UBQ2OMN

Marking Scheme

SUMMATIVE ASSESSMENT – I (2015-16)
Mathematics (Class – X)

General Instructions:

1. The Marking Scheme provides general guidelines to reduce subjectivity and maintain uniformity. The answers given in the marking scheme are the best suggested answers.
2. Marking be done as per the instructions provided in the marking scheme. (It should not be done according to one's own interpretation or any other consideration).
3. Alternative methods be accepted. Proportional marks be awarded.
4. If a question is attempted twice and the candidate has not crossed any answer, only first attempt be evaluated and 'EXTRA' be written with the second attempt.
5. In case where no answers are given or answers are found wrong in this Marking Scheme, correct answers may be found and used for valuation purpose.

खण्ड-अ / SECTION-A

प्रश्न संज्या **1** से **4** में प्रत्येक का **1** अंक है।

Question numbers **1** to **4** carry one mark each

1

$$\frac{\mathrm{DA}}{\mathrm{AE}}=\frac{\mathrm{DB}}{\mathrm{BW}}$$

$$\frac{4}{8}=\frac{x}{24-x}$$

$$24-x=2x$$

$$3x=24$$

$$x=8\ \mathrm{cm}=\mathrm{DB}=8\ \mathrm{cm}$$

1

2

$$1+\cos^2\theta=\frac{5}{4}$$

1

$\cos^2\theta = \frac{5}{4} - 1 = \frac{1}{4}$

$\theta = 60$

3 1 — 1

4 — 1

C.I.	1400-1550	1550-1700	1700-1850	1850-2100
f	8	15	21	8
c.f.	8	23	44	52

$\frac{\Sigma f}{2} = 26 \Rightarrow$ Median class $= 1700 - 1850$

खण्ड–ब / SECTION-B

प्रश्न संज्या **5** से **10** में प्रत्येक के **2** अंक हैं।

Question numbers **5** to **10** carry two marks each.

5 Let if possible, $2+3\sqrt{5}$ is rational — 2

$$2+3\sqrt{5} = \frac{a}{b}, \text{ where a and b are integers and } b \neq 0$$

$$\Rightarrow \sqrt{5} = \frac{a-2b}{3b}$$

Which is contradiction as $\sqrt{5}$ is irrational and $\frac{a-2b}{3b}$ is rational

Hence $2+3\sqrt{5}$ is irrational

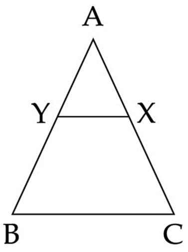
6 Let us find HCF of $70-5=65$ and $125-8=117$ — 2

Q$117 > 65$

$\therefore 117 = 65 \times 1 + 52$

		$\Rightarrow 65 = 52 \times 1 + 13$ $\Rightarrow 52 = 13 \times 4 + 0$ $\text{Q} \text{remainder} = 0$ $\therefore \text{HCF} = 13.$	
	7	$\alpha + \beta = 7$ ____________(1) $\alpha\beta = k$ ____________(2) $\alpha - \beta = 1$ ____________(3) (given) (1) and (3) give $\alpha = 4,\ \beta = 3$ From (2), $k = 12.$	2
	8	$\frac{AY}{AC} = \frac{AY}{AY + YC} = \frac{2}{2+6} = \frac{1}{4}, \frac{AX}{AB} = \frac{1}{4}$ $\frac{AX}{XB} = \frac{AY}{YC}$ By converse of B.P.T., $XY \parallel BC$	2
	9	$\frac{\text{cosec } 13°}{\sec 77°} - \frac{\cot 20°}{\tan 70°} = 1 - 1 = 0$	2
	10	Getting $\sum f = 50, \sum f x = 220$ Mean $\bar{x} = \frac{\sum f x}{\sum f} = \frac{220}{50} = 4.4$	2

		खण्ड–स / SECTION-C प्रश्न संख्या **11** से **20** में प्रत्येक के **3** अंक हैं। Question numbers **11** to **20** carry three marks each.	
	11	Let a be any positive integer. By Euclid lemma $a = 6q, 6q+1, 6q+2, 6q+3, 6q+4, 6q+5$ Now $a^2 = 36q^2 = 6m$ $a^2 = (6q+1)^2 = 36q^2 + 12q + 1 = 6(6q^2 + 2q) + 1 = 6m + 1$ $a^2 = (6q+2)^2 = 36q^2 + 24q + 4 = 6m + 4$ $a^2 = (6q+3)^2 = 36q^2 + 36q + 9 = 6m + 3$ $a^2 = (6q+4)^2 = 36q^2 + 48q + 16 = 6m + 4$ $a^2 = (6q+5)^2 = 36q^2 + 60q + 25 = 6m + 1$ Hence square of any positive integer cannot be of the form $6m + 2$ or $6m + 5$.	3
	12	Multiply (1) by 4 and (2) by 2 and add $4(5x - 2y) + 2(3x + 4y) = 11 \times 4 + 2 \times 4$ $26x = 52$ $\Rightarrow \quad x = 2$ $y = -\frac{1}{2}$	3
	13	Division Quotient $= 4x - 10$, Remainder $= -3$	3

		Verification	
	14	(i) $2x+5y=8$ (ii) $4x-10y=8$ (iii) $4x-10y=7$	3
	15	In ΔABC, XY$\|\|$AB $\therefore \frac{AX}{XC} = \frac{AY}{YB}$ ____________________(1) $\frac{AX}{XC} = 1$ (given) ____________________(2) (1) and (2) give AY$=$YB Y is middle point of AB 	3
	16	ΔABC ~ ΔPQR $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP} = \frac{\text{perimeter of VABC}}{\text{perimeter of VPQR}}$ $\frac{BC}{5} = \frac{180}{50}$	3

BC = 18 cm

17

To get $\cos\theta = \frac{8}{17}$,

$$\text{L.H.S} = \frac{3-4\sin^2\theta}{4\cos^2\theta-3} = \frac{3-4.\left(\frac{15}{17}\right)^2}{4.\left(\frac{8}{17}\right)^2-3} = \frac{-33}{-611} = \frac{33}{611}$$

3

18

Getting $\frac{\sin\theta\,(1-2\sin^2\theta)}{\cos\theta\,(2\cos^2\theta-1)}$

$$= \frac{\tan\theta\,(\cos^2\theta-\sin^2\theta)}{(\cos^2\theta-\sin^2\theta)} = \tan\theta$$

3

19

Production more than/equal to	c.f
50	100
55	98
60	90
65	78
70	54
75	16

and ogive

3

20

C.I.	f_i	x_i	$u_i =$	$f_i u_i$

3

			$\frac{x_i - \text{a}}{\text{h}}$	
20-30	8	25	-2	-1
30-40	6	35	-1	-6
$40-50$	x	45	0	0
50-60	11	55	1	11
60-70	y	65	2	$2y$

$$\Sigma f_i u_i = -20 + 11 + 2y$$

$$= 2y - 11$$

$\Sigma f_i = 25 + x + y = 50 \Rightarrow x + y = 25$

Let a $= 45$

$$\text{Mean} = \text{a} + \frac{\Sigma f_i \, u_i}{\Sigma f_i} \times \text{h}$$

$$48 = 45 + \frac{2y - 11}{50} \times 10$$

$$5 \times 3 = 2y - 11$$

$y = 13$

Put value of y in (1)

$x = 12$

खण्ड-द / SECTION-D

प्रश्न संज्या **21** से **31** में प्रत्येक के **4** अंक हैं।

Question numbers **21** to **31** carry four marks each.

21 Length of the rectangular courtyard $= 18.72$ cm 4

Breadth of the rectangular courtyard $= 13.20$ cm

For least no. of tiles, tiles must be of maximun size

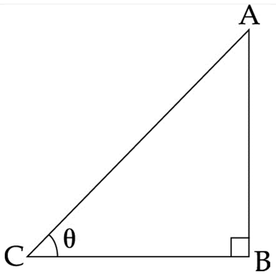
Using Euclid division

$\therefore$ HCF (1872,1320) $= 24$ cm

$$\therefore \text{No of tiles } = \frac{\text{Area of courtyard}}{\text{Area of one tile}}$$

		$= \frac{1872 \times 1320}{24 \times 24}$ $= 4290$	
	22	Let cost of 1 chair $=$ ₹ x and cost of 1 table $=$₹ y ATQ $4x+3y=2100$__________(1) $5x+2y=1750$__________(2) Multiplying (1) by 2 and (2) by 3 $8x+6y=4200$ __________(3) $15x+6y=5250$ __________(4) $(4)-(3) \Rightarrow 7x=1050 \Rightarrow x=150$ On putting value of x in (1) , $y=500$ Cost of chair and table $=$ ₹ 150, ₹ 500	4
	23	$f(x)=4x^2-8kx+8x-9$ $=4x^2-8(k-1)x-9$ $\because$ zeros are negative of each other $\therefore \alpha=-\beta$ $\Rightarrow \alpha+\beta=0$ $\Rightarrow -\frac{b}{a}=0$ $\Rightarrow \frac{8(k-1)}{4}=0$ $\Rightarrow k-1=0$ $\Rightarrow k=1$	4

		$\therefore\ kx^2+3kx+2$ $= x^2+3x+2$ $=(x+1)\ (x+2)$ $\therefore$ zeros $= -1,\ -2$	
	24	Let No. of workers $= g(x)$ $\therefore\ g(x)= \dfrac{p(x)-r(x)}{q(x)}$ $= \dfrac{6x^4+8x^3+17x^2+21x+7-x-2}{2x^2+5}$ $= \dfrac{6x^4+8x^3+17x^2+20x+5}{2x^2+5}$ $=3x^2+4x+1$ Values - leadership, concern for fellow being.	4
	25	In ΔABC, DP$\|\|$BC, so by B.P.T. $\dfrac{AD}{DB} = \dfrac{AP}{PC}$ __________ (1) In ΔABC, EQ$\|\|$AC, so by B.P.T. $\dfrac{BE}{EA} = \dfrac{BQ}{QC} = \dfrac{AD}{EA}$ __________ (2) (Q AD = BE) from (1) and (2) AD $= \dfrac{AP\times DB}{PC} = \dfrac{BQ\times EA}{CQ}$	4

		$\frac{\text{AP}}{\text{PC}} = \frac{\text{BQ}}{\text{QC}}$ (Q DB = AB − AD = AB − BE = AE) So, by converse of B.P.T. PQ‖AB	
	26	Given and T.P, const ; proof $\text{AC}^2 = 12^2 = 144$ $\text{AB}^2 + \text{BC}^2 = \left(6\sqrt{3}\right)^2 + (6)^2 = 36 \times 3 + 36 = 36 \times 4 = 144$ $\Rightarrow \text{AB}^2 + \text{BC}^2 = \text{AC}^2 \therefore \Delta\text{ABC}$ is rt Δ at .B $\therefore \angle\text{B} = 90°$	4
	27	Changing cos55°, tan75°, tan13°, tan23° by complimentary angle**2** Simplification **2**	4
	28	$x + y = 2\sec\text{A}$ and $x - y = 2\sin\text{A}$ $\left(\frac{2}{x+y}\right)^2 + \left(\frac{x-y}{2}\right)^2 = \sin^2\text{A} + \cos^2\text{A} = 1$	4
	29		4

In ΔABC

$AB^2 + BC^2 = AC^2$

$$\Rightarrow \frac{AB^2}{AC^2} + \frac{BC^2}{AC^2} = 1$$

$\Rightarrow \sin^2\theta + \cos^2\theta = 1$

Now $\sin^4\theta - \cos^4\theta = (\sin^2\theta)^2 - (\cos^2\theta)^2$

$= (\sin^2\theta + \cos^2\theta)\ (\sin^2\theta - \cos^2\theta)$

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

$= 1 - \cos^2\theta - \cos^2\theta$

$= 1 - 2\cos^2\theta = \text{RHS}$

30

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$$= 45 + \frac{33 - 31}{66 - 31 - 17} \times 10$$

$$= 45 + \frac{2}{18} \times 10$$

$= 46.1$

4

31

C. I.	f_i	$u_i = \frac{x_i - 54}{4}$	$f_i u_i$
40-44	4	-3	-12
44-48	6	-2	-12
48-52	10	-1	-10
52-56	14	0	0
56-60	10	1	10
60-64	8	2	16
64-68	6	3	18
68-72	2	4	8

4

	$\Sigma f_i = 60$		$\Sigma f_i u_i = 18$

Let a = assumed mean = 54

$$\text{Mean} = 54 + \frac{18}{60} \times 4 = 55.2$$

Maximum frequency = 14 ⇒ Modal class = 52 – 56

$$\text{Mode} = 52 + \frac{14 - 10}{28 - 10 - 10} \times 4 = 54$$

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