

Grade - 9

Subject: Mathematics (E)

Semester - I.

Subject Code

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Answer Key

SECTION A (1 mark each)

20 marks

- 1 three dimensions
- 2 -2
- 3 $\frac{7}{3}$
- 4 1
- 5 $\frac{4}{3}$
- 6 -13
- 7 $0.\bar{5}$
- 8 CA = RP
- 9 40°
- 10 90°
- 11 supplementary
- 12 2
- 13 5
- 14 65°
- 15 72°
- 16 $105^\circ, 105^\circ$
- 17 45°
- 18 adjacent side/hypotenuse
- 19 Assertion (A) is true but Reason (R) is false.
- 20 Both Assertion (A) and Reason (R) are True. Reason explains Assertion

Section B (2 marks each)

2. i) Mark distance $(5.8 + 1)$ cm. }
 - ii) Finding mid-point of (6.8) cm } $\frac{1}{2}$
 - iii) Drawing semicircle with the mid-pt as centre and $\frac{1}{2}(6.8)$ as radius } $\frac{1}{2}$
 - iv) Drawing $\perp$ lar and locating $\sqrt{5.8}$ } 1
- 2 marks

22. Let $x = 2.\overline{31}$

$$100x = 231.\overline{31}$$

$$100x - x = 231.\overline{31} - 2.\overline{31}$$

$$99x = 229$$

$$x = \frac{229}{99}$$

$$2.\overline{31} = \frac{229}{99}$$

1/2

1/2

1/2

1/2

2 marks

23. $15x^2 + 2x - 8$

$$= 15x^2 + 12x - 10x - 8$$

$$= 3x(5x + 4) - 2(5x + 4)$$

$$= (5x + 4)(3x - 2)$$

OR

$$10x^2 - 9x - 7$$

$$= 10x^2 - 14x + 5x - 7$$

$$= 2x(5x - 7) + 1(5x - 7)$$

$$= (5x - 7)(2x + 1)$$

1

1/2

1/2

2 marks

1

1/2

1/2

2 marks

24. $64^{-1/3} [64^{1/3} - 64^{2/3}]$

$$= (4^3)^{-1/3} [(4^3)^{1/3} - (4^3)^{2/3}]$$

$$= 4^{-1} (4 - 4^2) \quad \text{or } 4^{-1} \times 4 (1 - 4)$$

$$= \frac{1}{4} (4 - 16)$$

$$= 4^0 \times (-3)$$

$$= \frac{1}{4} (-12)$$

$$= -3$$

$$= -3$$

1/2

1/2

1/2

1/2

(Any other alternate method should be accepted)

2 marks

25. Since $30+20-50=0$
 $\therefore 30^3+20^3-50^3 = 3(30)(20)(-50)$
 $= -90000$

}
1

2 marks

26. Proof:

Statement	Reason	
i) $\angle POS + \angle POR = 180^\circ$	linear pair axiom	1/2
ii) $\angle POR + \angle ROQ = 180^\circ$		1/2
iii) $\angle POS + \angle POR = \angle POR + \angle ROQ$	Euclid's axiom: Things equal to the same thing are equal to one another.	1/2
iv) $\angle POS = \angle ROQ$	Euclid's axiom: When equals are subtracted from equals the remainders are equal.	1/2

2 marks

27. $(3x+y)^3$
 $= (3x)^3 + 3(3x)^2y + 3(3x)(y)^2 + y^3$
 $= 27x^3 + 27x^2y + 9xy^2 + y^3$

1

1

2 marks

OR

$(a-2b)^3$
 $= a^3 - 3(a)^2(2b) + 3(a)(2b)^2 - (2b)^3$
 $= a^3 - 6a^2b + 12ab^2 - 8b^3$

1

1

2 marks

28. Proof:

Statement	Reason	
i) $OX = LO$	given	} $\frac{1}{2}$
ii) $OY = OM$	given	
iii) $OX + OY = LO + OM$	Euclid's axiom: When equals are added to equals the wholes are equals	
iv) $XY = LM$	figure	$\frac{1}{2}$
		<u>2 marks</u>

29. Proof:

Statement	Reason	
i) $\angle DCA = \angle BAC$	alternate angles	} 1
ii) $AC = AC$	common side	
iii) $\angle DAC = \angle BCA$	alternate angles	
iv) $\triangle DAC \cong \triangle BCA$	ASA test of congruence	$\frac{1}{2}$
v) $DC = BA, DA = BC$	c.p.c.t	$\frac{1}{2}$
		<u>2 marks</u>

30. $4\sin^2 60^\circ + 8\cos^2 30^\circ$

$$= 4\left(\frac{\sqrt{3}}{2}\right)^2 + 8\left(\frac{\sqrt{3}}{2}\right)^2$$

$$= 4 \times \frac{3}{4} + 8 \times \frac{3}{4}$$

$$= 3 + 6$$

$$= 9$$

} $\frac{1}{2}$

$\frac{1}{2}$

2 marks

31. $60 + a = 110^\circ \dots$ alternate angles

$a = 50^\circ$

$a + b = 110^\circ \dots$ exterior angles theorem

$b = 60^\circ$

(also $b = 60^\circ \dots$ alternate angles)

(Any other alternate method should be accepted.)

32. Section C (3 marks each)

32. $x = 2 + \sqrt{3}$

$\frac{1}{x} = \frac{1}{2 + \sqrt{3}}$

$= \frac{2 - \sqrt{3}}{4 - 3} \left\{ \begin{array}{l} \text{multiplying \& dividing by the} \\ \text{conjugate} \end{array} \right\}$

$= 2 - \sqrt{3}$

$x + \frac{1}{x} = 2 + \sqrt{3} + 2 - \sqrt{3}$

$= 4$

Any other alternate method should be accepted

33. $(2a + 3)^3 - (2a - 3)^3$

Using $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

$= (2a + 3 - 2a + 3)((2a + 3)^2 + (2a + 3)(2a - 3) + (2a - 3)^2)$

$= 6(4a^2 + 12a + 9 + 4a^2 - 9 + 4a^2 - 12a + 9)$

$= 6(12a^2 + 9)$

$= 18(4a^2 + 3) \quad \text{OR} \quad 72a^2 + 54$

3 marks

Any other alternate method should be accepted

34	$a = 47^\circ$	alternate angle	1
	$b = 59^\circ$	corresponding angle	1
	$c = 74^\circ$	straight angle / angle sum prop.	1
			3 marks

OR

34.	$2x + 17 = 3x - 32$		
	$x = 49^\circ$		1
	$y = 180 - (3x - 32)$		
	$= 180 - 115$		
	$= 65^\circ$		1
	$z = 115^\circ$		1
			3 marks

35. Proof:

Statement	Reason	
i) In $\triangle ACE$ & $\triangle BCD$		
i) $AC = BC$	C is the mid point	1/2.
ii) $\angle ACD = \angle BCE$	given	
iii) $\angle ACD + \angle DCE = \angle BCE + \angle DCE$	Euclid's axiom: when equals are added to equals, the wholes are equal.	1/2.
iv) $\angle ACE = \angle BCD$	st iii) & figure	1/2.
v) $CE = CD$	given	1/2.
vi) $\triangle ACE \cong \triangle BCD$	SAS test of congruency	1/2.
vii) $AE = BD$	cpct	1/2.
		3 marks

36 (i) $\angle CDE = 62^\circ$ alternate angles

1

(ii) $\angle DEC = 180 - 102$

$$= 78^\circ$$

angle sum property of Δ

1

(iii) $\angle AEC = 102^\circ$

linear pair / exterior angles thm

1

3 marks

OR

(i) $\angle DCB = 55^\circ$

angle sum property of Δ

1

(ii) $\angle AEB = 85^\circ$

exterior angle theorem

1

(iii) $\angle EOD = 120^\circ$

exterior angle theorem / angle

1

sum property of $\square$

3 marks

37. $\angle ABC = 90^\circ$, $\angle OBC = 60^\circ$

$$\angle ABO = 90 - 60$$

$$= 30^\circ$$

$$AB = BC = OB$$

$$\therefore \angle OAB = x$$

$$2x + 30 = 180$$

$$x = 75^\circ$$

$$y = 90 - 75$$

$$= 15^\circ$$

1

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

3 marks

38. (i) $XZ = 13\text{cm}$

(ii) $\sin X = \frac{12}{13}$

(iii) $\tan Z = \frac{5}{12}$

1

1

1

3 marks

39. $x = 57^\circ$

$$y = 98^\circ$$

$$z = 82^\circ$$

1

1

1

3 marks

40 Proof:

Statement

Reason

i) $AB = DC$

given

$\frac{1}{2}$

ii) $\angle ABC = \angle DCB$

given

$\frac{1}{2}$

iii) $BC = BC$

common side

$\frac{1}{2}$

iv) $\triangle ABC \cong \triangle DCB$

SAS test of congruency

$\frac{1}{2}$

v) $AC = DB$

cpct

$\frac{1}{2}$

vi) $OA = OD$

given

vii) $AC - OA = DB - OD$

viii) $OC = OB$

when equals are subtracted
from equals, the remainders
are equal

1

ix $\triangle BOC$ is an isosceles triangle

OR v) $\angle ACB = \angle DBC$

CPCT

vi) $OB = OC$

sides opp. to equal $\angle$ s of $\triangle OBC$

3 marks

vii) $\triangle OBC$ is an isosceles triangle.

41. $\angle DAB + \angle B = 180^\circ$

$2x + \angle B = 180^\circ$

$x + \angle B + \angle APB = 180^\circ$

property of parallelogram

$\frac{1}{2}$

angle sum property of $\triangle$

$\frac{1}{2}$

$\angle DAB + \angle B = x + \angle B + \angle APB$

Euclid's axiom.

$\frac{1}{2}$

$2x = x + \angle APB$

$\angle APB = x$

$AB = BP$

base angles property

$\frac{1}{2}$

$CD = AB = \frac{1}{2} BC$

P is mid point of B

$\frac{1}{2}$

$2CD = AD$

property of parallelogram

$\frac{1}{2}$

OR

3 marks

$\angle BPA = \angle DPA = x$

$BP = BA$

$AD = BC$

alternate interior angles

sides opp. to equal angles

opp. sides of a parallelogram

$= 2BP$

$= 2AB$

$\Rightarrow AD = 2CD$

(Any other alternate method should be accepted)

Section D (4 marks)

42. $p(2) = 8 - 4 - 28 + 24$
 $= 0$

$(x-2)$ is a factor

$$\begin{array}{r}
 x^2 + x - 12 \\
 x-2 \overline{) x^3 - x^2 - 14x + 24} \\
 \underline{-x^3 + 2x^2} \\
 x^2 - 14x \\
 \underline{-x^2 + 2x} \\
 -12x + 24 \\
 \underline{-12x + 24} \\
 0
 \end{array}$$

$x^2 + x - 12$ is a factor

$= (x+4)(x-3)$

$x^3 - x^2 - 14x + 24 = (x-2)(x-3)(x+4)$

(Student can find all the factors using factor theorem.)

43. i) $\angle OBC = \angle OBA$

OB bisects $\angle ABC$

ii) $\angle OBC = \angle P$

corresponding angles

iii) $\angle OBA = \angle BAP$

alternate angles

iv) $\angle P = \angle BAP$

st i) ii) iii)

v) $BA = BP$

base angles property

|||

vi) $CQ = CA$

vii) $AB + BC + AC = PB + BC + CQ$

viii) $AB + BC + AC = PQ$