Code No. **Series AG-2-2612**

TMC -D/79/89/36

- Please check that this question paper contains 4 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 30 questions.

General Instructions :-

1. Please check that this question paper contains 3 printed pages.
2. All questions are compulsory.
3. The question paper consists of 34 questions divided into four sections A, B and C & D .Section A contains 10 multiple choice type of questions of 1 marks each . Section B is of 8 questions of 2 marks each , Section C is of 10 questions of 3 marks each and Section D is of 6 questions of 4 marks each .
4. Write the serial number of the question before attempting it.
5. If you wish to answer any question already answered, cancel the previous answer.

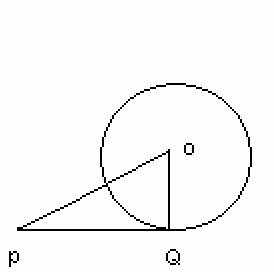
Pre-Board Examination 2010 -11

Time: 3 hrs. ***M.M.: 80***

CLASS – X *MATHEMATICS*

Section A

Q.1 In the given figure PQ is a tangent to the circle with centre O, OP = 13cm, OQ = 5cm, then PQ is



(a) 7cm (b) 15cm (c) 12cm (d) 14cm Ans c

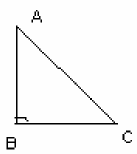
Q.2 If one roots of the equation $2x^2 - 3x + p = 0$ is 3, then value of p is

(a) -8 (b) 8 (c) -9 (d) 9Ans c

Q.3 Minute hand of a clock is 21cm. Distance moved by the tip of minute hand in 1 hr is

(a) $21\pi cm$ (b) $42\pi cm$ (c) $10.5\pi cm$ (d) $7\pi cm$ Ans b

Q.4



If AB = 4m and AC =8m, then angle of observation of A as observed from C is

(a) 60^0 (b) 30^0 (c) 45^0 (d) can not be determined Ans b

Q.5 If PQ and PT are tangents to a circle with centre O and radius 5 cm. If PQ = 12, then perimeter of quadrilateral PQOT is

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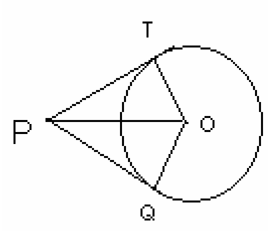

(a) 24cm (b) 34cm (c) 17cm (d) 20cm Ans b

Q.6 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.7 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.8 A card is drawn from a pack of 52 playing cards. The probability of getting a face card is
(a) 3/13 (b) 4/13 (c) 1/2 (d) 2/3 Ans a

Q.9 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.10 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

Section B

Q.11 **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).** Ans 10 x – 4 y + 29 = 0

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)
$(x - 2)^2 + (y - 5)^2 = (x + 3)^2 + (y - 7)^2$
$\Rightarrow x^2 - 4x + 4 + y^2 - 10y + 25$
$= x^2 + 6x + 9 + y^2 - 14y + 49$
$\Rightarrow -4x - 10y - 6x + 14y = 9 + 49 - 4 - 25$
$\Rightarrow -10k + 4y = 29$
$\therefore$ 10x + 29 = 4y is the required relation

Q.12 **In Fig. 7, OAPB is a sector of a circle of radius 3.5 cm with the centre at O and $\angle AOB = 120°$. Find the length of OAPBO.**

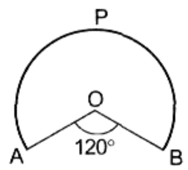

Fig. 7

Sol. $\theta = 360° - 120° = 240°$
$r = 3.5 \text{ cm} = \frac{35}{10} = \frac{7}{2} \text{cm}.$
Length of OAPBO = Length of arc BPA + OA + OB
$= \frac{\theta}{360}(2\pi r) + r + r$
$= \left(\frac{240}{360} \times 2 \times \frac{22}{7} \times \frac{7}{2}\right) + 2r$

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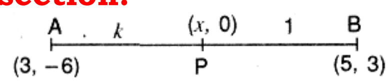
	$=\left(\frac{2}{3}\times 22\right)+\left(2\times\frac{7}{2}\right)$ $=\frac{44}{3}+7=\frac{44+21}{3}$ $=\frac{65}{3}=21\frac{2}{3}$
Q.13	Which term of the sequences 114,109,104 ………is the first negative term ? Ans $n = 24^{th}$ term
Q.14	Cards each marked with one of the numbers 4,5,6…..20 are placed in a box and mixed thoroughly One card is drawn at random from the box. What is the probability of getting an even prime number ?Ans 0
Q.15	Write the nature of roots of the quadratic equation $\sqrt{5}x^2-3\sqrt{6}x-\sqrt{20}=0$. . Ans D = 94 ; Real , un equal , irrational
Q.16	Find the fourth vertex of the rectangle whose three vertices taken in order are (4, 1) , (7 ,4) , (13 , -2) .Ans (10 , - 5)
Q.17	**Find the area of the quadrilateral whose vertices taken in order are A (- 5, - 3), B (- 4, - 6), C (2, - 1) and D (1, 2). Area of quad. ABCD =$\left(\frac{23}{2}+\frac{23}{2}\right)$=23 units²**
Q.18	**Justify the statement: "Tossing a coin is a fair way of deciding which team should get the batting First at the beginning of a cricket game."** **Sol. When we toss a coin, the outcomes head and tail are equally likely.** **Thus,the result of an individual coin toss is completely unpredictable.** **Hence both the teams get equal chance to bat first so the given statement is justified.** **OR** One card is drawn from a well shuffled deck of 52 playing cards. Find the probability of getting (i) a non-face card (ii) a black king or a red queen.Ans 7/20 or 1/13
	Section C
Q.19	**Find the ratio in which the line segment joining the points A (3, - 6) and B (5,3) is divided by x-axis. Also find the coordinates of the point of intersection.** **Sol.**  **Let AP:BP = k:1** **Coordinates of P = Coordinates of P** **P** $\left(\frac{5k+3}{k+1},\frac{3k-6}{k+1}\right)$**…(i)** **This point lies on x-axis** $\therefore \frac{3k-6}{k+1}=0$ $\Rightarrow 3k-6=0 \Rightarrow 3k=6$ $\Rightarrow k=\frac{6}{3}=2$ **Hence the ratio is 2 : 1** **Putting $k = 2$ in (i), we get Point of intersection,** **P** $=\left(\frac{5(2)+3}{2+1},\frac{3(2)-6}{2+1}\right)$

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$= \left(\frac{10+3}{3}, \frac{6-6}{3}\right) = \left(\frac{13}{3}, 0\right)$

Q.20 In Figure 2, PA and PB are tangents to the circle drawn from an external point P. CD is a third tangent touching the circle at Q.If PB = 10 cm and CQ = 2 cm, what is the length of PC?

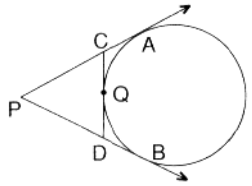

Fig. 2

Ans. 8 cm

Q.21 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

$\therefore \quad 1/2\,[x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2)] = 0$

$\Rightarrow 1\,(1 - 11) + 6k(11 - 5) + 4(5 - 1) = 0$

$\Rightarrow - 10 + 6k + 4(4) = 0$

$\Rightarrow -10 + 6k + 16 = 0$

$\Rightarrow 6k + 6 = 0$

$\Rightarrow 6k = -6$

$\Rightarrow k = -6/6 = -1$ $\therefore$ The required value of $k = -1$

Q.22 Determine an A.P. whose 3rd term is 16 and when 5th term is subtracted from the 7th term, we get 12.

Sol. Let the A.P. be

$a, a + d, a + 2d, \ldots\ldots\ldots$

a is the first term and d is the common difference

Using $a_n = a + (n - 1)\, d$

A.T.Q. $a + 2d = 16 (a_3 = 16)$...(ii)

$(a + 6d)-(a + 4d)=12(a_7 - a_5 = 12)$ ...(ii) From (ii), $a + 6d - a - 4d = 12$

$2d = 12 \Rightarrow d = 6$

Putting the value of d in (i), we get

$a = 16-2d \Rightarrow a = 16-2(6) = 4$ $\therefore$.Required A.P. = 4,10,16,22,..........

Q.23 Construct a triangle similar to a given ΔABC in which AB = 4 cm , BC = 6 cm and $\angle ABC = 60°$, such that each side of the new triangle is $3/4$ of the given ΔABC.

Sol.

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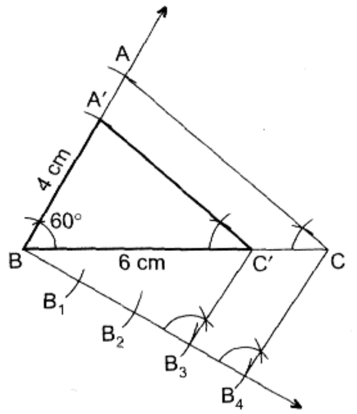

ΔA'BC is the required Δ.

Q.24 The altitude of a right triangle is 7cm. less than its base. If the hypotenuse is 13cm, find the other two sides. Ans base = 12cm altitude = 5cm

OR

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.25 The sum of third and seventh terms of an A.P. is 6 and their product is 8. find the sum of first sixteen terms of the A.P. Ans $a = 5, d = \frac{1}{2}, s_{16} = 20$

OR

If the 10th 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)

$\Rightarrow a + 9d = 47\ [\because a_n = a + (n-1)d]$

$\Rightarrow 47 = 2 + (10 - 1)d \Rightarrow 47 = 2 + 9d \Rightarrow 9d = 47 - 2 = 45$

$\therefore d = \frac{45}{9} = 5$

$S_n = \frac{n}{2}[2a + (n-1)d]$

$\therefore S_{15} = \frac{15}{2}[2(2) + (15-1)(5)]$

$\Rightarrow S_{15} = \frac{15}{2}[4 + (14)(5)]$

$\Rightarrow S_{15} = \frac{15}{2}[4 + 7C]$

$\Rightarrow S_{15} = \frac{15}{2}[74].$

$\therefore S_{15} = 15(37) = 555$

Q.26 **A square field and an equilateral triangular park have equal perimeters. If the cost of ploughing the field at the rate of Rs. 5/m² is Rs. 720, find the cost of maintaining the park at the rate of Rs. 10/m².**

Sol. **Let the side of the square be x m**

Area of the square $= \frac{\text{Total Cost}}{\text{Rate per m}^2}$

$x^2 = \frac{720}{5} = 144\ m^2$

$x = \sqrt{144} = +12$ m ($\therefore$ side can not be - ve)

Perimeter of square = $4x = 4(12) = 48$ m Let side of Δ be y m Perimeter of a Δ = Perimeter of a square ... (Given)

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$3y = 48$

$\therefore\ y = \frac{48}{3} = 16$ m

Area of an equilateral $\Delta = \frac{\sqrt{3}}{4}$ (side)^2

$= \frac{\sqrt{3}}{4}(y)^2$

$= \sqrt{3}/4 \times 16 \times 16 = 64\sqrt{3}$ m^2

Cost of maintaining the park @ Rs. 10 per m^2

$= 64\sqrt{3} \times 10$

$= 640 \times 1.732$ ...[$\because \sqrt{3} = 1.732$]

= Rs. 1108.48

Or

An iron solid sphere of radius 3 cm is melted and recast into small spherical balls of radius 1 cm each. Assuming that there is no wastage in the process, find the number of small spherical balls made from the given sphere.

Sol. Number of small spherical balls

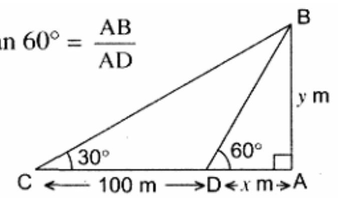
$= \frac{\text{Vol. of given sphere}}{\text{Vol. of one small spherical ball}}$

$= \frac{\frac{4}{3}\pi(3)^3}{\frac{4}{3}\pi(1)^3}$ [Δ Vol. of a sph. $= \frac{4}{3}\pi r^3$]

= 27

Q.27 **The angle of elevation of the top of a tower at a point on the level ground is 30°. After walking a distance of 100 m towards the foot of the tower along the horizontal line through the foot of the tower on the same level ground, the angle of elevation of the top of the tower is 60°. Find the height of the tower.**

Sol. In rt. ΔBAD, $\tan 60° = \frac{AB}{AD}$



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

$\Rightarrow \sqrt{3}x = y$

$\Rightarrow x = \frac{y}{\sqrt{3}}$ ...(*i*)

In it. ABAC, $\tan 30° = -\frac{AB}{AC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{y}{x+100}$

$\Rightarrow \sqrt{3}\,y = x + 100 \Rightarrow \sqrt{3}y - x = 100$

$\Rightarrow \sqrt{3}\,y - \frac{y}{\sqrt{3}} = 100$...[From(0]

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

$\Rightarrow 2y = 100\sqrt{3} \Rightarrow y = 50(1.732)$

Height of the tower = 86.6 m

Q.28 **A bag contains 5 red balls, 8 green balls and 7 white balls. One ball is drawn at random from the bag. Find the probability of getting :**

(i) a white ball or a green ball.

(ii) neither a green ball nor a red ball.

Sol. Total number of balls = 5 + 8 + 7 = 20

(i)P (white or green ball) $= \frac{15}{20} = \frac{3}{4}$

(ii) P (neither green nor red) $= \frac{7}{20}$

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Section D

Q.29 **Find the value of k so that the following quadratic equation has equal roots :**

$2x^2 - (k - 2)x + 1 = 0$

Sol. Here $a = 2$. $b = -(k - 2) = -k + 2 = 2 - k$, $c = 1$

$D = 0$ $\because$ Equal roots...(Given)

$b^2 - 4ac = 0$

$\Rightarrow (2-k)^2 - 4(2)(1) = 0 \Rightarrow 4 + k^2 - 4k - 8 = 0$

$\Rightarrow k^2 - 4k - 4 = 0$ Again here,

$A = 1, B = -4, C = -4$ $D = B^2 - 4AC$

$= (-4)^2 - 4(1)(-4)$

$= 16 + 16 = 32$

$\therefore \quad \sqrt{D} = \sqrt{16 \times 2} = 4\sqrt{2}$

$k = \dfrac{-B \pm \sqrt{D}}{2A} \quad \Rightarrow \quad k = \dfrac{-(-4) \pm 4\sqrt{2}}{2(1)}$

$\Rightarrow A = -\dfrac{4 \pm 4\sqrt{2}}{2} \quad \Rightarrow \quad k = 2\left(\dfrac{2 \pm 2\sqrt{2}}{2}\right)$

$\therefore \quad A = 2 + 2\sqrt{2}$ or $k = 2 - 2\sqrt{2}$

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

$\therefore \quad \dfrac{3}{x} - \dfrac{3}{x+1} = \dfrac{15}{60}$ $\quad \left[\because \text{Time} = \dfrac{\text{Distance}}{\text{Speed}} \quad 15 \text{ mns} = \dfrac{15}{60} \text{ hrs.}\right]$

$\Rightarrow \quad \dfrac{3x + 3 - 3x}{x(x+1)} = \dfrac{1}{4}$

$\Rightarrow x(x + 1) = 12$

$\Rightarrow x^2 + x - 12 = 0$

$\Rightarrow x^2 + 4x - 3x - 12 = 0$

$\Rightarrow x(x + 4) - 3(x + 4) = 0$

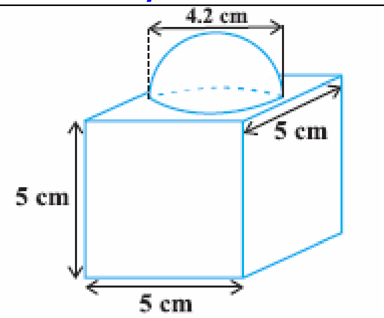
$\Rightarrow (x + 4)(x - 3) = 0$

$\Rightarrow x + 4 = 0$ 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

Q.30



The decorative block shown in Fig. is made of two solids — a cube and a hemisphere. The base of the block is a cube with edge 5 cm, and the hemisphere fixed on the top has a diameter of 4.2 cm. Find the total surface area of the block. (π =22 /7) . (Ans. 163.86 sq cm

Q.31 PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at a point

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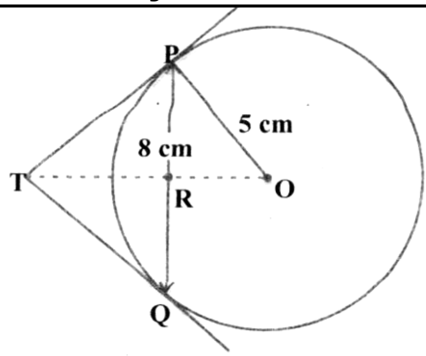


T (see Fig.). Find the length TP. Ans. 20 / 3 cm

Q.32 **Find the sum of all three digit numbers which leave the remainder 3 when divided by 5.**

Sol. **The three digit numbers which when divided by 5 leave the remainder 3 are 103, 108, 113,…, 998**

Let their number be n

Then $t_n = a + (n-1)d$

$\Rightarrow 998 = 103 + (n-1)5$

$\Rightarrow 998 = 103 + 5n - 5 \begin{bmatrix} \text{Here } a = 103 \\ d = 108 - 103 = 5 \end{bmatrix}$

$\Rightarrow 5n = 998 - 98 = 900$

$\Rightarrow n = 900/5 = 180$

Now, $S_n = \frac{n}{2}[a + l]$ $\begin{bmatrix} a = \text{first term} = 103 \\ l = \text{last term} = 998 \end{bmatrix}$

$\therefore \quad S_{180} = \frac{180}{2}[103 + 998]$

$= 90 \times 1101 = 99090$

Q.33 **An open container made up of a metal sheet is in the form of a frustum of a cone of height 8 cm with radii of its lower and upper ends as 4 cm and 10 cm respectively. Find the cost of oil which can completely fill the container at the rate of Rs. 50 per litre. Also, find the cost of metal used, if it costs Rs. 5 per 100 cm². (Use $\pi = 3.14$)**

Sol. **Height of container h = 8 cm**

Radius of the bases, R = 10 cm and r = 4 cm

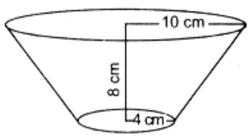
Slant heightl $= \sqrt{h^2 + (R - r)^2}$

$\sqrt{8^2 + (10-4)^2} = \sqrt{8^2 + 6^2}$

$\sqrt{64 + 36} = \sqrt{100}$ = **10 cm Volume of container**

$\frac{1}{3}\pi h\,(R^2 + r^2 + Rr)$

$= \frac{1}{3} \times 3.14 \times 8\,(100+16+40)\ \text{cm}^3 = \frac{1}{3} \times 3.14 \times 8(156)$



$= 1306.24\ \text{cm}^3$

$\frac{1306.24}{1000}$ lit. ($\because$ 1000 cm³ = 1 lit.)

= 1.30624 lit. = 1.31 lit. (approx.)

$\therefore$ Quantity of oil= 1.31 lit.

Cost of oil = Rs. (1.31 × 50) = Rs. 65.50

Suface area of the container (excluding the upper end)

= C.S. ar + ar of base

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$= \pi l\,(R + r) + \pi r^2$

$= \pi\,[l\,(R + r) + r^2]$

= 3.14 x [10(10 + 4)+16]

= 3.14 x 156

= 489.84 cm²

Cost of metal = Rs. $\left(489.84 \times \frac{5}{100}\right)$ **= 24.492**

= Rs. 24.49 (approx.)

Q.34 At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is $\frac{5}{12}$. on walking 192 metres towards the tower, the tangent of the angle of elevation is $\frac{3}{4}$. find the height of the tower. Ans h = 180m

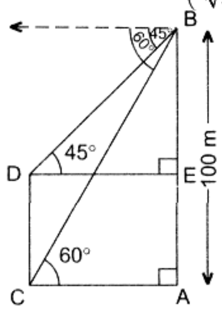
OR

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 ΔBAC 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 ΔBED, $\frac{BE}{DE}$ **= tan 45°**

$\Rightarrow \frac{BE}{DE} = 1 \Rightarrow$ **BE = DE**

$\therefore$ **BE =** $\left(\frac{100}{\sqrt{3}}\right) \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{100\sqrt{3}}{3}$

$\frac{100 \times 1.732}{3}$ **= 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.

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