COMMON PRE-BOARD EXAMINATION 2022-23

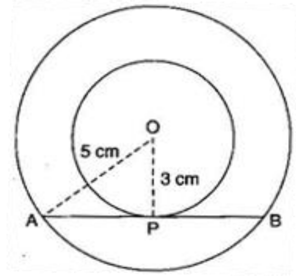
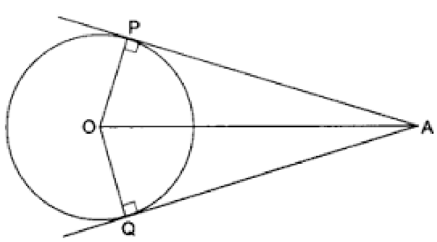
Subject: Mathematics (Basic) (241)

Class: X | Time: 3 Hours

Date: | Max. Marks: 80

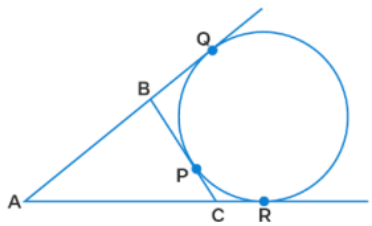
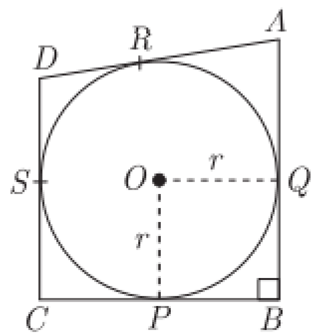
SECTION A		
Section A consists of 20 questions of 1 mark each.		
Sl. No		Marks
1.	(c) 2	1
2.	(d) $\frac{-2}{3}$	1
3.	(a) no solution	1
4.	(b) $x = 2$	1
5.	(b) 24.5	1
6.	(d) 63	1
7.	(c) an irrational number	1
8.	(d) 2520	1
9.	(b) 14	1
10.	(b) $\frac{2}{\sqrt{3}}$	1
11.	(d) IV quadrant	1
12.	(c) 30 – 40	1
13.	(a)0	1
14.	(c) $\sqrt{3}$	1
15.	(b) 154 cm^2	1
16.	(a)$4\pi r^2$	1
17.	(d)-12	1
18.	(b)14cm	1
19.	(d) Assertion (A) is false but reason (R) is true.	1
20.	(d) Assertion (A) is false but reason(R) is true.	1
	SECTION B	
	Section B consists of 5 questions of 2 marks each.	

21.	$\sin(A+B) = 1 \Rightarrow$ A+ B = 90°----(1) $\sin(A-B) = \frac{1}{2} \Rightarrow$ A- B = 30° $---$ (2) Solving (1) and (2) , 2A = 120 , A =60° and B = 30°	 1 ½+½
22.	In $\Delta AOQ\ and\ \Delta POB$ ∠A =∠B (90) ∠AOQ =∠POB (voa) $\therefore \Delta AOQ \sim \Delta BOP(AA)$ $\frac{AO}{BO} = \frac{OQ}{OP} = \frac{AQ}{BP}$ $\frac{20}{12} = \frac{AQ}{18}$ AQ = $\frac{20\times18}{12} = 30cm$	2
23.	Let the ratio be $k:1$ P(-4 ,6) = $\left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$ = $\left(\frac{k\times3+1\times-6}{k+1}, \frac{k\times-8+1\times-6}{k+1}\right)$ -4 = $\frac{3k-6}{k+1} \Rightarrow -4k-4 = 3k-6$ $-7k = -2, k = \frac{2}{7}$ Ratio = 2:7	 1 ½ ½
24.	$\frac{a_1}{a_2} = \frac{8}{16} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{-3}{-6} = \frac{1}{2}, \frac{c_1}{c_2} = \frac{1/4}{1/2} = \frac{1}{2}$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ The lines are coincident OR For infinite solution , $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\frac{a_1}{a_2} = \frac{2}{\alpha}, \frac{b_1}{b_2} = \frac{3}{\alpha+\beta}, \frac{c_1}{c_2} = \frac{7}{28}$ $\frac{2}{\alpha} = \frac{7}{28} \Rightarrow \alpha = 8$ $\frac{3}{\alpha+\beta} = \frac{7}{28}$	1 ½ ½ ½ ½ ½

	$\frac{3}{8+\beta} = \frac{7}{28} \Rightarrow 8+\beta = 12\ , \beta = 4$	½
25.	 Let O be the common centre of the two concentric circles. Let AB be a chord of the larger circle which touches the smaller circle at P. Join OP and OA. Then ∠OPA =90°($t$he tangent at any point of a circle is perpendicular to the radius through the point of contact) In $\Delta APO\ ,\ OA^2 = \ OP^2 + \ AP^2$ ie , $5^2 = \ 3^2 + \ AP^2$ AP^2 =25-9 =16 cm AP = 4cm Since the perpendicular from the centre of a circle to a chord bisects the chord, AB = $2 \times AP = 2 \times 4 = 8cm$ OR  Fig. 30.1 Given: A circle with centre O and A is the point outside the circle and two tangents AP and AQ on the circle from A. To prove: AP = AQ Construction: Join OA , OP and OQ Proof: In $\Delta OAP\ and\ \Delta OAQ$ (i) OP= OQ (radius)	1 ½ ½ ½ ½

	(ii) OA = OA (common) (iii) $\angle P = \angle Q = 90°$ (radius is perpendicular to tangent) $\therefore \Delta OAP \cong \Delta OAQ (RHS)$ $\Rightarrow$ AP = AQ (CPCT)	1
	SECTION C	
	Section C consists of 6 questions of 3 marks each.	
26.	Prove that 7 + $\sqrt{3}$ is an irrational number Let us assume that $\sqrt{5}$ is rational. ie, $\sqrt{3} = \frac{p}{q}$, $where\ p\ qnd\ q\ are\ integers\ and\ q \neq 0$, and p and q are co-prime numbers. Squaring on both sides, we have $3 = \frac{p^2}{q^2}$ $\Rightarrow 3q^2 = p^2$ -------------(1) $\therefore 3 divides\ p^2$ $\Rightarrow$ 3 divides p So we can write p=3c, for some integer c $\therefore p^2 = (3c)^2$ =9 c^2 Substituting for p^2 in (1)we have $3q^2 = 9\ c^2$ $\Rightarrow q^2 = 3\ c^2$ $\therefore 3 divides\ q^2$ $\Rightarrow$ 3 divides q $\therefore$ 3 is a common factor of p and q, which is a contradiction to our assumption that p and q are coprime numbers. $\therefore$Our assumption is wrong $\therefore \sqrt{3}$ is irrational Let us assume that 7+$\sqrt{3}$ is rational. ie, $7 + \sqrt{3} = \frac{p}{q}$, $where\ p\ qnd\ q\ are\ integers\ and\ q \neq 0$, and p and q are co-prime numbers. $\sqrt{3} = \frac{p}{q} - 7$ $= \frac{p-7q}{q}$ $\sqrt{3} = \frac{p-7q}{q}$	1½ 1½

	Here RHS is $\frac{integer}{integer}$ which is a rational number and LHS is an irrational number, which is a contradiction to our assumption. Our assumption is wrong. $\therefore 7+\sqrt{3}$ is irrational.	
27.	(i)P(king of black colour) =$\frac{2}{52} = \frac{1}{26}$ (ii)P(face card) =$\frac{12}{52} = \frac{3}{13}$ (iii)P(an ace) = $\frac{4}{52} = \frac{1}{13}$ (iv)p(jack of hearts) =$\frac{1}{52}$ (v)P(a spade) =$\frac{13}{52} = \frac{1}{4}$ (vi) P(the queen of diamonds) = $\frac{1}{52}$	½ ½ ½ ½ ½ ½
28.	$\frac{5\,cos^2 60° + 4\,cos^2 30° - tan^2 45}{sin^2 30° + cos^2 60°} = \frac{5\times\left(\frac{1}{2}\right)^2 + 4\times\left(\frac{\sqrt{3}}{2}\right)^2 - 1}{\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2}$ $= \frac{5/4 + 3 - 1}{\frac{1}{2}} = \frac{5+12-4}{2} = 13/2$	1 1 1
29.	Let numerator =x , denominator = y Fraction = $\frac{x}{y}$ As per data, $\frac{x+2}{y+2} = \frac{9}{11}$ 11x+22=9y+18 11x−9y+4=0---------(1) Now , $\frac{x+3}{y+3} = \frac{5}{6}$ 6x+18=5y+15 6x−5y+3=0 -----------(2) Solving (1) and (2) , $x = 7$, $y = 9$ Fraction is $\frac{7}{9}$	½ 1 1 ½
30.	Lengths of tangents drawn from an external point to a circle are equal. Ie , AQ=AR, BQ=BP, CP=CR Perimeter of ΔABC=AB+BC+CA	1

	AB+(BP+PC)+(AR−CR) =(AB+BQ)+PC+(AQ−PC) =AQ+AQ=2AQ AQ= ½(perimeter of ΔABC)   OR AB =29cm, AD = 23cm ∠B =90° and DS = 5cm Tangents to a circle from an external point are equal in length AQ=AR DS=DR CP=CS PB=BQ AB=AQ+BQ Since DS=5cm DR=5cm So, AR=23−5=18cm AQ=18cm and BQ=29−18=11cm In quadrilateral OPBQ, ∠B=90∘. Also, ∠OPB=∠OQB=90° (tangent is perpendicular to radius at point of contact) So, ∠POQ=90∘; that is OPBQ is a rectangle. Further since BQ=PB; OPBQ is a square. Hence, Radius=OP=BQ=11cm. (Sides of a square)	1 1
31.	$\alpha + \beta = 6 , \alpha\beta = k$ $(\alpha + \beta)^2 = \alpha^2 + \beta^2 + 2\alpha\beta$ $36 = 40 + 2\,k$ 2k = -4 ,k = -2	½ 1 ½ 1

	OR	
	$x^2 - 3\sqrt{3}x + 2 = x^2 - 2\sqrt{3}x - \sqrt{3}x + 2$	
	$= \sqrt{3}x(\sqrt{3x} - 2) - 1(\sqrt{3x} - 2)$	
	$= (\sqrt{3x} - 2)(\sqrt{3x} - 1)$	
	$x = \frac{2}{\sqrt{3}}$ and $\frac{1}{\sqrt{3}}$	2
	Sum of zeroes $= \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3} = \frac{-b}{a}$	
	Product of zeroes $= \frac{2}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = \frac{2}{3} = \frac{c}{a}$	1
	SECTION D	
	Section D consists of 4 questions of 5 marks each.	
32.	Distance =600km	
	Speed = x	½
	Time $= \frac{distance}{speed} = \frac{600}{x}$	
	Speed= $x - 200$	1
	Time $= \frac{600}{x-200}$	
	$\frac{600}{x-200} - \frac{600}{x} = \frac{1}{2}$	
	$600\left[\frac{1}{x-200} - \frac{1}{x}\right] = \frac{1}{2}$	1
	$2 \times 600(x - x + 200) = x(x - 200)$	
	$1200 \times 200 = x^2 - 200x$	
	$\boldsymbol{x^2 - 200x - 240000 = 0}$	1
	$b^2 - 4ac = 40000 + 960000 = 1000000$	
	$\sqrt{b^2 - 4ac} = 1000$	½
	$X = \frac{-b \pm\sqrt{b^2-4ac}}{2a} = \frac{200\pm1000}{2} = 600, -400$	
	Duration $= \frac{600}{x} = \frac{600}{600} = 1$ $hour$	1
33.		
	(see table below)	1½

Class	Fre	cf
0-10	5	5

10-20	x	$x+5$
20-30	20	$x+25$
30-40	15	$x+40$
40-50	y	$x+40+y$
50-60	5	$x+45+y$

Median $=l+\frac{\frac{n}{2}-cf}{f}\times h$, n =60 , f =20 , h =10

$cf = x+5$

½

$28.5 = 20+\frac{30-(x+5)}{20}\times 10$

$8.5 \times 2 = 30 - x - 5$ 1

17 = 25 –x 1

X = 8 , y = 60-(45+8) = 60-53 =7

1

34. Volume of wood used = volume of hemisphere + volume of cone

$166\frac{5}{6} = \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$ 1

½

$\frac{1}{3}\pi r^2(2r+h) = \frac{1}{3}\times\frac{22}{7}\times 3.5\times 3.5(7+h)$

$166\frac{5}{6}\times 3 = 22\times 0.5\times 3.5(7+h)$ =

$$7+h = \frac{1001\times 3}{22\times 0.5\times 3.5\times 6} = 13$$ 1½

H =13-7 =6

½

Height of toy = 6+3.5 =9.5

Cost of painting hemispherical part = $2\pi r^2 = 2\pi\times 3.5\times 3.5\times$ 1½

$$= 77\times 10 = ₹770$$

OR

Volume of the cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\times\frac{22}{7}\times 5^2\times 8 = \frac{200\pi}{3}$ 1

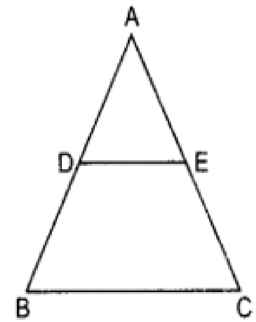
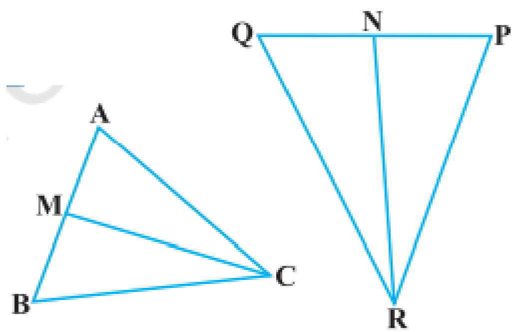
Let radius of ball = r

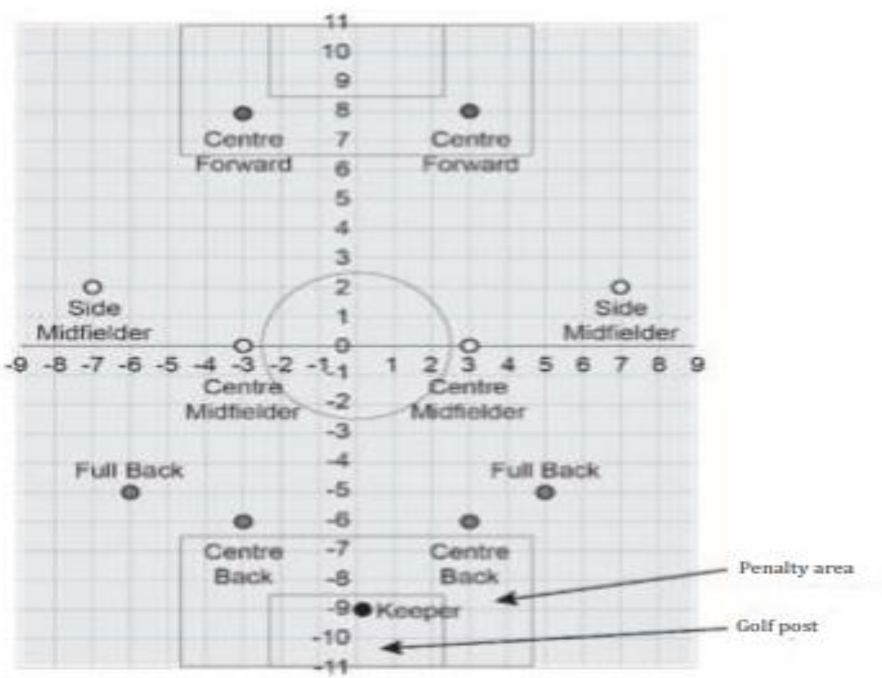
Volume of the ball = $\frac{4}{3}\pi r^3$ ½

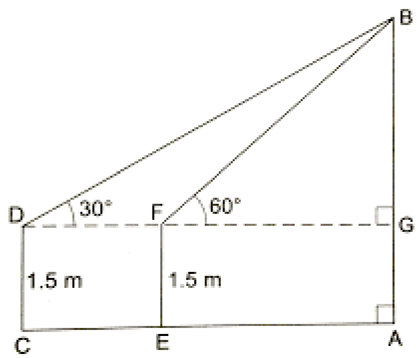
Volume of 100 balls = $\frac{1}{4}\times \textit{volume of the cone}$ 1

$100\times\frac{4}{3}\pi r^3 = \frac{1}{4}\times\frac{200\pi}{3}$ 1

$400r^3 = 50$ ½

	$r^3 = \frac{1}{8}, r = \frac{1}{2} = 0.5\ cm$	1
35.	Theorem -proof **Given:** A ΔABC in which D is the mid-point of AB and DE || BC **To Prove:** AE = EC **Proof:** In ΔABC, DE||BC $\therefore \quad \frac{AD}{DB} = \frac{AE}{EC}$ But $\quad AD = DB$ $\Rightarrow \quad \frac{AD}{DB} = 1$ $\Rightarrow \quad 1 = \frac{AE}{EC} \Rightarrow AE = EC$ Hence, DE bisects AC.  . OR  Given, $\triangle ABC$ and $\triangle PQR$ CM is the median of $\triangle ABC$ and RN is the median of $\triangle PQR$ So, AM=MB=½AB ----(1) Similarly, RN is the median of $\triangle PQR$ So, PN=QN=½PQ -------(2) Given, $\triangle ABC \sim \triangle PQR$ $\frac{BC}{QR} = \frac{AB}{PQ} = \frac{AC}{PR}$ $\frac{AB}{PQ} = \frac{AC}{PR} \Rightarrow \frac{2AM}{2PN} = \frac{AC}{PR}$ $\therefore \frac{AM}{PN} = \frac{AC}{PR}$ and $\angle A = \angle P$	3½ ½ 1 ½ ½ 1 1 ½

	By SAS, Δ AMC ~ Δ PNR So $\frac{MC}{NR} = \frac{AM}{PN} = \frac{AC}{PR}$ $\frac{MC}{NR} = \frac{2AM}{2PN} \Rightarrow \frac{MC}{NR} = \frac{AB}{PQ}$	½ 1
	SECTION E	
	Case study based questions are compulsory.	
36.	 (i) (0, -9) (ii) Distance $=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $\sqrt{(3- -3)^2+(8-8)^2} = \sqrt{36}$ =6 (iii)The coordinates are (-3,8) and ((3,0) Point on Y –axis (0 ,y) $\sqrt{(0- -3)^2+(y-8)^2} = \sqrt{(0-3)^2+(y-0)^2}$ $Squaring$ $9+y^2-16y+64 = 9+y^2$ $16\,y = 64\,,\ y = 4$ Coordinate =(0 ,4) OR The coordinates are (-3,-6) and ((5,-5) Point on x –axis (x ,0) $\sqrt{(x- -3)^2+(0- -6)^2} = \sqrt{(x-5)^2+(0- -5)^2}$ $Squaring$ $9+x^2-6x+36 = 25-10x+x^2+25$	 1 1 1 1 2

	$4x = 5$, $x = 5/4$ Coordinate =(5/4 ,0)	
37.	(i)  (ii) BG = 120 -1.5 = 118.5 ΔAGF $Tan\ 60 = \frac{BG}{GF}$ $\sqrt{3} = \frac{118.5}{GF}$ $GF = \frac{118.5 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = 39.5\sqrt{3}$ ΔBDG $Tan\ 30 = \frac{BG}{GF}$ $\frac{1}{\sqrt{3}} = \frac{BG}{DG}$ $\frac{1}{\sqrt{3}} = \frac{118.5}{DG}$ DG = $118.5\sqrt{3}$ DF = DG – FG = $118.5\sqrt{3} - 39.5\sqrt{3} = 79\sqrt{3}$	1 2 1
38.	(i)AP =100 ,120 , 140 ….,2500 A =100 , d = 20 , $a_n = 2500$ $a_7 = a + 6d = 100 + 20 \times 6 = 100 + 120 = 240$ (iii) What were the total sales after the 12th month? $S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{12} = 6 \times [200 + 11 \times 20] = 6 \times (200 + 220) = 6 \times 420 = 2520$ (iii)Was the goal of 2500 total sales met after the 12th month? Yes	1 2 1

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