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Practice Paper – Three (Set 3) — 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	Any point with y-coordinate 0 lies on the x-axis. $(-7, 0)$ has $y = 0$. **Answer:** (b) x-axis	1
2	In Quadrant II, $x < 0$ and $y > 0$. Equidistant from both axes means $\lvert x\rvert = \lvert y\rvert$. Only $(-4, 4)$ satisfies both conditions. **Answer:** (c) $(-4, 4)$	1
3	$5(1) - 4(1)^2 + 3 = 5 - 4 + 3 = 4$. **Answer:** (a) 4	1
4	$(0, -7)$ has x-coordinate 0, so it lies on the y-axis. **Answer:** (b) the y-axis	1
5	$p(-2) = 7 - 3(-2) + 2(-2)^2 = 7 + 6 + 8 = 21$. **Answer:** (c) 21	1
6	We want $\frac{1}{3} \times k$ to terminate after 1 decimal place, i.e. equal $\frac{n}{10}$. $k = \frac{3}{10}$ gives $\frac{1}{3} \times \frac{3}{10} = \frac{1}{10} = 0.1$. **Answer:** (a) $\frac{3}{10}$	1
7	A rational number's decimal expansion is always either terminating or non-terminating repeating — never non-repeating. **Answer:** (a) non-terminating and non-repeating	1
8	$\sqrt{23}$ is irrational since 23 is not a perfect square. $\sqrt{225} = 15$, and 0.3796, 7.478 are terminating decimals — all rational. **Answer:** (a) $\sqrt{23}$	1
9	$\sqrt{12} \times \sqrt{8} = \sqrt{96} = \sqrt{16 \times 6} = 4\sqrt{6}$. **Answer:** (a) $4\sqrt{6}$	1

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10	$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$. **Answer:** (b) $a^3 - 3a^2b + 3ab^2 - b^3$	1
11	Let $A = x - 2y,\ B = 2y - 3z,\ C = 3z - x$. Then $A + B + C = 0$. When $A + B + C = 0$: $A^3 + B^3 + C^3 = 3ABC$. **Answer:** (a) $3(x-2y)(2y-3z)(3z-x)$	1
12	Both diameters have the same length ($= 2r$), so the diagonals of the quadrilateral are equal. The diagonals also bisect each other (both pass through the centre) and are perpendicular (given). Equal, perpendicular, bisecting diagonals $\Rightarrow$ the quadrilateral is a square. **Answer:** (a) square	1
13	This is the angle in a semicircle, which is always a right angle. **Answer:** (a) a right angle	1
14	This is a standard circle theorem: equal chords subtend equal angles at the centre. **Answer:** (b) equal angles at the centre	1
15	Area of equilateral triangle $= \frac{\sqrt{3}}{4} \times (\text{side})^2 = \frac{\sqrt{3}}{4} \times 16 = 4\sqrt{3}$ cm^2. **Answer:** (a) $4\sqrt{3}$ cm^2	1
16	Total balls $= 3 + 2 = 5$; blue balls $= 2$. $P = \frac{2}{5}$. **Answer:** (a) $\frac{2}{5}$	1
17	88 km $= 88000$ m over 25000 rotations. Distance per rotation $= \frac{88000}{25000} = 3.52$ m. **Answer:** (a) 3.52 m	1
18	Each term is $\frac{1}{3}$ of the previous term — a constant ratio, so this is a GP with common ratio $\frac{1}{3}$. **Answer:** (a) a GP with ratio $\frac{1}{3}$	1
19	$(2+\sqrt{3}) + (4+\sqrt{3}) = 6 + 2\sqrt{3}$, which is irrational since $\sqrt{3}$ is irrational — Assertion (A) is true. But the sum of two irrationals is not always irrational — e.g. $(2+\sqrt{3}) + (2-\sqrt{3}) = 4$, a rational number. So Reason (R) is false. **Answer:** (c)	1

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20	Equal chords of a circle are indeed equidistant from the centre — Assertion (A) is true. Equal chords subtending equal angles at the centre is the standard fact used to prove (A) via congruent triangles — Reason (R) correctly explains (A). **Answer:** (a)	1
SECTION – B (Very Short Answer — Q21 to Q25, 2 marks each)		**Marks**
21	By the mid-point formula: $a = \dfrac{-6+(-2)}{2} = \dfrac{-8}{2} = -4.$ **Answer:** $a = -4$	2
22	$p(0) = 4 + 0 - 0 + 0 = 4.$ $p(-1) = 4 + (-1)^3 - (-1) + 2(-1)^2 = 4 - 1 + 1 + 2 = 6.$ **Answer:** $p(0) = 4,\ p(-1) = 6$	2
23	Let $x = 0.323232\ldots$, so $100x = 32.3232\ldots$. $100x - x = 32 \Rightarrow 99x = 32 \Rightarrow x = \dfrac{32}{99}.$ **Answer:** $\dfrac{32}{99}$ **OR** Let $x = 15.7341341341\ldots$ (block "341" repeats after one digit "7"). $10x = 157.341341\ldots$ and $10000x = 157341.341341\ldots$ $10000x - 10x = 157341 - 157 = 157184 \Rightarrow 9990x = 157184.$ $x = \dfrac{157184}{9990} = \dfrac{78592}{4995}.$ **Answer:** $\dfrac{78592}{4995}$	2
24	$103 \times 107 = (105-2)(105+2) = 105^2 - 2^2.$ $= 11025 - 4 = 11021.$ **Answer:** 11021	2
25	Half-chord = 12 cm, distance = 5 cm. Radius $= \sqrt{12^2 + 5^2} = \sqrt{144 + 25} = \sqrt{169} = 13$ cm. **Answer:** 13 cm	2
SECTION – C (Short Answer — Q26 to Q31, 3 marks each)		**Marks**

Q. No.	Step-by-Step Solution	Marks
26	$PR = \sqrt{(2-4)^2 + (-2-8)^2} = \sqrt{4+100} = \sqrt{104}$. $\sqrt{104} = 2\sqrt{26}$. **Answer:** $PR = 2\sqrt{26}$ units **OR** $AB = \sqrt{(7-(-2))^2 + (10-5)^2} = \sqrt{81+25} = \sqrt{106}$. $BC = \sqrt{(-2-3)^2 + (5-(-4))^2} = \sqrt{25+81} = \sqrt{106}$. $AC = \sqrt{(7-3)^2 + (10-(-4))^2} = \sqrt{16+196} = \sqrt{212}$. Since $AB = BC$, the triangle is isosceles. $AB^2 + BC^2 = 106 + 106 = 212 = AC^2$, so $\angle B = 90^\circ$ (converse of Pythagoras). Hence $\triangle ABC$ is an isosceles right triangle. **Answer:** Isosceles right triangle, right angle at B.	3
27	$AB^2 = (5-2)^2 + (2-(-2))^2 = 9+16 = 25$. $BC^2 = (2-(-2))^2 + (-2-t)^2 = 16 + (t+2)^2$. $AC^2 = (5-(-2))^2 + (2-t)^2 = 49 + (2-t)^2$. Since $\angle B = 90^\circ$: $AB^2 + BC^2 = AC^2$. $25 + 16 + (t+2)^2 = 49 + (2-t)^2$. $t^2 + 4t + 45 = t^2 - 4t + 53$. $8t = 8 \Rightarrow t = 1$. **Answer:** $t = 1$	3
28	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) **OR** $y = 30(12) + 500 = 360 + 500 = 860$. **Answer:** Rs. 860	3
29	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
30	$s = \dfrac{26+28+30}{2} = 42$ m. Area $= \sqrt{42 \times 16 \times 14 \times 12} = \sqrt{112896} = 336$ m^2. Cost $= 336 \times 25 =$ Rs. 8400. **Answer:** Rs. 8400	3

Q. No.	Step-by-Step Solution	Marks
31	Multiples of 5 from 1 to 30: $5, 10, 15, 20, 25, 30$ — that is 6. $P = \frac{6}{30} = \frac{1}{5}.$ **Answer:** $\frac{1}{5}$	3
	SECTION – D (Long Answer — Q32 to Q35, 5 marks each)	**Marks**
32	$a^2 + b^2 + c^2 = (a+b+c)^2 - 2(ab+bc+ca) = 5^2 - 2(10) = 25 - 20 = 5.$ $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca).$ $= (a+b+c)\big[(a^2+b^2+c^2) - (ab+bc+ca)\big] = 5(5-10) = 5(-5) = -25$ — proved. **Answer:** $a^3 + b^3 + c^3 - 3abc = -25$ (proved) **OR** $x^2 + \frac{1}{x^2} = \left(x - \frac{1}{x}\right)^2 + 2 = 5^2 + 2 = 27.$ **Answer:** 27	5
33	Since $BE \parallel DC$ and BC is a transversal, $\angle EBC = \angle BCD$ (alternate angles). $ABCD$ cyclic $\Rightarrow \angle DAB + \angle BCD = 180^\circ \Rightarrow \angle BCD = 180^\circ - 95^\circ = 85^\circ$. So $\angle EBC = 85^\circ$. Exterior angle of a cyclic quadrilateral = interior opposite angle: $\angle ADC = \angle FBC = \angle FBE + \angle EBC = 20^\circ + 85^\circ = 105^\circ$. **Answer:** $\angle ADC = 105^\circ$ **OR** Half-chords: 5 cm and 12 cm; let d_1, d_2 be the respective distances from the centre. $d_1 = \sqrt{r^2 - 25}$, $d_2 = \sqrt{r^2 - 144}$, and (same side) $d_1 - d_2 = 7$. Solving: $r^2 - 25 - 2\sqrt{(r^2-25)(r^2-144)} + r^2 - 144 = 49$; solving this equation gives $r = 13$ cm. **Answer:** $r = 13$ cm	5

Q. No.	Step-by-Step Solution	Marks
34	$s = \dfrac{7.5 + 6.5 + 7}{2} = 10.5$ cm. Area of $\triangle ABC = \sqrt{10.5 \times 3 \times 4 \times 3.5} = \sqrt{441} = 21$ cm^2. Parallelogram $DBCE$ has the same area, on base $BC = 7$ cm. Area = base $\times$ height $\Rightarrow 21 = 7 \times DF \Rightarrow DF = 3$ cm. **Answer:** $DF = 3$ cm **OR** $s = 42$ m; Area $= \sqrt{42 \times 16 \times 14 \times 12} = 336$ m^2 (Heron's formula). Cost $= 336 \times 25 = $ Rs. 8400. **Answer:** Rs. 8400	5
35	Total throws $= 500$. (i) < 3 means 1 or 2: $80 + 90 = 170$; $P = \dfrac{170}{500} = \dfrac{17}{50}$. (ii) > 4 means 5 or 6: $88 + 82 = 170$; $P = \dfrac{170}{500} = \dfrac{17}{50}$. (iii) even means $2, 4, 6$: $90 + 85 + 82 = 257$; $P = \dfrac{257}{500}$. **Answer:** (i) $\dfrac{17}{50}$ (ii) $\dfrac{17}{50}$ (iii) $\dfrac{257}{500}$ **OR** Survived $= 150 - 18 = 132$. $P(\text{survived}) = \dfrac{132}{150} = \dfrac{22}{25}$; $P(\text{not survived}) = \dfrac{18}{150} = \dfrac{3}{25}$. Sum $= \dfrac{22}{25} + \dfrac{3}{25} = \dfrac{25}{25} = 1$ — verified. **Answer:** $\dfrac{22}{25}$ and $\dfrac{3}{25}$ (sum $= 1$)	5
SECTION – E (Case-Study Based — Q36 to Q38, 4 marks each)		**Marks**

Q. No.	Step-by-Step Solution	Marks
36	(i) Without directly computing, note $\frac{2357}{1000}$ has denominator $1000 = 2^3 \times 5^3$, which would make the decimal terminating. But $2.3\overline{57}$ is a repeating (non-terminating) decimal, so it cannot equal $\frac{2357}{1000}$. **Answer:** A terminating-decimal denominator cannot represent a repeating decimal (ii) Let $x = 2.3575757\ldots$. Then $10x = 23.575757\ldots$ and $1000x = 2357.575757\ldots$ $1000x - 10x = 2357 - 23 = 2334 \Rightarrow 990x = 2334 \Rightarrow x = \frac{2334}{990} = \frac{1061}{450}$. **Answer:** $x = \frac{1061}{450}$ (iii) This matches Student B's answer exactly. **Answer:** Student B is correct **OR** $\gcd(1061, 450) = 1$ (their only common factor is 1), so $\frac{1061}{450}$ is already in lowest terms. **Answer:** Yes, $\frac{1061}{450}$ is in lowest terms	4
37	(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

Q. No.	Step-by-Step Solution	Marks
38	(i) Transactions in order: start with +200 (fortune), spend 150 (debt, −150), gain 400 (fortune, +400). **Answer:** +200, −150, +400 (ii) Net = 200 − 150 + 400 = 450. **Answer:** Rs. 450 (iii) Net change per month = −150 + 400 = +250. Month 1: Rs. 200; Month 2: 200 + 250 = 450; Month 3: 450 + 250 = 700. Since the same amount (250) is added each month, this is an AP. **Answer:** Rs. 200, 450, 700, . . . — an AP with common difference 250 **OR** After 5 cycles: 200 + 5 × 250 = 200 + 1250 = 1450. **Answer:** Rs. 1450	4

Answer Key By Deepika Bhati
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