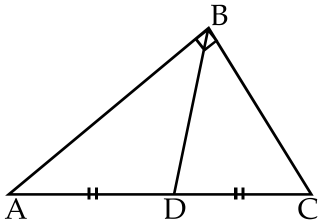
Q.P. SET CODE
C

MT - y

2018 ___ ___ 1100 - MT - y - MATHEMATICS (71) Geometry - SET - C (E)

Time : 2 Hours **Preliminary Model Answer Paper** **Max. Marks : 40**

A.1.(A)	**Solve ANY FOUR of the following :**	
(i)	If diagonals of a parallelogram are congruent, then it is a rectangle.	1
(ii)	If a transversal intersects two parallel lines then the sum of interior angles on the same side of the transversal is 180°.	1
(iii)	In ΔABC, $\angle ABC = 90^\circ$ Seg BD is the median on hypotenuse AC.  $BD = \frac{1}{2} AC$ (Median drawn to the hypotenuse is half of it) $\therefore\ 7 = \frac{1}{2} AC$ $\therefore\ AC = 14$ cm	1
(iv)	A quadrilateral is a parallelogram if a pair of opposite sides is parallel and congruent.	1
(v)	Equation of the Y – axis is X = 0	1
(vi)	$\frac{\tan 40^\circ}{\cot 50^\circ}$ $= \frac{\tan 40^\circ}{\tan(90-50)^\circ}$ $= \frac{\tan 40^\circ}{\tan 40^\circ}$ $= 1$	1

A.1.(B) Solve ANY TWO of the following :

(i) For a cone

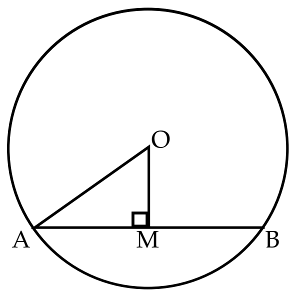
Area of the base = 1386 sq. cm Height (h) = 28 cm

Volume of a cone = $\pi r^2 h$ — 1

$= \frac{1}{3} \times 1386 \times 28$ — ½

Volume of a cone = 12936 cm^3 — ½

(ii) A circle with centre O



chord AB = 24 cm

seg OM ⊥ chord AB

OM = 5 cm

AM $= \frac{1}{2}$ AB — ½

[Perpendicular drawn from the centre to the chord, bisects the chord]

$= \frac{1}{2} \times 24$

AM = 12 cm — ½

In ΔOMA, ∠OMA = 90°

$OA^2 = 5^2 + 12^2$ [Pythagoras theorem] — ½

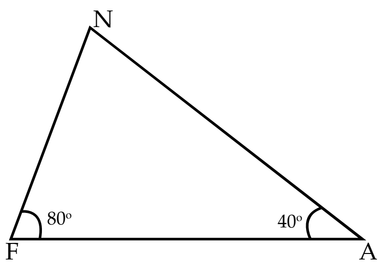
∴ $OA^2 = 25 + 144$

∴ $OA^2 = 169$

∴ OA = 13 cm

∴ Radius of the circle is 13 cm — ½

(iii) In ΔFAN,



∠F = 80°

∠A = 40°

∴ ∠N = 60° [Remaining angle] — ½

∴ ∠F > ∠N > ∠A — ½

∴ AN > AF > FN [In a triangle, side opposite to greater angle is greater] — ½

∴ Greatest side is AN and the smallest side is FN — ½

A.2.(A) Select the correct alternative answer and write it :

			Marks
(i)	(c)	22.4	1
(ii)	(d)	0	1
(iii)	(b)	550 cm^2	1
(iv)	(a)	(1, 3)	1

A.2.(B) Solve ANY TWO of the following :

(i)

Line PQ || Line RS ...(Given)

∴ Slope of line PQ = Slope of line RS ½

$\frac{6-4}{3-2} = \frac{k-1}{5-3}$ ½

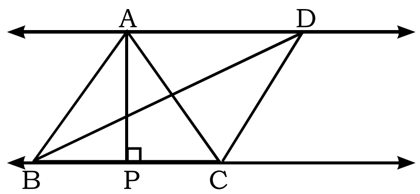
∴ $\frac{2}{1} = \frac{k-1}{2}$

∴ $2 \times 2 = k - 1$ ½

∴ $4 + 1 = k$

∴ $k = 5$ ½

(ii)



line AD || line BC ...(Given)

∴ ABC and BCD lie between the same two parallel lines AD and BC. ½

∴ Their heights are equal.

Also, they have a common base BC ½

∴ A(ABC) = (BCD) ...(Triangles having equal base and equal height) ½

∴ $\frac{A(\Delta ABC)}{A(\Delta BCD)} = 1$ ½

(iii) $PS^2 = PQ \times PR$ .... tangent secant segments theorem ½

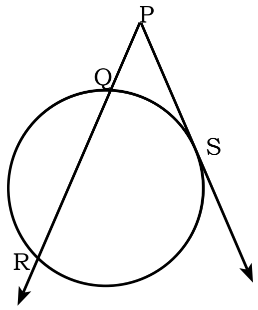
$= PQ \times (PQ + QR)$ ½

$= 3.6 \times [3.6 + 6.4]$

$= 3.6 \times 10$ ½

$PS^2 = 36$

$\therefore$ $PS = 6$ ½



A.3.(A) Carry out ANY TWO of the following activites :

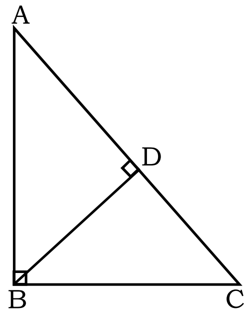
(i) Given : In Δ ABC, $\angle B = 90^o$ 2

seg BD $\perp$ hypotenuse AC

To prove : $\Delta ADB \sim \Delta BDC$

Proof :

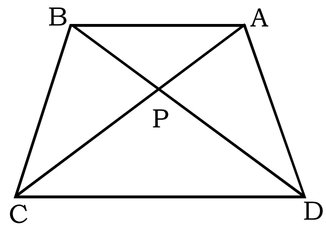
In ΔADB and ΔABC



$\angle A \cong \angle A$		common angle
$\angle ADB \cong \angle ABC$		(each 90^o)
$\therefore$ $\Delta ADB \sim \Delta ABC$	...(i)	AA test of similarity
In Δ BDC and Δ ABC		
$\angle C \cong \angle C$		common angle
$\angle BDC \cong \angle ABC$		(each 90^o)
$\therefore$ $\Delta BDC \sim \Delta ABC$	...(ii)	AA test of similarity
$\therefore$ $\Delta ADB \sim \Delta BDC$		from (i) and (ii)

(ii) Given : In trapezium ABCD, side AB || side CD, diagonal AC and BD intersect each other at point P.

To prove : $\frac{A(\Delta ABP)}{A(\Delta CPD)} = \frac{AB^2}{CD^2}$



Proof : □ ABCD is a trapezium (Given)

side AB || side CD (Given) 2

on transversal AC

$\angle BAC \cong \angle ACD$ ...(i) [ ]

In Δ APB and Δ CPD,

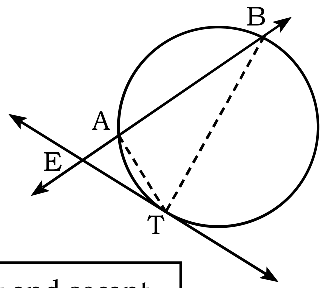
$\boxed{\angle BAC} \cong \boxed{\angle ACD}$ [from (i)]

$\therefore$ $\angle APB \cong \angle CPD$ Vertically opposite angles

$\therefore$ $\Delta APB \sim \Delta CPD$ AA test of similarity

$\therefore$ $\frac{A(\Delta ABP)}{A(\Delta CPD)} = \frac{AB^2}{CD^2}$ Theorem of areas of smilar triangle

(iii) Given : Line ET is the tangent at T and E AB is the secnt.



To prove : $EA \times EB = ET^2$

Construction : Draw seg AT and seg BT

Proof : In Δ EAT and Δ ETB,

$\angle E \cong \angle E$ Common angle

$\angle ETA \cong \angle EBT$ Angle between tangent and secant

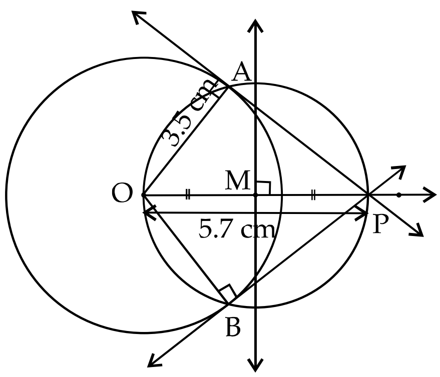
$\therefore$ $\Delta EAT \sim \Delta ETB$ AA test of similarity

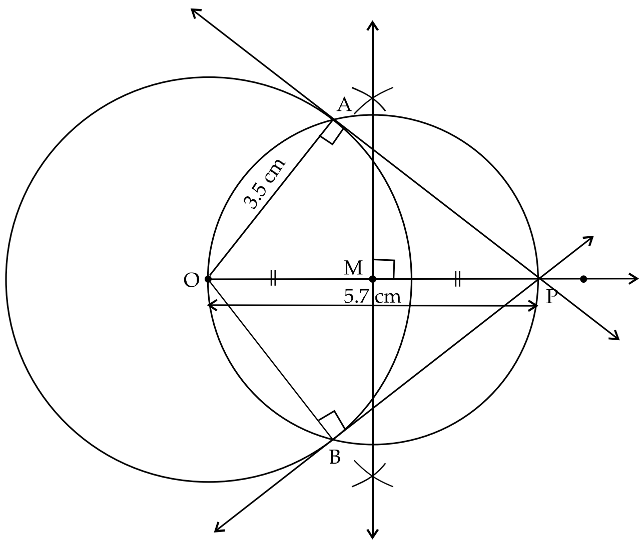
$\therefore$ $\frac{ET}{\boxed{EB}} = \frac{\boxed{EA}}{ET}$ ...(c.s.s.t)

$\therefore$ $EA \times EB = ET^2$ 2

A.3.(B) Solve ANY TWO of the following :

(i) **Analytical figure:**





½ mark for drawing circle and locating point P
½ mark for drawing perpendicular bisector of OP
½ mark for drawing circle with centre M
½ mark for drawing Tangents.

(ii)

A(8, 9) $= (x_1, y_1)$
B(1, 2) $= (x_2, y_2)$
P(k, 7) $= (x, y)$

Let point P divide seg AB in the ratio $m : n$.

By Section formula,

$$y = \frac{my_2 + ny_1}{m+n}$$ ½

$$7 = \frac{m \times 2 + n \times 9}{m+n}$$

$\therefore$ $7(m + n) = 2m + 9n$

$\therefore$ $7m + 7n = 2m + 9n$

$\therefore$ $7m - 2m = 9n - 7n$

$\therefore$ $5m = 2n$

$\therefore$ $\frac{m}{n} = \frac{2}{5}$ ½

$\therefore$ $m : n = 2 : 5$

$$x = \frac{mx_2 + nx_1}{m+n}$$ ½

$\therefore \quad k = \dfrac{2 \times 1 + 5 \times 8}{2+5}$

$\therefore \quad k = \dfrac{2+40}{7}$

$\therefore \quad k = \dfrac{42}{7}$

$\therefore \quad \boxed{k = 6}$ ½

(iii) L.H.S. $= \left(1 + \dfrac{1}{\tan^2 A}\right)\left(1 + \dfrac{1}{\cot^2 A}\right)$ ½

$= (1 + \cot^2 A)(1 + \tan^2 A)$

$= \text{cosec}^2 A \times \sec^2 A$ ($\because$ $1 + \cot^2 A = \text{cosec}^2 A$ and $1 + \tan^2 A = \sec^2 A$)

$= \dfrac{1}{\sin^2 A} + \dfrac{1}{\cos^2 A}$ ½

$= \dfrac{1}{\sin^2 A(1 - \sin^2 A)}$ ($\sin^2 A + \cos^2 A = 1$ $\therefore \cos^2 A = 1 - \sin^2 A$) ½

$= \dfrac{1}{\sin^2 A - \sin^4 A}$ ½

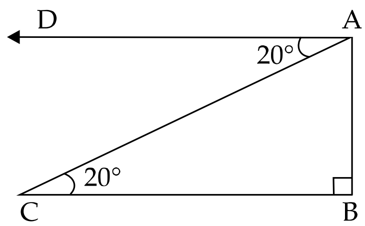
$=$ R.H.S.

$\therefore \quad \left(1 + \dfrac{1}{\tan^2 A}\right)\left(1 + \dfrac{1}{\cot^2 A}\right) = \dfrac{1}{\sin^2 A - \sin^4 A}$

A.4. Solve ANY THREE of the following :

(i) A represents the position of the plane above the ground.

'C' is the landing point of the plane on the ground AB represents the height of the plane from the ground. 1



ĎDAC is the angle of depression

ĎDAC = ĎACB = 20

Distance (AC) = speed × time

$= 200 \text{ km/hr} \times 54 \text{ sec}$

$= 200 \text{ km/hr} \times \frac{54}{3600} \text{ hr}$

(∵ 1 hr= 3600 sec)

$= 200 \times \frac{54}{3600}$

$= 3\text{km}$ ½

∴ AC $= 3000$ m

In ΔABC, $\angle ABC = 90$

∴ $\sin \angle ACB = \frac{AB}{AC}$ ...(By definition) ½

∴ $\sin 20 = \frac{AB}{3000}$ ½

∴ $0.342 = \frac{AB}{3000}$

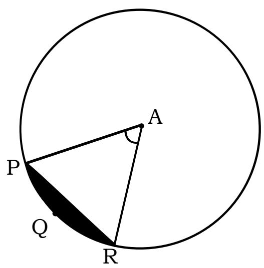
∴ AB $= 0.342 \quad 3000$

∴ AB $= 1026$ km.

y **Plane was at a height of 1026 km, when it started landing.** ½

(ii) For segment PQR, $r = AP = 7.5$ units

$\theta = \angle PAR = 30°$



A (segment PQR) $= r^2 \left[\frac{\pi\theta}{360} - \frac{\sin\theta}{2}\right]$ ½

$= (7.5)^2 \left[\frac{3.14 \times 30}{360} - \frac{\sin 30}{2}\right]$ ½

$= 56.25 \left[\frac{3.14}{12} - \frac{1}{2 \times 2}\right]$ ½

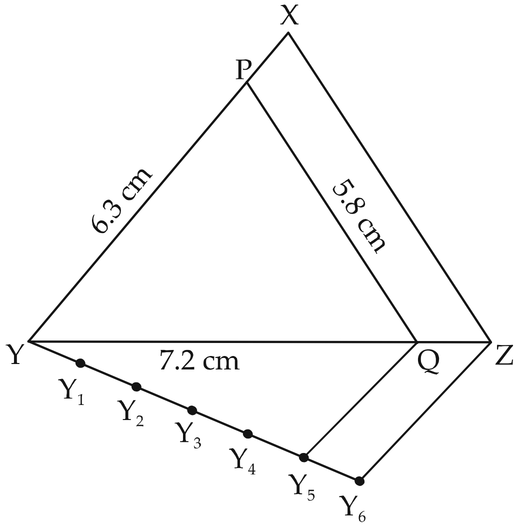
$= 56.25 \left[\frac{3.14 - 3}{12}\right]$ ½

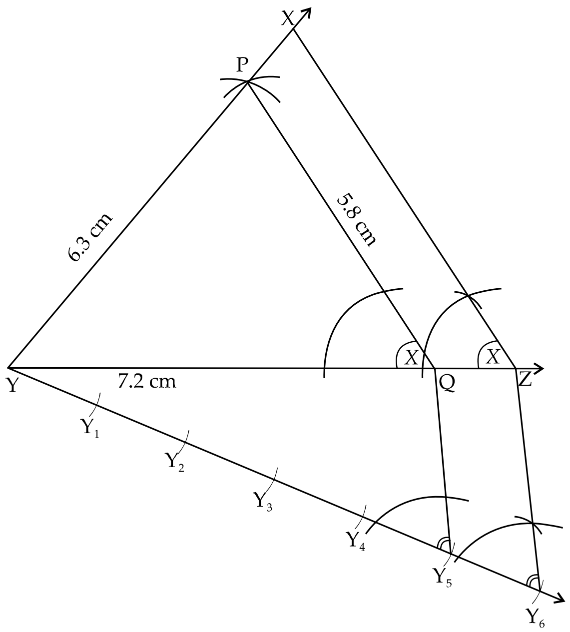
$= 56.25 \times \frac{0.14}{12}$ ½

$= 0.66$

∴ **A (segment PQR) is 0.66 sq. units** ½

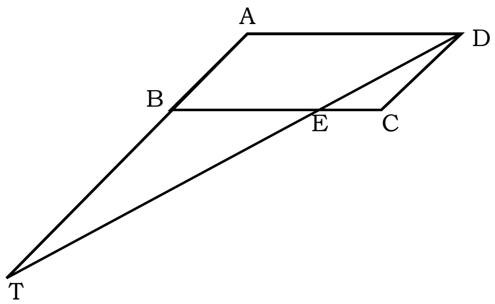
(iii) **Analytical figure:**





1 mark for ΔPQY
1 mark for constructing $\angle YY_5Q \cong \angle YY_6Z$
1 mark for constructing $\angle YQP \cong \angle YZX$

(iv)



□ABCD is a parallelogram ...(Given)

seg AB || seg CD ...(Opposite sides of a parallelogram)

seg AT || seg CD ...(A - B - T)

on transversal TD,

∴ ∠ATD ≅ ∠CDT ...(Alternate angles theorem) ½

∴ ∠BTE ≅ ∠CDE ...(i) (A - B - T, T - E - D) ½

In ΔBTE and ΔCDE,

∠BTE ≅ ∠CDE ...[From (i)]

∠BET ≅ ∠CED ...(vertically opposite angles)

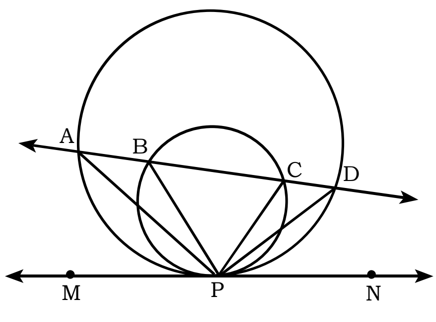
∴ BTE ~ CDE ...(By AA test of similarity) 1

∴ $\frac{BE}{CE} = \frac{TE}{DE}$ (c.s.s.t.) ½

∴ $DE \times BE = CE \times TE$ ½

A.5. Solve ANY ONE of the following :

(i)



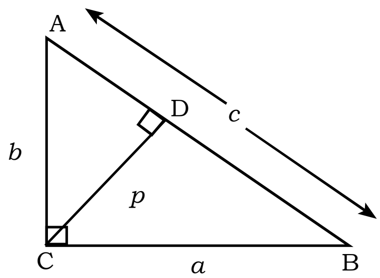
Construction : Draw a common tangent MN at point P

∠APM ≅ ∠ADP [Theorem of Angle between tangent and secant] ½

Let, m∠APM = m∠ADP = x ...(i)

∠BPM ≅ ∠BCP [Theorem of Angle between tangent and secant] ½

Let, m∠BPM = m∠BCP = y ...(ii)

	m∠BPM = m∠APB + m∠APM [Angle addition property]	½
	y = m∠APB + x [From (i) and (ii)]	
	m∠APB = $y - x$ ...(iii)	½
	∠BCP is an exterior angle of DCDP	
	mvBCP = m∠CDP + m∠CPD [Remote-interior angles theorem]	½
	∴ $y = x$ + m∠CPD	
	∴ m∠CPD = $y - x$ ...(iv)	½
	∴ m∠APB = m∠CPD [From (iii) and (iv)]	½
	∴ ∠APB ≅ ∠CPD	½
(ii)	Proof : (i) c p = a b	
		
	A(ΔABC) = $\frac{1}{2}$ × base × height	
	A(ΔABC) = $\frac{1}{2}$ × AB × CD	
	A(ΔABC) = $\frac{1}{2}$ × c × p ...(i)	½
	A(ΔABC) = $\frac{1}{2}$ × BC × AC	
	A(ΔABC) = $\frac{1}{2}$ × a × b ...(ii)	½
	∴ $\frac{1}{2} \times c \times p = \frac{1}{2} \times a \times b$ [From (i) and (ii)]	
	∴ c p = a b	½
	c p = a b	
	∴ $\frac{1}{cp} = \frac{1}{ab}$ [By invertendo]	½
	∴ $\frac{1}{p} = \frac{c}{ab}$	
	∴ $\frac{1}{p^2} = \frac{c^2}{a^2b^2}$ [Squaring on both sides]	½

In ΔACB, $m\angle ACB = 90^\circ$ [Given]

$AB^2 = AC^2 = BC^2$ [Pythagoras theorem] ½

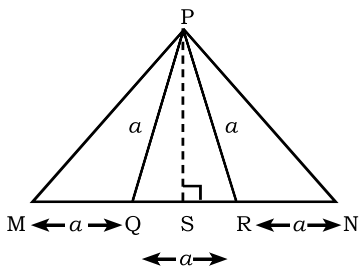
$c^2 = b^2 + a^2$

$\therefore \quad \frac{1}{p^2} = \frac{b^2}{a^2b^2} + \frac{a^2}{a^2b^2}$ ½

$\therefore \quad \frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$ ½

A.6. Solve ANY ONE of the following :

(i)



$MQ = QR = RN = a$...(Given)

Point Q is the midpoint of seg MR ...(i)

$\therefore$ In PMR, seg PQ is a median ...[From (i), Definition]

$\therefore$ $PM^2 + PR^2 = 2PQ^2 + 2QM^2$ ...(Apollonius theorem) ½

$\therefore$ $PM^2 + a^2 = 2a^2 + 2a^2$ ½

$\therefore$ $PM^2 = 4a^2 - a^2$ ½

$\therefore$ $PM^2 = 3a^2$ ½

$\therefore$ $PM = \sqrt{3} \times a$ ...(Taking square roots) ½

Similarly we can prove, $PN = \sqrt{3} \times a$

$\therefore$ $PM = PN = \sqrt{3} \times a$ ½

(ii)	For the sphere, $r = 9$ cm	
	For the wire, Thickness (diameter) = 4 mm	
	$\therefore$ Radius $(r_1) = \frac{4}{2}$ mm = 2 mm = $\frac{2}{10}$ cm ...[1 cm = 10 mm]	
	Let the length of wire be h_1	
	Wire is made by melting the sphere,	
	Volume of the wire = Volume of the sphere	½
	$\therefore \pi r_1^2 h_1 = \frac{4}{3} \times \pi r^3$	½
	$\therefore \pi \times \frac{2}{10} \times \frac{2}{10} \times h_1 = \frac{4}{3} \pi \times 9 \times 9 \times 9$	½
	$\therefore h_1 = \frac{4 \times \pi \times 9 \times 9 \times 9 \times 10 \times 10}{3 \times \pi \times 2 \times 2}$	½
	$\therefore h_1 = 24{,}300$ cm	
	$\therefore h_1 = 243$ m ...[$\because$ 1 m = 100 cm]	½
	$\therefore$ **Length of the wire formed is 243 m.**	½

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