii) Expected boundaries in 40 deliveries $= 40 \times \frac{3}{5} = 24$. **Answer:** (i) $\frac{3}{5}$ (ii) $\frac{2}{5}$ (iii) 24 boundaries	5
SECTION – E (Case-Study Based — Q36 to Q38, 4 marks each)		**Marks**

Q. No.	Step-by-Step Solution	Marks
36	(i) The side of a square of area 5 m^2 is $\sqrt{5}$ m, which is irrational (since 5 is not a perfect square). **Answer:** Irrational (side = $\sqrt{5}$ m) (ii) $\sqrt{5}$ cannot be written as $\frac{p}{q}$, so it is irrational. **Answer:** $\sqrt{5}$ m (iii) Let $x = 0.454545\ldots$, so $100x = 45.4545\ldots$ $100x - x = 45 \Rightarrow 99x = 45 \Rightarrow x = \frac{45}{99} = \frac{5}{11}$. **Answer:** $0.\overline{45} = \frac{5}{11}$ **OR** $\frac{2}{11} \approx 0.182$ and $\frac{3}{11} \approx 0.273$. Three rationals in between: 0.2, 0.22, 0.25. **Answer:** 0.2, 0.22, 0.25 (many other answers possible)	4
37	(i) 5th section = $150 + (5-1) \times 20 = 150 + 80 = 230$. **Answer:** 230 saplings (ii) The number of saplings increases by a constant 20 each section, so this is an AP (common difference 20). **Answer:** AP, common difference 20 (iii) $150 + (n-1)(20) = 690 \Rightarrow (n-1)(20) = 540 \Rightarrow n - 1 = 27 \Rightarrow n = 28$. **Answer:** Section 28 **OR** $S_{10} = \frac{10}{2}\big[2(150) + 9(20)\big] = 5(300 + 180) = 5(480) = 2400$. **Answer:** 2400 saplings	4

Q. No.	Step-by-Step Solution	Marks
38	(i) 18th week $= 150 + (18-1) \times 25 = 150 + 425 = 575$. **Answer:** Rs. 575 (ii) Savings increase by a constant Rs. 25 each week, so this is an AP (common difference 25). **Answer:** AP, common difference 25 (iii) $150 + (n-1)(25) = 500 \Rightarrow (n-1)(25) = 350 \Rightarrow n - 1 = 14 \Rightarrow n = 15$. **Answer:** Week 15 **OR** 25th week $= 150 + 24(25) = 750$; 10th week $= 150 + 9(25) = 375$. Difference $= 750 - 375 = 375$. Together $= 750 + 375 = 1125$. **Answer:** Difference = Rs. 375; together = Rs. 1125	4

Answer Key By Deepika Bhati
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