Secondary School Examination

March -2010

Marking Scheme--- Mathematics (Outside Delhi) 30/1, 30/2, 30/3

General Instructions

1. The Marking Scheme provides general guidelines to reduce subjectivity and maintain uniformity among large number of examiners involved in the marking. The answers given in the marking scheme are the best suggested answers.

2. Marking is to 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 should be strictly adhered to and religiously followed.

3. Alternative methods are accepted. Proportional marks are to be awarded.

4. Some of the questions may relate to higher order thinking ability. These questions will be indicated to you separately by a star mark. These questions are to be evaluated carefully and the students' understanding / analytical ability may be judged.

5. The Head-Examiners have to go through the first five answer-scripts evaluated by each evaluator to ensure that the evaluation has been done as per instructions given in the marking scheme. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.

6. If a question is attempted twice and the candidate has not crossed any answer, only first attempt is to be evaluated. Write 'EXTRA' with second attempt.

7. A full scale of marks 0 to 80 has to be used. Please do not hesitate to award full marks if the answer deserves it.

8. Separate Marking Scheme for all the three sets has been given.

QUESTION PAPER CODE 30/1

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Marks

1. Rational	2. -1	3. 6	
4. 7 cm	5. 2 cm	6. $\frac{1}{5}$	1×10
7. $\sqrt{2}$ c	8. 60°	9. 3 cm	= 10 m
10. $\frac{1}{3}$			

SECTION - B

11. When 3 is a zero, we have $2(3)^2 + (3) + k = 0$ 1 m

$\Rightarrow 18 + 3 + k = 0$ or $k = -21$ 1 m

12. The condition for infinitety many solutions is

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$ ½ m

$$\Rightarrow \frac{2}{m-1} = \frac{3}{m+1} = \frac{7}{3m-1}$$ ½ m

solving to get m = 5 1 m

13. $265 = \frac{n}{2}[4 + 49] \Rightarrow n = 10$ 1 m

$49 = 4 + 9d \Rightarrow d = 5$ 1 m

14. Join OA, OB and OP

$OP^2 = (5)^2 + (12)^2 = 169 \Rightarrow OP = 13$ cm 1 m

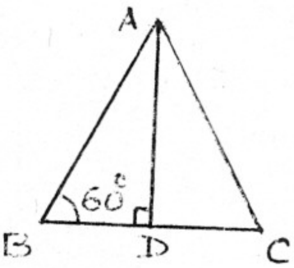
$BP^2 = (13)^2 - (3)^2 = 160 \Rightarrow BP = \sqrt{160}$ cm or $4\sqrt{10}$ cm 1 m

15. $\cos 70^\circ = \cos(90^\circ - 20^\circ) = \sin 20^\circ$, $\sec^2 59^\circ = \text{cosec}^2 31^\circ$

Given expression $= \dfrac{\sin 20^\circ}{3\sin 20^\circ} + \dfrac{4(\text{cosec}^2 31^\circ - \cot^2 31)}{3} - \dfrac{2}{3}\sin 90^\circ$ 1 m

$= \dfrac{1}{3} + \dfrac{4}{3} - \dfrac{2}{3} = 1$ 1 m

OR



Let ABC be an equilateral triangle and $AD \perp BC$

If $AB = BC = AC = a$ then $BD = \dfrac{a}{2}$ and $\angle B = 60^\circ$ 1 m

$\sec 60^\circ = \sec B = \dfrac{AB}{BD} = \dfrac{a}{\frac{a}{2}} = 2$ ½ m

Hence $\sec 60^\circ = 2$ ½ m

SECTION -C

16. Let us suppose that $\sqrt{3}$ be a rational number

$\therefore$ Let $\sqrt{3} = \dfrac{p}{q}$, p, q are integers $q \neq 0$ and p and q are coprimes 1 m

$\Rightarrow 3 = \dfrac{p^2}{q^2}$ or $p^2 = 3q^2 \Rightarrow 3$ divides p^2

Hence 3 divides p .... (i) 1m

Let $p = 3a$, where a is an integer

$\therefore\ 9a^2 = 3q^2 \Rightarrow q^2 = 3a^2 \Rightarrow 3$ divides q^2

Hence 3 divides q .... (ii) ½m

But p and q are coprimes, hence a contradiction

$\therefore\ \sqrt{3}$ is not rational. Hence $\sqrt{3}$ is irrational ½ m

17. Simplifying given equations, we get

$$b^2x + a^2y = a^3b + ab^3; \; x + y = 2ab$$ ½ m

$$\Rightarrow \begin{array}{l} b^2x + a^2y = a^3b + ab^3 \\ \underline{a^2x \pm a^2y = 2a^3b} \end{array}$$

$$\Rightarrow (b^2 - a^2)x = ab(b^2 - a^2)$$ ½ m

$$\Rightarrow x = ab$$ 1 m

$$x + y = 2ab \quad \Rightarrow y = ab$$ 1 m

OR

Let the fraction be $\frac{x}{y}$

$\Rightarrow x + y = 2x + 4$ or $x - y + 4 = 0$ .... (i) 1 m

$\frac{x+3}{y+3} = \frac{2}{3} \Rightarrow 3x + 9 = 2y + 6$ or $3x - 2y + 3 = 0$ ....(ii) 1 m

Solving (i) and (ii) to get $x = 5, y = 9$ ½ m

$\therefore$ Fraction is $\frac{5}{9}$ ½ m

18. Here $S_{10} = -80$ and $S_{20} = -80 - 280 = -360$ ½ m

$5[2a + 9d] = -80$ or $2a + 9d = -16$ ½ m

$10[2a + 19d] = -360$ or $2a + 19d = -36$ ½ m

Solving to get $d = -2$ and $a = 1$ 1 m

$\Rightarrow$ AP is $1, -1, -3, -5,$ .... ½ m

19. In Δs ABD and ECF, $\angle D = \angle F = 90^0$ and $\angle B = \angle C$ $[\because AB = AC]$ 1 m

$\therefore \ \Delta ABD \sim \Delta ECF \quad (AA)$ ½ m

$\Rightarrow \dfrac{AB}{EC} = \dfrac{AD}{EF} \quad \therefore \ AB \times EF = AD \times EC$ 1+½ m

20. $\text{LHS} = \dfrac{(\sin A + \cos A - 1)}{\sin A} \cdot \dfrac{(\cos A + \sin A + 1)}{\cos A}$ 1 m

$= \dfrac{(\sin^2 A + \cos^2 A) + 2\sin A \cos A - 1}{\sin A \cos A}$ 1 m

$= \dfrac{2\sin A \cos A}{\sin A \cos A} = 2 = \text{RHS}$ 1 m

OR

$\text{LHS} = \dfrac{\sin A(\cos A + \sin A)}{\cos A} + \dfrac{\cos A(\sin A + \cos A)}{\sin A}$ 1 m

$= (\sin A + \cos A)\left(\dfrac{\sin^2 A + \cos^2 A}{\cos A \sin A}\right)$ 1 m

$= \dfrac{\sin A + \cos A}{\cos A \sin A} = \sec A + \operatorname{cosec} A \cdot = \text{RHS}$ 1 m

21. Constructing Δ ABC 1 m

Constructing a triangle

(similar to Δ ABC with 2 m

scale facter $\frac{4}{5}$)

22. $\underset{(-1,3)}{A}$ ——— $\underset{(x,y)}{\overset{K:1}{P}}$ ——— $\underset{(9,8)}{B}$ Let (x,y) be the coordinates of P

$\therefore \quad x = \frac{9k-1}{k+1}, \quad y = \frac{8k+3}{k+1}$ 1 m

P lies on x-y + 2 = 0 $\Rightarrow \frac{9k-1}{k+1} - \frac{8k+3}{k+1} + 2 = 0$ 1m

Solving to get $k = \frac{2}{3}$ 1m

23. Let A (p,q), B (m,n) and C (p–m, q–n) be collinear points

$\therefore$ area Δ ABC = 0 ½ m

$\Rightarrow \quad p(n-q+n) + m(q-n-q) + (p-m)(q-n) = 0$ 1 m

$\Rightarrow \quad 2pn - pq - mn + pq - pn - qm + mn = 0$ 1 m

$\Rightarrow \quad pn = qm$ ½ m

24. Let h m be the height of water collected on the roof

$\therefore$ Volume of water at the roof $= 22 \times 20 \times h \ m^3$ ....(i) 1 m

Volume of water in cylinder $= \frac{22}{7} \times (1)^2 \times 3.5 \ m^3$ ....(ii) 1m

From (i) and (ii) $h = \frac{1}{40}$ m or 2.5 cm. 1m

OR

Shaded area = Area of circle of radius 7 cm – Area of circle of radius

3.5 cm – area of Δ BCD 1m

$= \left[\frac{22}{7} \times 7 \times 7 - \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} - \frac{1}{2} \times 14 \times 7\right] cm^2$ 1m

$= [154 - 38.5 - 49] \ cm^2 = 66.5 \ cm^2$ 1m

25. Total number of cards $= 89$ 1m

(i) P (a two digit number) $= \dfrac{81}{89}$ 1m

(ii) P (a perfect square) $= \dfrac{8}{89}$ 1m

SECTION D

26. Let the age of sister be x years

$\therefore$ Age of the girl (Elder Sister) $= 2x$ years ½ m

Four years hence, their ages will be $(x+4)$ years and $(2x+4)$ years 1 m

$\therefore\ (x+4)\ (2x+4) = 160 \ \Rightarrow\ x^2 + 6x - 72 = 0$ 1+1m

$\Rightarrow\ (x+12)\ (x-6) = 0 \ \Rightarrow\ x = 6 \quad (x = -12$ is rejected) 1½ m

$\therefore$ Ages of two sisters are 6 years and 12 years 1m

27. For correct Given, To Prove, Construction and Figure ½ x 4 = 2 m

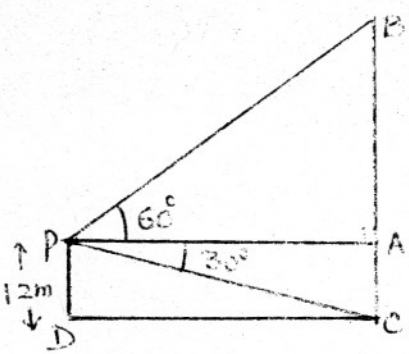
For Correct Proof 2 m

Given $PR^2 = 2PQ^2 = PQ^2 + PQ^2$ ½ m

$= PQ^2 + QR^2 \qquad (\because\ PQ = QR)$ ½ m

$\therefore\ \angle Q = 90^0$ (converse of Pythagoras theorem) 1 m

28.



[Correct Fig.] 1 m

Let distance of cliff from the ship be CD

$\therefore\ \dfrac{AB}{AP} = \tan 60^0 = \sqrt{3}$ ½ m

$\therefore\ AB = \sqrt{3}\ (AP)$ ....(i) 1 m

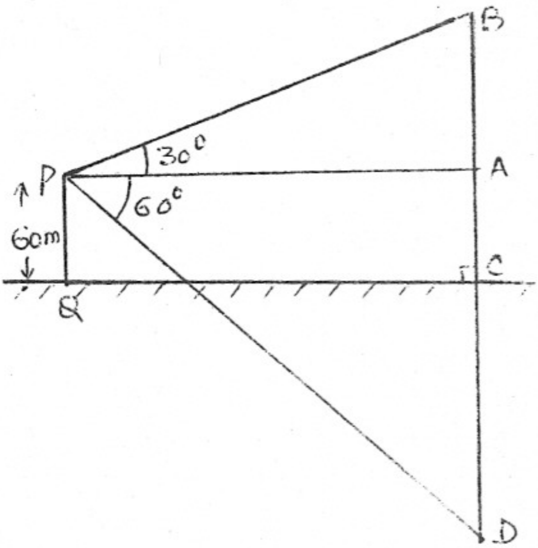
$\dfrac{AC}{AP} = \tan 30^0 = \dfrac{1}{\sqrt{3}}$, But AC = 12m ½ m

$\Rightarrow$ AP $= 12\sqrt{3}$ m $=$ 20.784 m 1 m

Putting in (i), AB $= \sqrt{3}\left(12\sqrt{3}\right)$ m $= 36$ m or 35.99 m 1 m

$\therefore$ Height of cliff $= 36 + 12 = 48$ m 1 m

or 47.99 m



OR

Correct Fig. 1 m

Let P be the given point such that PQ $= 60$ m. Let B be the position of cloud and D be its reflection in the lake

Let BC $=$ h m and AP $= x$ m.

$\therefore$ AB $= (\mathrm{h} - 60)$ m and AD $= (\mathrm{h} + 60)$ m. ½ m

$\therefore$ In Δ PAB, $\frac{AB}{AP} = \tan 30^0$ or $\frac{\mathrm{h}-60}{x} = \frac{1}{\sqrt{3}}$ 1 m

or $x = \sqrt{3}\ (\mathrm{h} - 60)$ m ½ m

In Δ APD, $\frac{\mathrm{h}+60}{x} = \tan 60^0 = \sqrt{3}$ 1 m

$\therefore$ $\mathrm{h} + 60 = \sqrt{3}\, x = \sqrt{3}\left[\sqrt{3}\,(\mathrm{h} - 60)\right]$ 1m

$\Rightarrow$ $\mathrm{h} + 60 = 3\mathrm{h} - 180$ $\Rightarrow$ $2\mathrm{h} = 240$ $\Rightarrow$ $\mathrm{h} = 120$ m. 1m

$\therefore$ Height of the cloud $= 120$ m.

29. Here $4 \times \frac{22}{7} \times \mathrm{r}^2 = 616$ $\Rightarrow$ r (radius of sphere) $= 7$ cm. 1 m

Volume of sphere $= \frac{4}{3}\ \pi \times (7)^3$ cm^3 ....(i) 1 m

Volume of cone $= \frac{1}{3}\ \pi\ \mathrm{R}^2 \times 28$ cm^3 ....(ii) 1m

$$\Rightarrow \frac{1}{3} \pi R^2 \times 28 = \frac{4}{3} \pi (7)^3$$ 1m

$\Rightarrow$ R (radius of cone) = 7 cm. 1m

$\therefore$ Diameter = 14 cm. 1m

OR

Here, $2\pi (R-r) \cdot 14 = 88 \text{ cm}^2$ 1 m

$\Rightarrow R - r = 1$ cm ....(i)

$$V = 176 = \frac{22}{7} \times 14 \left[R^2 - r^2\right]$$ 1 m

$\Rightarrow R^2 - r^2 = 4$ i.e $(R + r)(R - r) = 4$ 1m

$\Rightarrow R + r = 4$ cm ....(ii) 1m

$\therefore$ Outer radius $= \frac{5}{2}$ cm

Inner radius $= \frac{3}{2}$ cm

1 m

$\therefore$ Outer diameter = 5 cm

Inner diameter = 3 cm

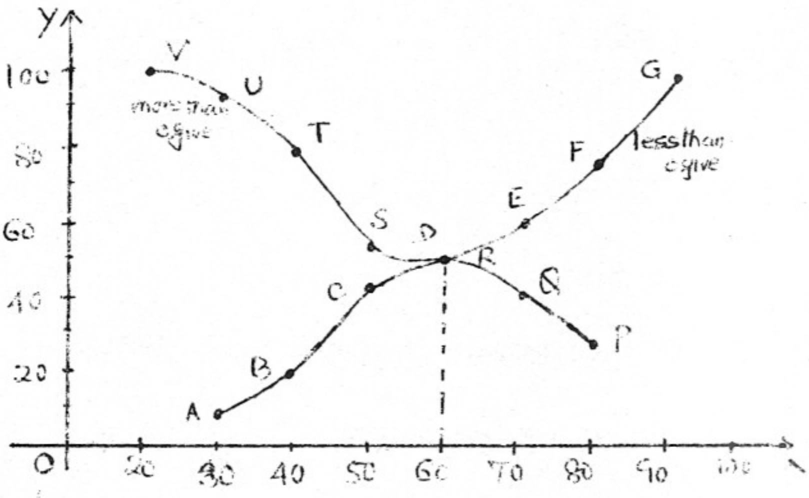
1 m

30. The points for 'less than ogive' are

$\overset{A}{(30, 8)}, \overset{B}{(40, 20)}, \overset{C}{(50, 44)}, \overset{D}{(60, 50)}, \overset{E}{(70, 60)}, \overset{F}{(80, 75)}, \overset{G}{(90, 100)}$ 1 m

The points for 'more than ogive' are

$\overset{P}{(80, 25)}, \overset{Q}{(70, 40)}, \overset{R}{(60, 50)}, \overset{S}{(50, 56)}, \overset{T}{(40, 80)}, \overset{U}{(30, 92)}, \overset{V}{(20, 100)}$ 1 m



For Correct less than ogive 1½ m

For Correct more than ogive 1½ m

Getting Median = 60 1m

QUESTION PAPER CODE 30/2

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Marks

1.	$\sqrt{2}$ c	2. 60°	3. 3 cm	
4.	$\frac{1}{3}$	5. rational	6. $\frac{1}{49}$	1×10 $= 10$ m
7.	7 cm.	8. 2 cm	9. 6	
10.	-1			

SECTION - B

11. -3 is a zero of the polynomial if $(-3)^2 + 11(-3) + k = 0$ 1 m

$9 - 33 + k = 0 \quad \Rightarrow \quad k = 24$ 1 m

12. Join OA, OB and OP

$OP^2 = (5)^2 + (12)^2 = 169 \;\Rightarrow\; OP = 13$ cm 1 m

$BP^2 = (13)^2 - (3)^2 = 160 \;\Rightarrow\; BP = \sqrt{160}$ cm or $4\sqrt{10}$ cm 1 m

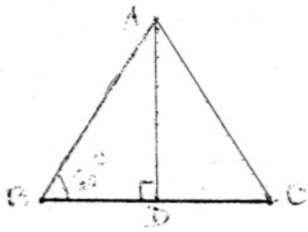
13. $\left.\begin{array}{l} \cos 70^\circ = \cos(90^\circ - 20^\circ) = \sin 20^\circ,\ \sec^2 59^\circ = \operatorname{cosec}^2 31^\circ \\ \text{Given expression} = \dfrac{\sin 20^\circ}{3\sin 20^\circ} + \dfrac{4(\operatorname{cosec}^2 31^\circ - \cot^2 31)}{3} - \dfrac{2}{3}\sin 90^\circ \end{array}\right\}$ 1 m

$= \frac{1}{3} + \frac{4}{3} - \frac{2}{3} = 1$ 1 m

OR

Let ABC be an equilateral triangle and $AD \perp BC$

If $AB = BC = AC = a$ then $BD = \frac{a}{2}$ and $\angle B = 60^\circ$ 1 m



$\sec 60^\circ = \sec B = \dfrac{AB}{BD} = \dfrac{a}{\frac{a}{2}} = 2$ ½ m

Hence $\sec 60^\circ = 2$ ½ m

14. The condition for infinitety many solutions is

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$ ½ m

$$\Rightarrow \frac{2}{m-1} = \frac{3}{m+1} = \frac{7}{3m-1}$$ ½ m

solving to get $m = 5$ 1 m

15. $265 = \dfrac{n}{2}[4 + 49] \Rightarrow n = 10$ 1 m

$49 = 4 + 9d \Rightarrow d = 5$ 1 m

SECTION -C

16. Let $\sqrt{5}$ be a rational number

$\therefore \sqrt{5} = \dfrac{p}{q}$, $q \neq 0$, p, q are integers and p,q are coprimes 1 m

$\Rightarrow 5 = \dfrac{p^2}{q^2}$ or $p^2 = 5q^2 \Rightarrow$ 5 divides p^2

$\Rightarrow$ 5 divides p .... (i) 1m

Let $p = 5a$, where a is some integer

$\therefore 25a^2 = 5q^2 \Rightarrow q^2 = 5a^2 \Rightarrow$ 5 divides q^2

$\Rightarrow$ 5 divides q .... (ii) ½m

(i) and (ii) leads to a contradiction as p, q are coprimes

Hence $\sqrt{5}$ is irrational ½ m

17. In Δs ABD and ECF, $\angle D = \angle F = 90^0$ and $\angle B = \angle C \left[\because AB = AC\right]$ 1 m

$\therefore \ \Delta ABD \sim \Delta ECF \quad (AA)$ ½ m

$\Rightarrow \ \dfrac{AB}{EC} = \dfrac{AD}{EF} \quad \therefore \ AB \times EF = AD \times EC$ 1+½ m

18. $\text{LHS} = \dfrac{(\sin A + \cos A - 1)}{\sin A} \cdot \dfrac{(\cos A + \sin A + 1)}{\cos A}$ 1 m

$= \dfrac{\left(\sin^2 A + \cos^2 A\right) + 2\sin A \cos A - 1}{\sin A \ \cos A}$ 1 m

$= \dfrac{2\sin A \cos A}{\sin A \cos A} = 2 = \text{RHS}$ 1 m

OR

$\text{LHS} = \dfrac{\sin A\left(\cos A + \sin A\right)}{\cos A} + \dfrac{\cos A\left(\sin A + \cos A\right)}{\sin A}$ 1 m

$= \left(\sin A + \cos A\right)\left(\dfrac{\sin^2 A + \cos^2 A}{\cos A \sin A}\right)$ 1 m

$= \dfrac{\sin A + \cos A}{\cos A \sin A} = \sec A + \operatorname{cosec} A \cdot = \text{RHS}$ 1 m

19. Simplifying given equations, we get

$b^2x + a^2y = a^3b + ab^3; \ x + y = 2ab$ ½ m

$$\Rightarrow \begin{array}{l} b^2x + a^2y = a^3b + ab^3 \\ \underline{a}^2x \pm a^2y = \underline{2}\,a^3b \end{array}$$

$\Rightarrow \left(b^2 - a^2\right)x = ab\left(b^2 - a^2\right)$ ½ m

$\Rightarrow \ x = ab$ 1 m

$x + y = 2ab \quad \Rightarrow \ y = ab$ 1 m

OR

Let the fraction be $\frac{x}{y}$

$\Rightarrow x + y = 2x + 4$ or $x - y + 4 = 0$ .... (i) 1 m

$\frac{x+3}{y+3} = \frac{2}{3} \Rightarrow 3x + 9 = 2y + 6$ or $3x - 2y + 3 = 0$ ....(ii) 1 m

Solving (i) and (ii) to get $x = 5, y = 9$ ½ m

$\therefore$ Fraction is $\frac{5}{9}$ ½ m

20. Here $S_{10} = -80$ and $S_{20} = -80 - 280 = -360$ ½ m

$5[2a + 9d] = -80$ or $2a + 9d = -16$ ½ m

$10[2a + 19d] = -360$ or $2a + 19d = -36$ ½ m

Solving to get $d = -2$ and $a = 1$ 1 m

$\Rightarrow$ AP is $1, -1, -3, -5,$ .... ½ m

21 Correct construction of Δ ABC 1 m

Constructing similar triangle with scale factor $\frac{3}{4}$ 2m

22. Let h m be the height of water collected on the roof

$\therefore$ Volume of water at the roof $= 22 \times 20 \times h \text{ m}^3$............................(i) 1 m

Volume of water in cylinder $= \frac{22}{7} \times (1)^2 \times 3.5 \text{ m}^3$.........................(ii) 1m

From (i) and (ii) $h = \frac{1}{40}$ m or 2.5 cm. 1m

OR

Shaded area = Area of circle of radius 7 cm – Area of circle of radius

3.5 cm – area of Δ BCD 1m

$$= \left[\frac{22}{7}\times 7\times 7 - \frac{22}{7}\times\frac{7}{2}\times\frac{7}{2} - \frac{1}{2}\times 14\times 7\right] \text{cm}^2$$ 1m

$$= [154 - 38.5 - 49]\ \text{cm}^2 = 66.5\ \text{cm}^2$$ 1m

23. If A (7,–2), B (5,1) and C (3, 2k) are collinear then

area Δ ABC = 0 ½ m

$\therefore$ 7 (1 – 2k) + 5 (2k + 2) + 3 (– 2–1) = 0 1½ m

7 – 14k + 10k + 10 – 9 = 0 ½ m

$\Rightarrow$ k = 2 ½ m

24. Total number of cards = 89 1m

(i) P (a two digit number) = $\frac{81}{89}$ 1m

(ii) P (a perfect square) = $\frac{8}{89}$ 1m

25. $\underset{(-1,3)}{A}$ —— $\underset{(x,y)}{\overset{K:1}{P}}$ —— $\underset{(9,8)}{B}$ Let (x,y) be the coordinates of P

$$\therefore\ x = \frac{9k-1}{k+1},\ y = \frac{8k+3}{k+1}$$ 1 m

P lies on x-y + 2 = 0 $\Rightarrow \frac{9k-1}{k+1} - \frac{8k+3}{k+1} + 2 = 0$ 1m

Solving to get $k = \frac{2}{3}$ 1m

SECTION D

26.	Here $4\times\frac{22}{7}\times r^2 = 616 \Rightarrow$ r (radius of sphere) = 7 cm.	1 m
	Volume of sphere = $\frac{4}{3}\pi\times(7)^3$ cm^3 ....(i)	1 m
	Volume of cone = $\frac{1}{3}\pi R^2 \times 28$ cm^3 ....(ii)	1m
	$\Rightarrow \frac{1}{3}\pi R^2\times 28 = \frac{4}{3}\pi(7)^3$	1m
	$\Rightarrow$ R (radius of cone) = 7 cm.	1m
	$\therefore$ Diameter = 14 cm.	1m
	OR	
	Here, $2\pi\,(R\text{-}r)\cdot 14 = 88\text{ cm}^2$	1 m
	$\Rightarrow R - r = 1$ cm ....(i)	
	$V = 176 = \frac{22}{7}\times 14\left[R^2 - r^2\right]$	1 m
	$\Rightarrow R^2 - r^2 = 4$ i.e $(R+r)\ (R-r) = 4$	1m
	$\Rightarrow R + r = 4$ cm ....(ii)	1m
	$\therefore$ Outer radius = $5/2$ cm Inner radius = $\frac{3}{2}$ cm	1 m
	$\therefore$ Outer diameter = 5 cm Inner diameter = 3 cm	1 m
27.	Correct Given, To Prove, Construction and Figure	½ x 4 = 2 m
	Correct Proof	2 m
	From Fig, BA ‖ QR $\Rightarrow \frac{QB}{PB} = \frac{AR}{AP}$ ....(i)	1m
	CA ‖ SR $\Rightarrow \frac{AR}{AP} = \frac{SC}{CP}$ ....(ii)	½ m

From (i) and (ii) $\dfrac{QB}{PB} = \dfrac{SC}{CP}$ ½ m

28. Let the age of sister be x years

$\therefore$ Age of the girl (Elder Sister) $= 2x$ years ½ m

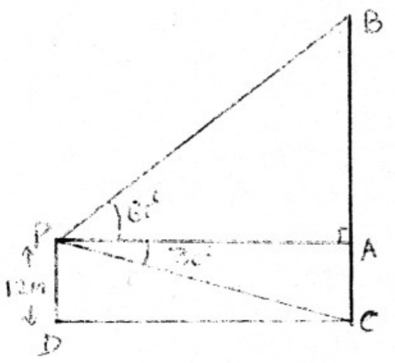
Four years hence, their ages will be $(x+4)$ years and $(2x+4)$ years 1 m

$\therefore\ (x+4)(2x+4) = 160 \Rightarrow x^2 + 6x - 72 = 0$ 1+1m

$\Rightarrow (x+12)(x-6) = 0 \Rightarrow x = 6$ ($x = -12$ is rejected) 1½ m

$\therefore$ Ages of two sisters are 6 years and 12 years 1m

29. [Correct Fig.] 1 m



Let distance of cliff from the ship be CD

$\therefore\ \dfrac{AB}{AP} = \tan 60^0 = \sqrt{3}$ ½ m

$\therefore\ AB = \sqrt{3}\,(AP)$ ....(i) 1 m

$\dfrac{AC}{AP} = \tan 30^0 = \dfrac{1}{\sqrt{3}}$, But AC = 12m ½ m

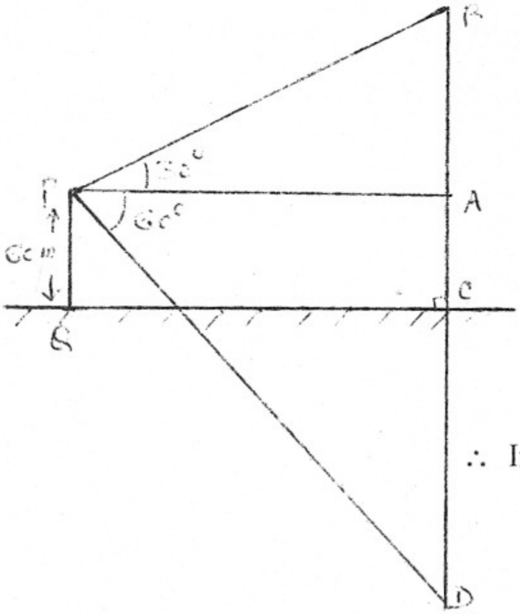
$\Rightarrow AP = 12\sqrt{3}$ m $= 20.784$ m 1 m

Putting in (i), $AB = \sqrt{3}\left(12\sqrt{3}\right)$ m = 36 m or 35.99 m 1 m

$\therefore$ Height of cliff $= 36 + 12 = 48$ m 1 m

or 47.99 m

OR



Correct Fig. 1 m

Let P be the given point such that

PQ = 60 m. Let B be the position of cloud

and D be its reflection in the lake

Let BC = h m and AP = x m.

$\therefore$ AB = (h – 60) m and AD = (h + 60) m. ½ m

$\therefore$ In Δ PAB, $\frac{AB}{AP} = \tan 30^0$ or $\frac{h-60}{x} = \frac{1}{\sqrt{3}}$ 1 m

or $x = \sqrt{3}\,(h-60)$ m ½ m

In Δ APD, $\frac{h+60}{x} = \tan 60^0 = \sqrt{3}$ 1 m

$\therefore\ h + 60 = \sqrt{3}\,x = \sqrt{3}\left[\sqrt{3}\,(h-60)\right]$ 1m

$\Rightarrow\ h + 60 = 3h - 180 \quad \Rightarrow\ 2h = 240 \quad \Rightarrow\ h = 120$ m. 1m

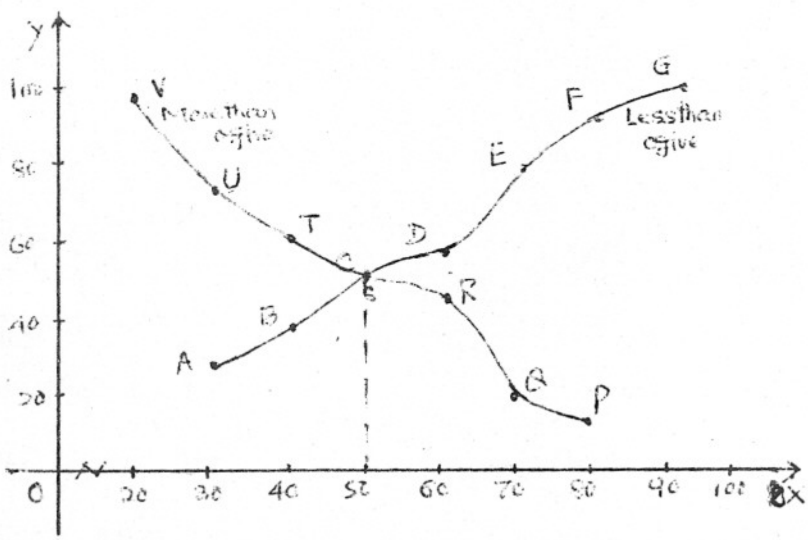
$\therefore$ Height of the cloud = 120 m.

30. The points for 'less than ogive' are

$\overset{A}{(30, 25)}$, $\overset{B}{(40, 40)}$, $\overset{C}{(50, 50)}$, $\overset{D}{(60, 56)}$, $\overset{E}{(70, 80)}$, $\overset{F}{(80, 92)}$, $\overset{G}{(90, 100)}$ 1 m

The points for 'more than ogive' are

$\overset{P}{(80, 8)}$, $\overset{Q}{(70, 20)}$, $\overset{R}{(60, 44)}$, $\overset{S}{(50, 50)}$, $\overset{T}{(40, 60)}$, $\overset{U}{(30, 75)}$, $\overset{V}{(20, 100)}$ 1 m



For Correct less than ogive 1½ m

For Correct more than ogive 1½ m

Getting Median = 50 1m

QUESTION PAPER CODE 30/3

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Marks

1. 60°	2. $\sqrt{2}$ c	3. $\frac{1}{3}$	
4. 3 cm	5. rational	6. $\frac{1}{9}$	1×10
			$= 10$ m
7. -1	8. 6	9. 7 cm.	
10. 2 cm			

SECTION - B

11. If -2 is a zero of $3x^2 + 4x + 2k$, then $3(-2)^2 + 4(-2) + 2k = 0$ 1 m

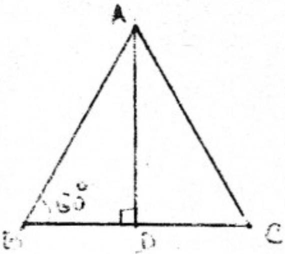
$12 - 8 + 2k = 0 \quad k = -2$ 1 m

12. $\cos 70^\circ = \cos(90^\circ - 20^\circ) = \sin 20^\circ$, $\sec^2 59^\circ = \mathrm{cosec}^2\, 31^\circ$

Given expriession $= \dfrac{\sin 20^\circ}{3\sin 20^\circ} + \dfrac{4(\mathrm{cosec}^2\, 31^\circ - \cot^2 31^\circ)}{3} - \dfrac{2}{3}\sin 90^\circ$ 1 m

$= \dfrac{1}{3} + \dfrac{4}{3} - \dfrac{2}{3} = 1$ 1 m

OR



Let ABC be an equilateral triangle and $AD \perp BC$

If $AB = BC = AC = a$ then $BD = \dfrac{a}{2}$ and $\angle B = 60^\circ$ 1 m

$\sec 60^\circ = \sec B = \dfrac{AB}{BD} = \dfrac{a}{\frac{a}{2}} = 2$ ½ m

Hence $\sec 60^\circ = 2$ ½ m

13. Join OA, OB and OP

$OP^2 = (5)^2 + (12)^2 = 169 \Rightarrow OP = 13$ cm — 1 m

$BP^2 = (13)^2 - (3)^2 = 160 \Rightarrow BP = \sqrt{160}$ cm or $4\sqrt{10}$ cm — 1 m

14. $265 = \frac{n}{2}[4+49] \Rightarrow n = 10$ — 1 m

$49 = 4 + 9d \Rightarrow d = 5$ — 1 m

15. The condition for infinitely many solutions is

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ — ½ m

$\Rightarrow \frac{2}{m-1} = \frac{3}{m+1} = \frac{7}{3m-1}$ — ½ m

solving to get m = 5 — 1 m

SECTION -C

16. Let $\sqrt{2}$ be a rational , then $\sqrt{2} = \frac{p}{q}$, p, q are integers and are coprimes — 1 m

$\Rightarrow 2 = \frac{p^2}{q^2} \Rightarrow p^2 = 2q^2 \Rightarrow$ 2 divides p^2

$\Rightarrow$ 2 divides p .... (i) — 1 m

Let p = 2a, where a is some integer then

$4a^2 = 2q^2 \Rightarrow q^2 = 2a^2 \Rightarrow$ 2 divides q^2

$\Rightarrow$ 2 divides q .... (ii) — ½m

(i) and (ii) leads to a contradiction, since p and q are coprimes

$\therefore$ $\sqrt{2}$ is an irrational, number — ½m

17. In Δs ABD and ECF, $\angle D = \angle F = 90^0$ and $\angle B = \angle C \left[\because AB = AC\right]$ 1 m

$\therefore\ \Delta ABD \sim \Delta ECF \quad (AA)$ ½ m

$\Rightarrow \dfrac{AB}{EC} = \dfrac{AD}{EF} \quad \therefore\ AB \times EF = AD \times EC$ 1+½ m

18. Total number of cards = 89 1m

(i) P (a two digit number) $= \dfrac{81}{89}$ 1m

(ii) P (a perfect square) $= \dfrac{8}{89}$ 1m

19. $\underset{(-1,3)}{A}$ ——— $\overset{K:1}{\underset{(x,y)}{P}}$ ——— $\underset{(9,8)}{B}$ Let (x,y) be the coordinates of P

$\therefore\ x = \dfrac{9k-1}{k+1},\ y = \dfrac{8k+3}{k+1}$ 1 m

P lies on x-y + 2 = 0 $\Rightarrow \dfrac{9k-1}{k+1} - \dfrac{8k+3}{k+1} + 2 = 0$ 1m

Solving to get $k = \dfrac{2}{3}$ 1m

20. Simplifying given equations, we get

$b^2x + a^2y = a^3b + ab^3;\ x + y = 2ab$ ½ m

$$\Rightarrow \begin{array}{l} b^2x + a^2y = a^3b + ab^3 \\ \underline{a}^2x \pm a^2y = \underline{2}\,a^3b \end{array}$$

$\Rightarrow \left(b^2 - a^2\right)x = ab\left(b^2 - a^2\right)$ ½ m

$\Rightarrow\ x = ab$ 1 m

$x + y = 2ab \quad \Rightarrow\ y = ab$ 1 m

OR

Let the fraction be $\frac{x}{y}$

$\Rightarrow x + y = 2x + 4$ or $x - y + 4 = 0$ .... (i) 1 m

$\frac{x+3}{y+3} = \frac{2}{3} \Rightarrow 3x + 9 = 2y + 6$ or $3x - 2y + 3 = 0$ ....(ii) 1 m

Solving (i) and (ii) to get $x = 5, y = 9$ ½ m

$\therefore$ Fraction is $\frac{5}{9}$ ½ m

21. Correct Construction of Δ ABC 1 m

Correct Construction of similar triangle 2m

with scale factor $\frac{2}{3}$

22. Let h m be the height of water collected on the roof

$\therefore$ Volume of water at the roof $= 22 \times 20 \times h\ m^3$ ....(i) 1 m

Volume of water in cylinder $= \frac{22}{7} \times (1)^2 \times 3.5\ m^3$ ....(ii) 1m

From (i) and (ii) $h = \frac{1}{40}$ m or 2.5 cm. 1m

OR

Shaded area = Area of circle of radius 7 cm – Area of circle of radius

3.5 cm – area of Δ BCD 1m

$= \left[\frac{22}{7} \times 7 \times 7 - \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} - \frac{1}{2} \times 14 \times 7\right] cm^2$ 1m

$= [154 - 38.5 - 49]\ cm^2 = 66.5\ cm^2$ 1m

23. If A (8,1), B (3,–4) and C (2, k) are collinear, then

area Δ ABC = 0 ½ m

$\therefore$ $8(-4-k)+3(k-1)+2(1+4)=0$ 1½ m

$-32-8k+3k-3+10=0$ ½ m

$k=-5$ ½ m

24. Here $S_{10}=-80$ and $S_{20}=-80-280=-360$ ½ m

$5[2a+9d]=-80$ or $2a+9d=-16$ ½ m

$10[2a+19d]=-360$ or $2a+19d=-36$ ½ m

Solving to get $d=-2$ and $a=1$ 1 m

$\Rightarrow$ AP is 1, –1, –3, –5, ... ½ m

25. $\text{LHS}=\dfrac{(\sin A+\cos A-1)}{\sin A}\cdot\dfrac{(\cos A+\sin A+1)}{\cos A}$ 1 m

$=\dfrac{(\sin^2 A+\cos^2 A)+2\sin A\cos A-1}{\sin A\cos A}$ 1 m

$=\dfrac{2\sin A\cos A}{\sin A\cos A}=2=\text{RHS}$ 1 m

OR

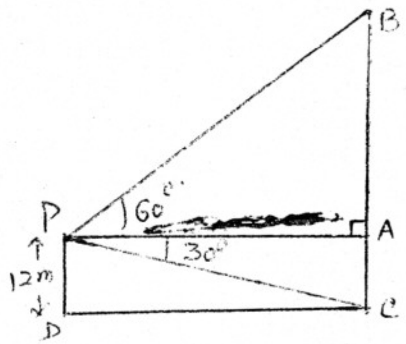
$\text{LHS}=\dfrac{\sin A(\cos A+\sin A)}{\cos A}+\dfrac{\cos A(\sin A+\cos A)}{\sin A}$ 1 m

$=(\sin A+\cos A)\left(\dfrac{\sin^2 A+\cos^2 A}{\cos A\sin A}\right)$ 1 m

$=\dfrac{\sin A+\cos A}{\cos A\sin A}=\sec A+\operatorname{cosec} A\cdot=\text{RHS}$ 1 m

SECTION D

26.



[Correct Fig.] 1 m

Let distance of cliff from the ship be CD

$\therefore \dfrac{AB}{AP} = \tan 60^0 = \sqrt{3}$ ½ m

$\therefore AB = \sqrt{3}\,(AP)$ ....(i) 1 m

$\dfrac{AC}{AP} = \tan 30^0 = \dfrac{1}{\sqrt{3}}$, But AC = 12m ½ m

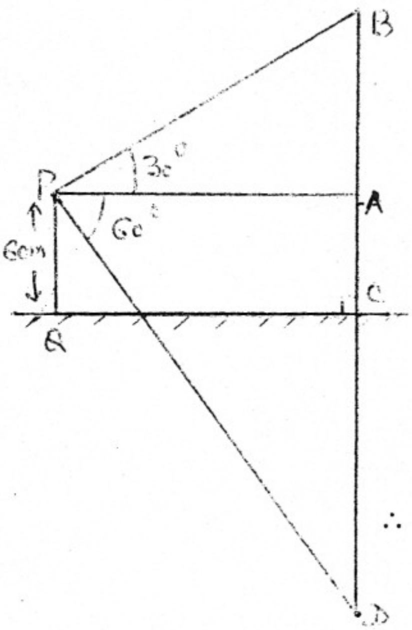
$\Rightarrow AP = 12\sqrt{3}$ m = 20.784 m 1 m

Putting in (i), $AB = \sqrt{3}\left(12\sqrt{3}\right)$ m = 36 m or 35.99 m 1 m

$\therefore$ Height of cliff = 36 + 12 = 48 m 1 m

or 47.99 m

OR



Correct Fig. 1 m

Let P be the given point such that

PQ = 60 m. Let B be the position of cloud

and D be its reflection in the lake

Let BC = h m and AP = x m.

$\therefore$ AB = (h – 60) m and AD = (h + 60) m. ½ m

$\therefore$ In Δ PAB, $\dfrac{AB}{AP} = \tan 30^0$ or $\dfrac{h-60}{x} = \dfrac{1}{\sqrt{3}}$ 1 m

or $x = \sqrt{3}\,(h - 60)$ m ½ m

In Δ APD, $\dfrac{h+60}{x} = \tan 60^0 = \sqrt{3}$ 1 m

$\therefore\ h + 60 = \sqrt{3}\,x = \sqrt{3}\left[\sqrt{3}\,(h - 60)\right]$ 1m

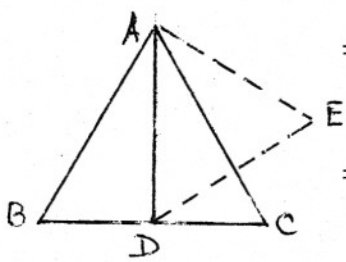
$\Rightarrow\ h + 60 = 3h - 180 \quad \Rightarrow\ 2h = 240 \quad \Rightarrow\ h = 120$ m. 1m

$\therefore$ Height of the cloud = 120 m.

27. Correct Given, To Prove, Construction and Figure ½ x 4 = 2 m

Correct Proof 2 m

Let AB = AC = BC = a



$\Rightarrow\ AD^2 = a^2 - a^2/4 = \dfrac{3a^2}{4}$

$\Rightarrow\ AD = \dfrac{\sqrt{3}\,a}{2}$ 1m

$\Delta\, ADE \sim \Delta\, ABC \Rightarrow \dfrac{ar \cdot \Delta\, ADE}{ar\ \Delta\, ABC} = \dfrac{AD^2}{AB^2} = \dfrac{\left(\sqrt{3}\,\frac{a}{2}\right)^2}{a^2} = \dfrac{3}{4}$ 1m

28. Here $4 \times \dfrac{22}{7} \times r^2 = 616 \Rightarrow r$ (radius of sphere) = 7 cm. 1 m

Volume of sphere = $\dfrac{4}{3}\,\pi \times (7)^3\ cm^3$ ....(i) 1 m

Volume of cone = $\dfrac{1}{3}\,\pi\, R^2 \times 28\ cm^3$ ....(ii) 1m

$\Rightarrow\ \dfrac{1}{3}\,\pi\, R^2 \times 28 = \dfrac{4}{3}\,\pi\,(7)^3$ 1m

$\Rightarrow$ R (radius of cone) = 7 cm. 1m

$\therefore$ Diameter = 14 cm. 1m

OR

Here, $2\pi\,(R\text{-}r) \cdot 14 = 88\ cm^2$ 1 m

$\Rightarrow\ R - r = 1$ cm ....(i)

$V = 176 = \dfrac{22}{7} \times 14\left[R^2 - r^2\right]$ 1 m

$\Rightarrow\ R^2 - r^2 = 4$ i.e $(R + r)\ (R - r) = 4$ 1m

$\Rightarrow R + r = 4$ cm ....(ii) 1m

$\left.\begin{array}{l}\therefore \text{ Outer radius } = \frac{5}{2} \text{ cm} \\ \quad\ \text{Inner radius } = \frac{3}{2} \text{ cm}\end{array}\right\}$ 1 m

$\left.\begin{array}{l}\therefore \text{ Outer diameter } = 5 \text{ cm} \\ \quad\ \text{Inner diameter } = 3 \text{ cm}\end{array}\right\}$ 1 m

29. Let the age of sister be x years

$\therefore$ Age of the girl (Elder Sister) = 2 x years ½ m

Four years hence, their ages will be (x + 4) years and (2 x + 4) years 1 m

$\therefore\ (x + 4)\ (2x + 4) = 160 \ \Rightarrow\ x^2 + 6x - 72 = 0$ 1+1m

$\Rightarrow\ (x + 12)\ (x - 6) = 0 \ \Rightarrow\ x = 6 \quad (x = -12$ is rejected) 1½ m

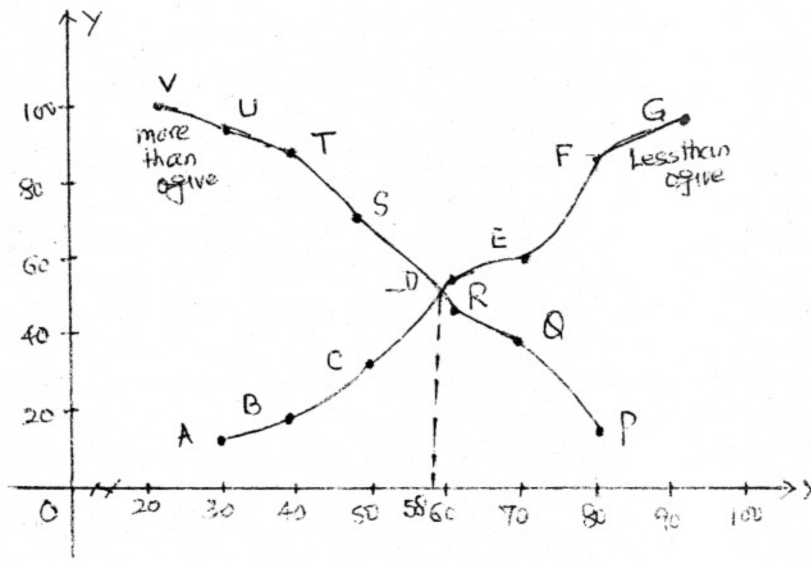
$\therefore$ Ages of two sisters are 6 years and 12 years 1m

30. The points for 'less than ogive' are

$\overset{A}{(30,10)},\ \overset{B}{(40,18)},\ \overset{C}{(50,30)},\ \overset{D}{(60,54)},\ \overset{E}{(70,60)},\ \overset{F}{(80,85)},\ \overset{G}{(90,100)}$ 1 m

The points for 'more than ogive' are

$\overset{P}{(80,15)},\ \overset{Q}{(70,40)},\ \overset{R}{(60,46)},\ \overset{S}{(50,70)},\ \overset{T}{(40,82)},\ \overset{U}{(30,90)},\ \overset{V}{(20,100)}$ 1 m



Correct less than ogive 1½ m

Correct more than ogive 1½ m

Median = 58 (approx) 1m