MT

2017 ____ ____ 1100 **Seat No.** | | | | | | | |

MT-GENERAL MATHEMATICS (71) GEOMETRY - SEMI PRELIM - I - PAPER - 1 (E)

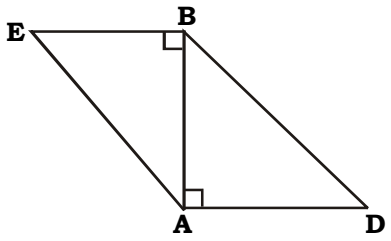
Time : 2½ Hours **Model Answer Paper** **Max. Marks : 40**

A.1. Attempt ANY FIVE of the following :

(i) $\frac{A(\triangle ABE)}{A(\triangle BAD)} = \frac{BE}{AD}$ [Triangles having common base AB] ½

$\therefore \frac{A(\triangle ABE)}{A(\triangle BAD)} = \frac{6}{9}$

$\therefore \boxed{\frac{A(\triangle ABE)}{A(\triangle BAD)} = \frac{2}{3}}$ ½



(ii) Side of cube (l) = 11 cm

Area of vertical faces = $4l^2$ ½

$= 4(11)^2$

$= 4 \times 121$

$= 484$ sq.cm. ½

∴ Area of vertical faces of cube is 484 sq.cm.

(iii) In $\triangle LMN$,

$\angle LMN = 90°$ [Given]

$LM^2 + LN^2 = MN^2$ [By Pythagoras theorem] ½

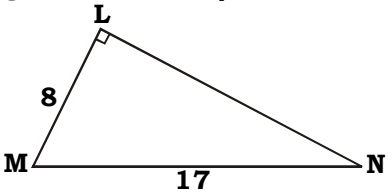
$(8)^2 + LN^2 = (17)^2$

$64 + LN^2 = 289$

$LN^2 = 289 - 64$

$LN^2 = 225$

$\boxed{LN = 15 \text{ units}}$ [Taking square roots] ½



(iv) Diameter of sphere = 6 cm

Its radius (r) $= \frac{6}{2}$

$= 3$ cm

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

$= \frac{4}{3} \times 3.14 \times 3 \times 3 \times 3$

$= 113.04$ cu.cm

y Volume of sphere is 113.04 cu.cm. ½

(v) $\triangle ABC \sim \triangle PQR$ [Given]

y $\angle A \cong \angle P$, $\angle B \cong \angle Q$, $\angle C \cong \angle R$ [c.a.s.t.] 1

(vi) Radius of base of cone (r) = 7 cm

Its height (h) = 24 cm

$l^2 = r^2 + h^2$ ½

y $l^2 = 7^2 + 24^2$

y $l^2 = 49 + 576$

y $l^2 = 625$

y $l = 25$ [Taking square roots]

y Slant height of cone is 25 cm. ½

A.2. Solve ANY FOUR of the following :

(i) $\frac{AB}{PQ} = \frac{15}{9}$

y $\frac{AB}{PQ} = \frac{5}{3}$ .....(i) ½

$\frac{BC}{QR} = \frac{10}{6}$

y $\frac{BC}{QR} = \frac{5}{3}$ .....(ii) ½

$\frac{AC}{PR} = \frac{10}{6}$

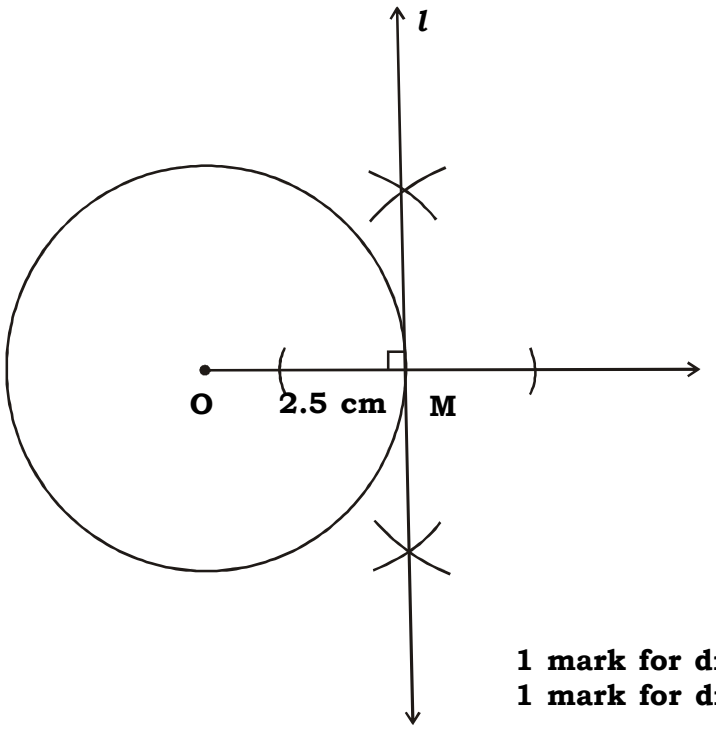
y $\frac{AC}{PR} = \frac{5}{3}$ .....(iii) ½

In $\triangle ABC$ and $\triangle PQR$,

$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$ [From (i), (ii) and (iii)]

y $\triangle ABC \sim \triangle PQR$ [By SSS test] ½

(ii)



1 mark for drawing circle
1 mark for drawing tangent

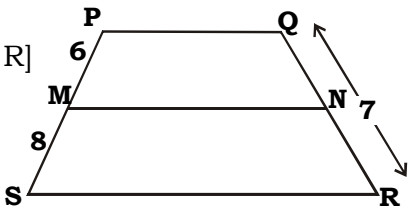
(iii)

length of auditorium (l) = 20 m
Its breadth (b) = 15 m
Volume of Auditorium = 3000m^3

y $l \times b \times h = 3000$ ½
y $20 \times 15 \times h = 3000$
y $300 \times h = 3000$ ½
y $h = \frac{3000}{300}$
y $h = 10$ ½
y Height of the auditorium is 10 m. ½

(iv)

Let, QN = x
QR = QN + NR [Q - N - R]
y 7 = x + PR
y NR = (7 – x) ½



seg PQ || seg MN || seg SR
On transversals PS and QR

$\frac{PM}{MS} = \frac{QN}{NR}$ [By property of intercepts made by three parallel lines] ½

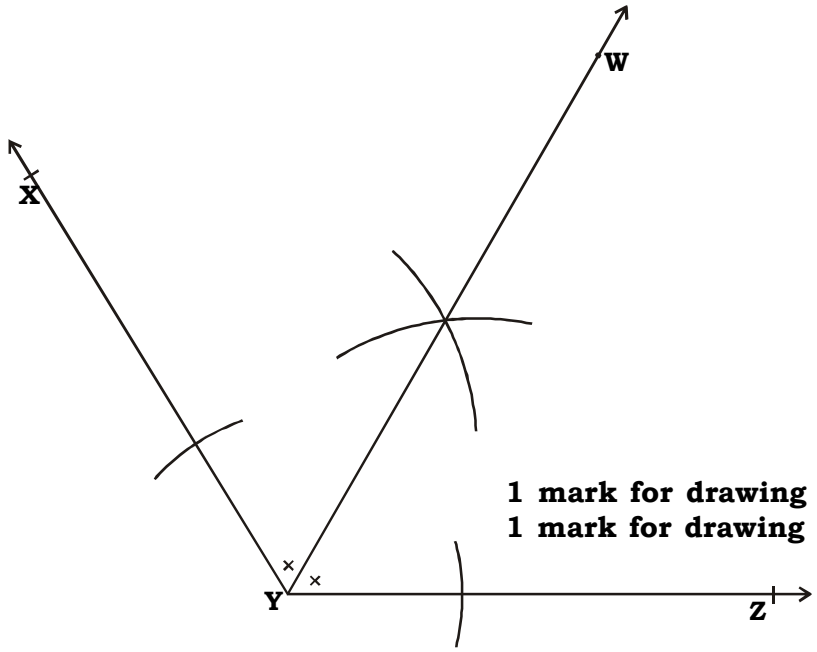
$\frac{6}{8} = \frac{x}{7 - x}$

y $6 (7 – x) = 8x$

y $42 - 6x = 8x$
y $42 = 8x + 6x$
y $42 = 14x$ ½

y $x = \frac{42}{14}$
y $x = 3$
y QN = 3 units ½

(v)



1 mark for drawing ĎXYZ
1 mark for drawing its bisector

(vi) Ratio of volume = 27:64
Ratio of radii = ?
y $V_1 : V_2 = 27 : 64$, $r_1 : r_2 = ?$

$$\frac{\text{Volume of smaller sphere}}{\text{Volume of larger sphere}} = \frac{\frac{4}{3}\pi \times r_1^3}{\frac{4}{3}\pi \times r_2^3}$$ **1**

y $$\frac{27}{64} = \frac{r_1^3}{r_2^3}$$

y $$\frac{27}{64} = \left(\frac{r_1}{r_2}\right)^3$$ ½

y $$\frac{r_1}{r_2} = \frac{3}{4}$$ [Taking cube roots]

y Ratio of radii is 3 : 4. ½

A.3. **Solve ANY THREE of the following :**

(i) $\left(\sqrt{13}\right)^2 = 13$ .....(i) ½

$(2)^2 + (3)^2 = 4 + 9 = 13$.....(ii) ½

From (i) and (ii),

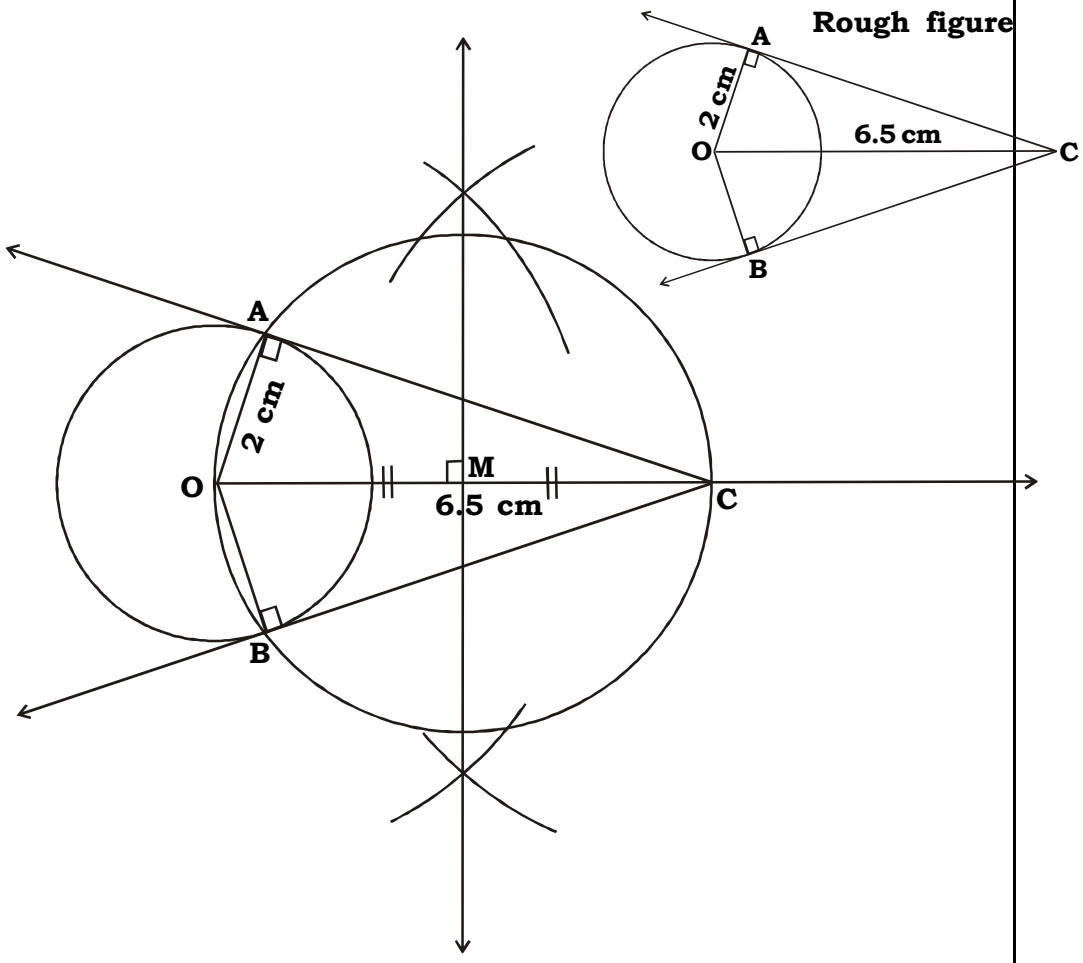
$\left(\sqrt{13}\right)^2 = (2)^2 + (3)^2$ ½

y The given triangle is a right angled triangle **1**

[By converse of Pythagoras theorem]

y Length of the hypotenuse is $\sqrt{13}$ units ½

(ii)



½ mark for drawing anlytical figure
½ mark for a drawing circle with centre O
½ mark for drawing seg OC
½ mark for drawing perpendicular bisector seg OC
½ mark for drawing a circle with centre M
½ mark for drawing two tangnets

(iii) Radius and height are equal

$\therefore$ $r = h$ (given)

Total Surface Area = 2464 sq.cm.

y $2\pi r(r + h) = 2464$ ½

y $2\pi r(r + r) = 2464$ $[\because r = h]$ ½

y $2\pi r(2r) = 2464$

y $2 \times \frac{22}{7} \times r \times 2r = 2464$ ½

y $2r^2 = \frac{2464 \times 7}{2 \times 22}$

y $r^2 = 28 \times 7$ ½

y $r^2 = 196$

y $r = 14$ cm [Taking square roots]

Curved surface area $= 2\pi rh$ ½

$= 2 \times \frac{22}{7} \times 14 \times 14$

$= 2 \times 22 \times 14 \times 2$

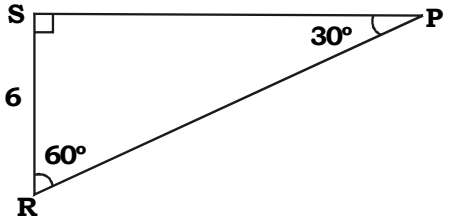
$= 1232$ sq.cm.

$\therefore$ Area of curved Surface is 1232 sq.cm. ½

(iv) aPSR is 30° - 60° - 90° triangle

By 30° - 60° - 90° triangle theorem

side opposite to $30° = \frac{1}{2} \times$ hypotenuse ½



y $RS = \frac{1}{2} \times RP$

y $6 = \frac{1}{2} \times RP$ ½

y $RP = 12$ ½

side opposite to $60° = \frac{\sqrt{3}}{2} \times$ hypotenuse ½

y $PS = \frac{\sqrt{3}}{2} \times RP$

y $PS = \frac{\sqrt{3}}{2} \times 12$ ½

y $PS = 6\sqrt{3}$ ½

(v) radius of cone (r) = 7 cm

Slant height of cone (l) = 25 cm

y $l^2 = r^2 + h^2$ ½

y $(25)^2 = (7)^2 + h^2$

y $625 = 49 + h^2$

y $625 - 49 = h^2$

y $h^2 = 576$ ½

y $h = 24$ cm [Taking square roots] ½

Volume of cone $= \frac{1}{3}\pi r^2 h$ ½

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24$

$= 22 \times 7 \times 8$ ½

$= 1232 cm^3$

y Volume of cone is 1232 cu.cm ½

A.4. Solve ANY TWO of the following :

(i) aPQR ~ aMNS ½

$\frac{PQ}{MN} = \frac{QR}{NS} = \frac{PR}{MS}$ [c.s.s.t] ½

y $\frac{PQ}{MN} = \frac{QR}{NS} = \frac{PR}{MS} = \frac{1}{2}$ .....(i) ½

y $\frac{PQ + QR + PR}{MN + NS + MS} = \frac{1}{2}$ [Theorem on equal ratios] ½

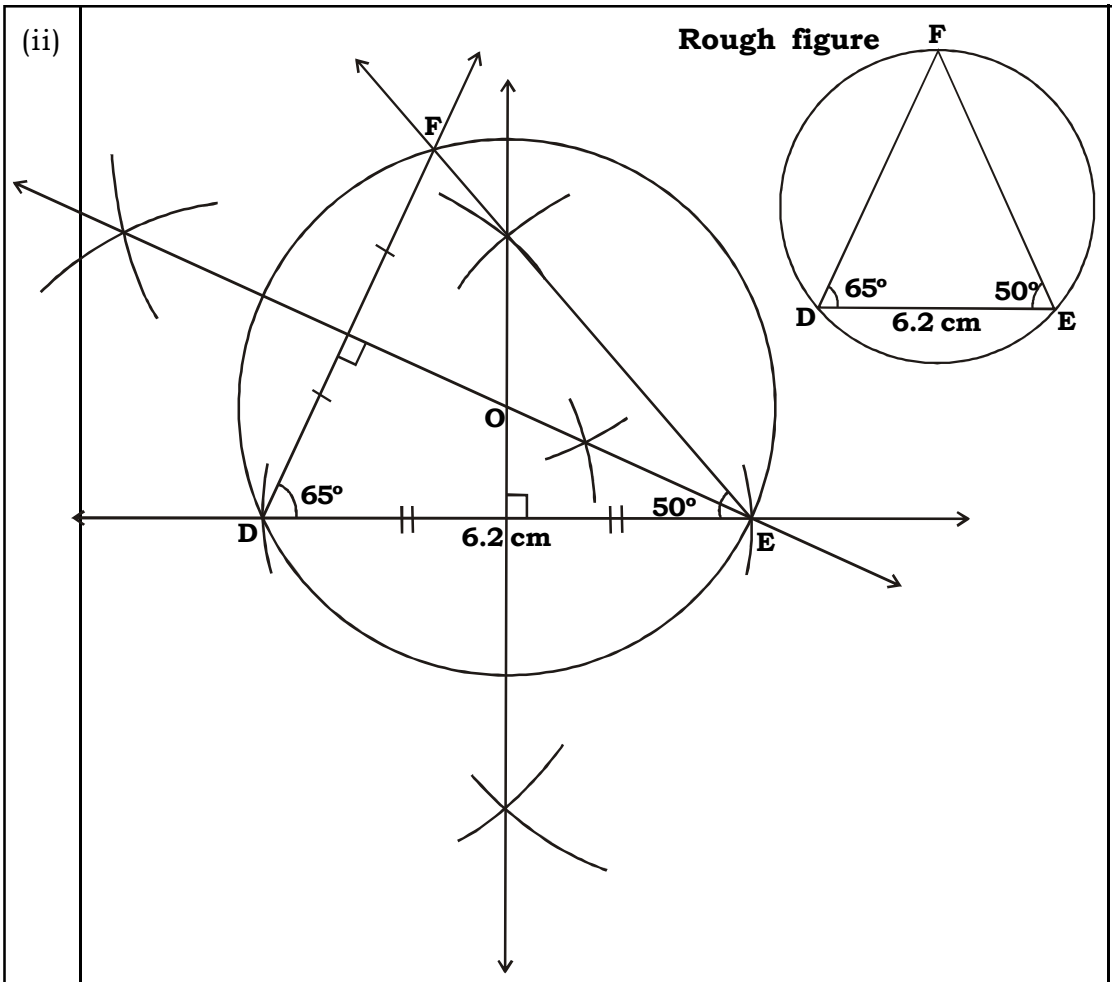
y $\frac{15}{MN + NS + MS} = \frac{1}{2}$ [∵ Perimeter of aPQR = 15] ½

y $MN + NS + MS = 15 \times 2$ ½

y $MN + NS + MS = 30$ ½

y Perimeter of aMNS is 30 units ½

(ii)



½ mark for drawing rough figure
1½ mark for drawing aDEF
1 mark for drawing perpendicular bisectors
1 mark for drawing circle

(iii) Let the common multiple be x.

The dimensions are in the ratio 4 : 3 : 2.

y length (l) = 4x, breadth (b) = 3x, height (h) = 2x ½

Surface area of Vertical faces = 448 sq.cm.

$2h\,(l + b) = 448$ ½

y $2 \times 2x\,(4x + 3x) = 448$

y $4x\,(7x) = 448$

y $28x^2 = 448$ ½

y $x^2 = \frac{448}{28}$ ½

y $x^2 = 16$

y $x = 4$ [Taking square roots] ½

y $l = 4x = 4\ (4) = 16$ cm ½
b $= 3x = 3\ (4) = 12$ cm ½
h $= 2x = 2\ (4) = 8$ cm ½

A.5. Solve ANY TWO of the following :

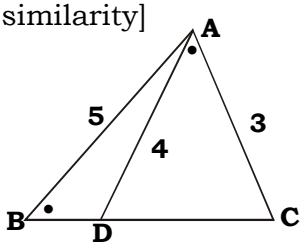
(i) In ΔACD and ΔBCA

$\angle ACD \cong \angle BCA$ [Common angle] ½

$\angle ABC \cong \angle DAC$ [Given]

$\Delta ACD \sim \Delta BCA$ [AA test of similarity] 1

$\frac{AC}{BC} = \frac{CD}{CA} = \frac{AD}{BA}$ [c.s.s.t] ½



$\therefore \frac{3}{BC} = \frac{CD}{3} = \frac{4}{5}$ .....(i) ½

$\therefore \frac{3}{BC} = \frac{4}{5}$ [From (i)]

$\therefore BC = \frac{5 \times 3}{4}$

$\therefore BC = \frac{15}{4}$

$\therefore \boxed{BC = 3.75 \text{ units}}$ ½

$\frac{CD}{3} = \frac{4}{5}$ [From (i)]

$\therefore CD = \frac{4 \times 3}{5}$

$\therefore CD = \frac{12}{5}$

$\therefore \boxed{CD = 2.4 \text{ units}}$ ½

ΔACD and ΔBCA have a common vertex A and their bases CD and BC lie on the same line BC

$\therefore$ their heights are equal

$\frac{A(\Delta ACD)}{A(\Delta BCA)} = \frac{DC}{BC}$ [Triangles having equal heights] ½

$\therefore \frac{A(\Delta ACD)}{A(\Delta BCA)} = \frac{2.4}{3.75}$

$\therefore \frac{A(\Delta ACD)}{A(\Delta BCA)} = \frac{2.4 \times 100}{3.75 \times 100}$ ½

y $\frac{A(\Delta ACD)}{A(\Delta BCA)} = \frac{240}{375}$

y $\boxed{\frac{A(\Delta ACD)}{A(\Delta BCA)} = \frac{16}{25}}$ ½

(ii)

length of wall (l) = 8m = 800 cm
breadth of wall (b) = 6m = 600 cm
height of wall (h) = 22.5 cm
Volume of wall = $l \times b \times h$ ½
= 800 × 600 × 22.5
= 1,08,00,000 cu.cm ½
length of brick (l) = 25 cm
breadth of brick (b) = 11.25 cm
height of brick (h) = 6 cm
Volume of brick = $l \times b \times h$ ½
= 25 × 11.25 × 6
= 1687.5 cu.cm ½

$$\text{No. of bricks} = \frac{\text{Volume of wall}}{\text{Volume of brick}}$$ 1

$$= \frac{10800000}{1687.5}$$ ½

= 6400 bricks. 1

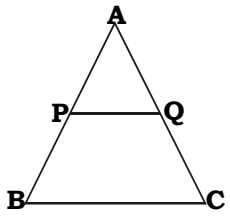
∴ 6400 bricks are used to build the wall. ½

(iii)

seg PQ || seg BC
On transversal AB,
∴ ∠APQ ≅ ∠ABC .....(i) [Corresponding angles] ½
In ΔAPQ and ΔABC,
∠APQ ≅ ∠ABC [From (i)]
∠PAQ ≅ ∠BAC [Common angle]
∴ ΔAPQ ~ ΔABC [AA test of similarity] 1

$$\therefore \frac{A(\Delta APQ)}{A(\Delta ABC)} = \frac{AP^2}{AB^2}$$ [Areas of similar triangles] 1

$$\therefore \frac{4}{A(\Delta ABC)} = \left(\frac{AP}{AB}\right)^2$$



$$\therefore \frac{4}{A(\Delta ABC)} = \left(\frac{1}{3}\right)^2$$ ½

$$\therefore \frac{4}{A(\Delta ABC)} = \frac{1}{9}$$ ½

∴ A (ΔABC) = 36 sq. units ½
A (ΔABC) = A (ΔAPQ) + A (□PBCQ) [Area addition property] ½
∴ 36 = 4 + A (□PBCQ)
∴ A (□PBCQ) = 36 – 4
∴ A (□PBCQ) = 32 sq. units. ½

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