TARGET MATHEMATICS
THE EXCELLENCE KEY
AGYAT GUPTA (M.Sc., M.Phil.)

21st YEAR OF QUALITY EDUCATION

CODE:- AG-TS-12-0360 **REG.NO:-TMC -D/79/89/36**

GENERAL INSTRUCTIONS :-

1. All questions are compulsory.
2. The question paper consists of 34 questions divided into four sections A,B,C and D. Section – A comprises of 8 question of 1 mark each. Section – B comprises of 6 questions of 2 marks each. Section – C comprises of 10 questions of 3 marks each and Section – D comprises of 10 questions of 4 marks each.
3. Question numbers 1 to 8 in Sections – A are multiple choice questions where you are to select one correct option out of the given four.
4. There is no overall choice. However, internal choice has been provided in 1 question of two marks, 3 questions of three marks each and 2 questions of four mark each. You have to attempt only one If the alternatives in all such questions.
5. Use of calculator is not permitted.
6. Please check that this question paper contains 6 printed pages.

Pre-Board Examination 2012 -13

MATHEMATICS CLASS X (SA-2)

Time : 3 to $3\frac{1}{4}$ Hours Maximum Marks : 90

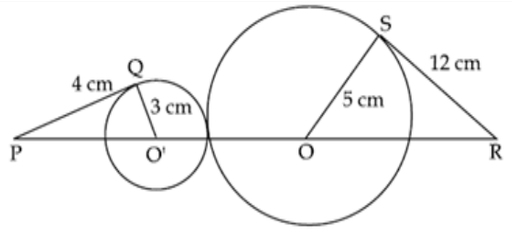
SECTION A

Q.1 The point of intersection of medians of a triangle whose vertices are (-1,0), (5,-2) and (8,2) is (a) (4,0) (b) $\left(-8,\frac{4}{3}\right)$ (c) $\left(\frac{4}{3},8\right)$ (d) $\left(\frac{4}{3},-8\right)$ Ans a

Q.2 1^{st} term of an AP is -3 and common difference is -2 , then fourth term of the AP is (a) 3 (b) -3 (c) 4 (d) -9 Ans d

Q.3 Distance of point (1,2), from the mid point of the line segment joining the points (6,8) and (2,4) is (a)4 units (b) 3 units (c) 2 units (d) 5 units Ans d

Q.4



In given fig. the length of PR is
(a) 20 cm (b) 26 cm (c) 24 cm (d) 28 cm Ans b

Q.5 A circle is inscribed in a triangle with sides 8, 15 and 17cm. The radius of the circle is (a) 6cm (b) 5cm (c) 4cm (d) 3cm Ans d

Q.6 Rahim and karim are friends. What is the probability that both have their birthdays on the same day in a non-leap year ?
(a) $\frac{1}{365}$ (b) $\frac{1}{7}$ (c) $\frac{1}{53}$ (d) $\frac{7}{365}$ Ans. A

Q.7 The circumference of a circle is 100 cm. the side of a square inscribed in the circle is (a) $50\sqrt{2}$ cm (b) $\frac{100}{\pi}$cm (c) $\left(\frac{50\sqrt{2}}{\pi}\right)$cm (d) $\left(\frac{100\sqrt{2}}{\pi}\right)$cm. Ans c

Q.8 A solid toy is in the from of a hemisphere surmounted by a right circular cone. Height of the cone is 2 cm and diameter of base is 4 cm. if a right circular cylinder circumscribes the solid, find how much more space it will cover. (a) $4\pi cm^3$ (b) $6\pi\, cm^3$ (c) $8\pi cm^3$ (d) $\frac{16}{3}\pi cm^3$. Ans c

SECTION B

Q.9 If PA and PB are two tangents from external point P to a circle with centre O and $\angle APB = 35^0$, find the angle OAB. Ans 145^0

Q.10 A box contains cards bearing numbers from 6 to 70. if one card is drawn at random from the box, find the probability that it bears. (i) a one digit

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	number (ii) a number divisible by 5. Ans (i) 4/65 (ii) 1/5
Q.11	If for a given A.P. : $a = 7, a_{13} = 35$, find S_{13} . Ans. $a = 7, a_{13} = 35$ $\therefore \quad a_{13} = a + 12d$ $\Rightarrow \quad 35 = 7 + 12d$ or $\quad d = \frac{7}{3}$ **1** $S_{13} = \frac{13}{2}\left[2(7) + 12\left(\frac{7}{3}\right)\right]$ $= \frac{13}{2} \times [42]$ $= 273$ **1**
Q.12	Find a relation between *x* and *y* such that the point P(x, *y)* is equidistant from the points A(2, 5) and B (- 3, 7). Sol. Let P *(x, y)* be equidistant from the points A (2, 5) and B (- 3, 7) AP = BP ...(Given) $\therefore AP^2 = BP^2$(Squaring both sides) $\Rightarrow (x - 2)^2 + (y - 5)^2 = (x + 3)^2 + (y - 7)^2$ $\Rightarrow x^2 - 4x + 4 + y^2 - 10y + 25 = x^2 + 6x + 9 + y^2 - 14y + 49 \quad \Rightarrow -4x - 10y - 6x + 14y = 9 + 49 - 4 - 25 \Rightarrow -10k + 4y = 29 \quad \therefore 10x + 29 = 4y$ is the required relation **OR** Determine the ratio in which the line 3x + 4y – 9 = 0 divides the line segment joining the points (1,3) and (2,7). Ans 6:25
Q.13	A coin is tossed three times. Find the probability of getting exactly two tails. Ans. Total no of out comes = 8 **½** No of cases of two tails = 3 **1** Prob = 3/8 **½**
Q.14	For what value of 'k' the points A(l, 5), B(k, 1) and C(4,11) are collinear? Sol. We have A (x_1, y_1) = A (1, 5). & B (x_2, y_2) = B (k, 1) C (x_3, y_3) = C(4,11) . Since the given points are collinear, therefore the area of the triangle formed by them must be 0 $\therefore$ 1/2 $[x_1 (y_2 - y_3) + x_2 (y_3 - y_1) +$

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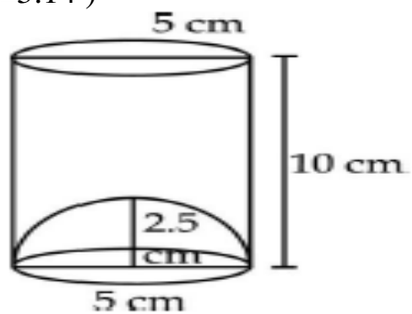
	$x_3 (y_1 - y_2)] = 0 \Rightarrow 1 (1 - 11) + 6k(11 - 5) + 4(5 - 1) = 0 \Rightarrow 10 + 6k + 4(4) = 0 \Rightarrow -10 + 6k + 16 = 0 \Rightarrow 6k + 6 = 0 \Rightarrow 6k = -6 \Rightarrow k = -6/6 = -1$ $\therefore$ The required value of $k = -1$
	SECTION C
Q.15	If -5 is a root of the quadratic equation $2x^2 + 2px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots find the value of k. *Ans.k = 7/8*
Q.16	A juice seller was serving his customers. The inner diameter of the cylindrical glass was 5cm but the bottom of the glass had a hemispherical raised portion which reduce the capacity of the glass if the height of the glass was 10cm. find the apparent capacity and actual capacity of the glass .(use π=3.14)  ANS: apparent capacity $= \pi r^2 h = \pi \times 2.5 \times 2.5 \times 10$ $= 3.14 \times 2.5 \times 2.5 \times 10$

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$= 196.25 \text{ cm}^3$

$$\text{Volume of raised portions} = \frac{2\pi r^3}{3}$$

$$= \frac{2 \times 3.14 \times 2.5 \times 2.5 \times 2.5}{3}$$

$$= \frac{2 \times 19.625 \times 2.5}{3} = 32.70 \text{ cm}^3$$

$$\text{Actual capacity} = 196.25 - 32.70$$

$$= 163.55 \text{ cm}^3$$

OR

If h, c and V respectively are the height, the curved surface and volume of cone, prove that $3\pi vh^3 - c^2h^2 + 9v^2 = 0$.

Q.17 Which term of the sequences 114,109,104 ……is the first negative term ?

Ans $n = 24^{th}$ term

Q.18 The sum of first 8 terms of an A.P. is 140 and sum of first 24 terms is 996.

Find the A.P. Ans. $S_8 = 140 \Rightarrow 4[2a + 7d] = 140$

$S_{24} = 996 \Rightarrow 12[2a + 23d] = 996$

or $2a + 7d = 35$ (1)

$2a + 23d = 83$ (2)

Solving $16d = 48$ or $d = 3$ 1

$a = 7$ 1

$\therefore$ A.P. is 7, 10, 13, ... 1

OR

If the 10^{th} term of an A.P. is 47 and its first term is 2, find the sum of its first 15 terms. **Sol.** Let *a* be the first term and *d* be the common difference of an A.P. $a_{10} = 47$, $a = 2$ (Given) , ...(i) $\Rightarrow a + 9d = 47$ [$\because a_n = a + (n-1)d$] $\Rightarrow 47 = 2 + (10 - 1)d \Rightarrow 47 = 2 + 9d \Rightarrow 9d = 47 - 2 = 45 \quad \therefore d = \frac{45}{9} = 5$ $S_n = \frac{n}{2}[2a + (n-1)d] \therefore S_{15} = \frac{15}{2}[2(2) + (15-1)(5)] \Rightarrow S_{15} = \frac{15}{2}[4 + (14)(5)] \Rightarrow S_{15} = \frac{15}{2}[74]. \therefore S_{15} = 15(37) = 555$

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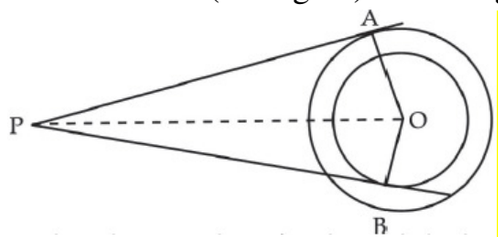
Q.19 Two concentric circles are of radii 3 cm and 3cm and centre at O. Two tangents PA and PB are drawn to two circles from an external point P such that AP = 12 cm (see figure). Find length of BP.



Ans. In ΔOAP, $OP^2 = OA^2 + AP^2$

$\Rightarrow OP = 13$ cm

In ΔOBP

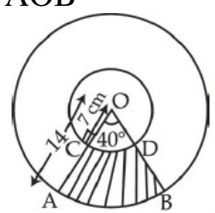
1

$OP^2 = OB^2 + BP^2$

$BP^2 = 13^2 - 3^2 = 160$ 1

$\Rightarrow BP = 4\sqrt{10}$ cm 1

Q.20 Find the area of shaded region in given figure, where radii of the two concentric circle with centre O are 7 cm and 14 cm respectively and angle AOB = 40°.



Ans. Area of shaded region $= \text{ar(OAB)} - \text{ar(OCD)}$

$$= \frac{\pi R^2\theta}{360^\circ} - \frac{\pi r^2\theta}{360^\circ} = \frac{\pi\theta}{360^\circ}\left(R^2 - r^2\right)$$

$$= \frac{22}{7} \times \frac{40^\circ}{360^\circ}\left(14^2 - 7^2\right) = \frac{22}{7} \times \frac{1}{9} \times 21 \times 7 = 51.33 \text{ cm}^2$$

1 2

Q.21 In a housing society there are 100 flats in which 500 persons resides, out of which 430 never indulge in any anti-social activity. Find the probability of the persons who ever indulge in any anti-social activity .which moral value

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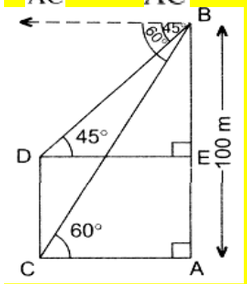
	is reflected in this problem? Ans: Here total number of persons are 500, persons who never indulge in any anti-social activity =430 , persons who ever indulge in any anti-social activity =500-430=70, probability of person to indulge in anti-social activity $= = \frac{70}{500} = \frac{7}{50}$ Mostly the person do not indulge in any kind of anti-social activities. They possess the value Harmoney with society and nation.
Q.22	The radii of circular ends of a solid frustum of a cone are 33cm and 27cm and its slant height is 10cm. Find its total surface area. Ans $7599.4 cm^2$
Q.23	From the top of a building 100m high, the angles of depression of the top and bottom of a tower are observed to be 45° and 60° respectively. Find the height of the tower. Also find the distance between the foot of the building and the bottom of the tower. **Sol.** In right ABAC tan 60° $= \frac{AB}{AC} \Rightarrow \frac{100}{AC} = \tan 60° \Rightarrow AC = \left(\frac{100}{\sqrt{3}}\right)$ m $\therefore$ DE = AC $= \left(\frac{100}{\sqrt{3}}\right)$ m  In right ABED, $\frac{BE}{DE} = \tan 45° \Rightarrow \frac{BE}{DE} = 1 \Rightarrow$ BE = DE $\therefore$ BE $= \left(\frac{100}{\sqrt{3}}\right) \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{100\sqrt{3}}{3} \Rightarrow \frac{100 \times 1.732}{3} = 57.73$ m [$\because \sqrt{3} = 1.732$] $\therefore$ Height of tower (CD) = AE = AB - BE = (100-57.73) m = **42.27 m** Distance between the foot of the building and the bottom of the tower (AC) = **57.73 m.**
Q.24	Find the value of k so that the following quadratic equation has equal roots : $2x^2 - (k-2)x + 1 = 0$. **Sol.** Here $a = 2$. $b = -(k-2) = -k + 2 = 2 - k$, $c = 1 \Rightarrow D = 0$ $\because$ Equal roots...(Given) $\Rightarrow b^2 - 4ac = 0 \Rightarrow (2-k)^2 - 4(2)(1) = 0$

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	$\Rightarrow 4 + k^2 - 4k - 8 = 0 \Rightarrow k^2 - 4k - 4 = 0$ Again here, A= 1, B=-4, C = -4 D = $B^2 - 4AC = (-4)^2 - 4(1)(-4) = 16+16 = 32$ $\therefore \sqrt{D} = \sqrt{16 \times 2} = 4\sqrt{2} \Rightarrow k = \frac{-B \pm \sqrt{D}}{2A} \Rightarrow k = \frac{-(-4) \pm 4\sqrt{2}}{2(1)} \Rightarrow$ A= $-\frac{4 \pm 4\sqrt{2}}{2} \Rightarrow k = 2\left(\frac{2 \pm 2\sqrt{2}}{2}\right) \therefore$ A =2 + 2√2 or k = 2-2√2 **OR** If a student had walked 1 km/hr faster, he would have taken 15 minutes less to walk 3 km. Find the rate at which he was walking. **Sol.** Let the original speed of the student = x km/h . Increased speed = $(x + 1)$ km/h $\therefore \frac{3}{x} - \frac{3}{x+1} = \frac{15}{60}$ $\left[\because \text{Time} = \frac{\text{Distance}}{\text{Speed}}, \ 15 \text{ mns} = \frac{15}{60} \text{ hrs.}\right]$ $\Rightarrow \frac{3x + 3 - 3x}{x(x+1)} = \frac{1}{4} \Rightarrow x(x+1) = 12 \Rightarrow x^2 + x - 12 = 0 \Rightarrow x^2 + 4x - 3x - 12 = 0 \Rightarrow x(x+4) - 3(x+4) = 0 \Rightarrow (x+4)(x-3) = 0 \Rightarrow x + 4 = 0$ or $x - 3 = 0$ $\Rightarrow x = -4$ or $x = 3$ Rejecting x = - 4, because speed cannot be - ve $\therefore$ His original speed was 3 km/h
	SECTION D
Q.25	The sum of the areas of two squares is $468 m^2$. If the difference of their perimeters is 24m, find the sides of the two squares. Ans. Let the sides of the two squares be x m and y m Area of 1st square $= x^2$ Area of 2nd square $= y^2$

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Difference of perimeters = 24 m

$\Rightarrow 4x-4y=24$

$x-y=6$

$x=y+6$ ½

By question,

$x^2+y^2=468$

$(y+6)^2+y^2=468$

$2y^2+12y=468-36=432$ 1

$2y^2+12y-432=0$

$y^2+6y-216=0$

$y^2+18y-12y-216=0$

$y(y+18)-12(y+18)=0$

$(y-12)(y+18)=0$

$Y=12,\ -18$ 2

Since a side can't be negative $y=12$.

Sides of the two squares are 12 m and 18 m. ½

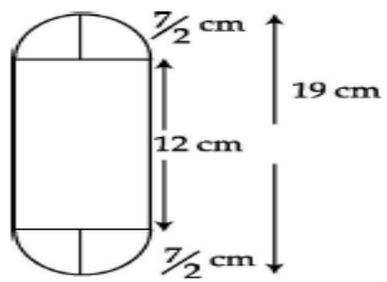
OR

Using quadratic formula, solve the following equation for x : $abx^2 + (b^2 - ac)x - bc = 0$.

Q.26 Water is being pumped out through a circular pipe whose internal diameter is 7 cm. If the flow of water is 72cm per second, how many litres of water are being pumped out in one hour ? Ans volume of water flow out per hour = 9979200 cubic cm = 9979.2 liters

Q.27 A mobile phones shopkeeper has 48 mobile phones of which 40are good, 5 have only minor defect and 3 have major defect. He sells all the phones at same cost Paridhi will buy a phone is selected at random from the shop. What are the probabilities that it is (i) acceptable to Paridhi? (ii) Acceptable to Ramesh? Which phone should not sell the shopkeeper at the same rate and why? Ans: (i) Probability of selecting good phone $=\frac{5}{6}$. (ii) Probability of mobile phone that it has major defect $=1-\frac{1}{16}=\frac{15}{16}$. Shopkeeper should not sell minor defected and major defected phones at the same cost, because if he/she do it his/her reliability and he/she will lose the value Honesty.

Q.28 A solid is in the form of a right circular cylinder with hemispherical ends. The total height of the solid is 19cm and the diameter of the cylinder and the hemispheres is 7cm. find the volume and total surface area of the solid.



Let r be radius and h be the height of cylinder.

$r=\frac{7}{2}$ cm, $h=19-2\left(\frac{7}{2}\right)=12$ cm.

Volume of solid = Vol. of cylinder + Vol. of two hemisphere

$=\pi r^2 h+2\left(\frac{2\pi}{3}r^3\right)=\pi\left[\left(\frac{7}{2}\right)^2\times 12\right]+\frac{4\pi}{3}\left(\frac{7}{2}\right)^3$

$=641.66\ cm^3$.

Total S. Area = CSA of cylinder + S.A. of two hemisphere.

$=2\pi rh+2(2\pi r^2)=\not{2}\pi\frac{7}{\not{2}}[12+7]$

$=22\times 19\ cm^2$

$=418\ cm^2$.

ANS:

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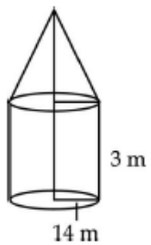
OR

A tent is in the shape of a right circular cylinder up to a height of 3cm and conical above it. The total height of the tent is 13.5m and radius of base 14cm. find the cost of cloth required to make the tent at the rate of Rs.80/- per sq. meter.



ANS:

Curved surface of Tent

$$\frac{\text{C.S Conical part + cylindrical part}}{\text{C.S} = \pi r l + 2\pi r h}$$

Height of cone = 13.5 – 3=10.5m

zow $l = \sqrt{(14)^2 + (\frac{21}{2})^2}$

$= \frac{\sqrt{1225}}{4} = \frac{35}{2} m$

$\text{C.S} = \frac{22}{7} \times 14 \times \frac{35}{2} + 2 \times \frac{22}{7} \times 14 \times 3 m^2$

$= 264 + 770\ m^2$

$= 1034 m^2$

Cost = 1034×80

$= 82720$ ₹

Q.29 Find the coordinates of the points which divide the line segment joining the points (–8, 0) and (4,–8) in four equal parts . Ans (-5,-2),(-2,-4), (1,-6)

Q.30 The angle of elevation of a jet aircraft from a point P on the ground is 60°. After a flight of 15 seconds, the angle of elevation becomes half of the previous angle. If the jet is flying at a speed of 720 km/hr, find the constant height at which the jet is flying. ($\sqrt{3} = 1.73$). Ans.

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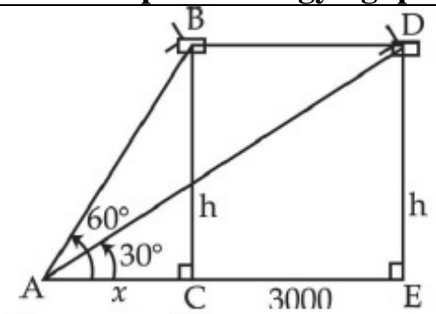

Distance = BD

time = 15 sec = $\frac{15}{3600}$ hr

speed = $720 \frac{km}{hr}$

Dis = speed × time = $720 \frac{km}{hr} \times \frac{15}{3600}$ hr **1**

i.e BD = 3 km = 3000 m

In rt ΔABC	In rt ΔADE
$\tan 60° = \frac{BC}{AC}$	$\tan 30° = \frac{DE}{AE}$
$\sqrt{3} = \frac{h}{x}$	$\frac{1}{\sqrt{3}} = \frac{h}{x+3000}$ **1**
$h = x\sqrt{3}$	$\therefore \frac{1}{\sqrt{3}} = \frac{x\sqrt{3}}{x+3000}$
	$\Rightarrow 3x = x + 3000$
	$2x = 3000$ **1**
	$x = 1500$

$\therefore h = 1500 \times \sqrt{3} = 1500 \times 1.73 = 2595$ m

Ans : The height at which jet is flying = 2595 m **1**

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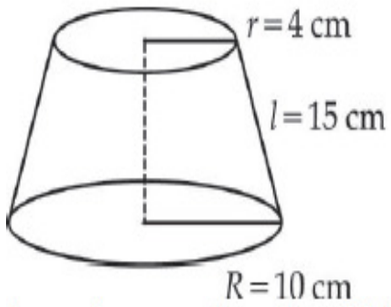
Q.31 A turks cap is shaped like a frustum of a cone. If its radius on the open side is 10 cm, radius at the upper base is 4 cm and its slant height is 15 cm, find the areas of the material used for making it. Ans.



1

Area of material used = CSA of frustum + πr^2

$= \pi(r + R)l + \pi r^2$ 1½

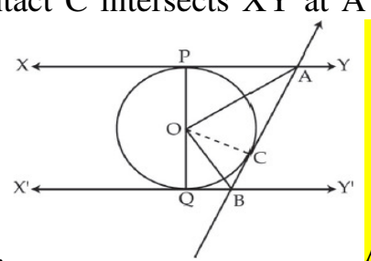
$= \frac{22}{7}[4 + 10]\,15 + \frac{22}{7} \times 4 \times 4$

$= \frac{22}{7} \times \overset{2}{\cancel{14}} \times 15 + \frac{352}{7}$

$= 660 + 50.3$

$= 710.3\ \text{cm}^2$ 1½

Q.32 In figure, XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB, with point of contact C intersects XY at A and X'Y' at B. prove that $\angle AOB = 90°$. Ans.



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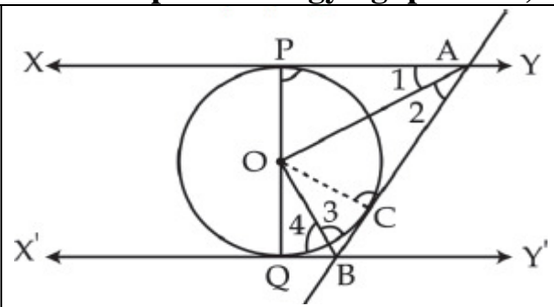

OP⊥XY (tangent ⊥ radius)

OC⊥AB 1½

In ΔOPA and ΔOCA

$\angle OPA = \angle OCA = 90°$

OP = OC (radii)

OA = OA

∴ ΔOPA≅ΔOCA (SAS)

⇒ ∠1 = ∠2 (CPCT)

$\therefore \angle 2 = \frac{1}{2}\angle PAC$

Similarily ∠3 = ∠4

$\Rightarrow \angle 3 = \frac{1}{2}\angle QBC$

XY||X'Y' and AB is transversal

∴ ∠PAB + ∠QBA = 180° (interior ang. on same side of transversal) ½

or ∠PAC = ∠QBC = 180°

$\therefore \frac{1}{2}(\angle PAC) + \frac{1}{2}\angle QBC = 90°$

⇒∠2 + ∠3 = 90°

In ΔOAB

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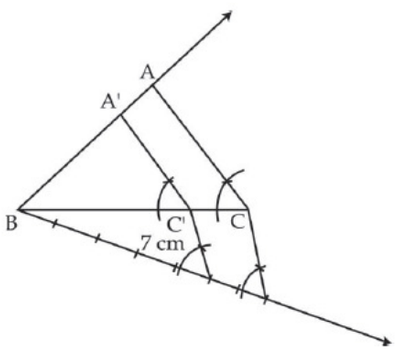
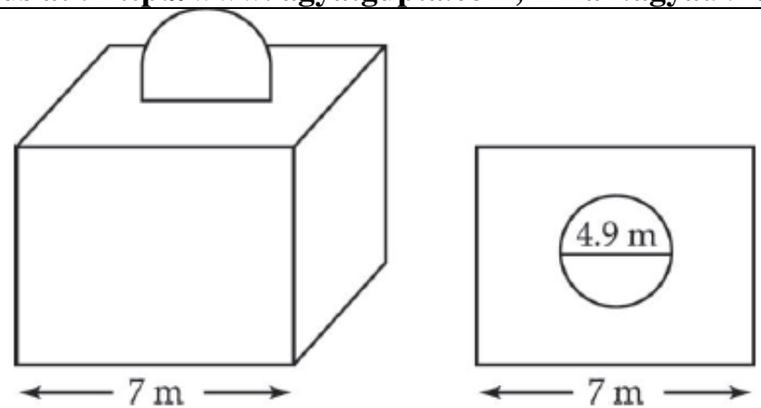
$\angle AOB + \angle 2 + \angle 3 = 180°$
$\Rightarrow \angle AOB = 90°$
Hence proved **1**

Q.33 Construct a triangle similar to a given ΔABC such that each side is $\left(\frac{5}{7}\right)^{th}$ of the corresponding sides of ΔABC. It is given that $AB = 5cm$, $BC = 7cm$ and $\angle ABC = 50°$. Ans. ΔABC $\Delta BA'C'$



1
2

Q.34 A decorative block is made of two solids – a cube and a hemisphere. The base of the block is the cube with edge of 7 cm and the hemisphere attached on the top has a diameter of 4.9 cm. If the block is to be painted, find the total area to be pained. Ans.



Total area to be painted =

T.SA of cube + C.SA of hemisphere − area of base of hemisphere
$= 6(\text{side})^2 + 2\pi r^2 - \pi r^2$ **1**
$= 6(\text{side})^2 + \pi r^2$ **½**
$= 6(7)^2 + \frac{22}{7} \times \frac{49}{20} \times \frac{49}{20}$ **1**
$= 294 + \frac{3773}{200}$
$= 294 + 18.86$
$= 312.86 \text{ cm}^2$ **1½**

HAPPINESS IS NOTHING MORE THAN GOOD HEALTH AND A BAD MEMORY.

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