

Secondary School Examination
SUMMATIVE ASSESSMENT - II, 2012
MARKING SCHEME
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). Marking Scheme be strictly adhered to and religiously followed.
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' written with 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.

SECTION - A

- | | | |
|-----|-----|---|
| 1. | (D) | 1 |
| 2. | (C) | 1 |
| 3. | (B) | 1 |
| 4. | (B) | 1 |
| 5. | (A) | 1 |
| 6. | (A) | 1 |
| 7. | (D) | 1 |
| 8. | (A) | 1 |
| 9. | (A) | 1 |
| 10. | (B) | 1 |

SECTION - B

- | | | |
|-----|--|------------------------------------|
| 11. | $(p-12)x^2 + 2(p-12)x + 2 = 0$
For equal roots, $D = 0$
$\therefore D = b^2 - 4ac = 0$ | $\frac{1}{2}$

$\frac{1}{2}$ |
| | $4(p-12)^2 - 4(p-12)(2) = 0$ | |

- $4(p-12)[p-12-2] = 0$
 $4(p-12)(p-14) = 0$
 $p-12 = 0$ or $p-14 = 0$ 1/2
 $p = 12$ or $p = 14$
 Rejecting $p = 12$, since $p - 12 = 0$ as $a \neq 0$
 $p = 14$ 1/2
12. $\therefore (4k-6) - (1k+2) = (3k-2) - (4k-6)$ 1
 $4k-k-3k+4k = 6-2+6+2$
 $4k = 12$ 1/2
 $k = 3$ 1/2
13. Since lengths of tangents from an external point to a circle are equal. 1/2
 $TP = TQ$ ----- 1
 $AP = AR$ ----- 2 1
 $BR = BQ$
 Since $TP = TQ$
 $TA + AP = TB + BQ$
 $TA + AR = TB + BR$ { from 1 and 2} 1/2
14. Perimeter of protractor, if r is its radius. 1/2
 $= 2r + \pi r$
 $= r(2 + \pi)$
 $\therefore r(2 + \frac{22}{7}) = 36$ 1/2
 $r\left(\frac{22+14}{7}\right) = 36$ 1/2
 $r = \frac{7 \times 36}{36}$
 $= 7$
 \therefore diameter of the protractor $= 7 \times 2 = 14$ cm 1/2
15. Let n be the number of balls formed. 1/2
 \therefore volume of sphere $= n \times$ volume of a small sphere
 $\frac{4}{3}\pi R^3 = n \times \frac{4}{3} \times \pi \times r^3$ 1/2
 $(3)^3 = n \times (0.3)^3$ 1/2
 $n = \frac{3 \times 3 \times 3}{0.3 \times 0.3 \times 0.3} = 1000$
 Thus, 1000 balls can be formed. 1/2
16. If points are collinear, then area of the triangle formed by these points $= 0$ 1/2
 $\frac{1}{2} [1(k-4) + 3(4-1) + (-1)(1-k)] = 0$ 1/2
 $\Rightarrow k-4+9-1+k=0$ 1/2
 $2k = -4$
 $k = -2$ 1/2
17. Let $A = (1,2)$ $B = (2,7)$ $m_1 : m_2 = 3 : 4$ 1/2
 Let the coordinates of the point P be (x,y) 1/2

$$\frac{p-q}{pq} = pd - d - qd + d \quad \frac{1}{2}$$

$$\frac{p-q}{pq} = d(p-q) \quad \frac{1}{2}$$

$$d = \frac{1}{pq}$$

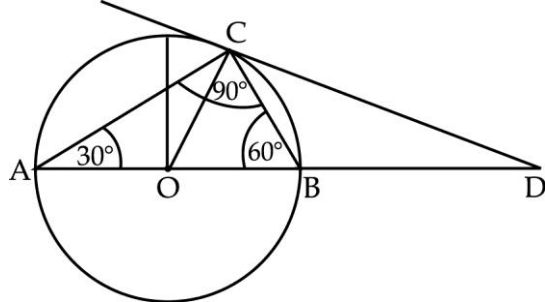
$$\therefore \frac{1}{q} = a + (p-1) \times \frac{1}{pq}$$

$$a = \frac{1}{q} - \frac{(p-1)}{pq}$$

$$a = \frac{p-p+1}{pq} = 1/pq \quad 1$$

$$\begin{aligned} \text{Now, } S_{pq} &= \frac{pq}{2} \left[2 \left(\frac{1}{pq} \right) + (pq-1) \left(\frac{1}{pq} \right) \right] \\ &= \frac{pq}{2} \left[\frac{2}{pq} + \frac{pq-1}{pq} \right] \\ &= \frac{pq}{2} \left[\frac{pq+1}{pq} \right] \\ &= \frac{1}{2} (pq + 1) \end{aligned}$$

21. Figure



AB is diameter

$$\therefore \angle ACB = 90^\circ \text{ (Angle in a semicircle)} \quad \frac{1}{2}$$

$$\angle BAC = 30^\circ \text{ (given)}$$

$$\therefore \angle ABC = 60^\circ \text{ (angle sum property)} \quad \frac{1}{2}$$

$$\angle CBD = 180^\circ - 60^\circ = 120^\circ \text{ (linear pair)}$$

$$\text{Also } \angle OCD = 90^\circ \text{ (Since CD is a tangent)}$$

$$\text{In } \triangle AOC, \angle OAC = \angle OCA = 30^\circ \text{ (OA = OC = r)}$$

$$\therefore \angle OCB = 90^\circ - \angle OCA = 90 - 30 = 60^\circ \quad \frac{1}{2}$$

$$\angle BCD = 90^\circ - \angle OCB$$

$$= 90^\circ - 60^\circ = 30^\circ$$

$$\text{In } \triangle BCD, \angle CBD + \angle BCD + \angle BDC = 180^\circ$$

$$\Rightarrow \angle BDC = 30^\circ$$

Since $\angle BDC = \angle BCD = 30^\circ$, Therefore $\triangle BCD$ is an isosceles triangle

$$BC = BD$$

Hence proved.

OR

$$AB = AQ \text{ (given)}$$

Since, lengths of tangents from an external point are equal

$$AR = AQ \quad \text{-----} \quad (1)$$

$$BR = BP \quad \text{-----} \quad (2)$$

$$CQ = CP \quad \text{-----} \quad (3)$$

$$\text{Since } AB = AC$$

$$AR + RB = AQ + QC$$

$$RB = QC \text{ (From 1)}$$

From (2) and (3)

$$BP = CP$$

\therefore P bisects the base

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

22. Drawing ΔABC correctly
Construction of similar Δ

1

2

23. Diameter $AB = 28$ cm

$$\text{Radius} = \frac{28}{2} = 14 \text{ cm}$$

$$AQ = \frac{1}{4} \times AB = \frac{1}{4} \times 28 = 7 \text{ cm}$$

$$QB = 28 - 7 = 21 \text{ cm}$$

Area of the shaded region = Area of semicircular region with QB as diameter
+ Area of semicircular region with AQ as diameter.

$$= \frac{1}{2} \times \pi \left(\frac{21}{2} \right)^2 + \frac{1}{2} \times \pi \left(\frac{7}{2} \right)^2$$

$$= \frac{1}{2} \times \frac{22}{7} + \left[\frac{441}{4} + \frac{49}{4} \right]$$

$$= \frac{1}{2} \times \frac{22}{7} \times \frac{490}{4}$$

$$= \frac{385}{2} = 192.5 \text{ cm}^2$$

1

1

1

24. Total height of toy = 30 cm = height of hemisphere + height of cone
Height of cone = 30 - 7 = 23 cm.

$\frac{1}{2}$

Radius of the hemisphere is = radius of cone = 7cm

Total volume of toy = volume of cone + volume of hemisphere

$\frac{1}{2}$

$$= \frac{1}{3} \pi (7)^2 \times 23 + \frac{2}{3} \pi (7)^3 \text{ cm}^3$$

1

$$= \frac{1}{3} \times \frac{22}{7} \times (7)^2 [23 + 14] \text{ cm}^3$$

$$= \left(\frac{1}{3} \times 154 \times 37 \right) \text{ cm}^3$$

$\frac{1}{2}$

$$= 1899 \frac{1}{3} \text{ cm}^3$$

$\frac{1}{2}$

OR

Let the radius of the original cylinder = r

And height of original cylinder = h

Volume = $\pi r^2 h$

New radius = r/2

1

New height = h

$$\text{New volume } \pi \left(\frac{r}{2} \right)^2 \times h = \frac{\pi r^2 h}{4}$$

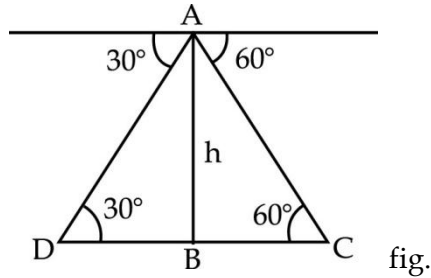
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$$\text{Volume of reduced cylinder} = \frac{1}{4}$$

1

Volume of the original cylinder

25.



1/2

$$\text{In } \triangle ABC, \frac{AB}{BC} = \tan 60^\circ$$

1/2

$$\Rightarrow BC = \frac{h}{\sqrt{3}}$$

1/2

$$\text{In } \triangle ABD, \frac{AB}{BD} = \tan 30^\circ$$

1/2

$$\therefore BD = h\sqrt{3}$$

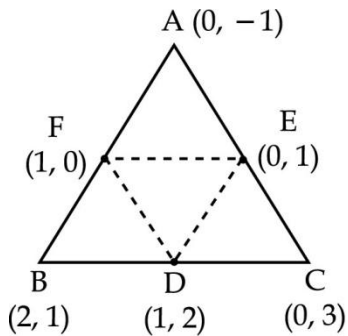
Total Distance DC = BD + BC

$$= \frac{h}{\sqrt{3}} + \sqrt{3} h$$

1

$$= \frac{h}{\sqrt{3}} (1+3) = \frac{4}{\sqrt{3}} h$$

26.



$$\text{The mid points are } D = \left(\frac{2+0}{2}, \frac{1+3}{2} \right) = (1, 2)$$

1/2

$$E = \left(\frac{0+0}{2}, \frac{-1+3}{2} \right) = (0, 1)$$

1/2

$$F = \left(\frac{0+2}{2}, \frac{-1+1}{2} \right) = (1, 0)$$

1/2

\therefore Area of $\triangle DEF$

1/2

$$= \frac{1}{2} [(1-0) + 0(0-2) + 1(2-1)]$$

1/2

$$= \frac{1}{2} (1+0+1)$$

1/2

$$= \frac{1}{2} (2)$$

$$= \frac{1}{2} \times 2 = 1 \text{ unit}^2$$

27. $AR = \frac{3}{4} AB \therefore 4AR = 3 AB$ 1/2

$$\Rightarrow AB = \frac{4}{3} AR$$

$$RB = AB - AR$$

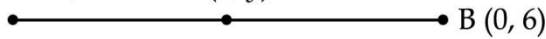
$$= \frac{4}{3} AR - AR = \frac{1}{3} AR$$
 1/2

$$\frac{AR}{RB} = \frac{AR}{\frac{1}{3}AR} = \frac{3}{1}$$
 1/2

$$AR : RB = 3 : 1$$

Let the coordinates of R (x, y)

A (-4, 0) R (x, y) 1/2



$$x = \frac{3 \times 0 - 1 \times (-4)}{3+1} = \frac{0 - (-4)}{4} = -1$$
 1/2

$$y = \frac{3 \times 6 + 1 \times 0}{3+1} = \frac{18}{4} = \frac{9}{2}$$
 1/2

$$\therefore R = \left(-1, \frac{9}{2}\right)$$

28. Total cards = 26 1

(i) Favourable outcomes = 5, 7, 11, 13, 17, 19, 23, 29 1

P (prime number) = $8/26 = 4/13$

(ii) Favourable outcomes = 6, 9, 12, 15, 18, 21, 24, 27, 30, 5, 10, 20, 25 1

P (multiple of 3 or 5) = $13/26 = 1/2$

(iii) Unfavourable outcomes = 5, 10, 15, 20, 25, 30

Number = 6

Favourable outcomes = $26 - 6 = 20$ 1

P (neither divisible by 5 nor by 10) = $20/30 = 2/3$

SECTION - D

29. Let the original speed of aircraft be 'x' km/hr 1/2

New speed = $(x - 200)$ km/hr

Time taken = $600/x$ hr

Time taken at reduced speed = $\frac{600}{x - 200}$ km/hr 1/2

$$\frac{600}{x - 200} - \frac{600}{x} = \frac{1}{2}$$
 1

$$x^2 - 200x - 240000 = 0$$

$$(x - 600)(x + 400) = 0$$

Rejecting $x = -400$ as speed can not be negative 1

Original speed = 600 km/hr

Duration of flight = $600 / 600 = 1$ hr 1

OR

Let the original number of persons = x 1/2

Share of each person = $6500/x$

New share = $6500 / x + 15$

Therefore , 1

$$\frac{6500}{x} - \frac{6500}{x+15} = 30$$
 1

$$x^2 + 15x - 3250 = 0$$

$$(x + 65)(x - 50) = 0$$

$$x = -65 \text{ or } x = 50$$

Since number of persons cannot be -ve therefore 1/2

Rejecting -65

Original number of persons = 50 1

30. Let the first term be 'a' and common difference 'd' 1/2

$$100 = S_8 = \frac{8}{2} [2a + (8-1)d]$$
 1/2

$$2a + 7d = 25$$

$$551 = S_{19} = \frac{19}{2} [2a + (19-1)d]$$
 1/2

$$2a + 19d = 58$$
 1/2

$$2a + 7d = 25$$

$$2a + 18d = 58$$

$$(-) \underline{\hspace{2cm}}$$
 1

$$-11d = -33$$

$$d = 3$$

$$2a + 7(3) = 25$$

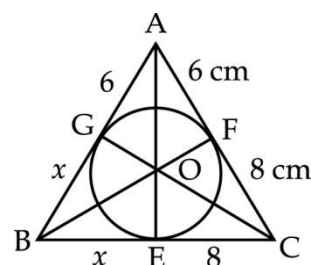
$$2a + 21 = 25$$
 1/2

$$2a = 4$$
 1/2

$$a = 2$$

Hence $a = 2$ and $d = 3$

31.



Since tangents to a circle from an external point are equal 1/2

$$AF = AG = 6 \text{ cm}$$

$$CF = CE = 8 \text{ cm}$$

$$BE = BG = x \text{ cm}$$

$$OE = OF = OG = 4 \text{ cm} = \text{radius}$$
 1

$$\text{Ar}(\Delta ABC) = \sqrt{s(s-a)(s-b)(s-c)}$$

$$S = \frac{6+x+x+8+8+6}{2} = 14 + x$$

$$\text{Also ar}(\Delta ABC) = \text{ar}(\Delta AOB) + (\text{ar} \Delta BOC) + (\text{ar} \Delta AOC)$$
 1

$$\begin{aligned}
&= \frac{1}{2} (\text{Perimetre}) \times \text{Inradius} \\
&= (14 + x) 4 \\
&= 56 + 4x \\
&\Rightarrow 672x + 48x^2 = (56 + 4x)^2 \\
&= 32x^2 + 224x - 3136 = 0 \\
&= x^2 + 7x - 98 = 0 \\
&= (x + 14)(x - 7) = 0 \\
&x = 7 \text{ or } x = -14 \\
&\text{But since side cannot be } -14 \text{ cm} \\
&\text{Therefore} \\
&AB = 6 + 7 = 13 \text{ cm} \\
&BC = 8 + 7 = 15 \text{ cm}
\end{aligned}$$

32. A bucket is in the shape of frustum of cone 1/2
- T.S.A of bucket = $\pi r^2 + \pi R^2 + \pi l (R + r)$
- $$L = \sqrt{(R - r)^2 + h^2}$$
- $$= \sqrt{12^2 + 16^2}$$
- $$= \sqrt{400}$$
- $$= 20 \text{ cm}$$
- TSA = $\pi[r^2 + R^2 + l(R + r)]$ 1/2
- $$= 3.14 (64 + 400 + 20(28))$$
- $$= 3215.36 \text{ cm}^2$$
- Cost of metal Rs = $(15/100 \times 3215.36) \text{ cm}^2$ 1
- $$= \text{Rs } 482.304$$

OR

Volume of liquid in the hemispherical bowl 1 1/2

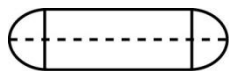
$$= \frac{2}{3} \pi (15)^3 \text{ cm}^3$$

Volume of one cylindrical bottle = $\pi \left(\frac{5}{2}\right)^2 \times 6 \text{ cm}^3$ 1

$$\therefore \text{Number of bottles required} = \frac{\cancel{2} \times \cancel{\pi} \times \overset{\cancel{3}}{15} \times \overset{\cancel{3}}{15} \times 15 \times 4}{\overset{\cancel{3}}{3} \times \cancel{\pi} \times \underset{2}{\cancel{6}} \times \overset{\cancel{3}}{3} \times \overset{\cancel{3}}{3} \times \overset{\cancel{3}}{3}}$$

$$= 60 \text{ bottles} \quad \text{1/2}$$

33.



Length = 5 cm

 $\frac{1}{2}$ Radius = $2.8/2 = 1.4$ cm

Radius of hemisphere = radius of cylinder = 1.4 cm

 $\frac{1}{2}$ Height of cylindrical portion = $5 - 2.8 = 2.2$ cmVol of gulab jamun = $2 \times \frac{2}{3} \pi r^3 + \pi r^2 h$

1

$$= \pi r^2 \left(\frac{4}{3} r + h \right)$$

$$= \frac{22}{7} (1.4 \times 1.4) \left(\frac{4}{3} \times 1.4 + 2.2 \right)$$

$$= \frac{22}{7} \times 1.4 \times 1.4 \left\{ \frac{5.6}{3} + 2.2 \right\}$$

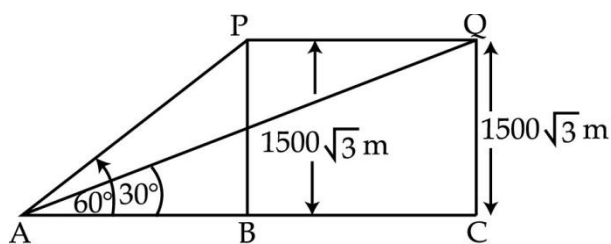
$$= 61.6 \times 12.2/3$$

 $\frac{1}{2}$ Therefore volume of 45 gulab jamuns = $45 \times 61.6 \times 12.2/3$ $\frac{1}{2}$ Volume of syrup = $30/100 \times 45 \times 61.6 \times 12.2/3$

$$= 3381.84 \text{ cubic cm.}$$

1

34.

Let P and Q be two position of aeroplane where $\angle PAB = 60^\circ$, $\angle QAC = 30^\circ$

1

$$\text{In triangle ABP, } \tan 60^\circ = \frac{BP}{AB} \Rightarrow \sqrt{3} = \frac{1500}{AB} \sqrt{3}$$

$$\Rightarrow AB = 1500 \text{ m}$$

1

$$\text{In triangle AQC, } \tan 30^\circ = \frac{CQ}{AC} \Rightarrow 1/\sqrt{3} = \frac{1500}{AC} \sqrt{3}$$

$$AC = 1500 \times 3 = 4500 \text{ m}$$

1

$$PQ = BC = AC - AB$$

$$= 4500 - 1500 = 3000 \text{ m}$$

 $\frac{1}{2}$

$$\text{Speed} = 3000/15 = 200 \text{ m/sec}$$

$$= 200/1000 \times 60 \times 60 = 720 \text{ km/hr}$$

 $\frac{1}{2}$

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