EQQ08WD

Marking Scheme

SUMMATIVE ASSESSMENT – I (2014-15)
Mathematics (Class – IX)

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 संख्या **1** से **4** में प्रत्येक का **1** अंक है।

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

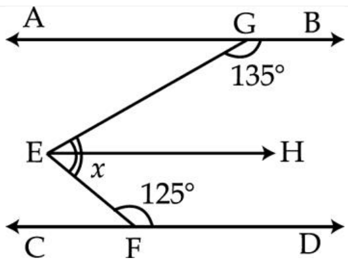
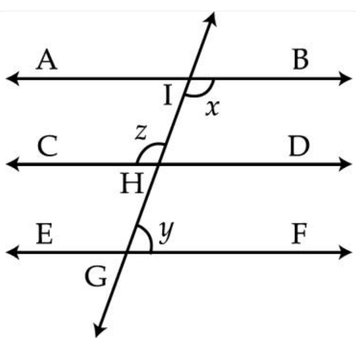
1	$\sqrt[4]{(36)^{-2}} = \left(36^{-2}\right)^{\frac{1}{4}} = 36^{-2\times\frac{1}{4}} = 36^{-\frac{1}{2}}$ $= \left(\frac{1}{36}\right)^{\frac{1}{2}} = \frac{1}{6}$	1
2	$8y^3 - 125x^3 = (2y)^3 - (5x)^3$ $= (2y-5x)(4y^2 - 10xy + 25x^2)$	1

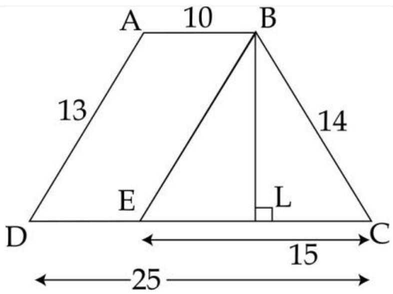
	3	No, because $\angle A + \angle B + \angle C = 220° > 180°$	1
	4	I quadrants	1
		खण्ड–ब / SECTION-B	
		प्रश्न संख्या **5** से **10** में प्रत्येक का **2** अंक है। Question numbers **5** to **10** carry two marks each.	
	5	$$\begin{array}{r} 0.230769\ldots \\ 13\overline{)\;3000000} \\ \underline{26} \\ 40 \\ \underline{39} \\ 100 \\ \underline{91} \\ 90 \\ \underline{78} \\ 120 \\ \underline{117} \\ 3 \end{array}$$ $\frac{3}{13} = 0.\overline{230769}$ This decimal expansion is non-terminating recurring.	2

	6	Identity : $(a+b)^2 = a^2 + b^2 + 2ab$ $(10)^2 = a^2 + b^2 + 32$ $a^2 + b^2 = 68$	2
	7	$\angle ACB = 180° - (90° + 40°) = 50°$ $\angle ADB = 180° - (90° + 40°) = 50°$ $\angle ACB = \angle ADB$ $BD = BC$ or ΔBCD is isosceles	2
	8	$AC = DC$, $CB = CE$ (given) Adding, $AC + CB = DC + CE$ $\Rightarrow AB = DE$ Euclid's axiom : If equals are added to equal, then wholes are equal.	2
	9	Let sides of Δ are x, x and $x + 7$ $3x + 7 = 70 \Rightarrow x = 21$ Sides are 21, 21 and 28, $s = 35$ Formula of area Area of Δ $\sqrt{35 \times 14 \times 14 \times 7} = 98\sqrt{5}$ m^2	2

	10	Analysing, and find the abscisa as 2 Finding the ordinate as 7	2
		खण्ड–स / SECTION-C	
		प्रश्न संख्या **11** से **20** में प्रत्येक का **3** अंक है। Question numbers **11** to **20** carry three marks each.	
	11	$\frac{1}{a} = 3 + 2\sqrt{2}$ $a + \frac{1}{a} = 3-2\sqrt{2} + 3+2\sqrt{2} = 6$ $a - \frac{1}{a} = 3-2\sqrt{2} - (3 + 2\sqrt{2}) = -4\sqrt{2}$ $a^2 - \frac{1}{a^2} = \left(a + \frac{1}{a}\right)\left(a - \frac{1}{a}\right) = -24\sqrt{2}$	3
	12	$(3^3)^{\frac{1}{3}}\left[(3^3)^{\frac{1}{3}} - (3^3)^{2/3}\right]$ $= 3\,[3-3^2]$ $= 3\,[3-9]$ $= 3\,[-6] = -18$	3
	13	$x^2 - y^2 - z^2 + 2yz + x + y - z = x^2 - (y^2 - 2yz + z^2) + (x+y-z)$ $= (x)^2 - (y-z)^2 + (x+y-z)$ $= (x+y-z)\,(x-y+z) + 1(x+y-z)$	3

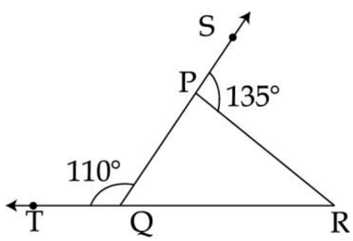
		$= (x+y-z)(x-y+z+1)$	
	14	$x-1 \overline{)\, 3x^4 - 4x^3 - 3x - 1\,}\ (3x^3 - 1x^2 - 1x - 4$ $3x^4 - 3x^3$ $(-)\quad(+)$ $-1x^3 + 0x^2$ $-1x^3 + 1x^2$ $(+)\quad(-)$ $-1x^2 - 3x$ $-1x^2 + 1x$ $(+)\quad(-)$ $-4x - 1$ $-4x + 4$ $(+)\quad(-)$ -5 $\therefore$ Quotient $= 3x^3 - x^2 - x - 4$ Remainder $= -5$	3
	15	$\angle AOC = 2\angle DOC = 2x$ $\angle BOC = 180^\circ - 2x$ $\angle COE = \frac{1}{2}\angle BOC = 90^\circ - x$	3
	16	Given , to prove, figure .... 1 Correct proof 2	3

17	 Draw EH‖AB. Then $\angle AGE = \angle GEH$ and $\angle CFE = \angle FEH$ ………………. 1 $\therefore x = \angle GEH + \angle FEH = \angle AGE + \angle CFE$ --------(i) ………………. 1 But $\angle AGE + 135° = 180°$, $\angle CFE + 125° = 180°$ ………………. ½ $\therefore \angle AGE = 45°$, $\angle CFE = 55°$ ………………. ½ Hence from (i) $x = 45° + 55° = 100°$. ………………. ½	3
18	 AB‖CD and transversal HI intersects these lines $\therefore x = z$. ----------(1) ………………. ½ Similarly $z = \angle EGH$ ………………. ½ Also $\angle EGH + y = 180°$ $\therefore y = 180° - z$ Then $y = 180° - x$ [Use (1)] ………………. ½ $x + y = 180°$ ------------(2) But $x : y = 5 : 4$ Let $x = 5r$ and $y = 4r$. Then (2) gives ………………. ½ $\therefore$ $5r + 4r = 180°$ $\therefore r = 20°$ gives $x = 100°$, $y = 80°$. $\therefore z = 100°$ ………………. 1	3

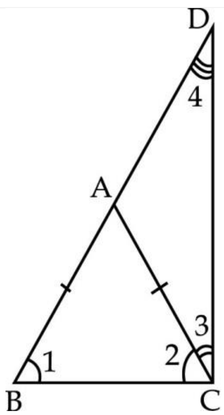
19	 Draw BE || AD and B L $\perp$ EC In ΔBEC, $s = 21$ Area (ΔBEC) $= \sqrt{21 \times 6 \times 7 \times 8}$ $= 84\ m^2$ Also area (ΔBEC) $= \frac{1}{2} \times 15 \times BL = 84$ $\Rightarrow BL = \frac{84 \times 2}{15} = \frac{56}{5}$ Area trapezium $= \frac{1}{2}\ (10 + 25) \times \frac{56}{5}$ $= 196\ m^2$	3
20	$P = 15$ cm Area$= \sqrt{15(15-5)(15-12)(15-13)}$ $= 30\ cm^2$ Shortest altitude is on longest side Longest side $= 13$ cm $\therefore$ Area $= \frac{1}{2} \times 13 \times$ altitude $\therefore$ Area $= \frac{60}{13}$ cm $= 4.6$ cm	3
	खण्ड–द / SECTION-D	

		प्रश्न संख्या **21** से **31** में प्रत्येक का **4** अंक है। Question numbers **21** to **31** carry four marks each.	
	21	Rationalise the denominator of each term $\frac{2}{\sqrt{5}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{2}}-\frac{3}{\sqrt{5}+\sqrt{2}}=\frac{2(\sqrt{5}-\sqrt{3})}{(\sqrt{5})^2-(\sqrt{3})^2}+\frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3})^2-(\sqrt{2})^2}-\frac{3(\sqrt{5}-\sqrt{2})}{(\sqrt{5})^2-(\sqrt{2})^2}$ $=\frac{\cancel{2}(\sqrt{5}-\sqrt{3})}{\cancel{2}}+\frac{\sqrt{3}-\sqrt{2}}{1}-\frac{\cancel{3}(\sqrt{5}-\sqrt{2})}{\cancel{3}}$ $=\sqrt{5}-\sqrt{3}+\sqrt{3}-\sqrt{2}-\sqrt{5}+\sqrt{2}$ $=0$	4
	22	$x=\frac{\sqrt{p+2q}+\sqrt{p-2q}}{\sqrt{p+2q}-\sqrt{p-2q}}\times\frac{\sqrt{p+2q}+\sqrt{p-2q}}{\sqrt{p+2q}+\sqrt{p-2q}}$ $=\frac{\left[\sqrt{p+2q}+\sqrt{p-2q}\right]^2}{p+2q-p+2q}$ $=\frac{1}{4q}\left[p+2q+p-2q+2\sqrt{p^2-4q^2}\right]$ $=\frac{1}{2q}\left[p+\sqrt{p^2-4q^2}\right]$ $2qx-p=\sqrt{p^2-4q^2}$ Squaring on both the sides, $\Rightarrow\ 4q^2x^2+\cancel{p^2}-4pqx=\cancel{p^2}-4q^2$ Dividing both sides by 4q $qx^2-px+q=0\Rightarrow qx^2+q=px$ $\Rightarrow q(x^2+1)=px.$	4
	23	$p(x)=x^3-12x^2+17x+30$ $p(-1)=-1-12-17+30=0$	4

		$\Rightarrow x+1$ is a factor of $p(x)$ $\frac{p(x)}{x+1} = x^2 - 13x + 30$ $x^2-13x+30=(x-10)\ (x-3)$ $p(x)=(x+1)\ (x-10)\ (x-3)$	
	24	Let $a+b=A$, $b+c=B$ and $c+a= C$ We know that $A^3+B^3+C^3-3ABC=(A+B+C)\ (A^2+B^2+C^2-AB-BC-CA)$ (i.e.) $(a+b)^3+(b+c)^3+(a+c)^3-3\ (a+b)\ (b+c)\ (c+a)$ $=(a+b+b+c+c+a)\ x\ \left((a+b)^2+(b+c)^2+(c+a)^2-(a+b)(b+c)-(b+c)(c+a)-(c+a)(a+b)\right)$ $=[2(a+b+c)][a^2+2ab+b^2+b^2+2bc+c^2+a^2+2ac+c^2-(ab+ac+b^2+bc)-(bc+ab+c+ac)$ $-ac+bc+a^2+ab)$ $=2(5)[2a^2+2b^2+2c^2+2ab+2bc+2ca-ab-ac-b^2-bc-bc-ab-c^2-ac-ac-bc-a^2-ab]$ $=10\ [a^2+b^2+c^2+2ab+2bc+2ca-3ab-3ac-3bc]$ $=10\ [a^2+b^2+c^2+(-ab)\ -bc-ac]$ $=10\ [(a+b+c)^2-2ab-2bc-2ac-ab-bc-ac]$ $=10\ [5^2-3\ (ab+bc+ca)]$ $=10\ [25-3(15)]$ $=10\ (25-45)$ $=10\ (-20)$ $=-200$	4
	25	Let $f(x)=x^3+2x^2-5x-6$ $f(-1)=(-1)^3+2\ (-1)^2-5\ x\ (-1)-6$ $=-1+2+5-6=0$ $\Rightarrow (x+1)$ is a factor of $f(x)$ The factors of the constant term of $p(x)$ are $\pm\ 1,\ \pm\ 2,\ \pm 3$ and ± 6 $f(2)=2^3+2(2)^2-5(2)-6$ $=8+8-10-6$ $=0$ $\Rightarrow (x-2)$ is a factor of $f(x)$ $f(-3)=(-3)^3+2(-3)^2-5(-3)-6$ $=-27+18+15-6$ $=-9+9=0$ $\Rightarrow (x+3)$ is a factor of $f(x)$	4

		since f(x) is a cubic polynomial, it can have only three factors $\therefore x^3+2x^2-5x-6=(x+1)\,(x-2)\,(x+3)$	
26		$x+1$ is a factor as $p(-1)=0$ $x^3+13x^2+32x+20=x^3+x^2+12x^2+12x+20x+20$ $= x^2(x+1)+12x(x+1)+20(x+1)$ $=(x^2+12x+20)(x+1)$ $=(x+10)(x+2)(x+1)$	4
27		Kindness, Humanity, Responsibility towards the society, Compassion, Empathy  $\angle SPR+\angle QPR=180°$ (Linear Pair) $\angle QPR=180°-135°=45°$ $\angle PQT+\angle PQR=180°$ (Linear Pair) $\angle PQR=180°-110°=70°$ In ΔPQR $\angle PQR+\angle QPR+\angle PRQ=180°$ $\angle PRQ=180°-(70°+45°)=180°-115°=65°$	4
28		Given, To prove, Figure ………………. 1½ Correct Proof ………………. 2½	4

29 | 4



correct figure ……………… **1**

Given ΔABC is isosceles with $AB = AC$ ……………… ½

Also in the figure $AB = AD$ (given)

$\therefore\ AC = AB = AD$

In ΔABC

$\angle 1 = \angle 2$ (angles opp. to equal sides)

Also $\angle DAC = \angle 1 + \angle 2$ (ext. angle of ΔABC)

$= 2\angle 2$ ……………… ½

Again, In ΔACD, $AC = AD$

$\therefore \angle 3 = \angle 4$

$\angle 3 + \angle 4 + \angle DAC = 180°$ (angles of ΔADC) ……………… ½

$\therefore\ 2\angle 3 + 2\angle 2 = 180°$

$\angle 3 + \angle 2 = 90°$ ……………… ½

$\therefore \angle BCD = \angle 3 + \angle 2 = 90°$ ……………… **1**

$\therefore\ \Delta BCD$ is right angled triangle

30 | 4

$\angle FEC = \angle ECD = 10°$

(alternate angles are equal) ………………½

$\angle BCA = 90°$

$\angle BCD + DCA = 90°$

$10° + \angle DCA = 90°$

$\angle DCA = 80°$ ………………**1**

$AC = DC$

$\angle DAC = \angle ADC = 50°$ ………………½

In ΔBAC

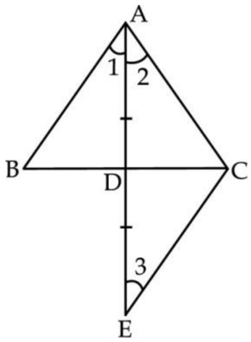
$\angle A + \angle B + \angle BCA = 180°$

$50° + \angle B + 90° = 180°$

$\angle B = 40°$ ………………**1**

In ΔBDE

$\angle B + \angle BED + \angle BDE = 180°$

		$40° + 90° + \angle BDE = 180°$ $\angle BDE = 50°$ ………………**1**	
	31	Extend AD to E such that AD = DE ………………½  In ΔABD and ΔCDE $AD = DE$ (By const.) $BD = DC$ (given) $\angle ADB = \angle EDC$ (V.O.A) $\Delta ABD \cong \Delta DCE$ (SAS) ………………1½ $\angle 1 = \angle 3$(cpct) and $AB = CE$ (cpct) But $\angle 1 = \angle 2$ (given) $\Rightarrow \angle 2 = \angle 3$ $\Rightarrow AC = CE$ ………………**1** (Side opposite to equal angles are equal) But $AB = CE$ (Proved above) $\Rightarrow AB = AC$ ………………**1** $\therefore \Delta ABC$ is an isosceles triangle	4