MATHEMATICS

Time allowed : 3 hours ***Maximum Marks : 100***

GENERAL INSTRUCTIONS :

(i) All questions are compulsory.

(ii) The question paper consists of 34 questions divided into four sections - A, B, C and D.

(iii) Section A contains 10 questions of 1 mark each, which are multiple choice type questions, Section B contains 8 questions of 2 marks each, Section C contains 10 questions of 3 marks each and Section D contains 6 questions of 4 marks each.

(iv) There is no overall choice in the paper. However, internal choice is provided in one question of 2 marks, three questions of 3 marks and two questions of 4 marks.

(v) Use of calculators is not permitted.

QUESTION PAPER CODE 30/1/1

SECTION - A

Question Numbers 1 to 10 carry 1 mark each. For each of the questions 1 to 10, four alternative choices have been provided, of which only one is correct. Select the correct choice.

1. The roots of the equation $x^2 + x - p(p+1) = 0$, where p is a constant, are

   (A) $p, p+1$

   (B) $-p, p+1$

   (C) $p, -(p+1)$

   (D) $-p, -(p+1)$

2. In an AP, if $d = -2$, $n = 5$ and $a_n = 0$, then the value of a is

   (A) 10

(B) 5

(C) -8

(D) 8

3. In Fig. 1, O is the centre of a circle, AB is a chord and AT is the tangent at A. If $\angle AOB = 100°$, then $\angle BAT$ is equal to

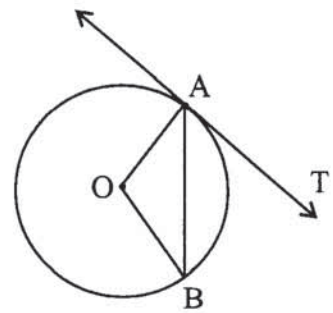


Fig.1

(A) 100°

(B) 40°

(C) 50°

(D) 90°

4. In Fig. 2, PA and PB are tangents to the circle with centre O. If $\angle APB = 60°$, then $\angle OAB$ is

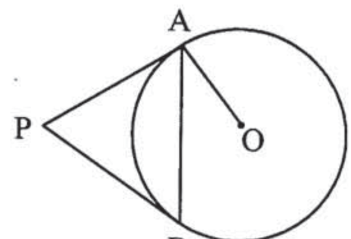


Fig. 2

(A) 30°

(B) 60°

(C) 90°

(D) 15°

5. The radii of two circles are 4 cm and 3 cm respectively. The diameter of the circle having area equal to the sum of the areas of the two circles (in cm) is

(A) 5

(B) 7

(C) 10

(D) 14

6. A sphere of diameter 18 cm is dropped into a cylindrical vessel of diameter 36 cm, partly filled with water. If the sphere is completely submerged, then the water level rises (in cm) by

(A) 3

(B) 4

(C) 5

(D) 6

7. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower is 45°. The height of the tower (in metres) is

(A) 15

(B) 30

(C) $30\sqrt{3}$

(D) $10\sqrt{3}$

8. The point P which divides the line segment joining the points A(2, – 5) and B(5, 2) in the ratio 2:3 lies in the quadrant

(A) I

(B) II

(C) III

(D) IV

9. The mid-point of segment AB is the point P(0, 4). If the coordinates of B are (-2, 3) then the coordinates of A are

(A) (2, 5)

(B) (–2, –5)

(C) (2, 9)

(D) (–2, 11)

10. Which of the following cannot be the probability of an event?

(A) 1.5

(B) $\frac{3}{5}$

(C) 25%

(D) 0.3

SECTION B

Question Numbers 11 to 18 carry 2 marks each.

11. Find the value of p so that the quadratic equation $px(x-3)+9=0$ has two equal roots.

12. Find whether – 150 is a term of the AP 17, 12, 7, 2, ...?

13. Two concentric circles are of radii 7 cm and r cm respectively, where $r > 7$. A chord of the larger circle, of length 48 cm, touches the smaller circle. Find the value of r.

14. Draw a line segment of length 6 cm. Using compasses and ruler, find a point P on it which divides it in the ratio 3:4.

15. In Fig. 3, APB and CQD are semi-circles of diameter 7 cm each, while ARC and BSD are semi-circles of diameter 14 cm each. Find the perimeter of the shaded region. $\left[\text{Use } \pi = \frac{22}{7}\right]$

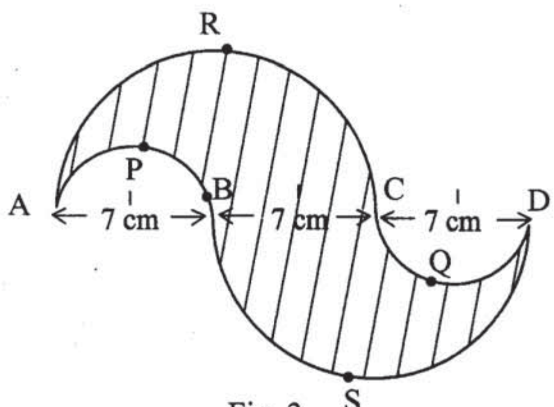


Fig. 3

Or

Find the area of a quadrant of a circle, where the circumference of circle is 44 cm. $\left[\text{Use } \pi = \frac{22}{7}\right]$

16. Two cubes, each of side 4 cm are joined end to end. Find the surface area of the resulting cuboid.

17. Find that value(s) of x for which the distance between the points P(x, 4) and Q(9, 10) is 10 units.

18. A coin is tossed two times. Find the probability of getting at least one head.

SECTION C

Question numbers 19 to 28 carry 3 marks each.

19. Find the roots of the following quadratic equation:

$$2\sqrt{3}x^2 - 5x + \sqrt{3} = 0$$

20. Find the value of the middle term of the following AP :

$-6, -2, 2, \ldots\ldots, 58.$

OR

Determine the AP whose fourth term is 18 and the difference of the ninth term from the fifteenth term is 30.

21. In Fig. 4, a triangle ABC is drawn to circumscribe a circle of radius 2 cm such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 4 cm and 3 cm respectively. If area of Δ ABC = 21 cm^2, then find the lengths of sides AB and AC.

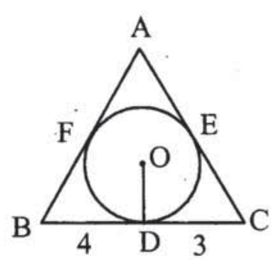


Fig. 4

22. Draw a triangle ABC in which AB = 5 cm, BC = 6 cm and $\angle$ ABC = 60°. Then construct a triangle whose sides are $\frac{5}{7}$ times the corresponding sides of Δ ABC.

23. Find the area of the major segment APB, in Fig 5, of a circle of radius 35 cm and $\angle$ AOB = 90°.

$\left[\text{Use } \pi = \frac{22}{7}\right]$

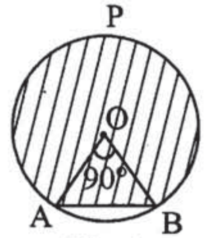


Fig. 5

24. The radii of the circular ends of a bucket of height 15 cm are 14 cm and r cm ($r < 14$ cm). If the volume of bucket is 5390 cm^3, then find the value of r. $\left[\text{Use } \pi = \frac{22}{7}\right]$

25. Two dice are rolled once. Find the probability of getting such numbers on two dice, whose product is a perfect square.

Or

A game consists of tossing a coin 3 times and noting its outcome each time. Hanif wins if he gets three heads or three tails, and loses otherwise. Calculate the probability that Hanif will lose the game.

26. From the top of a tower 100 m high, a man observes two cars on the opposite sides of the tower with angles of depression 30° and 45° respectively. Find the distance between the cars. [Use $\sqrt{3}$ = 1.73]

27. If (3, 3), (6, y), (x, 7) and (5, 6) are the vertices of a parallelogram taken in order, find the values of x and y.

28. If two vertices of an equilateral triangle are (3, 0) and (6, 0), find the third vertex.

Or

Find the value of k, if the points P(5, 4), Q(7, k) and R(9, -2) are collinear.

SECTION D

Question Numbers 29 to 34 carry 4 marks each.

29. A motor boat whose speed is 20 km/h in still water, takes 1 hour more to go 48 km upstream than to return downstream to the same spot. Find the speed of the stream.

Or

Find the roots of the equation $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, x \neq -4, 7$

30. If the sum of first 4 terms of an AP is 40 and that of first 14 terms is 280, find the sum of its first n terms.

Or

Find the sum of the first 30 positive integers divisible by 6.

31. Prove that the lengths of tangents drawn from an external point to a circle are equal.

32. In Fig. 6, arcs are drawn by taking vertices A, Band C of an equilateral triangle ABC of side 14 cm as centres to intersect the sides BC, CA and AB at their respective mid-point D, E and F. Find the area of the shaded region. $\left[\text{Use } \pi = \frac{22}{7} \text{ and } \sqrt{3} = 1.73\right]$

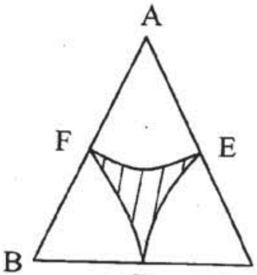


Fig. 6

33. From a solid cylinder whose height is 15 cm and diameter 16 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid. $[\text{Take } \pi = 3.14]$

34. Two poles of equal heights are standing opposite to each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°, respectively. Find the height of the poles.

QUESTION PAPER CODE 30/1

SECTION - A

Question numbers 1 to 10 carry 1 mark each. For each of the question numbers 1 to 10, four alternative choices have been provided, of which only one is correct. Select the correct choice.

1. The roots of the equation $x^2 - 3x - m(m + 3) = 0$, where m is a constant, are

(A) m, m + 3

(B) – m, m + 3

(C) $m, -(m+3)$

(D) $-m, -(m+3)$

2. If the common difference of an A.P. is 3, then $a_{20} - a_{15}$ is

(A) 5

(B) 3

(C) 15

(D) 20

3. In Figure 1, O is the centre of a circle, PQ is a chord and PT is the tangent at P. If $\angle POQ = 70°$, then $\angle TPQ$ is equal to

(A) 55°

(B) 70°

(C) 45°

(D) 35°

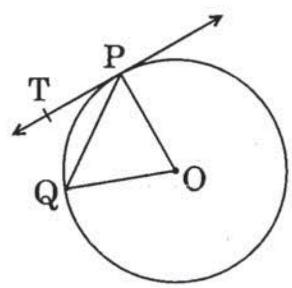


Figure 1

4. In Figure 2, AB and AC are tangents to the circle with centre O such that $\angle BAC = 40°$. Then $\angle BOC$ is equal to

(A) 40°

(B) 50°

(C) 140°

(D) 150°

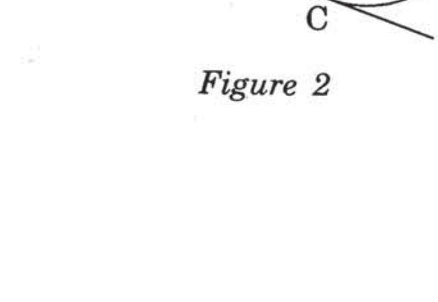


Figure 2

5. The perimeter (in cm) of a square circumscribing a circle of radius a cm, is

(A) 8 a

(B) 4 a

(C) 2 a

(D) 16 a

6. The radius (in cm) of the largest right circular cone that can be cut out from a cube of edge 4.2 cm is

(A) 4.2

(B) 2.1

(C) 8.4

(D) 1.05

7. A tower stands vertically on the ground. From a point on the ground which is 25 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 45°. Then the height (in meters) of the tower is

(A) $25\sqrt{2}$

(B) $25\sqrt{3}$

(C) 25

(D) 12.5

8. If $p\left(\frac{a}{2}, 4\right)$ is the mid-point of the line-segment joining the points $A(-6, 5)$ and $B(-2, 3)$, then the value of a is

(A) – 8

(B) 3

(C) – 4

(D) 4

9. If A and B are the points $(-6, 7)$ and $(-1, -5)$ respectively, then the distance 2AB is equal to

(A) 13

(B) 26

(C) 169

(D) 238

10. A card is drawn from a well-shuffled deck of 52 playing cards. The probability that the card will not be an ace is

(A) $\frac{1}{13}$

(B) $\frac{1}{4}$

(C) $\frac{12}{13}$

(D) $\frac{3}{4}$

SECTION B

Question numbers 11 to 18 carry 2 marks each.

11. Find the value of m so that the quadratic equation $mx(x-7) + 49 = 0$ has two equal roots.

12. Find how many two-digit numbers are divisible by 6.

13. In Figure 3, a circle touches all the four sides of a quadrilateral ABCD whose sides are AB = 6 cm, BC = 9 cm and CD = 8 cm. Find the length of side AD.

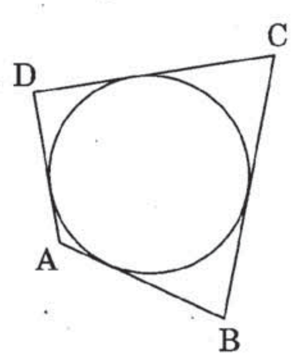


Figure 3

14. Draw a line segment AB of length 7 cm. Using ruler and compasses, find a point P on AB such that $\frac{AP}{AB} = \frac{3}{5}$.

15. Find the perimeter of the shaded region in Figure 4, if ABCD is a square of side 14 cm and APB and CPD are semicircles. $\left[\text{Use } \pi = \frac{22}{7}\right]$

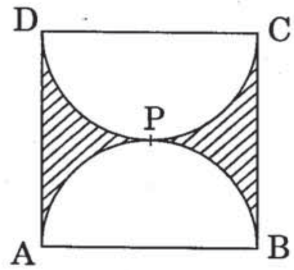


Figure 4

16. Two cubes each of volume 27 cm^3 are joined end to end to form a solid. Find the surface area of the resulting cuboid.

OR

A cone of height 20 cm and radius of base 5 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere.

17. Find the value of y for which the distance between the points A(3, –1) and B(11, y) is 10 units.

18. A ticket is drawn at random from a bag containing tickets numbered from 1 to 40. Find the probability that the selected ticket has a number which is a multiple of 5.

SECTION C

Question numbers 19 to 28 carry 3 marks each.

19. Find the roots of the following quadratic equation:

$$x^2 - 3\sqrt{5}\ x + 10 = 0$$

20. Find an A.P. whose fourth term is 9 and the sum of its sixth term and thirteenth term is 40.

21. In Figure 5, a triangle PQR is drawn to circumscribe a circle of radius 6 cm such that the segments

QT and TR into which QR is divided by the point of contact T, are of lengths 12 cm and 9 cm respectively. If the area of $\Delta PQR = 189 \text{ cm}^2$, then find the lengths of sides PQ and PR.

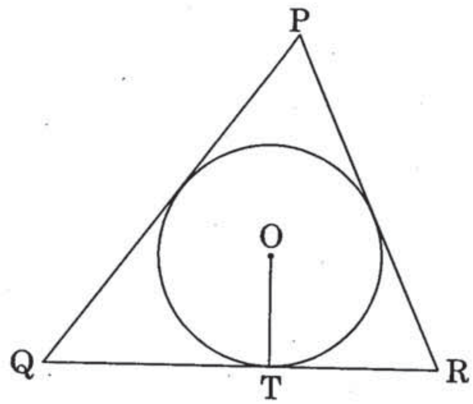


Figure 5

22. Draw a pair of tangents to a circle of radius 3 cm, which are inclined to each other at an angle of 60°.

OR

Draw a right triangle in which the sides (other than hypotenuse) are of lengths 4 cm and 3 cm. Then construct another triangle. whose sides are $\frac{3}{5}$ times the corresponding sides of the given triangle.

23. A chord of a circle of radius 14 cm subtends an angle of 120° at the centre. Find the area of the corresponding minor segment of the circle. $\left[\text{Use } \pi = \frac{22}{7} \text{ and } \sqrt{3} = 1.73\right]$

24. An open metal bucket is in the shape of a frustum of a cone of height 21 cm with radii of its lower and upper ends as 10 cm and 20 cm respectively. Find the cost of milk which can completely fill the bucket at Rs. 30 per litre. $\left[\text{Use } \pi = \frac{22}{7}\right]$

25. Point P(x, 4) lies on the line segment joining the points A(– 5, 8) and B(4, –10). Find the ratio in which point P divides the line segment AB. Also find the value of x.

26. Find the area of the quadrilateral ABCD, whose vertices are A(–3, –1), B(– 2, – 4), C(4, –1) and D(3, 4).

OR

Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are A(2, 1), B(4, 3) and C(2, 5).

27. From the top of a vertical tower, the angles of depression of two cars, in the same straight line with the base of the tower, at an instant are found to be 45° and 60°. If the cars are 100 m apart and are on the same side of the tower, find the height of the tower. [Use $\sqrt{3} = 1.73$]

28. Two dice are rolled once. Find the probability of getting such numbers on the two dice, whose product is 12.

OR

A box contains 80 discs which are numbered from 1 to 80. If one disc is drawn at random from the box, find the probability that it bears a perfect square number.

SECTION D

Question numbers 29 to 34 carry 4 marks each.

29. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

30. The first and the last terms of an A.P. are 8 and 350 respectively. If its common difference is 9, how many terms are there and what is their sum?

OR

How many multiples of 4 lie between 10 and 250 ? Also find their sum.

31. A train travels 180 km at a uniform speed. If the speed had been 9 km/hour more, it would have taken 1 hour less for the same journey. Find the speed of the train.

OR

Find the roots of the equation $\frac{1}{2x-3}+\frac{1}{x-5}=1,\ x \neq \frac{3}{2}, 5.$

32. In Figure 6, three circles each of radius 3.5 cm are drawn in such a way that each of them touches the other two. Find the area enclosed. between these three circles (shaded region). $\left[\text{Use } \pi = \frac{22}{7}\right]$

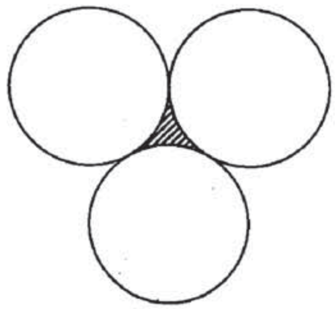


Figure 6

33. Water is flowing at the rate of 15 km/hour through a pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time will the level of water in the pond rise by 21 cm ?

34. The angle of elevation of the top of a vertical tower from a point on the ground is 60°. From another point 10 m vertically above the first, its angle of elevation is 30°. Find the height of the tower.

Secondary School Examination

March — 2011

Marking Scheme — Mathematics 30/1/1

<u>*General Instructions*</u>

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.

QUESTION PAPER CODE 30/1/1

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Q.No.				Marks
1.	(C); p, – (p + 1)	2. (D); 8	3 . (C); 50°	
4.	(A); 30°	5. (C); 10	6. (A); 3	$1 \times 10 = 10$m
7.	(B); 30	8. (D); IV	9 . (A); (2, 5)	
10.	(A); 1.5			

SECTION - B

11. For roots to be equal $b^2 - 4ac = 0$ ½ m

$px^2 - 3px + 9 = 0$

$\Rightarrow 9p^2 - 36p = 0 \Rightarrow p = 4$ (p = 0 rejected) 1½ m

12. Here $a = 17$, $d = -5$, $t_n = -150$

$\Rightarrow -150 = 17 + (n - 1)(-5)$ ½ m

$\Rightarrow \frac{-167}{-5} + 1 = n$, which is not a natural number 1 m

$\therefore$ – 150 is not a term of the A.P. ½ m

13.

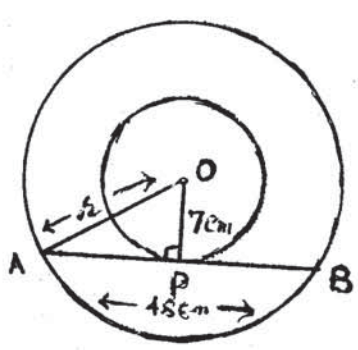


Figure ½ m

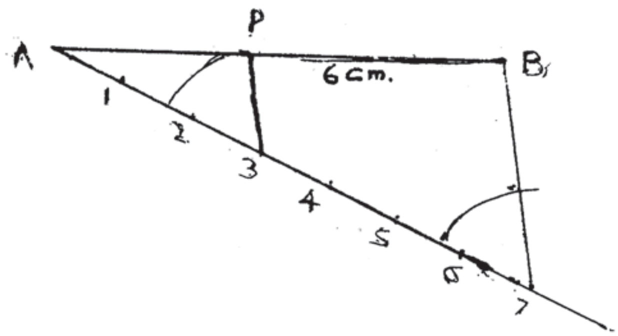
Here OP = 7cm, OA = r cm

$AP = \frac{48}{2}$ cm or 24 cm ½ m

$\therefore\ r^2 = OP^2 + AP^2 = 24^2 + 7^2 = 625$ 1 m

$\Rightarrow\ r = 25$ cm

14. Correct construction 2



15. Perimeter of two bigger semicircles

$$= 2\left(\frac{22}{7} \times 7\right) \text{cm} = 44 \text{ cm}$$ 1 m

Perimeter of two smaller semicircles $= 2 \times \frac{22}{7} \times \frac{7}{2} = 22\text{cm}$ ½ m

$\therefore$ Total perimeter $= (44 + 22)\text{cm}$ or 66 cm ½ m

OR

$2\pi r = 44 \Rightarrow 2 \times \frac{22}{7} \times r = 44 \Rightarrow r = 7$ cm 1 m

$\therefore$ Area of quadrant of radius r $= \left(\frac{1}{4} \times \frac{22}{7} \times 7 \times 7\right) \text{cm}^2$

$= 38.5 \text{ cm}^2$ 1 m

16. Dimensions of resulting cuboid

Length = 8 cm, Breadth = Height = 4 cm ½ m

$\therefore$ Surface area of cuboid

$= 2 [8 \times 4 + 4 \times 4 + 8 \times 4) \text{ cm}^2$ 1 m

$= 160 \text{ cm}^2$ ½ m

17. $\overset{\longleftarrow \quad 10 \text{ units} \quad \longrightarrow}{P(x, 4) \text{———————} Q(9, 10)}$

$PQ^2 = (x-9)^2 + (4-10)^2 = 100$ ½ m

$\Rightarrow x^2 - 18x + 17 = 0$ ½ m

$(x-1)(x-17) = 0 \Rightarrow x = 1, 17$ ½+½

18. Total outcomes are HH, HT, TH, TT ½ m

P (at least one Head) 1 – P (no Head) 1 m

$= 1 - \frac{1}{4} = \frac{3}{4}$ ½ m

SECTION -C

19. $2\sqrt{3}\, x^2 - 5x + \sqrt{3} = 0$

$2\sqrt{3}\, x^2 - 2x - 3x + \sqrt{3} = 0$ 1 m

$\Rightarrow 2x(\sqrt{3}\, x - 1) - \sqrt{3}(\sqrt{3}\, x - 1) = 0$

$(2x - \sqrt{3})(\sqrt{3}\, x - 1) = 0$ 1 m

$\Rightarrow x = \frac{1}{\sqrt{3}}, \frac{\sqrt{3}}{2}$

$\therefore$ The roots are $\frac{1}{\sqrt{3}}, \frac{\sqrt{3}}{2}$ 1 m

20. Here $a = -6$, $d = 4$, $a_n = 58$

$\therefore\ 58 = -6 + (n-1)4 \Rightarrow n = 17$ 1½ m

$\therefore$ Middle term is 9th ½ m

$a_9 = a + 8d = -6 + 32 = 26$ 1 m

OR

$a_4 = 18$ and $a_{15} - a_9 = 30$

$\Rightarrow a + 3d = 18$ and $(a + 14d) - (a + 8d) = 30$ 1½

$\Rightarrow d = 5$

$\Rightarrow a + 15 = 18 \Rightarrow a = 3$ 1 m

$\therefore$ AP is 3, 8, 13, 18, ... ½ m

21. Let AF be equal to x $\Rightarrow$ AE = x

Also BF = BD = 4 cm, CD = CE = 3cm 1 m

$\therefore$ Semi-perimeter of Δ ABC is $(7 + x)$ ½ m

$\Rightarrow (7 + x)2 = 21 \Rightarrow x = 3.5$ 1 m

$\therefore$ AB = 7.5 cm, AC = 6.5 cm ½ m

22. Correct Construction of

i) Δ ABC 1 m

ii) Triangle similar to Δ ABC 2 m

23. Area of minor Segment = Area of (sector OAB – Δ OAB) ½ m

$$= \left[\frac{90}{360} \times \frac{22}{7} \times (35)^2 - \frac{1}{2} \times 35 \times 35\right] \text{cm}^2$$

$$= \frac{1925}{2} - \frac{1225}{2} \text{ or } 350 \text{ cm}^2$$ 1½ m

$$\therefore \text{Area of major segment} = \left(\frac{22}{7} \times 35 \times 35 - 350\right) \text{cm}^2$$

$$= 3500 \text{ cm}^2$$ 1 m

24. Volume of bucket = $\frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$ ½ m

$$5390 = \frac{1}{3} \times \frac{22}{7} \times 15\left[14^2 + r^2 + 14r\right]$$ ½ m

$49 \times 7 = (196 + (r^2 + 14r)$

$\Rightarrow \quad r^2 + 14r - 147 = 0$ 1 m

$\Rightarrow \quad (r + 21)(r - 7) = 0 \quad \Rightarrow \quad r = 7$ cm ½+½ m

25. Total number of possible out comes = 36 ½ m

The number of cases favourable to the event

"Product is a perfect square" are 8 1½

[(1, 1), (2, 2), (3, 3) (4, 4) (5, 5), (6, 6), (1, 4), (4, 1)]

$\therefore$ Required Probability $= \frac{8}{36} = \frac{2}{9}$ 1 m

OR

Total number of outcomes are {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT} 8 1 m

$\therefore$ No. of cases favourable to winning = 2

No. of cases when game is lost = 6 ½+½ m

$\therefore$ Required Probability $= \frac{6}{8} = \frac{3}{4}$ 1 m

26.

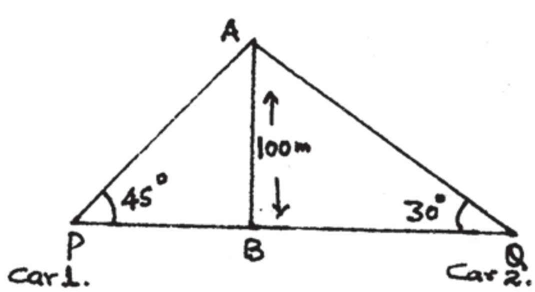


Figure ½ m

i) $\frac{AB}{PB} = \tan 45^\circ = 1$

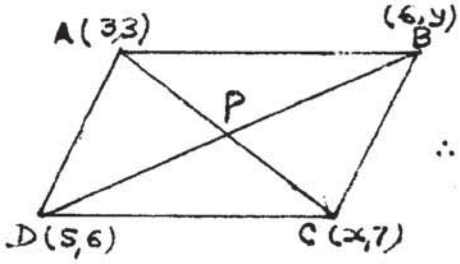
$\Rightarrow$ PB = 100m ½ m

ii) Again $\frac{AB}{BQ} = \tan 30^\circ = \frac{1}{\sqrt{3}}$ 1½ m

$\Rightarrow$ BQ = $100\sqrt{3}$ or 173 m

$\therefore$ PQ = (100 + 173)m or 273 m ½ m

27. In the figure, ABCD is a $||^{gm}$



Diagonals of a $||^{gm}$ bisect each other ½ m

Let P be the point of intersection

$\therefore$ Mid-point of AC = Mid-point of BD ½ m

$$\left(\frac{x+3}{2}, 5\right) = \left(\frac{11}{2}, \frac{y+6}{2}\right)$$ 1 m

$\Rightarrow$ $x = 8, \ y = 4$ 1 m

28. ABC is an equilateral triangle of side 3 units ½ m

$\therefore \ AB^2 = AC^2 = 9$

$\Rightarrow (x-3)^2 + y^2 = (x-6)^2 + y^2$ ½ m

$\Rightarrow 6x = 27, \ \Rightarrow \ x = \frac{9}{2}$ 1 m

$\therefore \left(\frac{9}{2} - 3\right)^2 + y^2 = 9 \ \Rightarrow \ y^2 = \frac{27}{4} \ \Rightarrow \ y = \pm\frac{3\sqrt{3}}{2}$ ½ m

$\therefore$ Coordinates of A are $\left(\frac{9}{2}, \pm\frac{3\sqrt{3}}{2}\right)$ ½ m

OR

For P, Q and R to be collinear, area (Δ PQR) = 0 1 m

$\Rightarrow$ 5 (k + 2) + 7 (–2 – 4) + 9 (4 – k) = 0 1 m

$\Rightarrow$ 5k + 10 – 42 + 36 – 9k = 0

$\Rightarrow$ 4k = 4 $\Rightarrow$ k = 1 1 m

SECTION D

29. Let the speed of stream be x km/hour

speed upstream = (20 – x) km/hr.

speed downstream = (20 + x) km/hr. ½ m

$$\therefore \quad \frac{48}{20-x} - \frac{48}{20+x} = 1$$ 1 m

or $48\,[20 + x - 20 + x] = 400 - x^2$

$\Rightarrow x^2 + 96x - 400 = 0$ 1 m

$(x + 100)\ (x - 4) = 0$

$\Rightarrow x = 4$ 1 m

i.e. speed of stream is 4km/hour ½ m

OR

$$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$$

or $30\,(x - 7 - x - 4) = 11\,(x^2 - 3x - 28)$ 2 m

$x^2 - 3x + 2 = 0 \Rightarrow x = 1, x = 2$ 2 m

30. $40 = S_4 = \frac{4}{2}\,[2a + 3d] \Rightarrow 2a + 3d = 20$ ....(i) 1 m

$280 = S_{14} = 7\,[2a + 13d] \Rightarrow 2a + 13d = 40$ ....(ii) 1 m

From (i) and (ii), a = 7, d = 2 1 m

$$S_n = \frac{n}{2}\left[14 + (n-1)2\right] = n\left[7 + (n-1)\right]$$

$= n^2 + 6n$ 1 m

OR

6, 12, 18, ..., 30 terms 1 m

$S_{30} = \frac{30}{2}$ [12 + 29 × 6] 1½ m

S_{30} = 15 [186] = 2790 1½ m

31. Correctly stated given, to prove, construction and correct figure ½×4 = 2 m

Correct Proof 2 m

32. Area of equilateral triangle of side 14 cm = $\left(\frac{\sqrt{3}}{4} \times 196\right)$ cm^2

$= 49 \times \sqrt{3}$ or 49×1.73 cm^2

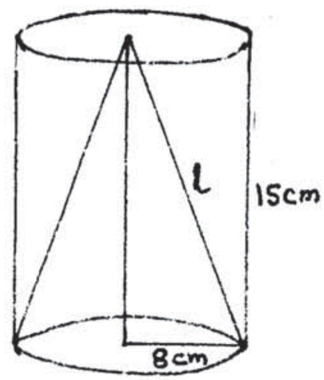
= 84.77 cm^2 1½ m

Combined area of three sectors = $\left(\frac{180}{360} \times \frac{22}{7} \times 7 \times 7\right)$ cm^2

= 77 cm^2 1½ m

∴ shaded area = (84.77 – 77.00) = 7.77 cm^2 1 m

33.



r = 8 cm, h = 15 cm

$\therefore\ l = \left(\sqrt{8^2 + 15^2}\right)$ cm = 17 cm 1 m

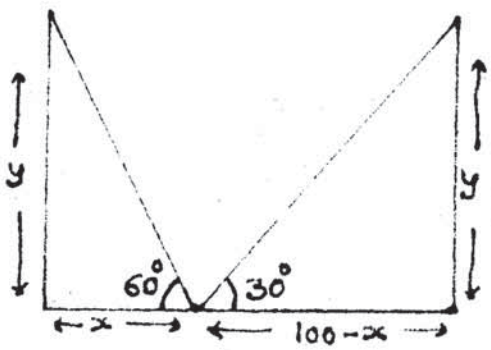
∴ Total surface area of remaining solid

= 3.14 [2rh + r^2 + rl] = 3.14 × 8 [30 + 8 + 17] 1½

= 3.14 × 8 × 55 cm^2

= 1381.6 cm^2 1½ m

34. Figure 1 m



(i) $\frac{y}{x} = \tan 60^\circ = \sqrt{3}$

$\Rightarrow \; x = \frac{y}{\sqrt{3}}$ 1 m

(ii) $\frac{y}{100 - x} = \tan 30^\circ = \frac{1}{\sqrt{3}}$

$100 - \frac{y}{\sqrt{3}} = \sqrt{3}y$ 1 m

$\Rightarrow \; 100\sqrt{3} = 4y \;\Rightarrow\; y = 25\sqrt{3}$

$\therefore$ Height of each pole = $25\sqrt{3}$ m 1 m

QUESTION PAPER CODE 30/1

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

Q.No.				Marks
1.	(B); -m, m+3	2. (C); 15	3 . (D); 35^{o}	
4.	(C); 140^{o}	5. (A); 8a	6. (B); 2.1	1×10 $= 10m$
7.	(C); 25	8. (A); -8	9 . (B); 26	
10.	(C); $\frac{12}{13}$			

SECTION - B

11. $mx(x-7) + 49 = 0 \Rightarrow mx^2 - 7mx + 49 = 0$

For equal roots $B^2 - 4AC = 0$ ½ m

$\therefore\ (-7m)^2 - 4(m)(49) = 0$ ½ m

$\Rightarrow\ m = 0 \ \text{ or } \ m = 4$ ½ m

but $m \neq 0\ \therefore\ m = 4$ ½ m

12. The numbers are

12, 18, 24, ---, 96 which is an A.P. ½ m

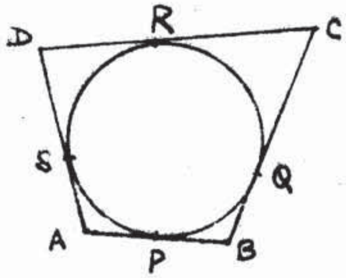
$\therefore\ 96 = 12 + (n - 1)\, 6$ 1 m

$\Rightarrow\ n = 15$ ½ m

13. let P, Q, R, S be the points of contact

$\therefore\ AP = AS$

$PB = BQ$



DR = DS

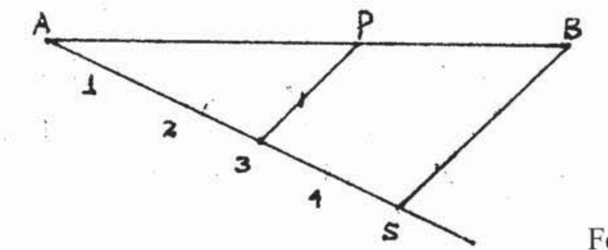
CR = CQ ½ m

$\therefore$ (AP + PB) + (DR + CR) = (AS + DS) + (BQ + QC)

$\therefore$ AB + CD = AD + BC ½ m

6 + 8 = AD + 9 $\Rightarrow$ AD = 5 cm. 1 m

14. For writing (or using) AP : PB = 3 : 2 ½ m



For correct construction 1½

15. Required Perimeter = circumference of circle of radius 7cm ½ m

+ lengths AD and BC.

$= (2 \times \frac{22}{7} \times 7 + 14 + 14)$ cm. 1 m

= 44 + 28 = 72 cm. ½ m

16. Getting side of cube = 3 cm. ½ m

Dimensions of the resulting cuboid are 6 cm × 3 cm × 3 cm ½ m,

$\therefore$ Surface area = 2 (6 × 3 + 3 × 3 + 3 × 6) cm^2

= 90 cm^2 1 m

OR

volume of cone = $\frac{1}{3}\pi(5)^2 . 20\ cm^2$ ½ m

$\therefore \frac{4}{3}\pi r^3 = \frac{1}{3}\pi(5)^2 . 20 \Rightarrow r = 5$ cm 1 m

$\therefore$ Diameter = 10 cm ½ m

17. $AB = \sqrt{(11-3)^2 + (y+1)^2} = \sqrt{65 + y^2 + 2y}$ ½ m

$\Rightarrow\ 65 + y^2 + 2y = 100$ or $y^2 + 2y - 35 = 0$ ½ m

$\therefore\ y = -7$ or $y = 5$ 1 m

18. Total number of tickets = 40

Number of tickets with number divisible by 5 = 8 1 m

$\therefore$ Required Probability $= \frac{8}{40}$ or $\frac{1}{5}$ 1 m

SECTION -C

19. $D = \left(-3\sqrt{5}\right)^2 - 4(1)(10) = 5$ 1 m

$\therefore\ x = \frac{\left(3\sqrt{5}\right) \pm \sqrt{5}}{2}$ 1 m

$= 2\sqrt{5},\ \sqrt{5}$ 1 m

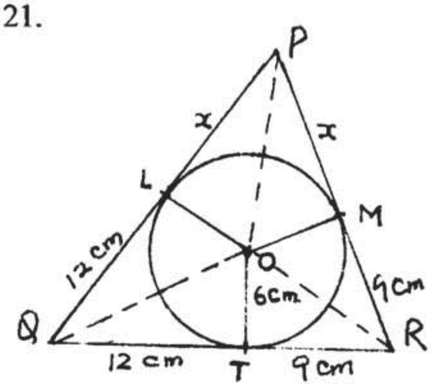
20. $a + 3d = 9,\ a + 5d + a + 12d = 40$

or $2a + 17d = 40$ 1 m

Solving to get $a = 3$ and $d = 2$ 1½ m

$\therefore$ AP is 3, 5, 7, ... ½ m

21.



Let PL = PM = x, also, QL = 12cm and RM = 9cm ½ m

$\therefore\ \Delta\, PQR = \frac{1}{2}(PQ + QR + PR) \cdot OT = 189$ 1m

$\Rightarrow\ \frac{1}{2}(2x + 42)\, 6 = 189$ or $2x + 42 = 63$

$\Rightarrow\ 2x = 21$ or $x = 10.5$ 1 m

$\therefore$ PQ = 22.5 cm and PR = 19.5 cm ½ m

22. Correct Construction 3 m

OR

Correct Construction 3 m

23. Area of Segment $= \pi(14)^2 \times \frac{120}{360} - (14)^2 \times \sin 60^\circ \times \cos 60^\circ$ 1½ m

$= \frac{22}{7} \times 14 \times 14 \times \frac{1}{3} - (196) \times \frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{616}{3} - 49(1.73)\ \text{cm}^2$ 1 m

$= 205.33 - 84.77 = 120.56\ \text{cm}^2$ ½ m

24. Volume $= \frac{1}{3} \times \frac{22}{7} \times 21\left[(20)^2 + (10)^2 + 20 \times 10\right] \text{cm}^3$ 1½ m

$= 22 \times 700 = 15400\ \text{cm}^3 = 15.4$ litres 1 m

Cost $= 15.4 \times 30 =$ Rs. 462 ½ m

25. A $(-5, 8)$ —— P $(x, 4)$ —— B $(4, -10)$ let P divide AB in the ratio k:l

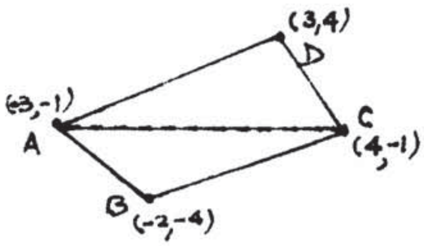
$\therefore\ x = \frac{4k - 5}{k + 1},\ 4 = \frac{-10k + 8}{k + 1}$ 1 m

$\Rightarrow\ 4k + 4 = -10k + 8$ or $14k = 4 \Rightarrow k = 2/7$ $\therefore$ Ratio is 2:7 1 m

$\therefore\ x = \frac{8/7 - 5}{2/7 + 1} = -\frac{27}{9} = -3$ 1 m

26. Area Δ ABC $= \frac{1}{2}\left[-3(-4+1) - 2(-1+1) + 4(-1+4)\right]$ 1 m

$= \frac{1}{2}[9 + 0 + 12] = \frac{21}{2} = 10.5$ sq.U. ½ m



Area Δ ACD $= \frac{1}{2}\left[-3(-1-4)+4(4+1)+3(-1+1)\right]$ 1 m

$= \frac{1}{2}[15+20+0] = \frac{35}{2} = 17.5$ sq.U.

$\therefore$ Area quad. ABCD = 10.5 + 17.5 = 28 sq. U. ½ m

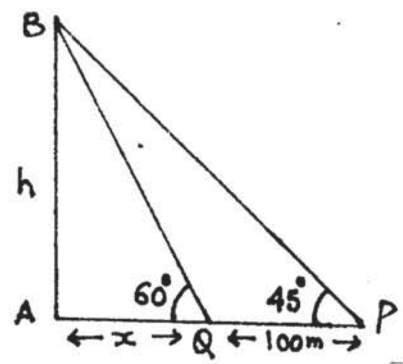
OR

Mid-points are (3, 2), (3, 4) and (2, 3) 1 m

Area of $\Delta = \frac{1}{2}\left[3(4-3)+3(3-2)+2(2-4)\right]$ 1 m

$= \frac{1}{2}[3+3-4] = 1$ sq.U. 1 m

27.



correct Fig. ½ m

Let height of tower (AB) be h.m.

$\therefore \frac{h}{x} = \tan 60^\circ = \sqrt{3} \Rightarrow x = \frac{h}{\sqrt{3}}$ ½ m

$\frac{h}{100+x} = \tan 45^\circ = 1 \Rightarrow 100 + x = h$ ½ m

$\Rightarrow h - \frac{h}{\sqrt{3}} = 100 \Rightarrow h = \frac{100\sqrt{3}}{\sqrt{3}-1} = 50\sqrt{3}\left(\sqrt{3}+1\right)$ 1 m

= 236.14 m [or 236.98m] or [236.5m] ½ m

28. Total number of possible outcomes = 36 ½ m

No. of pairs whose product is 12

{(2, 6) (6, 2), (3, 4), (4, 3)} = 4 1½ m

$\therefore$ Required Probability $= \frac{4}{36} = \frac{1}{9}$ 1 m

OR

Total number of discs $= 80$ ½ m

Number of discs with a perfect square $= 8$ 1½ m

{1, 4, 9, 16, 25, 36, 49, 64}

$\therefore \text{ Prob } = \frac{8}{80} = \frac{1}{10}$ 1 m

SECTION D

29. For correct Given, To prove, const. and fiqure ½×4=2 m

Correct Proof 2 m

30. $a = 8, a_n = 350$ and $d = 9$

$\therefore\ 350 = 8 + (n-1)9 \Rightarrow n = 39$ 1½+½ m

$S_{39} = \frac{39}{2}[8 + 350] = 39 \times 179 = 6981$ 2 m

OR

Numbers are 12, 16, 20, ..., 248 ½ m

$\therefore\ 248 = 12 + (n-1)\,4 \Rightarrow n = 60$ 1½+½ m

$S_{60} = 30\,[12 + 248] = 30 \times 260 = 7800$ 1½ m

31. Let speed of train be x km/h

$\Rightarrow \frac{180}{x} - \frac{180}{x+9} = 1$ 1½ m

$\Rightarrow\ x(x+9) = 180 \times 9$ or $x^2 + 9x - 1620 = 0$ 1 m

Solving to get $x = -45, 36$ 1 m

$\therefore$ speed of train $= 36$ km/hr. ½ m

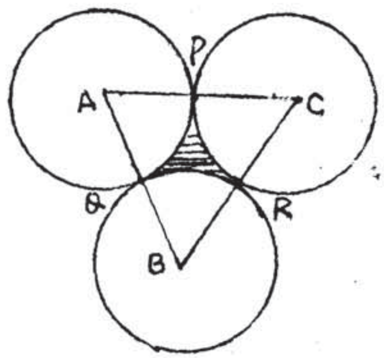
OR

$\frac{1}{2x-3}+\frac{1}{x-5}=1 \Rightarrow (2x-3)(x-5)=(3x-8)$ 1 m

$\therefore\ 2x^2-10x-3x+15-3x+8=0$ or $2x^2-16x+23=0$ 1 m

Solving to get $x=\frac{8+3\sqrt{2}}{2}, \frac{8-3\sqrt{2}}{2}$ 2 m

32. Correct Figure ½ m



From figure, AB = BC = AC = 7 cm ½ m

$\therefore$ Area of Δ ABC $=\frac{\sqrt{3}(7)^2}{4}=\frac{49(1.73)}{4}$

$=21.19\ cm^2$ 1 m

Area of 3 sectors $=3\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times\frac{60}{360}=\frac{77}{4}\ cm^2$

$=19.25\ cm^2$ 1 m

$\therefore$ Area of shaded region $=21.19-19.25=1.94\ cm^2$ 1 m

33. Volume of pond $=50\times44\times\frac{21}{100}\ m^3$ 1 m

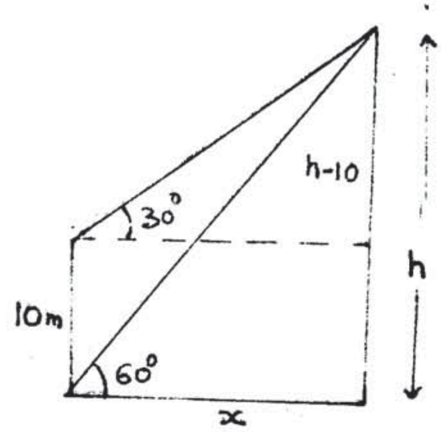
Volume of water through the pipe in 1 hr. $=15000\times\frac{22}{7}\times\frac{7}{100}\times\frac{7}{100}\ m^3$ 1m

$\therefore$ Time (in hrs.) $=\frac{50\times44\times21\times7\times100\times100}{15000\times22\times100\times7\times7}$ 1½ m

$=2$ hours. ½ m

34. Correct figure 1 m

$\frac{h}{x}=\tan 60^\circ=\sqrt{3}$



$\Rightarrow \ x = \frac{h}{\sqrt{3}}$ ....(i) 1 m

$\frac{h-10}{x} = \tan 30^\circ = \frac{1}{\sqrt{3}}$

$\therefore \quad x = \sqrt{3}\,(h-10)$ ....(ii) 1 m

$\frac{h}{\sqrt{3}} = \sqrt{3}\,(h-10) \Rightarrow h = 3h - 30$

$2h = 30 \Rightarrow h = 15$ m 1 m