Time allowed: 3 hours   Maximum Marks: 80
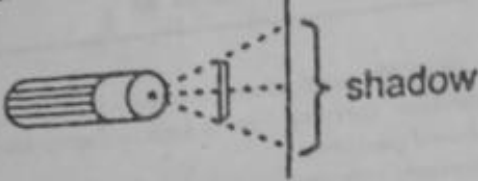
General instructions:
(i) This question paper consists of 38 questions divided into 5 sections A, B, C, D and E.
(ii) Section A comprises 20 questions carrying 1 mark each including Multiple Choice questions, Assertion and Reasoning based questions.
(iii) Section B comprises 5 questions carrying 2 marks each.
(iv) Section C comprises 6 questions carrying 3 marks each.
(v) Section D comprises 4 questions carrying 5 marks each.
(vi) Section E comprises 3 case study-based questions of 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
(vii) All questions are compulsory. However internal choices have been provided in some of the questions.
(viii) Draw neat figures wherever required.

SECTION-A
Multiple Choice Questions (20 Marks)

Q No.	Question	Marks
1	The LCM of 6^4, 8^2 and k is 12^4 where k is a positive integer. The value of k is (a) 2^2 (c) 2^4 (b) 2^6 (d) 2^8	1
2	The value of a for which the polynomial $p(x) = x^2 + 4x + a$ is a perfect square, is (a) 1 (c) 4 (b) 9 (d) 10	1
3	The sum of the first 10 terms of the A.P: $a - 8$, $a-2$, $a+4$, ...is (a) $190-10a$ (c) $10a-190$ (b) $190+10a$ (d) $10a+180$	1
4	Two concentric circles are of radii 6 cm and 8 cm. The length of the chord of the larger circle which touches the smaller circle is (a) 12 cm (c) 28 cm (b) $2\sqrt{7}$ cm (d) $4\sqrt{7}$ cm	1

5	If $\sin\theta + (\sin\theta)^2 = 1$, then the value of $(\cos\theta)^8 + 2(\cos\theta)^6 + (\cos\theta)^4$ is (a) 1 (c) 2 (b) 3 (d) 4	1
6	A 12 cm rod is held between a flashlight and a wall as shown in the figure. The length of the shadow on the wall, if the rod is 45 cm from the wall and 15 cm from the light is (a) 75 cm (c) 48 cm (b) 96 cm (d) 60 cm	1
7	If the area of a sector of a circle is $\frac{5}{18}$ of the area of that circle, then the central angle of the sector is (a) 100° (c) 110° (b) 105° (d) 120°	1
8	If the length of the shadow of a man is $\frac{1}{\sqrt{3}}$ times its height, then the angle of elevation of the sun will be (a) 0° (c) 30° (b) 45° (d) 60°	1
9	From the top of a pillar, the angle of depression of a point on the ground is 60°. If the distance of the point from the foot of the pillar is 16 m, then the height of the pillar is (a) 12 m (c) $8\sqrt{3}$ m (b) 16 m (d) $16\sqrt{3}$ m	1
10	The length of an arc of a sector of a circle with radius 21 cm, subtending an angle 45° at the centre is (a) 12.6 cm (c) 16.5 cm (b) 20.8 cm (d) 18.4 cm	1

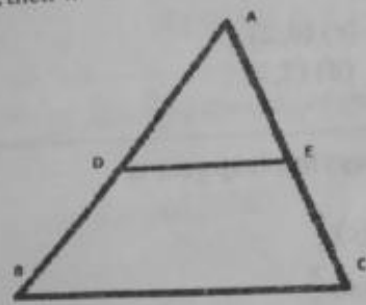| 11	If the radii of two cylinders are in the ratio 3 : 2 and their heights are in the ratio 4 : 3, then the ratio of their volumes will be	1
	(a) 3:4 (b) 9:8 (c) 3:1 (d) 1:3	
12	Two friends were born in the year 1996. The probability that they have the same date of birth is	1
	(a) $\frac{1}{132}$ (c) $\frac{2}{365}$ (b) $\frac{1}{365}$ (d) $\frac{1}{366}$	
13	The coordinates of point P on the x-axis equidistant from points A(−1, 0) and B(5, 0) is	1
	(a) (2, 0) (c) (0, 2) (b) (3, 0) (d) (2, 2)	
14	The probability of getting 53 Fridays in a leap year is	1
	(a) $\frac{3}{7}$ (c) $\frac{4}{7}$ (b) $\frac{5}{7}$ (d) $\frac{2}{7}$	
15	The coordinates A(7, 10), B(−2, 5) and C(3, −4) are the vertices of	1
	(a) a right-angled triangle (c) an isosceles triangle (b) an equilateral triangle (d) a scalene triangle	
16	The volume of the largest right-circular cone that can be carved out of a solid hemisphere of radius r is	1
	(a) $\frac{4}{3}\pi r^3$ (c) $\frac{2}{3}\pi r^3$ (b) $\frac{1}{3}\pi r^3$ (d) $4\pi r^3$	
17	If the modal class of the data given below is 30-40, then	1

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	9	14	7	a	13	12

(a) $a \leq 6$ (c) $a > 15$
(b) $a < 15$ (d) $a \geq 15$

18	If for an event E, $P(E) + P(E') = x$, then the value of $x^3 - 3$ is	
	(a) 1 (c) -1 (b) 2 (d) -2	
	In the question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A). (c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.	
19	Assertion (A): In $\triangle ABC$, if DE || BC, AD = 2cm, AE = (x + 1) cm, DB = (x + 1)cm and EC = 2 cm, then x = 1. Reason (R): If a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, the other two sides are divided in the same ratio.	1
20	Assertion(A): The mid-point of a line segment divides the line segment in the ratio 1: 1. Reason (R): The ratio in which the point $(-3, k)$ divides the line segment joining the points $(-5, 4)$ and $(-2, 3)$ is 1:2.	1

SECTION-B
(10 Marks)

Q No.	Question	Marks
21	Prove that $(2 - \sqrt{3})^2$ is an irrational number, given that $\sqrt{3}$ is an irrational number.	2
22	If α and β are the zeroes of the polynomial $p(x) = x^2 + px + q$, then form a polynomial whose zeroes are $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$.	2

23	If $2x + y = 23$ and $4x - y = 19$, then find the value of $(5y - 2x)$ and $(\frac{y}{x} - 2)$. OR If the system of linear equations $2x + 3y = 7$ and $2ax + (a + b)y = 28$ have an infinite number of solutions, then find the values of a and b.	2
24	The Red queen and the black jack are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the drawn card is (i) a face card (ii) a non red card	2
25	If the perimeter of the quadrant of a circle is 16.5 cm, then find the radius of the circle. OR A pendulum swings through an angle of $60°$ and describes an arc of 15.4 cm in length. Find the length of the pendulum.	2

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SECTION-C
(12 Marks)

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| Q No.	Question	Marks
26	Find the smallest pair of 4-digit numbers such that the difference between them is 303 and their HCF is 101.	3
27	Find the area of a rhombus if its vertices $(3, 0), (4, 5), (-1, 4)$ and $(-2, -1)$ are taken in order. OR Point P divides the line segment joining the points $A(2, 1)$ and $B(5, -8)$ such that $\frac{AP}{AB} = \frac{1}{3}$. If P lies on the line $2x - y + k = 0$, then find the value of k.	3
28	Draw the graphs of the equations $y = -1, y = 3$, and $4x - y = 5$. Shade the quadrilateral formed by the lines and the y-axis. Also, calculate the area of the quadrilateral.	3
29	If the roots of the equation $(a^2 + b^2)x^2 - 2(ac + bd)x + (c^2 + d^2) = 0$ are equal, then prove that $\frac{a}{b} = \frac{c}{d}$.	3
30	From a window 34 m high above the ground of a house on a street, the angle of depression of the top and the foot of a lamp post on the opposite side of the street are $30°$ and $45°$ respectively. Find the height of the lamp post. OR	3

|		
	There is a small island in the middle of a 100 m wide river and a tall tree stands on the island. P and Q are points directly opposite each other on the two banks and in line with the tree. If the angles of elevation of the top of the tree from P and Q are $30°$ and $45°$ respectively, find the height of the tree.	3
31	In the given figure, AB and CD are tangents to the circles whose centres are P and Q respectively. If PQ = 18 cm, QD = 12 cm, AE = 4 cm and FC = 8 cm, then find the value of AB + CD.	
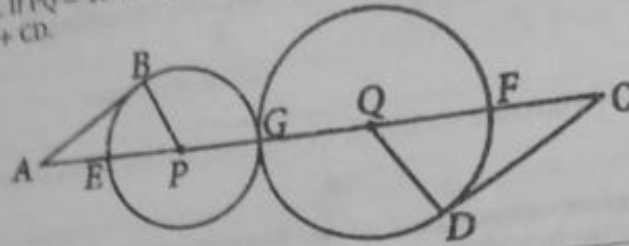
SECTION-D
(10 Marks)

|	Questions	Marks
Q No.		5
32	(i) Prove that $\dfrac{(\tan A)^2}{(\tan A)^2-1} + \dfrac{(\csc A)^2}{(\sec A)^2-(\csc A)^2} = \dfrac{1}{1-2(\cos A)^2}$.	
	(ii) Prove that $2[(\sin A)^6 + (\cos A)^6] - 3[(\cos A)^4 + (\sin A)^4] + 1 = 0$.	5
33	A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segment BD and CD are of lengths 10 cm and 8 cm respectively. Find the lengths of the sides AB and AC, if the area of the triangle ABC is 90 cm².	
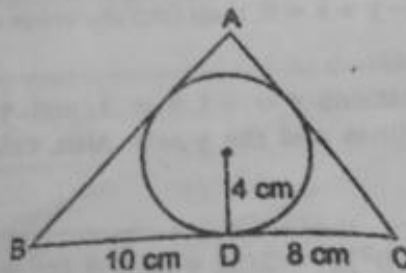
OR

If a, b and c are the sides of a right-angled triangle, right angled at C, where c is the hypotenuse, then prove that the radius r of the circle which touches the sides of the triangle is given by $r = \dfrac{a+b-c}{2}$.
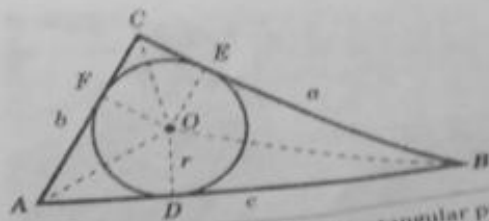
34	In a rectangular park of dimensions 50 m × 40 m, a rectangular pond is constructed so that the area of grass strip of uniform width surrounding the pond would be 1184 m². Find the length and the breadth of the pond.	5
	OR	
	₹9,000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got ₹160 less. Find the original number of persons.	

35	If the median of the following frequency distribution is 32.5, find the values of f_1 and f_2.	5

Class Intervals	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

SECTION-E
(8 Marks)

Questions

Q No.		Marks
		4
36	**Case Study**	
	Manpreet is the national record holder for women in the shot-put discipline. Her throw of 18.86 m at the Asian grand Prix in 2017 is the biggest distance for an Indian female athlete. Keeping her as a role model, Sanchita is determined to earn the gold in the Olympics one day. Initially her throw reached 7.56 m only. Being an athlete at school, she regularly practiced both in the mornings and in the evenings and was able to improve her distance by 9 cm every week. During a special camp for 15 days, she started with 40 throws and every day kept increasing the number of throws by 12 to achieve remarkable progress.	

Based on the above information, answer the following questions.

(i) How many throws did Sanchita practice on the 11ᵗʰ day of the camp?

(ii) How many throws did she do during the entire camp of 15 days?

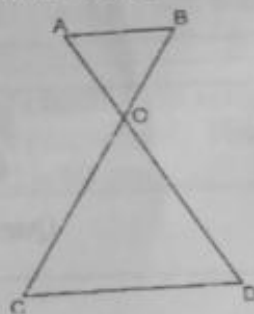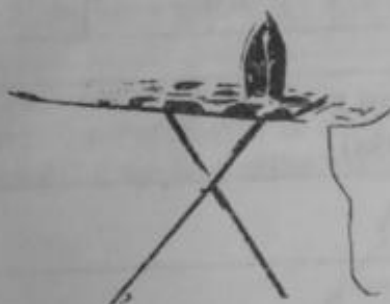(iii) What should be Sanchita's throw distance at the end of 6 weeks?

OR

(iii) When will she be able to achieve a throw of 11.16 m?

4

37 | Case Study

The legs of an iron table form two triangles as shown in the picture.

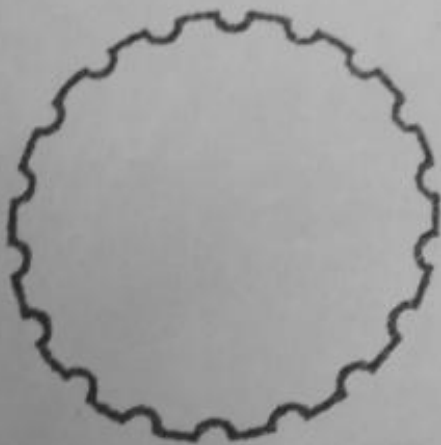Based on the above information, answer the following questions.

(i) Are ΔAOB and ΔCOD congruent? If yes, then name the congruency criterion. If no, then justify your answer.

(ii) If AO = 10 cm, OB = 25 cm, OC = x +5 and OD = 15 cm, then find the value of x.

(iii) Show that the ΔAOB and ΔCOD are similar. Name the similarity criterion.

OR

(iii) If AO = 30 cm and OD = 45 cm, then find the ratio of the perimeter of ΔAOB and and the perimeter of ΔCOD.

| 38 | Case Study | 4 |

A golf ball is spherical with about 300-500 dimples that help increase its velocity while in play. Golf balls are traditionally white but available in colours also. In the given figure, a golf ball has a diameter of 4.2 cm and its surface has 315 dimples (hemispherical) of radius 2 mm.

Based on the above information, answer the following questions.

(i) Find the surface area of one dimple.

(ii) Find the volume of the material dug out to make one dimple.

(iii) Find the total surface area exposed to the surroundings.

OR

(iii) Find the volume of the golf ball.