MARKING SCHEME

HALF YEARLY EXAMINATION (2026–27) — MATHEMATICS STANDARD (Code 041)

Class: X **Chapters 1–8** **Maximum Marks: 80**

SECTION – A (1 mark each — correct option only)

Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	(b) 204	6	(b) parallel	11	(a) 4.5 cm	16	(a) 1
2	(c) $\sqrt{23}$	7	(c)	12	(b) 1:9	17	(a) 1/2
3	(b) 1	8	(a) 5, −2	13	(d) ASA	18	(b) 2
4	(a)	9	(a) 32	14	(a) 5	19	(a)
5	(c) inconsistent	10	(a) 2	15	(a) (3,5)	20	(a)

Q4: $b = -3a$, $c = 3a$ | Q7: $(x+2)^3 = x^3 - 4$ simplifies to $6x^2 + 12x + 12 = 0$ (genuine quadratic); the others reduce to linear equations or an identity.

SECTION – B (2 marks each)

21. **2 marks**

$96 = 2^5 \times 3$, $404 = 2^2 \times 101$

[1] HCF $= 2^2 = 4$

[1] LCM $= 2^5 \times 3 \times 101 = 9696$

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22. **2 marks**

$x^2 - 3x - 4 = (x - 4)(x + 1) \rightarrow$ zeroes $= 4, -1$

[1] Zeroes correctly found

[1] Verification: sum $= 4+(-1) = 3 = -(-3)/1$ ✓; product $= 4\times(-1) = -4 = -4/1$ ✓

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23. **2 marks**

$a = 21$, $d = -3$. $a_n = a + (n-1)d = -81 \rightarrow 21 - 3(n-1) = -81 \rightarrow n = 35$

[1] 35th term $= -81$

[1] $a_n = 0 \rightarrow n = 8$ (a positive integer), so yes — the 8th term of the AP is 0

OR

$a_n = 3 + 2n \rightarrow a_1 = 5$, $d = 2$

[1] $S_{24} = 24/2\,[2(5) + 23(2)] = 12(10+46)$

[1] $S_{24} = 12 \times 56 = 672$

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24. **2 marks**

Let point be (x, 0). $(x-2)^2 + 25 = (x+2)^2 + 81$

[1] Simplify: $-4x + 29 = 4x + 85 \rightarrow -8x = 56 \rightarrow x = -7$

[1] Required point: (−7, 0)

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25. **2 marks**

$$\text{LHS} = \frac{\sin\theta+\cos\theta-1}{\sin\theta} \times \frac{\cos\theta+\sin\theta+1}{\cos\theta} = \frac{(\sin\theta+\cos\theta)^2 - 1}{\sin\theta \cos\theta}$$

[1] $= (1 + 2\sin\theta\cos\theta - 1)/(\sin\theta\cos\theta)$

[1] $= 2\sin\theta\cos\theta / \sin\theta\cos\theta = 2 =$ RHS ✓

OR

$3\cot\theta = 4 \rightarrow \cot\theta = 4/3 \rightarrow$ in a right triangle: opposite = 3, adjacent = 4, hyp = 5 $\rightarrow \sin\theta = 3/5, \cos\theta = 4/5$

[1] Correct $\sin\theta$, $\cos\theta$ found

[1] $(4\sin\theta-\cos\theta)/(4\sin\theta+\cos\theta) = (12/5-4/5)/(12/5+4/5) = (8/5)/(16/5) = 1/2$

SECTION – C (3 marks each)

26. **3 marks**

$2x+3y=11$ ...(i); $2x-4y=-24$ ...(ii)

[1] Subtract: $7y = 35 \rightarrow y = 5$

[1] Substitute in (i): $2x = -4 \rightarrow x = -2$

[1] $y = mx+3 \rightarrow 5 = -2m+3 \rightarrow m = -1$

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27. **3 marks**

Let speed = x km/h. $480/(x-8) - 480/x = 3$

[1] Equation set up correctly

[1] Simplify: $x^2 - 8x - 1280 = 0$

[1] $x = (8\pm72)/2 \rightarrow x = 40$ km/h ($x = -32$ rejected)

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28. **3 marks**

$a+5d=12$ ...(i); $a+7d=22$ ...(ii)

[1] Equations formed correctly

[1] Solve: $2d=10 \rightarrow d=5$; $a = 12-25 = -13$

[1] First three terms: −13, −8, −3

OR

$a=34, d=-2, l=10 \rightarrow n = 13$

[1] n = 13 found correctly

[2] $S_{13} = 13/2\,(34+10) = 13 \times 22 = 286$

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29. **3 marks**

[1] Correct statement of the theorem, with Given / To Prove / Construction (join BE and CD; draw EM⊥AB, DN⊥AC)

[1] ar(ADE)/ar(DBE) = AD/DB and ar(ADE)/ar(ECD) = AE/EC

[1] Since △DBE and △ECD lie on the same base DE between the same parallels DE∥BC, ar(DBE) = ar(ECD). Hence AD/DB = AE/EC — Hence Proved.

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30. **3 marks**

LHS = $\dfrac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$

[1] Correct factorisation of numerator and denominator

[1] $1 - 2\sin^2\theta = 2\cos^2\theta - 1$ (using $\sin^2\theta+\cos^2\theta=1$)

[1] LHS = $\sin\theta/\cos\theta = \tan\theta$ = RHS ✓

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31. **3 marks**

Area = $\frac{1}{2}|x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2)|$

[1] Formula applied correctly: $\frac{1}{2}|2(4) + (-1)(-7) + 2(3)|$

[1] $= \frac{1}{2}|8+7+6| = \frac{1}{2} \times 21$

[1] Area = 10.5 sq. units

OR

[2] Area of triangle formed by (1,−1), (5,2), (9,5) = $\frac{1}{2}|1(2-5)+5(5+1)+9(-1-2)| = \frac{1}{2}|-3+30-27| = 0$

[1] Since area = 0, the three points are collinear

SECTION – D (5 marks each)

32. **5 marks**

Let smaller tap take x hours; larger tap takes (x−10) hours. Combined: $1/x + 1/(x-10) = 8/75$

[1] Equation correctly framed

[1] $75(2x-10) = 8x(x-10)$

[1] Simplify to: $4x^2 - 115x + 375 = 0$

[1] $x = (115 \pm 85)/8 \rightarrow x = 25$ or $x = 3.75$ (rejected, as x−10 would be negative)

[1] Smaller tap = 25 hours; Larger tap = 15 hours

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33. **5 marks**

[1] Given, To Prove, Construction stated correctly (draw $BD \perp AC$ in right $\triangle ABC$, right-angled at B)

[1] $\triangle ADB \sim \triangle ABC \rightarrow AD/AB = AB/AC \rightarrow AB^2 = AD \cdot AC$

[1] $\triangle BDC \sim \triangle ABC \rightarrow CD/BC = BC/AC \rightarrow BC^2 = CD \cdot AC$. Adding: $AB^2+BC^2 = AC(AD+CD) = AC^2$ — Hence Proved

[1] Application: $\text{diagonal}^2 = 30^2 + 16^2 = 900+256 = 1156$

[1] Diagonal = $\sqrt{1156} = 34$ cm

OR

Draw $AE \perp BC$. Using $BD = \frac{1}{3}BC$ and Pythagoras in $\triangle ADE$ and $\triangle ABE$, $9AD^2 = 9(AE^2+DE^2) = 9AE^2+(BC/2 - BC/3)^2 \cdot 9$ ... simplifying with $AE^2=AB^2-(BC/2)^2$ gives $9AD^2 = 7AB^2$ [5, full stepwise construction & derivation]

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34. **5 marks**

[1] Correct table of values for $x - y + 1 = 0$, e.g. $(-1,0)$, $(0,1)$, $(3,4)$

[1] Correct table of values for $3x + 2y - 12 = 0$, e.g. $(0,6)$, $(2,3)$, $(4,0)$

[1] Both lines correctly plotted and labelled on the same graph

[1] Point of intersection correctly read as $(2, 3)$

[1] Triangle vertices identified as $(-1, 0)$, $(4, 0)$ and $(2, 3)$, with region shaded

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35. **5 marks**

LHS = $(1/\sin\theta - \sin\theta)(1/\cos\theta - \cos\theta) = (\cos^2\theta/\sin\theta)(\sin^2\theta/\cos\theta)$

[2] LHS simplified to $\sin\theta \cos\theta$

[2] RHS = $1/(\tan\theta+\cot\theta) = 1/[(\sin^2\theta+\cos^2\theta)/(\sin\theta\cos\theta)] = \sin\theta \cos\theta$

[1] LHS = RHS = $\sin\theta \cos\theta$ — Hence Proved

OR

$\sin 65° = \cos 25°$ and $\cos 73° = \sin 17°$

[2] First fraction = $(\sin^2 25°+\cos^2 25°)/(\cos^2 17°+\sin^2 17°) = 1/1 = 1$

[2] $\sin^2 90° \cdot \tan^2 60° = 1 \times 3 = 3$

[1] Total = $1 + 3 = 4$

SECTION – E (Case Studies, 1+1+2 marks)

36. **4 marks**

[1] (i) AB = $\sqrt{[(6-2)^2+(3-3)^2]} = 4$ m

[1] (ii) BC = $\sqrt{[(6-6)^2+(7-3)^2]} = 4$ m

[1] (iii) Midpoint M of AC = $((2+6)/2, (3+7)/2) = (4, 5)$

[1] BM = $\sqrt{[(6-4)^2+(3-5)^2]} = \sqrt{8} = 2\sqrt{2}$ m

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37. **4 marks**

$a = 30$, $d = 2$

[1] (i) $a_{10} = 30 + 9(2) = 48$ seats

[1] (ii) $a_{20} = 30 + 19(2) = 68$ seats

[1] (iii) $S_{20} = 20/2\,(30+68) = 10 \times 98$

[1] $S_{20} = 980$ seats

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38. **4 marks**

[1] (i) $\sin 60° = 20\sqrt{3}/\text{string} \rightarrow \text{string} = 20\sqrt{3} \div (\sqrt{3}/2) = 40$ m

[1] (ii) $\tan 60° = 20\sqrt{3}/\text{distance} \rightarrow \text{distance} = 20\sqrt{3} \div \sqrt{3} = 20$ m

[1] (iii) $\sin 30° = 20\sqrt{3}/\text{new string} \rightarrow \text{new string} = 20\sqrt{3} \div (1/2)$

[1] New string length = $40\sqrt{3}$ m (≈ 69.3 m); additional length let out = $40\sqrt{3} - 40 = 40(\sqrt{3}-1)$ m

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— END OF MARKING SCHEME —