CODE:3101- AG-TS-X-5 **REG.NO:-TMC -D/79/89/36/63**

General Instructions :-

(i) **All** Question are compulsory :

(ii) This question paper contains **40** questions.

(iii) Question **1-20**in **PART-A** are Objective type question carrying **1** mark each.

(iv) Question **21-26**in **PART-B** are sort-answer type question carrying **2** mark each.

(v) Question **27-34**in **PART-C** are long-answer-**I** type question carrying **3** mark each.

(vi) Question **35-40** in **PART-D** are long-answer-**II** type question carrying **4** mark each

(vii) You have to attempt only one lf the alternatives in all such questions.

(viii)Use of calculator is not permitted.

(ix) Please check that this question paper contains 12 printed pages.

(x) 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.

Time : 3 Hours | Maximum Marks : 80

CLASS – X **MATHEMATICS**

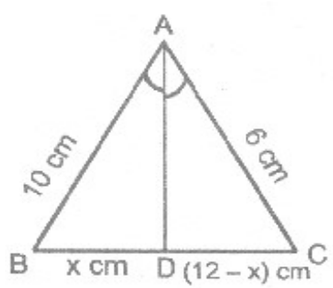
PRE-BOARD EXAMINATION 2020-21

PART – A (Question 1 to 20 carry 1 mark each.)

SECTION I : Single correct answer type

This section contain 10 multiple choice question . Each question has four choices (A) , (B) , (C) &(D) out of which **ONLY ONE** is correct .

Q.1	If the least prime factor of a is 3, the least prime factor of b is 7, then the least prime factor of (a+b) is (a) 2 (b) 3 (c) 5 (d) 11 Ans a
Q.2	The median of the observations 11 , 12 , 14 , 18 , x +2 , x + 4 , 30 , 32 , 35 , 41 .arranged in ascending order is 24 . then the value of x .

	(a) 22 (b) 21 (c) 20 (d)none of these Ans b
Q.3	Two alarm clocks ring their alarms at regular intervals of 50 seconds and 48 seconds. If they first beep together at 12 noon, at what time will they beep again for the first time ? (a) 12.20 pm (b) 12.12 pm (c) 12.11 pm (d) none of these Ans. a
Q.4	The value of k for which the system of equations $3x+5y=0$ and $kx+10y=0$ has a non-zero solution is (a)0 (b)2 (c)6 (d)8 Ans. c
Q.5	If $\sin\alpha=\frac{1}{2}$ and α is acute, then $(3\cos\alpha-4\cos^3\alpha)$ is equal to (a) 0 (b) $\frac{1}{2}$ (c) $\frac{1}{6}$ (d) -1 Ans. A
Q.6	In a ΔABC, AD is the bisector of ∠A, meeting side BC at D.If AB = 10 cm, AC = 6 cm, BC = 12 cm, find BD.  (a) 3.3 (b) 18 (c) 7.5 (d) 1.33 Ans. C
Q.7	The positive value of y for which the distance between the points P(2, -3) and Q(10, y) is 10 units, is

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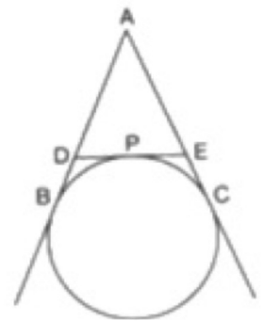
	(a)2 (B) 4 (C) 3 (D) 1 ANS. (C)
Q.8	The distance of the point P(2, 3) from the x- axis is (A)2 (B) 3 (C) 11 (D) 5 ANS.(B)
Q.9	If ΔPQR is right angled at R, then the value of cos (P+Q) is (a) 1 (b) 0 (c) ½ (d) $\sqrt{3}/2$ Ans. b
Q.10	 In the given figure , AB = 8 cm. If PE = 3 cm, then the measure of AE is a. 3 cm b. 11 cm c. 5 cm d. 7 cm (c) 5 cm Explanation: Since Tangents from an external point to a circle are equal. PE = EC = 3 cm and AB = AE = 8 cm Therefore, AE = AC - EC = 8 - 3 = 5 cm
	(Q11 – Q15) Answer the following questions
Q.11	Without actual division find whether the rational number $\frac{41}{37500}$ is a terminating or a non-terminating repeating decimal. Ans. Non terminating repeating décimal

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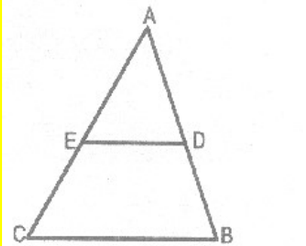
Q.12 D and E are respectively the points on the sides AB and AC of a ΔABC such that AB = 12 cm, AD = 8 cm, AE = 12 cm and AC = 18 cm, show that DE || BC.

Sol. We have, AB = 12 cm, AC = 18 m, AD = 8 cm and AE = 12 cm.



$\therefore$ BD = AB - AD = (12 - 8) cm = 4 cm ; CE = AC - AE = (18 12) cm = 6 cm

Now, $\frac{AD}{BC}=\frac{8}{4}=\frac{2}{1}$ And, $\frac{AE}{CE}=\frac{12}{6}=\frac{2}{1}\Rightarrow\frac{AD}{BD}=\frac{AE}{CE}$

Thus, DE divides sides AB and AC of ΔABC in the same ratio. Therefore, by the conserve of basic proportionality theorem we have DE||BC.

Q.13 The length of a tangent from a point A at a distance of 26 cm from the center of the circle is 10 cm of the radius of the circle is ---------- 24 cm

OR

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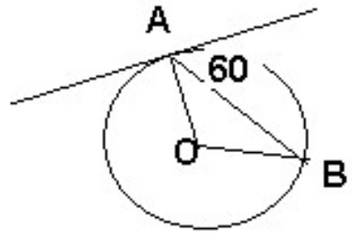

In the figure , if O is the center of the circle, AB is a chord and the tangent at A makes an angle of 60° with AB, then $\angle AOB$ is equal to:

(A) 120° (B) 100° (C) 30° (D) 90° ANS : A

Q.14 Find the value of a, b and c, such that the numbers a, 10, b, c, 31 are in A.P. ANS:

a, 10, b, c, 31 are in A.P.
Common difference = d
$a+d=10$; $a+4d=31\Rightarrow d=7$ and $a=3$.
$a=3$, $b=3+14=17$, $c=3+21=24$.
Solution : $a=3$; $b=17$; $c=24$.

Q.15 The zeros of a quadratic equation $x^2-7x+k=0$ are $\alpha and \beta$ such that $\alpha-\beta=3$.find the value of k. {Ans.10

Fill in the blanks (Q16 – Q20)

Q.16 The radius of wire is decreased to one –third. If volume remains the same, the length will become ---------9times

Q.17 If the roots of $5x^2-px+1=0$ are real and distinct, then condition for p ----------

OR

The remainder when $x^4 + x^3 - 2x^2 + x + 1$ is divided by x - 1 is _____. 2

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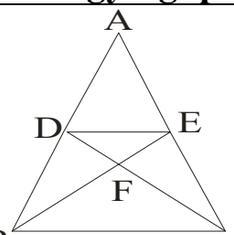
Q.18 In the given figure 

, DE | | BC and AD : DB = 5 : 4. Find $\frac{area\ (\Delta DEF)}{area\ (\Delta CFB)}$ =---------- 25 : 81

Q.19 If the ratio between the sums of n terms of two AP's is $3n + 8 : 7n + 15$, then the ratio between their 12^{th} terms is ---------- 7 : 16

Q.20 A number x is selected from the number 1,2,3 and then a second number y is selected from the number 1,4,9 what is the probability that the product x y of the two numbers will be less than 9 is ---------- ANS:

xy : sample space = {1, 4, 9, 2, 8, 18, 3, 12, 27}

Favorables cases = 1, 4, 2, 8, 3

$$\therefore p(\text{product } xy < 9) = \frac{\text{No. of favourable outcomes}}{\text{Total no. of possible outcomes}} = \frac{5}{9}$$

PART – B (Question 21 to 26 carry 2 mark each.)

Q.21 Write the decimal number $2.44\ \bar{8}$ in the form $\frac{p}{q}$ in the simplest form. Ans. $\frac{551}{225}$

Q.22 In the given figure, PA and PB are two tangents drawn to a

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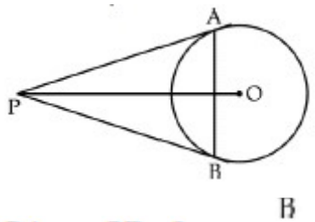
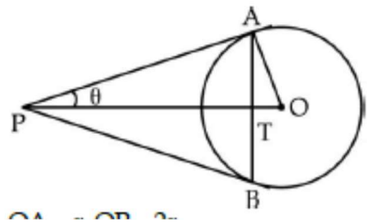
circle with center O and radius r. if OP = 2r, show that ΔAPB is equilateral.



ANS:



OA = r, OP = 2r

In ΔOAP, OA ⊥ AP (r ⊥ tangent)

$\sin\theta = \frac{r}{2r} = \frac{1}{2}$

$\therefore \theta = 30°$ similarly $\angle BPO = 30°$

$\angle APT = \angle BPT = 30°$

$\therefore \angle APB = 60°$

PA = PB (Tangents from an external point are equal in length)

$\therefore \angle ABP = \angle PAB$ (Base ∠s)

Since, $\angle APB = 60°$, $\angle ABP = \angle PAB = 60°$ (angle sum prop)

$\therefore$ ΔAPB is an equilateral Δ.

Q.23 State and prove Pythagoreans Theorem .

Statement: In a right triangle, the square of the hypotenuse is equal to the sum of the square of the other two sides.

Given : A right triangle ABC, right angled at B.

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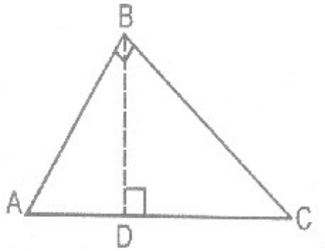

To prove : $AC^2 = AB^2 + BC^2$

Construction : $BD \perp AC$

Proof : ΔADB & ΔABC

$\angle DAB = \angle CAB$ [Common]

$\angle BDA = \angle CBA$ [90^0 each]

So, $\Delta ADB \sim \Delta ABC$ [By AA similarity]

$$\frac{AD}{AB} = \frac{AB}{AC}$$ [Sides are proportional]

or, $AD \cdot AC = AB^2$ .....(i)

Similarly $\Delta BDC \sim \Delta ABC$

So, $\frac{CD}{BC} = \frac{BC}{AC}$

or $CD \cdot AC = BC^2$ .....(ii)

Adding (i) and (ii),

$AD \cdot AC + CD \cdot AC = AB^2 + BC^2$

or, $AC\,(AD + CD) = AB^2 + BC^2$

or $AC.AC = AB^2 + BC^2$

or, $\mathbf{AC^2 = AB^2 + BC^2}$ **Hence Proved.**

OR

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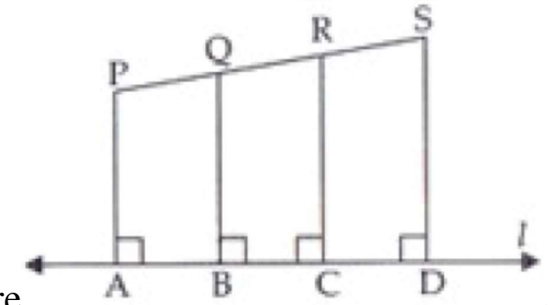
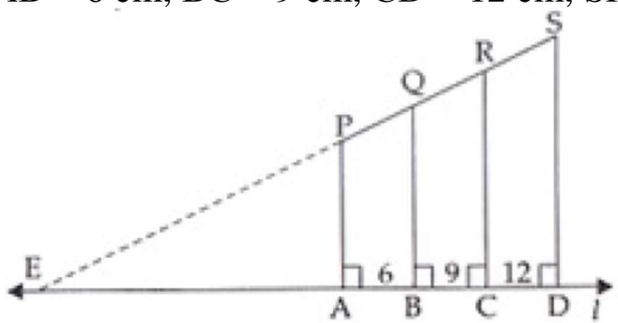


In the given figure , PA, QB, RC and SD are all perpendiculars to a line '*l*', AB = 6 cm, BC = 9 cm, CD = 12 cm and SP = 36 cm. Find PQ, QR and RS.

Given: PA, QB, RC and SD are perpendicular on line l.

AB = 6 cm, BC = 9 cm, CD = 12 cm, SP=36 cm



To find: PQ, QR and RS.

Construction: we produce SP so that it joins l at E.

Proof: In ΔEDS,

AP ‖ BQ ‖ CR ‖ SD [Given]

∴ PQ : QR : RS = AB : BC : CD

PQ : QR : RS = 6 : 9 : 12

Let PQ = 6x

then QR = 9x

and RS = 12x

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Now, PQ + QR + RS = 36 cm (given)

$\Rightarrow 6x + 9x + 12x = 36$

$\Rightarrow 27x = 36$

$\Rightarrow x = \frac{36}{27} = \frac{4}{3}$

Therefore, PQ = $6 \times \frac{4}{3}$ = 8 cm

QR = $9 \times \frac{4}{3}$ = 12 cm

RS = $12 \times \frac{4}{3}$ = 16 cm

Q.24 A boy is standing on the ground and flying a kite with 100 m of string at an elevation of 30^0. Another boy is standing on the roof of a 10 m high building and is flying his kite at an elevation of 45^0. Both the boys are on opposite sides of both the kites. Find the length of the string that the second boy must have so that the two kites meet.

Sol. Let the length of second string b x m.

In Δ ABC

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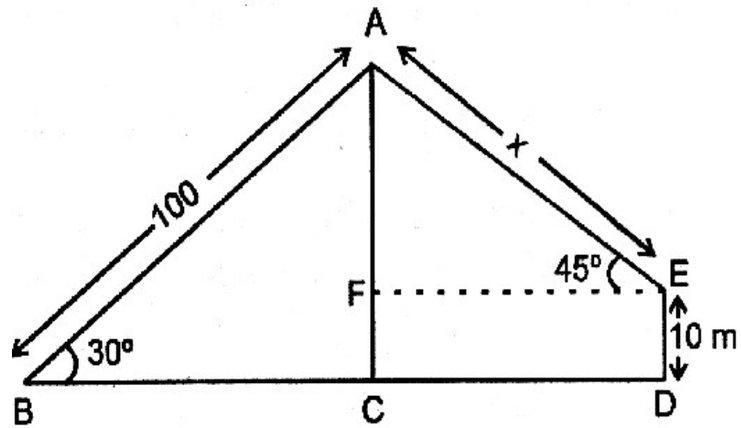

$\text{Sin } 30^0 = \frac{AC}{AB}$

$\frac{1}{2} = \frac{AC}{100} \Rightarrow AC = 50\,m$

In ΔAEF ; $\text{Sin } 30^0 = \frac{AF}{AE}$

$\frac{1}{\sqrt{2}} = \frac{AC - FC}{x} \because \frac{1}{\sqrt{2}} = \frac{50-10}{x}$ [$\therefore$ AC = 50 m, FC = ED = 10 m]

$\frac{1}{\sqrt{2}} = \frac{40}{x} \because x = 40\sqrt{2}m$

(So the length of string that the second boy must have so that the two kites meet = $40\sqrt{2}$ m.)

Q.25 Two dice are thrown simultaneously at the same time. Find the probability of getting different number on both the dice. ANS:

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S = {(1,1) (1,2) ---------- (1,6)
(2,1) (2,2) ---------- (2,6)
(3,1) (3,2) ---------- (3,6)
(4,1) (4,2) ---------- (4,6)
(5,1) (5,2) ---------- (5,6)
(6,1) (6,2) ---------- (6,6)}

prob. of getting different number = 1 – probability of getting same no

prob. of getting same number = $\frac{6}{36}=\frac{1}{6}$

Prob. Of getting different no = $1-\frac{1}{6}=\frac{5}{6}$

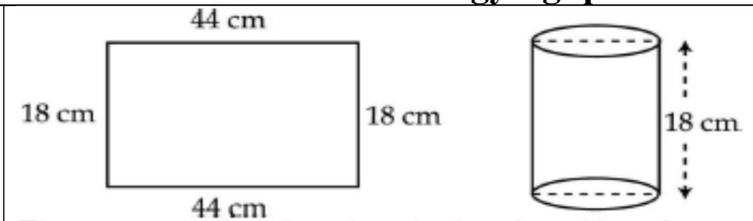
OR

A bag contains 6 red ball and some blue balls. If probability of drawing A blue ball from the bag is twice that of a red ball. Find the number of Blue ball in the bag. ANS: 7

Let the number of blue balls = X
Total balls = 6 + X
P(B) = 2P(R), where B = Blue ball, R = (Red ball)
$\Rightarrow \frac{x}{6+x}=\frac{2.6}{6+x}$
X = 12

Q.26 A rectangular sheet of paper of dimensions 44cm× 18cm is rolled along its length and a cylinder is formed. Find the volume of the cylinder so formed (use $\pi=\frac{22}{7}$)

ANS:



The paper is rolled along length, therefore, 44 cm forms the circumference of base of cylinder

$\therefore \quad 2\pi r = 44 \Rightarrow r = 7$ cm

$\therefore$ volume of the cylinder $= \pi r^2 h$

$= \frac{22}{7} \times (7)^2 \times 18$

$= 2772$ cm^3

PART – C (Question 27 to 34 carry 3 mark each.)

Q.27 Find the least number that is divisible by all the numbers between 1 and 10 (both inclusive). ANSWER-: 2520

OR

A,B and C start cycling around a circular path in the same direction at the same time. Circumference of the path is 1980m. if the speed of A is 330m/min, speed of B is 198m/min and that of C is 220m/min and they start from same point, then after what time they will be together at the starting point? Answer-: $time = \frac{distance}{speed}$, time taken by A,B,C=6,10,9 min . L.C.M.(6,10,9)=90

Q.28 Find the middle term of the sequence formed by all three-digit numbers which leave a remainder 3, when divided by 4. Also find the sum of all numbers on both sides of the middle term separately.

ans:

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The three digit number which leave remainder 3

when divided by 4 are

$103, 107, 111, \ldots\ldots\ldots\ldots, 999$

$\therefore \quad 999 = 103 + (n-1)\,4$

$\Rightarrow \quad n = 225$

Therefore $\frac{225+1}{2} = 113$th term is middle term

Middle term $= 103 + 112 \times 4 = 551$

Sum of first 112 terms $= \frac{112}{2}(206 + 111 \times 4) = 36400$

Sum of last 112 terms $= \frac{112}{2}(1110 + 111 \times 4) = 87024$

Q.29 Kavya went to a fair in her village. She wanted to enjoy rides on the Giant wheel and play Hoopla (a game in which you throw a ring on the item kept in a stall, and if the ring covers any object completely, you get it). She asked the rates of both rides to stall owner. He said each ride costs Rs 3, and a game of Hoopla cost Rs. 4. Her father gave her only Rs. 20 and also told her that the number of times she played Hoopla should be half the number of rides she had on the Giant wheel.
(a) Represent the situation by two equations.
(b) Find the solution to this pair of equations.

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(a) Let the number of rides that Kavya had be x and the number of times she played
hoopla be y.
Now, the situation can be represented by the two equations as:
3x + 4y = 20------(i)
y = x/2 ------(ii)
(b) By substitution method, put the value of y in eq. (i), we get
3x + 4(x) = 20
3x + 2x = 20
5x = 20
x = 4
Now put the value of x in (ii) we get,
y = 4/2 = 2
i.e. Number of rides Kavya takes is 4 and the number of times she played hoopla is 2.

OR

For which value(s)of λ, do the pair of linear equations $\lambda x + y = \lambda^2$ and $x + \lambda y = 1$ have (1)no solution?(2)infinitely many solutions? (3) a unique solution?
Ans.(i) $\lambda = -1 (ii) \lambda = 1$ (iii)all real values of λ except $\pm$ 1.

Q.30 The zeros of a quadratic polynomial $p(x) = 2x^2 + x + m$ are α & β .Find the value of m if $\alpha^2 + \beta^2 + \alpha\beta = \frac{13}{4}$. {Ans. m = -6

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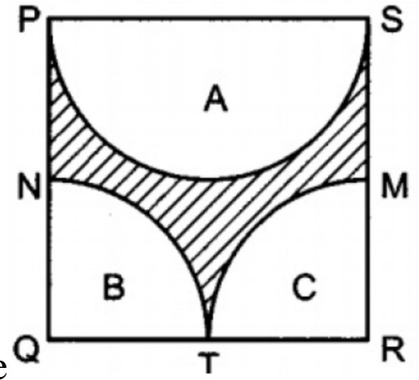
Q.31



In given figure , PQRS is a square of side 14 cm. Region A is a semicircle on PS as diameter. Region B and C are quadrants of a circles with centres Q and R respectively each having radius 7 cm. Find area of the shaded part.

Area of square PQRS = $14 \times 14 = 196\ cm^2$

The area of region A = $\frac{1}{2}\pi r^2 = \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77\ cm^2$

The area of region B = $\frac{1}{4}\pi r^2 = \frac{1}{4} \times \frac{22}{7} \times 7 \times 7 = \frac{77}{2}\ cm^2$

The area of region C = $\frac{1}{4}\pi r^2 = \frac{1}{4} \times \frac{22}{7} \times 7 \times 7 = \frac{77}{2}\ cm^2$

Area of shaded part = area of square - area of region A - area of region B - area of region C.

$= \left(196 - 77 - \frac{77}{2} - \frac{77}{2}\right)$

$= 42\ cm^2$

Q.32

If $\sec\theta = x + \frac{1}{4x}$, then prove that $\sec\theta + \tan\theta = 2x$ or $\frac{1}{2x}$.

Sol. $\sec\theta = x + \frac{1}{4x}$ .....(i)

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$\therefore 1 + \tan^2\theta = \sec^2\theta \Rightarrow \tan^2\theta = \sec^2\theta - 1$

$\Rightarrow \tan^2\theta = \left(x + \frac{1}{4x}\right)^2 - 1$

$\Rightarrow \tan^2\theta = x^2 + \frac{1}{16x^2} + 2 \times x \times \frac{1}{4x} - 1$

$\Rightarrow \tan^2\theta = x^2 + \frac{1}{16x^2} + \frac{1}{2} - 1$

$\Rightarrow \tan\theta = \pm\left(x - \frac{1}{4x}\right)$

$\Rightarrow \tan^2\theta = \left(x - \frac{1}{4x}\right)^2 \Rightarrow \tan\theta = \pm\left(x - \frac{1}{4x}\right)$

So, $\tan\theta = x - \frac{1}{4x}$ .....(ii)

or $\tan\theta = -\left(x - \frac{1}{4x}\right)$ .....(iii)

Adding equation (i) and (ii)

$\sec\theta + \tan\theta = x + \frac{1}{4x} + x - \frac{1}{4x}$

$\sec\theta + \tan\theta = 2x$

Adding equation (i) and (ii)

$\sec\theta + \tan\theta = x + \frac{1}{4x} - x + \frac{1}{4x} = \frac{1}{2x}$

Hence, $\sec\theta + \tan\theta + 2x$ or $\frac{1}{2x}$.

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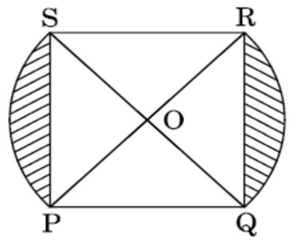
OR

Evaluate :

Q.33 In figure 5, PQRS is a square lawn with side PQ = 42 metres. Two circular flower beds are there on the sides PS and QR with centre at O, the intersection of its diagonals. Find the total area of the two flower beds (shaded parts).



Radius of circle with centre O is OR

let OR = x $\therefore$ $x^2 + x^2 = (42)^2 \Rightarrow x = 21\sqrt{2}$ m.

Area of one flower bed = Area of segment of circle with centre angle 90^0

$$= \frac{22}{7} \times 21\sqrt{2} \times 21\sqrt{2} \times \frac{90}{360} - \frac{1}{2} \times 21\sqrt{2} \times 21\sqrt{2}$$

$$= 693 - 441 = 252 \text{ m}^2$$

Area of two flower beds $= 2 \times 252 = 504 \text{ m}^2$

Q.34 The mean of the following frequency distribution is 57.6 and

Cl	0-20	20-40	40-60	60-80	80-100	100-120
F	7	f_1	12	f_2	8	5

the sum of the observation is 50. Find the missing frequency f_1 and f_2. Ans $f_1 = 8$ & $f_2 = 10$

PART – D (Question 35 to 40 carry 4 mark each.)

Q.35 Draw a circle of radius 4 cm. Take a point P outside the circle. Without using the centre of the circle, draw two tangents to the

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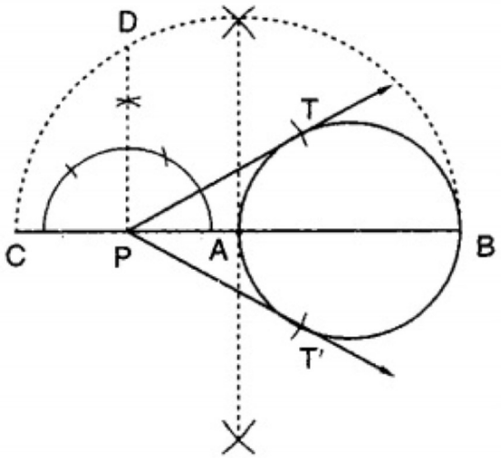

circle from point P.

Steps of construction

STEP I Draw a line segment 4 cm.

STEP II Take a point P outside the circle and draw a secant PAB, intersecting the circle at A and B.

STEP III Produce AP to C such that AP = CP.

STEP IV Draw a semi-circle with CB as diameter.

STEP V Draw PD CB, intersecting the semi-circle at D.

STEP VI With P as centre and PD as radius draw arcs to intersect the given circle at T and Y.

STEP VII Join PT and PT'. Then, PT and PT' are the required tangents.

Q.36	Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the center. ANS:

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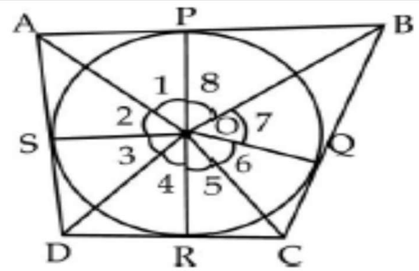


$\Delta AOP \cong \Delta AOS \Rightarrow \angle 1 = \angle 2$

Similar $\angle 4 = \angle 3$

$\angle 5 = \angle 6$

$\angle 8 = \angle 7$

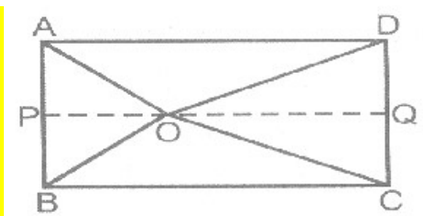
adding $(\angle 1 + \angle 8) + (\angle 4 + \angle 5) = (\angle 2 + \angle 3) + (\angle 6 + \angle 7)$

$\Rightarrow \quad \angle AOB + \angle DOC = \angle AOD + \angle BOC = \frac{1}{2}\ 360^\circ$

$= 180^\circ$

OR

O is any point inside a rectangle ABCD.Prove that $OB^2 + OD^2 = OA^2 + OC^2$



Sol. Through O, draw PQ||BC so that P lies on A and Q lies on DC.

Now, PQ||BC

Therefore, $PQ \perp AB$ and $PQ \perp DC$ [$\angle B = 90^0$ and $\angle C = 90^0$]

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So, $\angle BPQ = 90^0$ and $\angle CQP = 90^0$

Therefore, BPQC and APQD are both rectangles.

Now, from Δ OPB,

$OB^2 = BP^2 + OP^2$ ....(i)

Similarly, from Δ ODQ,

$OD^2 = OQ^2 + DQ^2$ ....(ii)

From Δ OQC, we have

$OC^2 = OQ^2 + CQ^2$ ...(iii)

And form Δ OAP, we have

$OA^2 = AP^2 + OP^2$ ....(iv)Adding (i) and (ii)

$OB^2 + OD^2 = BP^2 + OP^2 + OQ^2 + DQ^2$

$= CQ^2 + OP^2 + OQ^2 + AP^2$

[As BP = CQ and DQ = AP]

$= CQ^2 + OQ^2 + OP^2 + AP^2 = OC^2 + OA^2$ [From (iii) and (iv)]

Hence Proved.

Q.37 Swati can row her boat at a speed of 5 km/h in still water. If it takes her 1 hour more to row the boat 5.25 km upstream than to return downstream, find the speed of the stream.

Sol. Let the speed of the stream be x km/h

∴ Speed of the boat in upstream = (5 - x)km/h

Speed of the boat in downstream = (5 + x)km/h

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Time, say t_1 (in hours), for going 5.25 km upstream = $\frac{5.25}{5-x}$

Time, say t_2 (in hours), for returning 5.25 km downstream = $\frac{5.25}{5+x}$

Obviously $t_1 > t_2$

Therefore, according to the given condition of the problem,

$t_1 = t_2 + 1$

i.e., $\frac{5.25}{5-x} = \frac{5.25}{5+x} + 1$ or $\frac{21}{4}\left(\frac{1}{5-x} - \frac{1}{5+x}\right) = 1$

or $21\left(\frac{5+x-5+x}{25-x^2}\right) = 4$

or $42x = 100 - 4x^2$

or $4x^2 + 42x - 100 = 0$ or $2x^2 + 21x - 50 = 0$

or $(2x + 25)(x - 2) = 0$. This gives x = 2, since we reject $x = \frac{-25}{2}$.

Thus, the speed of the stream is 2 km/h.

OR

Find the value of p for which the following equation has two equal roots : $(p-12)x^2 + 2(p-12)x + 2 = 0$ ANS:

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$(p-12)x^2 + 2(p-12)x + 2 = 0$

For equal roots, D = 0

$\therefore D = b^2 - 4ac = 0$

$4(p-12)^2 - 4(p-12)(2) = 0$

$4(p-12)[p-12-2] = 0$

$4(p-12)(p-14) = 0$

$P - 12 = 0$ or $p - 14 = 0$

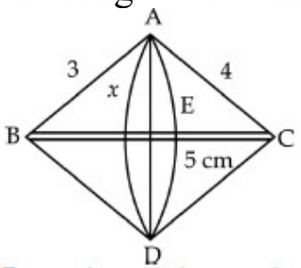
$P = 12$ or $p = 14$

Rejecting $p = 12$, since $p - 12 = 0$ as $a \neq 0$

$p = 14$

.

Q.38 A right angled triangle whose sides are 3cm ,4cm 5cm is revolved about the longest side find surface area of obtained



(use $\pi = 22/7$) .

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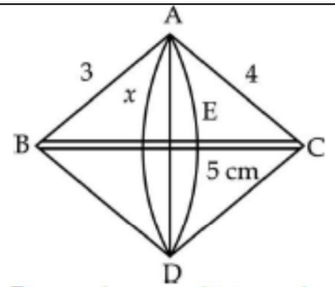

By revolving right triangle about longest side double cone is generated. Let radius of double cone = x cm

In ΔABE and ΔABC

$\angle AEB = \angle BAC = 90°$

ANS: $\angle ABE = \angle ABC$ common angle

$\Rightarrow \Delta ABC \cong \Delta EBA$

$$\frac{AB}{EB} = \frac{AC}{EA} = \frac{BC}{BA}$$

$$\frac{3}{EB} = \frac{4}{x} = \frac{5}{3}$$

(i) (ii) (iii)

By (ii) and (iii)

$$x = \frac{12}{5} = 2.4 \text{ cm}$$

$$EB = \frac{9}{5} = 1.8 \text{ cm}$$

S.A of double cone $= \pi r l_1 + \pi r l_2$

$= \pi r(l_1 + l_2)$

$= \frac{22}{7} \times 2.4 \times (3+4)$

$= 22 \times 2.4 = 52.8 \text{ cm}^2$

OR

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A hemispherical tank of radius $1\frac{3}{4}$ is full of water. It is connected with a pipe which empties it at the rate of 7 liters per second. How much time will it take to empty the tank completely ?

Sol. Radius of the hemisphere $= \frac{7}{4}\text{m} = \frac{7}{4} \times 100 \text{ cm} = 175 \text{ cm}$

$\therefore$ Volume of the hemisphere $= \frac{2}{3} \times \pi \times 175 \times 175 \times 175 \text{ cm}^3$

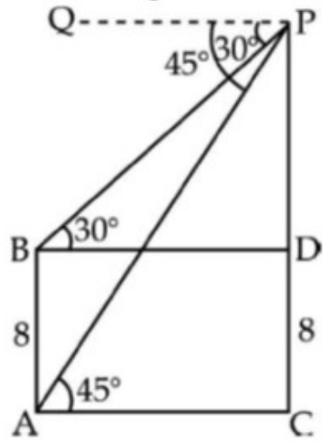
The cylindrical pipe empties it at the rate of 7 liters i.e., 7000 cm^3 of water per second.

Hence, the required time to empty the tank $= \left(\frac{2}{3} \times \frac{22}{7} \times 175 \times 175 \times 175 \div 7000\right)\text{s}$

$= \frac{2}{3} \times \frac{22}{7} \times \frac{175 \times 175 \times 175}{7000 \times 60}\text{min} = \frac{11 \times 25 \times 7}{3 \times 2 \times 12}\text{ min} = \frac{1925}{72}\text{min}$

$\cong$ 26.75 min, nearly.

Q.39 The angles of depression of the top and bottom of an 8 m tall building from the top of a multistoreyed building are 30° and 45 °respectively. Find the height of the multi-storeyed building and the distance between the two buildings. ANS:



In Δ PBD,

$$\frac{PD}{BD} = \tan 30° = \frac{1}{\sqrt{3}}$$

$$BD = PD\sqrt{3}$$

In Δ PAC,

$$\frac{PC}{AC} = \tan 45$$

$$PC = AC$$

$$PC = PD + DC = AC$$

$AC = BD$ and $DC = AB = 8$

$\therefore PD + 8 = BD \quad (\because AC = BD)$

$= PD\sqrt{3}$

$$\therefore PD = \frac{8}{\sqrt{3}-1} = 4(\sqrt{3}+1)\text{ m}$$

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Height of the multistoreyed building

$$= 4(\sqrt{3}+1)+8 = 4(3+\sqrt{3})\text{ m}$$

Distance between the two buildings

$$= 4(3+\sqrt{3})\text{ m}$$

Q.40 A survey regarding the heights (in cm) of 50 girls of a class was conducted and the following data was obtained:

Height(in cm)	120 - 130	130 - 140	140 - 150	150 - 160	160 - 170	[redacted]
Number of girls	2	8	12	20	8	[redacted]

Find the mean, median and mode of the above data.

ANS :

Class	Frequency	Mid value x_i	$u_i = \left(\frac{x_i - A}{h}\right)$	$f_i u_i$	Cumulative Frequency
120 - 130	2	125	-2	-4	2
130 - 140	8	135	-1	-8	10
140 - 150	12	145 = A	0	0	22
150 - 160	20	155	1	20	42
160 - 170	8	165	2	16	50
	N = 50				$\Sigma f_i u_i = 24$

i. Let the assumed mean A be 145. Class interval h = 10

$$\text{Mean}(\bar{x}) = A + h\left(\frac{\sum f_i u_i}{N}\right)$$

$$= 145 + 10 \times \left(\frac{24}{50}\right)$$

$$= 145 + 4.8 = 149.8$$

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ii. N = 50; $\frac{N}{2} = \frac{50}{2} = 25$

Cumulative Frequency just after 25 is 42.

Therefore, median class is 150 - 160.

$l = 150, h = 10, f = 20, c.f. = 22$

$$\text{Median (M)} = l + h\left(\frac{\frac{N}{2} - c.f.}{f}\right)$$

$$= 150 + 10 \times \left(\frac{25-22}{20}\right)$$

$$= 150 + \frac{10\times 3}{20}$$

$$= 150 + 1.5 = 151.5$$

iii. we know that, Mode = 3 median - 2 mean

$$= 3(151.5) - 2(149.8)$$

$$= 454.5 - 299.6$$

$$= 154.9$$

Thus, Mean = 149.8, Median = 151.5, Mode = 154.9

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शिक्षा की जड़ कडवी है, पर उसके फल मीठे हैं.

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