

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

SECTION - B

11. The given equation can be written as
 $100x^2 - 20x + 1 = 0$

$$100x^2 - 10x - 10x + 1 = 0$$

1/2

$$10x(10x - 1) - 1(10x - 1) = 0$$

1/2

$$(10x - 1)(10x - 1) = 0$$

1/2

$$x = \frac{1}{10}, \frac{1}{10}$$

1/2

12. $k + 1$, $3k$ and $4k + 2$ are in A.P

1

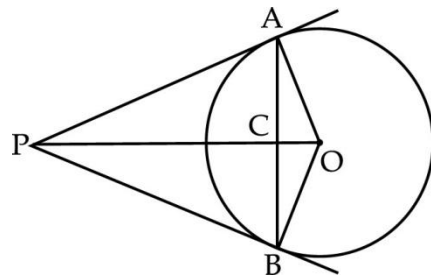
$$\therefore 3k - k - 1 = 4k + 2 - 3k$$

$$2k - 1 = k + 2$$

1

$$k = 3$$

- 13.



1

In ΔACP and ΔBCP ,

1/2

$AP = BP$ (by theorem)

$PC = PC$ (common)

1/2

$\angle APC = \angle BPC$ ($\because \angle APO = \angle BPO$)

$\Delta ACP \cong \Delta BCP$

$\Rightarrow AC = CB$ (c.p.c.t)

$$\angle ACP = \angle BCP = \frac{1}{2} \times 180^\circ = 90^\circ$$

Hence the proof

14. Area of the paper $ABCD = 18 \times 14 = 252 \text{ cm}^2$

1/2

$$r = \frac{1}{2} BC = \frac{1}{2} \times 14 = 7 \text{ cm}$$

1/2

$$\text{Area of the semicircular portion} = \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77 \text{ cm}^2$$

1/2

$$\text{Area of the remaining paper} = 252 - 77 = 175 \text{ cm}^2$$

1/2

15. Let a be the edge of the cube

Volume of the cube = volume of the plate

1/2

$$a^3 = 1 \times 9 \times 81 = 9^3$$

$$a = 9 \text{ cm}$$

1/2

Surface area of the cube = $6a^2$

$$= 6 \times 9 \times 9$$

$$= 486 \text{ cm}^2$$

1

16. Area of $\Delta PQR = 0$

$$\frac{1}{2} [x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2)] = 0 \quad \frac{1}{2}$$

$$\frac{1}{2} \{1(1 - 11) + 9(1 - 5) + 4(5 - 1)\} = 0 \quad \frac{1}{2}$$

$$-10 + 6a + 16 = 0 \quad 1$$

$$a = -1$$

17. $AP = \frac{3}{7} AB$ $\frac{1}{2}$

\therefore P divides AB in the ratio 3 : 4

Co-ordinates of P = $\left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n} \right)$ $\frac{1}{2}$

$$= \left(\frac{3 \times 2 + 4 \times (-2)}{3 + 4}, \frac{3 \times (-4) + 4 \times -2}{3 + 4} \right) \quad \frac{1}{2}$$

$$= \left(\frac{-2}{7}, \frac{-20}{7} \right) \quad \frac{1}{2}$$

18. $S = \{ (1, 1) (1, 2) \text{-----} (1, 6)$
 $(2, 1) \text{-----} (2, 6)$

 $(6, 1) \text{-----} (6, 6) \}$

Total number = 36

Let A = $\{ (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6)$ **1**
 $(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6)$
 $(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6) \}$

P(getting an even no : on the first die) **1**

$$= \frac{18}{36} = \frac{1}{2}$$

OR

$S = \{ HH, HT, TH, TT \}$

Total number of out comes = 4

At least one tail occurs when **1**

A = $\{ HT, TH, TT \}$ occurs **1**

P(getting at least one tail) = $\frac{3}{4}$

SECTION - C

19. $x^2 - 2(a^2 + b^2)x + (a^2 - b^2)^2 = 0$

$$D = [-2(a^2 + b^2)]^2 - 4 \times 1 \times (a^2 - b^2)^2$$

$$= 4(a^2 + b^2)^2 - 4(a^2 - b^2)^2$$

$$= 4[a^4 + b^4 + 2a^2b^2 - a^4 - b^4 + 2a^2b^2]$$

$$\begin{aligned}
 &= 4[4a^2b^2] && \frac{1}{2} \\
 &= 16a^2b^2 && \frac{1}{2} \\
 x &= \frac{2(a^2+b^2) \pm \sqrt{16a^2b^2}}{2} && \frac{1}{2} + \frac{1}{2} \\
 &= a^2 + b^2 + 2ab \text{ or } a^2 + b^2 - 2ab \\
 &= (a+b)^2 \text{ or } (a-b)^2
 \end{aligned}$$

OR

Let the two parts be x and y

$$x + y = 29 \Rightarrow y = 29 - x$$

$$x^2 + y^2 = 425 \quad \frac{1}{2}$$

$$x^2 + (29 - x)^2 = 425$$

$$x^2 - 29x + 208 = 0 \quad 1$$

$$(x - 16)(x - 13) = 0 \quad 1$$

$$x = 16, 13$$

When $x = 16$, $y = 13$ $\frac{1}{2}$

When $x = 13$, $y = 16$

Two parts are 13 and 16

20. Two digit natural numbers which when divided by 3 yield 1 as remainder form an A. P. 10, 13, 16, -----, 97

$\frac{1}{2}$

$$a = 10, d = 3$$

$$a_n = 97$$

$$\Rightarrow 10 + (n - 1)3 = 97$$

$$n = 30$$

$1\frac{1}{2}$

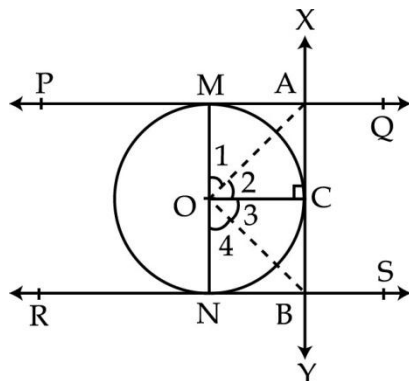
$$S_{30} = \frac{30}{2} (10 + 97)$$

$$= 15 \times 107$$

1

$$= 1605$$

21.



Construction : Join OA, OB, OC

In $\triangle OMA$ and $\triangle OCA$

$\frac{1}{2}$

$$\angle OMA = \angle OCA = 90^\circ$$

$$OA = OA \quad (\text{common})$$

$$OM = OC \quad (\text{radii})$$

$$\triangle OMA \cong \triangle OCA \quad (\text{RHS})$$

$$\angle 1 = \angle 2 \quad (\text{cpct})$$

$$\text{Similarly, } \angle 3 = \angle 4 \quad (\text{cpct})$$

$$\angle 1 + \angle 2 + \angle 3 + \angle 4 = 180^\circ$$

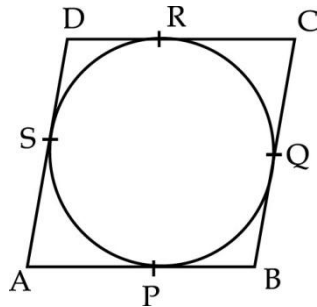
$$\angle 2 + \angle 2 + \angle 3 + \angle 3 = 180^\circ$$

$$2(\angle 2 + \angle 3) = 180^\circ$$

$$\angle 2 + \angle 3 = \frac{180}{2}$$

$$\therefore \angle AOB = 90^\circ$$

OR



$$1) AP = AS \quad \text{_____ (i)}$$

$$BP = BQ \quad \text{_____ (ii)}$$

$$CQ = CR \quad \text{_____ (iii)}$$

$$DR = DS \quad \text{_____ (iv)}$$

$$AB + DC = AP + PB + CR + DR$$

$$= AS + BQ + CQ + DS \quad (\text{using (i), (ii), (iii) and (iv)})$$

$$= (AS + DS) + (BQ + CQ)$$

$$= AD + BC$$

$$\Rightarrow AB + AB = AD + AD \quad (\text{opp. Sides of a } \parallel\text{gm})$$

$$\Rightarrow 2AB = 2AD$$

$$AB = AD$$

Adjacent sides of the parallelogram ABCD are equal. \therefore It is a rhombus

22. Drawing $\triangle ABC$ correctly

Construction of similar triangle

$$23. \text{ Required Area} = \frac{1}{2} \times \frac{22}{7} \times 6^2 + \frac{1}{2} \times \frac{22}{7} \times 2^2 - \frac{1}{2} \times \frac{22}{7} \times 4^2$$

$$= 37.71 \text{ cm}^2$$

24. Radius of sphere = 10.5 cm

$$\text{Vol. of the sphere} = \frac{4}{3} \times \pi \times (10.5)^3$$

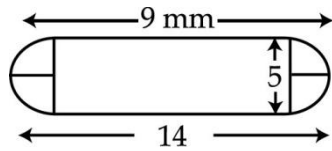
Radius of the base of the cone = 3.5 cm

Height of the cone = 3 cm

$$\text{Vol. of the cone} = \frac{1}{3} \times \pi \times (3.5)^2 \times 3 \quad 1$$

$$\begin{aligned} \text{No. of cones obtained} &= \frac{\text{Vol. of sphere}}{\text{Vol. of one cone}} \\ &= \frac{\frac{4}{3} \times \pi \times (10.5)^3}{\frac{1}{3} \times \pi \times (3.5)^2 \times 3} \\ &= 126 \end{aligned} \quad 1$$

OR

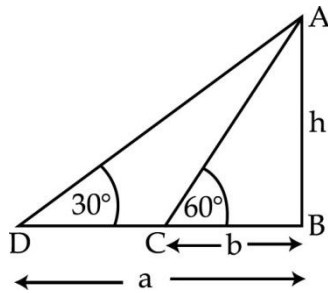


Diameter = 5 mm, Radius = 2.5 mm

$$\begin{aligned} \text{Length of the cylindrical portion} &= 14 - 2.5 - 2.5 \\ &= 9 \text{ mm} \end{aligned} \quad \begin{array}{l} \frac{1}{2} \\ 1 \end{array}$$

$$\begin{aligned} \therefore \text{Surface area of the capsule} &= 2 \times \text{Surface area of hemisphere} \\ &+ \text{Curved surface area of cylinder} \\ &= 2 \times 2\pi (2.5)^2 + 2\pi (2.5) \times 9 \\ &= 220 \text{ mm}^2 \text{ (app)} \end{aligned} \quad 1\frac{1}{2}$$

25.



$$\text{In } \triangle ABD, \frac{h}{a} = \tan 30^\circ = \frac{1}{\sqrt{3}} \quad \text{--- (i)} \quad 1+1$$

$$\text{In } \triangle ABC, \frac{h}{b} = \tan 60^\circ = \sqrt{3} \quad \text{--- (ii)} \quad \frac{1}{2}$$

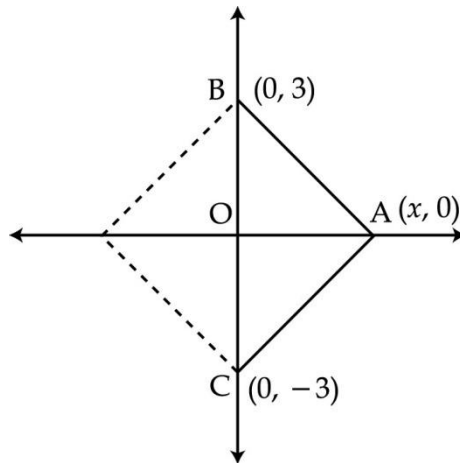
$$\begin{aligned} \text{(i)} \times \text{(ii)} &\Rightarrow \frac{h^2}{ab} = \frac{1}{\sqrt{3}} \cdot \sqrt{3} = 1 \\ &\Rightarrow h = \sqrt{ab} \text{ m} \end{aligned}$$

26. P divides AB in the ratio 1 : 2 1/2
Q divides AB in the ratio 2 : 1

$$\begin{aligned} (p, -2) &= \left(\frac{1+6}{3}, \frac{2-8}{3} \right) \\ p &= \frac{7}{3} \end{aligned} \quad 1\frac{1}{2}$$

$$\begin{aligned} \left(\frac{5}{3}, q \right) &= \left(\frac{2+3}{3}, \frac{4-4}{3} \right) \\ q &= 0 \end{aligned} \quad 1$$

27.



Co-ordinates of B (0, 3).

A lies on the x-axis.

\therefore co-ordinates of A(x, 0)

AB = BC

$$\sqrt{(x-0)^2 + (0-3)^2} = \sqrt{0 + (-3-3)^2}$$

$$\sqrt{x^2 + 9} = 6$$

$$x = \pm 3\sqrt{3}$$

Co-ordinates of A ($\pm 3\sqrt{3}$, 0)

" " B (0, 3)

A ($3\sqrt{3}$, 0), B(0, 3), C (0, -3)

$$\text{Area} = \frac{1}{2} [3\sqrt{3} (3+3) + 0+0]$$

$$= \frac{18\sqrt{3}}{2} = 9\sqrt{3} \text{ sq. u}$$

$\frac{1}{2}$

$\frac{1}{2}$

1

1

28. Total no. of outcomes = 52

(i) $P(\text{a king of red colour}) = \frac{2}{52} = \frac{1}{26}$

$\frac{1}{2}$

(ii) $P(\text{a face card}) = \frac{12}{52} = \frac{3}{13}$

$\frac{1}{2}$

(iii) $P(\text{a red face card}) = \frac{6}{52} = \frac{3}{26}$

$\frac{1}{2}$

(iv) $P(\text{jack of hearts}) = \frac{1}{52}$

$\frac{1}{2}$

(v) $P(\text{a spade}) = \frac{13}{52} = \frac{1}{4}$

$\frac{1}{2}$

(iv) $P(\text{queen of diamonds}) = \frac{1}{52}$

$\frac{1}{2}$

SECTION - D

29. Let the speed of the stream be x km/hr
 \therefore speed of the boat upstream = $(18 - x)$ km/hr
 Speed of the boat downstream = $(18 + x)$ km/hr 1/2
 Time taken to go upstream = $\frac{\text{distance}}{\text{speed}}$

$$= \frac{24}{18 - x}$$

 Time taken to go downstream = $\frac{24}{18 + x}$ 1/2
 According to the question,

$$\frac{24}{18 - x} - \frac{24}{18 + x} = 1$$
 1

$$x^2 + 48x - 324 = 0$$
 1/2

$$x = \frac{-48 \pm \sqrt{48^2 + 1296}}{2}$$
 1/2

$$= \frac{-48 \pm 60}{2} = 6 \text{ or } -54$$

 Speed of the stream = 6 km/hr 1

OR

Let the 3 consecutive positive integers be 1/2
 $x, x + 1, x + 2$
 By the given condition,

$$x^2 + (x + 1)(x + 2) = 154$$
 1/2

$$2x^2 + 3x - 152 = 0$$
 1

$$(x - 8)(2x + 19) = 0$$

 Or $x = -\frac{19}{2}$ which is rejected as positive integers are taken. 1

$$x = 8$$
 1/2

$$\therefore x = 8$$
 1/2
 Three positive integers are 8, 8 + 1, 8 + 2
 ie, 8, 9, 10

30. A = Rs 5000, d = Rs 200 1/2
 Let a_n = Rs 7000 1/2
 $\Rightarrow a + (n - 1)d = 7000$ 1/2

$$5000 + (n - 1) \times 200 = 7000$$
 1

$$n = 11$$
 1
 ie, $1995 + 11 = 2006$
 man's income will reach Rs 7000 in 11 years
 ie, in the year 2006 1/2

31. Correct given, To prove, construction and figure 1/2 \times 4 = 2
 Correct Proof 2

32. Cylindrical well

1/2

$$r = \frac{7}{2} \text{ m} \quad H = 20 \text{ m}$$

Let h be the height raised by spreading the earth on the platform (22 m × 14 m)

Volume of the platform with earth = 22 × 14 × h

1/2

Volume of the earth taken out of the well

1/2

$$= \pi r^2 H$$

1/2

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{5}{20} = 154 \times 5$$

1

$$22 \times 14 \times h = 154 \times 5$$

$$h = \frac{\frac{7}{2} \times 5}{\frac{22}{2} \times \frac{14}{2}}$$

1

$$= 2.5 \text{ m}$$

OR

Speed of water = 3 km/hr = 3000 m/hr

Internal radius of the pipe = 10 cm = $\frac{1}{10}$ m

Let the time taken to fill the tank be x hrs

Vol. of water that flows in x hrs

$$= \pi \left(\frac{1}{10} \right)^2 \times 3000 x \text{ m}^3$$

$$= 30 \pi x \text{ m}^3$$

Radius of the base of the tank = 5 m

Depth „ = 2 m

Vol. of cylindrical tank = 50 π m³

1

$$30\pi x = 50\pi$$

1

1

$$x = \frac{5}{3} \text{ hrs} = 100 \text{ minutes}$$

$$= 1 \text{ hr } 40 \text{ minutes}$$

33. R = 28 cm, r = 7 cm, h = 45 cm

Capacity of the bucket = $\frac{1}{3} \pi h (R^2 + r^2 + Rr)$

1/2

$$= \frac{1}{3} \times \frac{22}{7} \times 45 [28^2 + 7^2 + 28 \times 7]$$

1/2

$$= 48510 \text{ cm}^3$$

1

Surface area of the bucket = $\pi l [R + r] + \pi r^2$

1/2

$$l = \sqrt{h^2 + (R - r)^2}$$

$$= \sqrt{45^2 + (28 - 7)^2} = 49.66 \text{ cm}$$

1/2

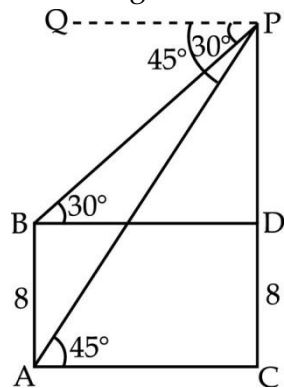
$$\text{Surface area} = \frac{22}{7} \times 49.66 [28 + 7] + \frac{22}{7} \times 7 \times 7$$

1/2

$$= 5616.5 \text{ cm}^2$$

1/2

34. Correct fig.



1

In ΔPBD ,

$$\frac{PD}{BD} = \tan 30^\circ = \frac{1}{\sqrt{3}}$$

$$BD = PD \sqrt{3}$$

In ΔPAC ,

$$\frac{PC}{AC} = \tan 45^\circ$$

$\frac{1}{2}$

$$PC = AC$$

$$PC = PD + DC = AC$$

$$AC = BD \text{ and } DC = AB = 8$$

$$\therefore PD + 8 = BD \quad (\because AC = BD)$$

$$= PD \sqrt{3}$$

1

$$\therefore PD = \frac{8}{\sqrt{3}-1} = 4(\sqrt{3} + 1) \text{ m}$$

1

Height of the multistoreyed building

$$= 4(\sqrt{3} + 1) + 8 = 4(3 + \sqrt{3}) \text{ m}$$

$\frac{1}{2}$

Distance between the two buildings

$$= 4(3 + \sqrt{3}) \text{ m}$$

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