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Secondary School Examination

March -2015

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

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. 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.
5. 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.
6. A full scale of marks 0 to 90 has to be used. Please do not hesitate to award full marks if the answer deserves it.
7. Separate Marking Scheme for all the three sets has been given.
8. The Examiners should acquaint themselves with the guidelines given in the Guidelines for Spot Evaluation before starting the actual evaluation.
9. Every Examiner should stay upto sufficiently reasonable time normally 5-6 hours every day and evaluate 20-25 answer books and should devote minimum 15-20 minutes to evaluate each answer book.
10. Every Examiner should acquaint himself/herself with the marking schemes of all the sets.

QUESTION PAPER CODE 30/2/1

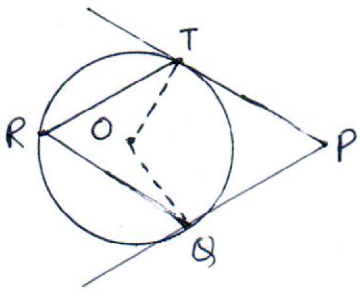
EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Q.No.		Marks
1.	55	1 m
2.	6 m	1 m
3.	$\frac{1}{2}$	1 m
4.	$2\sqrt{a^2 - b^2}$	1m

SECTION - B

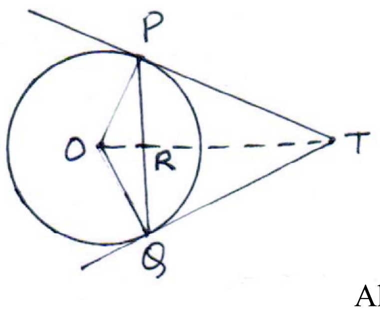
5.



$\angle TOQ = 180^o - 70^o = 110^o$ 1 m

$\Rightarrow \quad \angle TRQ = \frac{1}{2} \angle TOQ = \frac{1}{2} \times 110^o = 55^o$ 1 m

6.



$OR = \sqrt{OP^2 - PR^2} = \sqrt{25 - 16} = 3cm$

Let RT be x

$PT^2 = PR^2 + RT^2 = 16 + x^2$ ½ m

Also $PT^2 = OT^2 - OP^2 = (3 + x)^2 - 25$

$= x^2 + 6x - 16$

$\Rightarrow \quad 16 + x^2 = x^2 + 6x - 16$ 1 m

$\Rightarrow \quad x = \frac{16}{3}$

Thus TP = TQ = $\sqrt{16+\frac{256}{9}} = \frac{20}{3}$ cm ½ m

7. $x^2 - \sqrt{3}\,x - x + \sqrt{3} = 0$ ½ m

$\Rightarrow \quad (x-\sqrt{3})\,(x-1) = 0$ 1 m

$\Rightarrow \quad x = \sqrt{3}, 1$ ½ m

8. Let the first term be a and the common difference be d

a + 3d = 11 .... (i) ½ m

(a + 4d) + (a + 6d) = 34

$\Rightarrow$ a + 5d = 17 .... (ii) 1 m

Solving (i) & (ii)

a = 2, d = 3 ½ m

9. $AB = \sqrt{(a+a)^2 + (a+a)^2} = 2\sqrt{2}\,a$ ½ m

$BC = \sqrt{\left(-a+\sqrt{3}a\right)^2 + \left(-a-\sqrt{3}a\right)^2} = 2\sqrt{2}\,a$ ½ m

$AC = \sqrt{\left(a+\sqrt{3}a\right)^2 + \left(a-\sqrt{3}a\right)^2} = 2\sqrt{2}\,a$ ½ m

Since AB = BC = AC, therefore ABC is an equilateral triangle ½ m

10. The given points (8, 1) (3, – 2k) and (k, – 5) are collinear

$\Rightarrow$ Area of the triangle formed = 0

$\Rightarrow \quad \frac{1}{2}\left[\,8\,(-2k+5) + 3\,(-5-1) + k\,(1+2k)\,\right] = 0$ 1 m

$\Rightarrow \quad 2k^2 - 15k + 22 = 0$ ½ m

$\Rightarrow \quad (k-2)(2k-11) = 0$

$\Rightarrow \quad k = 2, \frac{11}{2}$ ½ m

SECTION - C

11. Point P(6, – 6) lies on the line $3x + k(y+1) = 0$

$\Rightarrow \quad 18 + k(-6+1) = 0$ 1½ m

$\Rightarrow \quad k = 18/5$ 1½ m

12. $x^2 + 5x - (a^2 + a - 6) = 0$

$\therefore \quad x = \frac{-5 \pm \sqrt{25 + 4(a^2 + a - 6)}}{2}$ 1 m

$= \frac{-5 \pm (2a+1)}{2}$ 1 m

$= \frac{2a-4}{2}, \frac{-2a-6}{2}$

$\therefore \quad x = a - 2, \ -a - 3$ ½+½ m

13. $a + 11d = -13$ .... (i) ½ m

$S_4 = 2(2a + 3d) = 24$

$\Rightarrow \quad 2a + 3d = 12$ .... (ii) 1 m

Solving (i) and (ii)

$a = 9, \quad d = -2$ 1 m

Thus $S_{10} = 5[18 - 18] = 0$ ½ m

14. (i) P (ball not red) $= 1 - \frac{x}{18}$ or $\frac{18 - x}{18}$ 1 m

(ii) Total number of balls = 20, red balls = x + 2

P (Red ball) $= \frac{x + 2}{20}$ ½ m

According to the question $\frac{x + 2}{20} = \frac{9}{8} \times \frac{x}{8}$ 1 m

$\Rightarrow \quad x = 8$ ½ m

15.

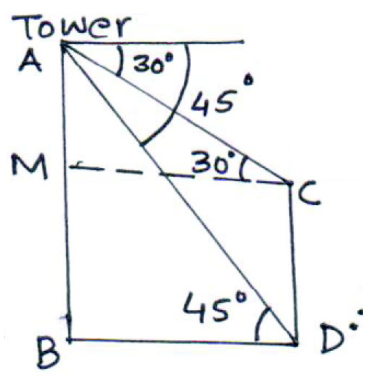


figure ½ m

AB = 50 m

$\tan 45^\circ = \frac{AB}{BD} = 1$

$\Rightarrow$ AB = BD = 50 m. 1 m

Distance of pole from bottom of tower = 50 m

$\tan 30^\circ = \frac{AM}{MC} = \frac{AM}{BD}$

$\Rightarrow \quad AM = \frac{50}{\sqrt{3}}$ or 28.87 m. 1 m

Height of pole = CD = BM = $50 - \frac{50}{\sqrt{3}}$

= 21.13 m ½ m

16. Long hand makes 24 rounds in 24 hours

Short hand makes 2 rounds in 24 hours } 1 m

Distance traveled by long hand in 24 rounds = $24 \times 12\pi$

$= 288\pi$ cm. ½ m

Distance traveled by short hand in 2 rounds = $2 \times 8\pi$

$= 16\pi$ cm. ½ m

Sum of the distance = $288\pi + 16\pi = 304\pi$

$= 304 \times 3.14$

$= 954.56$ cm. 1 m

17. Volume of small sphere $= \frac{4}{3}\pi(3)^3 = 36\pi \text{ cm}^3$ ½ m

Volume of big sphere $= 7 \times 36\pi = 252\pi \text{ cm}^3$ ½ m

Volume of sphere formed $= 36\pi + 252\pi = 288\pi \text{ cm}^3$

$\therefore \quad \frac{4}{3}\pi r^3 = 288\pi$ 1 m

$\Rightarrow \quad r = 6$ cm. ½ m

Diameter of the sphere = 12 cm. ½ m

18. Volume of the cylinder $= \pi(3)^2 \times 5 = 45\pi \text{ cm}^3$ ½ m

Volume of conical hole $= \frac{1}{3}\pi\left(\frac{3}{2}\right)^2 \times \frac{8}{9} = \frac{2}{3}\pi \text{ cm}^3$ 1 m

Metal left in the cylinder $= \left(45\pi - \frac{2\pi}{3}\right) = \frac{133\pi}{3} \text{ cm}^3$ 1 m

Required ratio is $\frac{133}{3}\pi : \frac{2}{3}\pi = 133 : 2$ ½ m

19. Area of trapezium $= \frac{1}{2}(18+32) \times 14 = 350 \text{ cm}^2$ ½ m

Area of four arcs $= \pi(7)^2 = 154 \text{ cm}^2$ 1½ m

Area of shaded region $= 350 - 154 = 196 \text{ cm}^2$ 1 m

20. Volume of water in cylinder = $\pi (60)^2 \times 180 = 648000\,\pi\ cm^3$. 1 m

Volume of solid cone = $\frac{1}{3}\pi (30)^2 \times 60 = 1800\,\pi\ cm^3$. 1 m

Volume of water left in cylinder = $648000\ \pi - 1800\ \pi$

$= 630000\ \pi\ cm^3$.

$= 1.98\ m^3$. 1 m

SECTION - D

21. $x = -2$ is root of the equation $3x^2 + 7x + p = 0$

$\Rightarrow\ 3(-2)^2 + 7(-2) + p = 0$

$\Rightarrow\ p = 2$ 1 m

Roots of the equation $x^2 + 4k\ x + k^2 - k + 2 = 0$ are equal

$\Rightarrow\ 16k^2 - 4(k^2 - k + 2) = 0$ 1 m

$\Rightarrow\ 3k^2 + k - 2 = 0$

$\Rightarrow\ (3k - 2)(k + 1) = 0$ 1 m

$\Rightarrow\ k = \frac{2}{3}, -1$ 1 m

22. The three digit number which leave remainder 3 when divided by 4 are

103, 107, 111, ..., 999 1 m

$\therefore\ 999 = 103 + (n - 1)\,4$

$\Rightarrow\ n = 225$ ½ m

Therefore $\frac{225 + 1}{2}$ = 113th term is middle term ½ m

Middle term = $103 + 112 \times 4 = 551$ 1 m

Sum of first 112 terms $= \frac{112}{2}(206 + 111 \times 4) = 36400$ ½ m

Sum of last 112 terms $= \frac{112}{2}(1110 + 111 \times 4) = 87024$ ½ m

23. Let lenght of cloth be x m.

Cost per meter = Rs. $\frac{200}{x}$

New lenght of cloth = (x + 5) m.

New cost per meter = Rs. $\left(\frac{200}{x} - 2\right)$ 1 m

$\therefore \quad (x+5)\left(\frac{200}{x} - 2\right) = 200$ 1 m

$\Rightarrow \quad x^2 + 5x - 500 = 0$

$\Rightarrow \quad (x+25)(x-20) = 0$

$\Rightarrow \quad x = 20, \quad x \neq -25$ 1 m

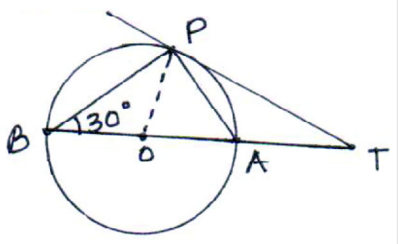
Length of piece = 20 m ½ m

Original cost per meter = Rs. $\frac{200}{20}$ = Rs. 10 ½ m

24. Correct figure given, to prove and construction ½ x 4 =2 m

Correct proof 2 m

25.



$\angle AOP = 2 \times 30^\circ = 60^\circ$ ½ m

$\angle OAP = 180^\circ - 30^\circ - 90^\circ = 60^\circ$

$\therefore \quad OP = PA$ 1 m

Also $\angle ATP = \angle APT = 30^{\circ}$ ½ m

$\therefore \quad AP = AT = OP = OA$ 1 m

Hence $BA = 2\,OA = 2\,AT$

$\Rightarrow \quad BA : AT = 2 : 1$ 1 m

26. Correct construction 3 m

Measure of each tangent = 6.3 cm (approx) 1 m

27.

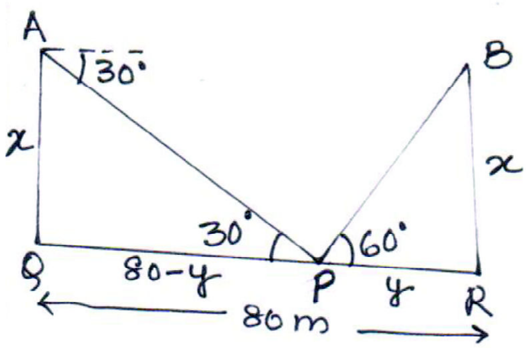


Figure 1 m

$\tan 60^{\circ} = \frac{x}{y}$

$\Rightarrow \quad x = y\sqrt{3}$ .... (i) ½ m

$\tan 30^{\circ} = \frac{x}{80-y}$

$\Rightarrow \quad \sqrt{3}\,x = 80 - y$ .... (ii) 1 m

Solving (i) and (ii)

$y = 20, \quad x = 20\sqrt{3}$ m. ½ m

Height of pole = $20\sqrt{3}$ m.

PR = 20 m.

OP = 80 – 20 = 60 m. 1 m

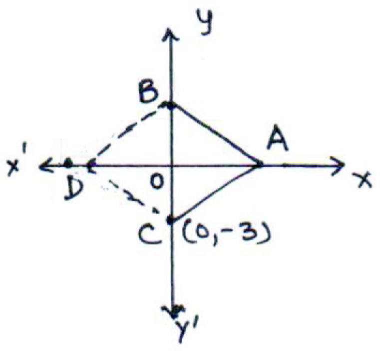
28. Total number of cords = 65

(i) P (a one digit number) = 4/65 1 m

(ii) P (a number divisible by 5) = $\frac{13}{65} = \frac{1}{5}$ 1 m

(iii) P (an odd number less than 30) = $\frac{12}{65}$ 1 m

(iv) P (a composite number between 50 and 70) = $\frac{15}{65} = \frac{3}{13}$ 1 m

29. 

Coordinates of point B are (0, 3) ½ m

$\therefore$ BC = 6 units

Let coordinates of point A be (x, 0) ½ m

$\Rightarrow$ $AB = \sqrt{x^2 + 9}$

$\because$ AB = BC

$\therefore$ $x^2 + 9 = 36$ 1 m

$\Rightarrow$ $x^2 = 27$ $\Rightarrow$ $x = \pm 3\sqrt{3}$

Coordinates of point A = $(3\sqrt{3}, 0)$ 1 m

Since BACD is a thombus $\Rightarrow$ AB = AC = CD = DB

$\therefore$ Coordinates of point D = $(-3\sqrt{3}, 0)$ 1 m

30. Volume of water in cone = $\frac{1}{3}\pi(5^2) \times 8 = \frac{200\pi}{3}$ cm^3 ½ m

Volume of water flows out = $\frac{1}{4}\left(\frac{200\pi}{3}\right) = \frac{50\pi}{3}$ cm^3 1 m

Let radius of one spherical ball be x cm.

$\therefore$ $\frac{4}{3}\pi(x^3) \times 100 = \frac{50\pi}{3}$ 1½ m

$\Rightarrow$ $x^3 = \frac{1}{8}$

$\Rightarrow$ $x = \frac{1}{2}$ cm or 0.5 cm. 1 m

31. Volume of milk in a container = $\frac{\pi\, 30}{3}\left(1600 + 400 + 800\right)$ 1 m

$= 88000 \text{ cm}^3$

$= 88$ litres 1 m

Number of containers needed = $\frac{880}{88} = 10$ ½ m

Cost of milk = Rs. 88 × 10 × 35

= Rs. 30800 ½ m

Value 1 m

QUESTION PAPER CODE 30/2/2

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Q.No.		Marks
1.	$\frac{1}{2}$	1 m
2.	$2\sqrt{a^2 - b^2}$	1 m
3.	55	1 m
4.	6 m	1m

SECTION - B

5. $AB = \sqrt{(a + a)^2 + (a + a)^2} = 2\sqrt{2}\, a$ ½ m

$BC = \sqrt{\left(-a + \sqrt{3}a\right)^2 + \left(-a - \sqrt{3}a\right)^2} = 2\sqrt{2}\, a$ ½ m

$AC = \sqrt{\left(a + \sqrt{3}a\right)^2 + \left(a - \sqrt{3}a\right)^2} = 2\sqrt{2}\, a$ ½ m

Since AB = BC = AC, therefore ABC is an equilateral triangle ½ m

6. The given points (8, 1) (3, – 2k) and (k, – 5) are collinear

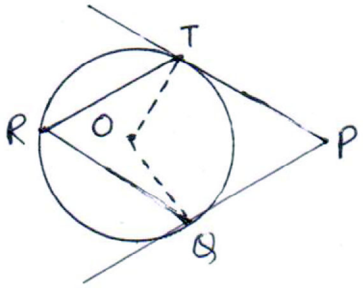
$\Rightarrow$ Area of the triangle formed = 0

$\Rightarrow \frac{1}{2}\left[\, 8\left(-2k + 5\right) + 3\left(-5 - 1\right) + k\left(1 + 2k\right)\right] = 0$ 1 m

$\Rightarrow 2k^2 - 15k + 22 = 0$ ½ m

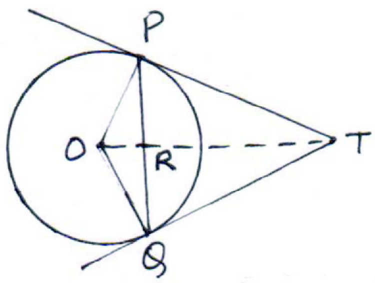
$\Rightarrow (k - 2)(2k - 11) = 0$

$\Rightarrow k = 2, \frac{11}{2}$ ½ m

7. 

$\angle TOQ = 180^\circ - 70^\circ = 110^\circ$ 1 m

$\Rightarrow \angle TRQ = \frac{1}{2} \angle TOQ = \frac{1}{2} \times 110^\circ = 55^\circ$ 1 m

8. 

$OR = \sqrt{OP^2 - PR^2} = \sqrt{25 - 16} = 3cm$

Let RT be x

$PT^2 = PR^2 + RT^2 = 16 + x^2$ ½ m

Also $PT^2 = OT^2 - OP^2 = (3 + x)^2 - 25$

$= x^2 + 6x - 16$

$\Rightarrow 16 + x^2 = x^2 + 6x - 16$ 1 m

$\Rightarrow x = \frac{16}{3}$

Thus $TP = TQ = \sqrt{16 + \frac{256}{9}} = \frac{20}{3}$ cm ½ m

9. $x^2 - \sqrt{3}\,x - x + \sqrt{3} = 0$ ½ m

$\Rightarrow (x - \sqrt{3})(x - 1) = 0$ 1 m

$\Rightarrow x = \sqrt{3}, 1$ ½ m

10. Let the first term be 'a' and the common difference be 'd'

$a + 4d = 20$ .... (i) ½ m

$(a + 6d) + (a + 10d) = 64$

$\Rightarrow \quad a + 8d = 32$ .... (ii) 1 m

Solving (i) & (ii)

$d = 3$ ½ m

SECTION - C

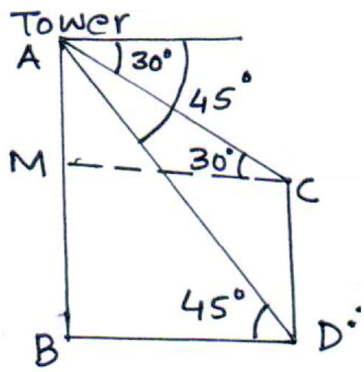
11. 

figure ½ m

AB = 50 m

$\tan 45^\circ = \frac{AB}{BD} = 1$

$\Rightarrow$ AB = BD = 50 m. 1 m

Distance of pole from bottom of tower = 50 m

$\tan 30^\circ = \frac{AM}{MC} = \frac{AM}{BD}$

$\Rightarrow \quad AM = \frac{50}{\sqrt{3}}$ or 28.87 m. 1 m

Height of pole $= CD = BM = 50 - \frac{50}{\sqrt{3}}$

$= 21.13$ m ½ m

12. Long hand makes 24 rounds in 24 hours

1 m

Short hand makes 2 rounds in 24 hours

Distance traveled by long hand in 24 rounds = $24 \times 12\,\pi$

$= 288\,\pi$ cm. ½ m

Distance traveled by short hand in 2 rounds = $2 \times 8\,\pi$

$= 16\,\pi$ cm. ½ m

Sum of the distance = $288\pi + 16\pi = 304\pi$

$= 304 \times 3.14$

$= 954.56$ cm. 1 m

13. Volume of the cylinder = $\pi (3)^2 \times 5 = 45\pi \text{ cm}^3$ ½ m

Volume of conical hole = $\frac{1}{3}\pi\left(\frac{3}{2}\right)^2 \times \frac{8}{9} = \frac{2}{3}\pi \text{ cm}^3$ 1 m

Metal left in the cylinder = $\left(45\pi - \frac{2\pi}{3}\right) = \frac{133\pi}{3} \text{ cm}^3$ 1 m

Required ratio is $\frac{133}{3}\pi : \frac{2}{3}\pi = 133 : 2$ ½ m

14. Area of trapezium = $\frac{1}{2}(18 + 32) \times 14 = 350 \text{ cm}^2$ ½ m

Area of four arcs = $\pi (7)^2 = 154 \text{ cm}^2$ 1½ m

Area of shaded region = $350 - 154 = 196 \text{ cm}^2$ 1 m

15. Point P(6, – 6) lies on the line $3x + k(y + 1) = 0$

$\Rightarrow \quad 18 + k(-6 + 1) = 0$ 1½ m

$\Rightarrow \quad k = 18/5$ 1½ m

16. $a + 11d = -13$ .... (i) ½ m

$S_4 = 2(2a + 3d) = 24$

$\Rightarrow \quad 2a + 3d = 12$ .... (ii) 1 m

Solving (i) and (ii)

$a = 9, \quad d = -2$ 1 m

Thus $\quad S_{10} = 5[18 - 18] = 0$ ½ m

17. Volume of water in cylinder = $\pi\,(60)^2 \times 180 = 648000\,\pi\ \text{cm}^3$. 1 m

Volume of solid cone = $\frac{1}{3}\pi\,(30)^2 \times 60 = 1800\,\pi\ \text{cm}^3$. 1 m

Volume of water left in cylinder = $648000\ \pi - 1800\ \pi$

$= 630000\ \pi\ \text{cm}^3$.

$= 1.98\ \text{m}^3$. 1 m

18. $x = \dfrac{(2b-1) \pm \sqrt{(2b-1)^2 - 4\left(b^2 - b + 20\right)}}{2}$ 1 m

$= \dfrac{(2b-1) \pm 9}{2}$ 1 m

$= \dfrac{2b+8}{2},\ \dfrac{2b-10}{2}$

$\Rightarrow \quad x = b + 4,\ b - 5$ ½+½ m

19. Total number of outcomes = $2^3 = 8$ 1 m

P (three heads) $= \dfrac{1}{8}$ 1 m

P (at least two tailss) $= \dfrac{4}{8}$ or $\dfrac{1}{2}$ 1 m

20. Volume of water collected in cylinderical vessel

$= \dfrac{4}{5} \times \pi \times (1)^2 \times \dfrac{7}{2}\ \text{m}^3$ 1 m

$= \dfrac{44}{5}\ \text{m}^3$ 1 m

Rainfall = $\dfrac{44}{5} \times \dfrac{1}{22 \times 20} = \dfrac{1}{50}\ \text{m} = 2\ \text{cm}$ 1 m

SECTION - D

21. Let lenght of cloth be x m.

$$\text{Cost per meter} = \text{Rs. } \frac{200}{x}$$

New lenght of cloth = (x + 5) m.

New cost per meter = Rs. $\left(\frac{200}{x} - 2\right)$ 1 m

$\therefore \quad (x+5)\left(\frac{200}{x} - 2\right) = 200$ 1 m

$\Rightarrow \quad x^2 + 5x - 500 = 0$

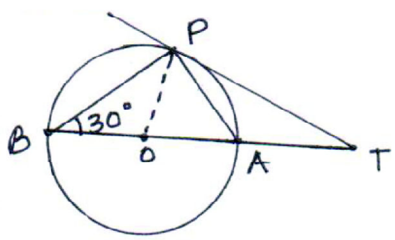
$\Rightarrow \quad (x+25)(x-20) = 0$

$\Rightarrow \quad x = 20, \quad x \neq -25$ 1 m

Length of piece = 20 m ½ m

Original cost per meter = Rs. $\frac{200}{20}$ = Rs. 10 ½ m

22.



$\angle AOP = 2 \times 30^\circ = 60^\circ$ ½ m

$\angle OAP = 180^\circ - 30^\circ - 90^\circ = 60^\circ$

$\therefore \quad OP = PA$ 1 m

Also $\angle ATP = \angle APT = 30^\circ$ ½ m

$\therefore \quad AP = AT = OP = OA$ 1 m

Hence BA = 2 OA = 2 AT

$\Rightarrow \quad BA : AT = 2 : 1$ 1 m

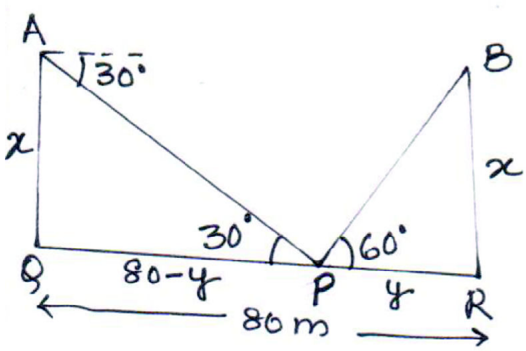
23. 

Figure 1 m

$\tan 60^\circ = \dfrac{x}{y}$

$\Rightarrow \quad x = y\sqrt{3}$ .... (i) ½ m

$\tan 30^\circ = \dfrac{x}{80-y}$

$\Rightarrow \quad \sqrt{3}\,x = 80 - y$ .... (ii) 1 m

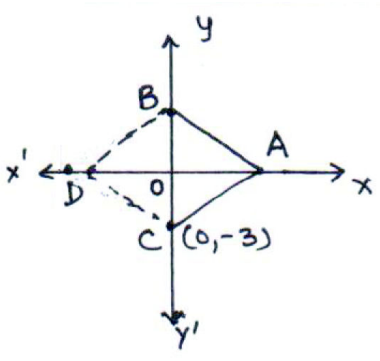
Solving (i) and (ii)

$y = 20, \quad x = 20\sqrt{3}$ m. ½ m

Height of pole = $20\sqrt{3}$ m.

PR = 20 m.

OP = 80 – 20 = 60 m. 1 m

24. 

Coordinates of point B are (0, 3) ½ m

$\therefore \quad$ BC = 6 units

Let coordinates of point A be (x, 0) ½ m

$\Rightarrow \quad AB = \sqrt{x^2 + 9}$

$\because \quad$ AB = BC

$\therefore \quad x^2 + 9 = 36$ 1 m

$\Rightarrow \quad x^2 = 27 \quad \Rightarrow \quad x = \pm 3\sqrt{3}$

Coordinates of point A = $(3\sqrt{3}, 0)$ 1 m

Since BACD is a thombus $\Rightarrow$ AB = AC = CD = DB

$\therefore \quad$ Coordinates of point D = $(-3\sqrt{3}, 0)$ 1 m

25. Volume of milk in a container = $\frac{\pi\, 30}{3}\left(1600+400+800\right)$ 1 m

$= 88000 \text{ cm}^3$

$= 88$ litres 1 m

Number of containers needed = $\frac{880}{88} = 10$ ½ m

Cost of milk = Rs. $88 \times 10 \times 35$

= Rs. 30800 ½ m

Value 1 m

26. Total number of cords = 65

(i) P (a one digit number) = 4/65 1 m

(ii) P (a number divisible by 5) = $\frac{13}{65} = \frac{1}{5}$ 1 m

(iii) P (an odd number less than 30) = $\frac{12}{65}$ 1 m

(iv) P (a composite number between 50 and 70) = $\frac{15}{65} = \frac{3}{13}$ 1 m

27. Volume of water in cone = $\frac{1}{3}\pi\left(5^2\right)\times 8 = \frac{200\,\pi}{3}\text{ cm}^3$ ½ m

Volume of water flows out = $\frac{1}{4}\left(\frac{200\,\pi}{3}\right) = \frac{50\,\pi}{3}\text{ cm}^3$ 1 m

Let radius of one spherical ball be x cm.

$\therefore\ \frac{4}{3}\pi\left(x^3\right)\times 100 = \frac{50\,\pi}{3}$ 1½ m

$\Rightarrow \quad x^3 = \frac{1}{8}$

$\Rightarrow \ x = \frac{1}{2}$ cm or 0.5 cm. 1 m

28. x = 3 is root of the equation $x^2 - x + k = 0$

$\Rightarrow \ (3)^2 - 3 + k = 0$

$\Rightarrow \ k = -6$ 1 m

Roots of equation $x^2 - 12x + 24 + p = 0$ are equal 1 m

$\Rightarrow \ 144 - 4\,(p + 24) = 0$ 1 m

$\Rightarrow \ p = 12$ 1 m

29. The sequence is

10, 13, ..., 94 1 m

$\therefore \ 94 = 10 + (n - 1) \times 3$

$\Rightarrow \ n = 29$ ½ m

Therefore $\frac{29 + 1}{2} =$ 15th term is the middle term ½ m

Middle term = $10 + 14 \times 3 = 52$ 1 m

Sum of first 14 terms = $\frac{14}{2}\,[20 + 13 \times 3] = 413$ ½ m

Sum of last 14 terms = $\frac{14}{2}\,[110 + 13 \times 3) = 1043$ ½ m

30. Correct figure, to prove, given and construction ½ x 4 =2 m

Correct proof 2 m

31. Correct construction 4 m

QUESTION PAPER CODE 30/2/3

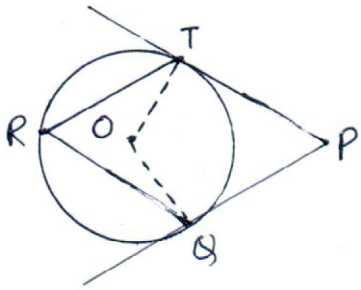
EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Q.No.		Marks
1.	$\frac{1}{2}$	1 m
2.	$2\sqrt{a^2 - b^2}$	1 m
3.	6 m	1 m
4.	55	1m

SECTION - B

5.



$\angle TOQ = 180^\circ - 70^\circ = 110^\circ$ — 1 m

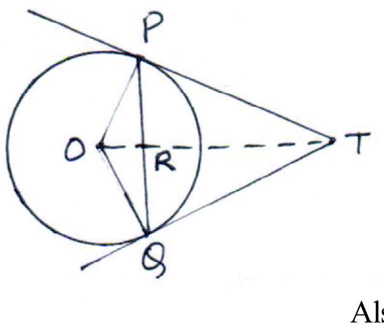
$\Rightarrow \angle TRQ = \frac{1}{2} \angle TOQ = \frac{1}{2} \times 110^\circ = 55^\circ$ — 1 m

6. $x^2 - \sqrt{3}\,x - x + \sqrt{3} = 0$ — ½ m

$\Rightarrow \left(x - \sqrt{3}\right)(x - 1) = 0$ — 1 m

$\Rightarrow x = \sqrt{3}, 1$ — ½ m

7.



$OR = \sqrt{OP^2 - PR^2} = \sqrt{25 - 16} = 3cm$

Let RT be x

$PT^2 = PR^2 + RT^2 = 16 + x^2$ — ½ m

Also $PT^2 = OT^2 - OP^2 = (3 + x)^2 - 25$

$= x^2 + 6x - 16$

$\Rightarrow \quad 16 + x^2 = x^2 + 6x - 16$ 1 m

$\Rightarrow \quad x = \frac{16}{3}$

Thus $TP = TQ = \sqrt{16 + \frac{256}{9}} = \frac{20}{3}$ cm ½ m

8. $AB = \sqrt{(a+a)^2 + (a+a)^2} = 2\sqrt{2}\,a$ ½ m

$BC = \sqrt{\left(-a+\sqrt{3}a\right)^2 + \left(-a-\sqrt{3}a\right)^2} = 2\sqrt{2}\,a$ ½ m

$AC = \sqrt{\left(a+\sqrt{3}a\right)^2 + \left(a-\sqrt{3}a\right)^2} = 2\sqrt{2}\,a$ ½ m

Since AB = BC = AC, therefore ABC is an equilateral triangle ½ m

9. The given points (8, 1) (3, – 2k) and (k, – 5) are collinear

$\Rightarrow$ Area of the triangle formed = 0

$\Rightarrow \quad \frac{1}{2}\left[\,8\left(-2k+5\right) + 3\left(-5-1\right) + k\left(1+2k\right)\right] = 0$ 1 m

$\Rightarrow \quad 2k^2 - 15k + 22 = 0$ ½ m

$\Rightarrow \quad (k-2)(2k-11) = 0$

$\Rightarrow \quad k = 2, \ \frac{11}{2}$ ½ m

10. $a + 8d = -32$ .... (i) ½ m

$(a + 10d) + (a + 12d) = -94$

$\Rightarrow \quad a + 11d = -47$ .... (ii) 1 m

Solving (i) & (ii)

$d = -5$ or common difference $= -5$ ½ m

SECTION - C

11. Long hand makes 24 rounds in 24 hours

1 m

Short hand makes 2 rounds in 24 hours

Distance traveled by long hand in 24 rounds $= 24 \times 12\,\pi$

$= 288\,\pi$ cm. ½ m

Distance traveled by short hand in 2 rounds $= 2 \times 8\,\pi$

$= 16\,\pi$ cm. ½ m

Sum of the distance $= 288\,\pi + 16\,\pi = 304\,\pi$

$= 304 \times 3.14$

$= 954.56$ cm. 1 m

12. Volume of the cylinder $= \pi\,(3)^2 \times 5 = 45\,\pi\ \text{cm}^3$ ½ m

Volume of conical hole $= \frac{1}{3}\pi\left(\frac{3}{2}\right)^2 \times \frac{8}{9} = \frac{2}{3}\pi\ \text{cm}^3$ 1 m

Metal left in the cylinder $= \left(45\,\pi - \frac{2\,\pi}{3}\right) = \frac{133\,\pi}{3}\ \text{cm}^3$ 1 m

Required ratio is $\frac{133}{3}\pi : \frac{2}{3}\pi = 133 : 2$ ½ m

13. Volume of water in cylinder $= \pi\,(60)^2 \times 180 = 648000\,\pi\ \text{cm}^3$. 1 m

Volume of solid cone $= \frac{1}{3}\pi\,(30)^2 \times 60 = 1800\,\pi\ \text{cm}^3$. 1 m

Volume of water left in cylinder $= 648000\,\pi - 1800\,\pi$

$= 630000\,\pi\ \text{cm}^3$.

$= 1.98\ \text{m}^3$.

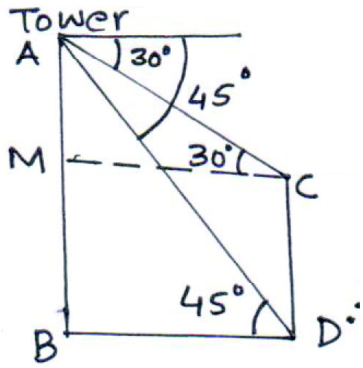
14. 

figure ½ m

AB = 50 m

$\tan 45^\circ = \frac{AB}{BD} = 1$

$\Rightarrow$ AB = BD = 50 m. 1 m

Distance of pole from bottom of tower = 50 m

$\tan 30^\circ = \frac{AM}{MC} = \frac{AM}{BD}$

$\Rightarrow \quad AM = \frac{50}{\sqrt{3}}$ or 28.87 m. 1 m

Height of pole = CD = BM = $50 - \frac{50}{\sqrt{3}}$

= 21.13 m ½ m

15. Volume of small sphere = $\frac{4}{3}\pi(3)^3 = 36\pi \text{ cm}^3$ ½ m

Volume of big sphere = $7 \times 36\,\pi = 252\pi \text{ cm}^3$ ½ m

Volume of sphere formed = $36\,\pi + 252\,\pi = 288\,\pi \text{ cm}^3$

$\therefore \quad \frac{4}{3}\pi r^3 = 288\,\pi$ 1 m

$\Rightarrow$ r = 6 cm. ½ m

Diameter of the sphere = 12 cm. ½ m

16. Area of trapezium = $\frac{1}{2}(18 + 32) \times 14 = 350 \text{ cm}^2$ ½ m

Area of four arcs = $\pi(7)^2 = 154 \text{ cm}^2$ 1½ m

Area of shaded region = $350 - 154 = 196 \text{ cm}^2$

17. Point P(6, – 6) lies on the line $3x + k(y + 1) = 0$

$\Rightarrow \quad 18 + k(-6 + 1) = 0$ 1½ m

$\Rightarrow \quad k = 18/5$ 1½ m

18. (i) $P(\text{ball not red}) = 1 - \frac{x}{20}$ or $\frac{20 - x}{20}$ 1 m

(ii) Total number of balls = 24, red balls = x + 4

$P(\text{red ball}) = \frac{x + 4}{24}$ ½ m

According to the question $= \frac{x + 4}{24} = \frac{5}{4} \times \frac{x}{20}$ 1 m

$\Rightarrow \quad x = 8$ ½ m

19. $x^2 + 6x - (a^2 + 2a - 8) = 0$

$x = \frac{-6 \pm \sqrt{36 + 4(a^2 + 2a - 8)}}{2}$ 1 m

$= \frac{-6 \pm (2a + 2)}{2}$ 1 m

$= \frac{2a - 4}{2}, \frac{-2a - 8}{2}$

$\therefore \quad x = a - 2, \; -a - 4$ ½+½ m

20. $a + 9d = -37$ .... (i) ½ m

$3(2a + 5d) = -27$

$\Rightarrow \quad 2a + 5d = -9$ .... (ii) 1 m

Solving (i) & (ii)

$a = 8, \ d = -5$ 1 m

$\therefore \quad S_8 = \frac{8}{2}[16 + 7(-5)]$

$= -76$ ½ m

SECTION - D

21. Let lenght of cloth be x m.

Cost per meter = Rs. $\frac{200}{x}$

New lenght of cloth = (x + 5) m.

New cost per meter = Rs. $\left(\frac{200}{x} - 2\right)$ 1 m

$\therefore \quad (x+5)\left(\frac{200}{x} - 2\right) = 200$ 1 m

$\Rightarrow \quad x^2 + 5x - 500 = 0$

$\Rightarrow \quad (x+25)(x-20) = 0$

$\Rightarrow \quad x = 20, \quad x \neq -25$ 1 m

Length of piece = 20 m ½ m

Original cost per meter = Rs. $\frac{200}{20}$ = Rs. 10 ½ m

22. Correct figure given, to prove and construction ½ x 4 =2 m

Correct proof 2 m

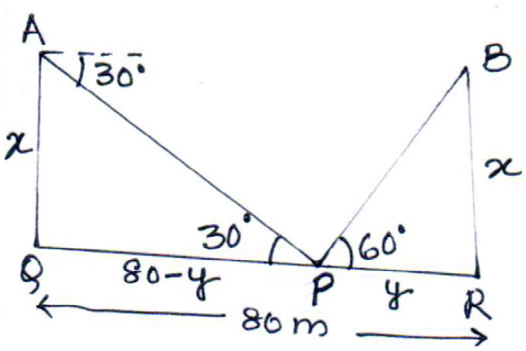
23. 

Figure 1 m

$\tan 60^{o} = \dfrac{x}{y}$

$\Rightarrow \quad x = y\sqrt{3}$ .... (i) ½ m

$\tan 30^{o} = \dfrac{x}{80 - y}$

$\Rightarrow \quad \sqrt{3}\,x = 80 - y$ .... (ii) 1 m

Solving (i) and (ii)

$y = 20, \quad x = 20\sqrt{3}$ m. ½ m

Height of pole = $20\sqrt{3}$ m.

PR = 20 m.

OP = 80 – 20 = 60 m. 1 m

24. Total number of cords = 65

(i) P (a one digit number) = 4/65 1 m

(ii) P (a number divisible by 5) = $\dfrac{13}{65} = \dfrac{1}{5}$ 1 m

(iii) P (an odd number less than 30) = $\dfrac{12}{65}$ 1 m

(iv) P (a composite number between 50 and 70) = $\dfrac{15}{65} = \dfrac{3}{13}$ 1 m

25. Volume of water in cone = $\dfrac{1}{3}\pi\left(5^2\right)\times 8 = \dfrac{200\,\pi}{3}$ cm^3 ½ m

Volume of water flows out = $\dfrac{1}{4}\left(\dfrac{200\,\pi}{3}\right) = \dfrac{50\,\pi}{3}$ cm^3 1 m

Let radius of one spherical ball be x cm.

$\therefore \quad \dfrac{4}{3}\pi\left(x^3\right)\times 100 = \dfrac{50\,\pi}{3}$ 1½ m

$$\Rightarrow \quad x^3 = \frac{1}{8}$$

$\Rightarrow \; x = \frac{1}{2}$ cm or 0.5 cm. 1 m

26. Volume of milk in a container $= \frac{\pi\, 30}{3}(1600 + 400 + 800)$ 1 m

$= 88000 \text{ cm}^3$

$= 88$ litres 1 m

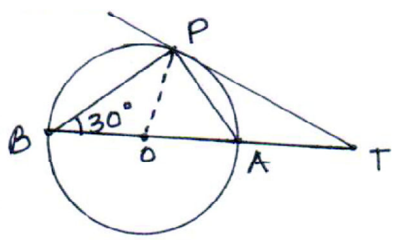
Number of containers needed $= \frac{880}{88} = 10$ ½ m

Cost of milk = Rs. $88 \times 10 \times 35$

= Rs. 30800 ½ m

Value 1 m

27.



$\angle AOP = 2 \times 30^\circ = 60^\circ$ ½ m

$\angle OAP = 180^\circ - 30^\circ - 90^\circ = 60^\circ$

$\therefore \quad OP = PA$ 1 m

Also $\angle ATP = \angle APT = 30^\circ$ ½ m

$\therefore \quad AP = AT = OP = OA$ 1 m

Hence $BA = 2\,OA = 2\,AT$

$\Rightarrow \quad BA : AT = 2 : 1$ 1 m

28. $x = -4$ is root of the equation $x^2 + 2x + 4p = 0$

$\Rightarrow \quad p = -2$ 1 m

Equation $x^2 - 2(1 + 3k)x + 7(3 + 2k) = 0$ has equal roots

$\therefore \quad 4(1 + 3k)^2 - 28(3 + 2k) = 0$ — 1 m

$\Rightarrow \quad 9k^2 - 8k - 20 = 0$

$\Rightarrow \quad (9k + 10)(k - 2) = 0$ — 1 m

$\Rightarrow \quad k = \frac{-10}{9}, \ 2$ — 1 m

29. The sequence is

103, 110, ..., 999 — 1 m

$\therefore \quad 999 = 103 + (n - 1) \times 7$

$\Rightarrow \quad n = 129$ — ½ m

Therefore $\frac{129 + 1}{2}$ = 65th term is the middle term — ½ m

Middle term = $103 + (64) \times 7 = 551$ — 1 m

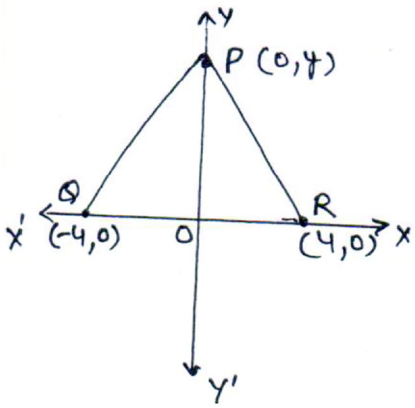
Sum of first 64 terms = $32\,[206 + 63 \times 7] = 20704$ — ½ m

Sum of last 64 terms = $32\,[1116 + 63 \times 7) = 49824$ — ½ m

30. Correct construction of circle — 1 m

Correct construction of tangents — 3 m

31.



oordinates of point R = (4, 0) — 1 m

OR = 8 units — ½ m

Let coordinates of point P be (0, y) — 1 m

Since PQ = OR

$\Rightarrow \quad (-4)^2 + y^2 = 64$

$\Rightarrow \quad y = \pm 4\sqrt{3}$ — 1 m

Coordinates of point P are $(0, \ 4\sqrt{3})$ or $(0, \ -4\sqrt{3})$ — ½ m