MKCL Creating a Knowledge Lit World www.mkcl.org	**Subject – Geometry** **Std: 10th EM/Semi**	**Set: – I** **Model Answer**

Q.1A Choose the correct alternative.

1) D
2) C
3) B
4) D

Q.2 Solve any TWO of the following:

1) Here, AC and PR represents the bigger and smaller poles, and BC and QR represents their shadows respectively.

Now, $\Delta ACB \sim \Delta PRQ$ ....[∵ Vertical poles and their shadows form similar figures]

$\therefore \frac{CB}{RQ} = \frac{AC}{PR}$ ......[Corresponding sides of similar triangles]

$\therefore \frac{x}{6} = \frac{8}{4}$

$\therefore x = \frac{8 \times 6}{4}$ $\therefore x = 12$ m

∴ The shadow of the bigger pole will be 12 metres long at that time.

2) Here, $x_1 = 1$, $x_2 = -2$, $y_1 = -1$, $y_2 = k$

Slope of line RS $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{k-(-1)}{-2-1} = \frac{k+1}{-3}$

But, slope of line RS is -2. ......[Given]

$\therefore -2 = \frac{k+1}{-3}$

$\therefore k + 1 = 6$

$\therefore k = 6 - 1$

$\therefore \mathbf{k = 5}$

3) In ΔABC, seg AM is the median. ....[Given]

∴ M is the midpoint of side BC.

$\therefore MC = \frac{1}{2} BC = \frac{1}{2} \times 24 = 12$ units

Now, $AB^2 + AC^2 = 2\,AM^2 + 2\,MC^2$ ....[Apollonius theorem]

$\therefore 22^2 + 34^2 = 2\,AM^2 + 2\,(12)^2$

$\therefore 484 + 1156 = 2\,AM^2 + 2\,(144)$

$\therefore 1640 = 2\,AM^2 + 2\,(144)$

$\therefore 820 = AM^2 + 144$ ......[Dividing both sides by 2]

$\therefore AM^2 = 820 - 144$

$\therefore AM^2 = 676$

$\therefore AM = \sqrt{676}$ ....[Taking square root of both sides]

$\therefore$ **AM = 26 units**

Q.3A Complete any TWO of the following activities:

1) In ΔABC and ΔDRE,

$\boxed{\text{Side AB}} \cong \boxed{\text{Side DR}}$
$\boxed{\text{Side CB}} \cong \boxed{\text{Side ER}}$ .....[Radii of congruent circles]

$\angle ABC \cong \angle DRE$ ......[Measures of congruent arcs]

$\therefore \Delta ABC \cong \Delta DRE$ ......[$\boxed{\text{SAS test of congruency}}$]

∴ chord AC ≅ chord DE ..... $\boxed{\text{[c.s.c.t]}}$

2) AB ∥ CD ∥ EF ....[Given]

$$AB \parallel CD \parallel EF$$

$$\therefore \quad \frac{AC}{\boxed{CE}} = \frac{\boxed{BD}}{DF}$$ **Property of three parallel lines and their transversals**

$$\therefore \quad \frac{5.4}{9} = \frac{\boxed{7.5}}{DF}$$

$$\therefore \quad DF = \frac{7.5 \times 9}{5.4}$$

$$\therefore \quad DF = \boxed{12.5 \text{ units}}$$

3)

$$\text{L.H.S.} = \frac{\tan^3\theta - 1}{\tan\theta - 1}$$

$$= \frac{(\tan\theta - 1)\boxed{(\tan^2\theta + \tan\theta + 1)}}{\tan\theta - 1}$$

$$\ldots\left[\because a^3 - b^3 = (a-b)\boxed{(a^2 + ab + b^2)}\right]$$

$$= \boxed{\tan^2\theta + \tan\theta + 1}$$

$$= \boxed{(1 + \tan^2\theta)} + \boxed{\tan\theta}$$

$$= \boxed{\sec^2\theta} + \tan\theta$$

$$= \text{R.H.S.}$$

$$\therefore \quad \frac{\tan^3\theta - 1}{\tan\theta - 1} = \sec^2\theta + \tan\theta$$

Q.3B Solve any TWO of the following

1) i) ΔQRS is an equilateral triangle. …..[Given]

∴ seg RS ≅ seg QS ≅ seg QR …….. [Sides of an equilateral triangle]

∴ arc RS ≅ arc QS ≅ arc QR....(i) [Corresponding arcs of congruent chords of a circle are congruent]

ii) m(arc RS) + m(arc QS) + m(arc QR) = 360° ………[Measure of a circle is 360°]

∴ m(arc QR) + m(arc QR) + m(arc QR) = 360° ………[From (i)]

∴ 3 m(arc QR) = 360°

∴ m(arc QR) = $\frac{360°}{3}$ = 120°

Now, m(arc QRS) = m(arc QR) + m(arc RS)

..[Property of sum of measures of arcs]

= m(arc QR) + m(arc QR) [From (i)]

= 2m(arc QR)

= 2 × 120°

∴ m(arc QRS) = 240°

2) **Given:** Area of minor sector = 3.85 cm^2,

Central angle (θ) = 36°

To find: Radius of the circle ®.

Area of minor sector = $\frac{\theta}{360} \times \pi r^2$

∴ $3.85 = \frac{36}{360} \times \frac{22}{7} \times r^2$

∴ $3.85 = \frac{1}{10} \times \frac{22}{7} \times r^2$

∴ $r^2 = \frac{3.85 \times 10 \times 7}{22} = \frac{38.5 \times 7}{22} = \frac{385 \times 7}{220}$

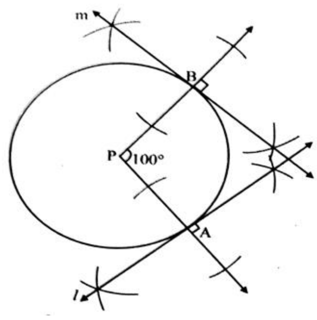
$\therefore r^2 = \frac{49}{4}$

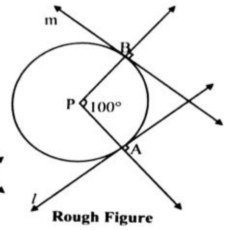
$\therefore r = \frac{7}{2}$ …….[Taking square root of both sides]

$= 3.5$ cm

∴ The radius of the circle is 3.5 cm.

3) m(arc AB) = ∠APB = 100°





Rough Figure

Steps of construction:

i) With centre P, draw a circle of any radius and take any point A on it.

ii) Draw ray PA.

iii) Draw ray PB such that ∠APB = 100°

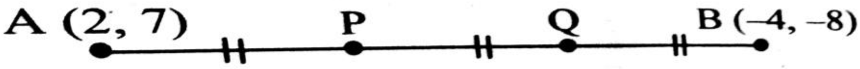
iv) Draw line *l* ⊥ ray PA at point A.

v) Draw line m ⊥ ray PB at point B.

Lines *l* and m are tangents at point A and B to the circle.

Q.4 Solve any THREE of the following:

1) Suppose the points P and Q trisect seg AB.



∴ AP = PQ = QB

Let AP be x.

Now, PB = PQ + QB ……[P–Q–B]

= x + x

∴ PB = 2x

$\frac{AP}{PB} = \frac{x}{2x} = \frac{1}{2}$

∴ Point P divides seg AB in the ratio 1 : 2.

∴ By section formula,

x co-ordinate of P $= \frac{mx_2 + nx_1}{m+n}$

$= \frac{1(-4) + 2(2)}{1+2} = \frac{-4+4}{3} = 0$

y co-ordinate of P $= \frac{my_2 + ny_1}{m+n}$

$= \frac{1(-8) + 2(7)}{1+2} = \frac{-8+14}{3} = \frac{6}{3} = 2$

Also, point Q divides seg AB in the ratio 2 : 1.

∴ By section formula,

x co-ordinate of Q $= \frac{mx_2 + nx_1}{m + n}$

$= \frac{2(-4) + 1(2)}{2 + 1} = \frac{-8+2}{3} = \frac{-6}{3} = -2$

y co-ordinate of Q $= \frac{my_2 + ny_1}{m + n}$

$= \frac{2(-8) + 1(7)}{2+1} = \frac{-16 + 7}{3} = \frac{-9}{3} = -3$

∴ The co-ordinates of the points of trisection of seg AB are (0, 2) and (−2, −3).

2) **Construction:** Draw seg CT, seg CP and seg CQ.

Proof: Line PQ is the tangent to the circle at point T. ……..[Given]

∴ seg CT ⊥ line PQ ……..[Tangent theorem]

But, seg AP ⊥ line PQ, and

Seg BQ ⊥ line PQ …….[Given]

$\therefore$ seg AP ∥ seg CT ∥ seg BQ .... $\left[\begin{array}{l}\text{Lines perpendicular to the same} \\ \text{line are parallel to each other}\end{array}\right]$

$\therefore \frac{AC}{CB} = \frac{PT}{TQ}$ .... $\left[\begin{array}{l}\text{Property of intercepts made by three parallel lines and} \\ \text{their transversals}\end{array}\right]$

But, AC = CB .....[Radii of the same circle]

$\therefore \frac{AC}{AC} = \frac{PT}{TQ}$

$\therefore \frac{PT}{TQ} = 1$

$\therefore$ PT = TQ

$\therefore PT^2 = TQ^2$ ....(i) [Squaring both sides]

Now, in ΔCTP, ∠CTP = 90° .....[seg CT ⊥ line PQ]

$\therefore CP^2 = CT^2 + PT^2$ .....[Pythagoras theorem]

$\therefore CT^2 = CP^2 - PT^2$ .....(ii)

Similarly in ΔCTQ, we can prove that

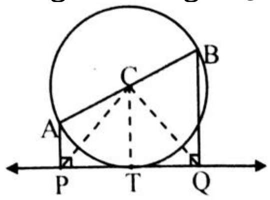
$CQ^2 = CT^2 + TQ^2$

$\therefore CQ^2 = CP^2 - PT^2 + TQ^2$ ....[From (ii)]

$\therefore CQ^2 = CP^2$ ......[From (i)]

$\therefore$ CP = CQ ....[Taking square root of both sides]

$\therefore$ **seg CP ≅ seg CQ**



3) In ΔADC, ∠ADC = 90° ....[Given]

$\therefore AC^2 = AD^2 + CD^2$ ......[Pythagoras theorem]

$\therefore AD^2 = AC^2 - CD^2$ ....(i)

Also, in ΔADB, ∠ADB = 90° ...[Given]

$\therefore AB^2 = AD^2 + DB^2$ ....[Pythagoras theorem]

$\therefore AB^2 = AD^2 + (3\,CD)^2$

$\therefore AB^2 = AD^2 + 9CD^2$

$\therefore AB^2 = AC^2 - CD^2 + 9\,CD^2$ ....[From (i)]

$\therefore AB^2 = AC^2 + 8\,CD^2$ ....(ii)

But, BC = BD + CD ....[B–D–C]

$\therefore$ BC = 3 CD + CD

$\therefore$ BC = 4 CD

$\therefore CD = \frac{1}{4}BC$ ......(iii)

$\therefore AB^2 = AC^2 + 8\left(\frac{1}{4}BC\right)^2$ .....[From (ii) and (iii)]

$\therefore AB^2 = AC^2 + 8 \times \frac{BC^2}{16}$

$\therefore AB^2 = AC^2 + \frac{1}{2}BC^2$

$\therefore \mathbf{2\,AB^2 = 2\,AC^2 + BC^2}$ .....[Multiplying both sides by 2]

4) In ΔADC, ∠ADC = 90° ......(Given)

$\therefore AC^2 = AD^2 + CD^2$ ... ...(Pythagoras theorem)

$\therefore AD^2 = AC^2 - CD^2$ ......(I)

Also, in ΔADB, ∠ADB = 90° ......(Given)

$\therefore AB^2 = AD^2 + DB^2$ ... ...(Pythagoras theorem)

$\therefore AB^2 = AD^2 + (3CD)^2$

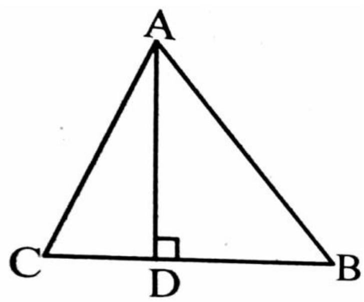
$\therefore AB^2 = AD^2 + 9CD^2$

$\therefore AB^2 = AC^2 - CD^2 + 9CD^2$ ...[From (I)]

$\therefore AB^2 = AC^2 + 8CD^2$ ... ...(II)

But, BC = BD + CD ......[B – D – C]

$\therefore$ BC = 3 CD + CD



$\therefore BC = 4\ CD$

$\therefore CD = \frac{1}{4} BC$ ....(III)

$\therefore AB^2 = AC^2 + 8\left(\frac{1}{4} BC\right)^2$ ...[From (II) and (III)]

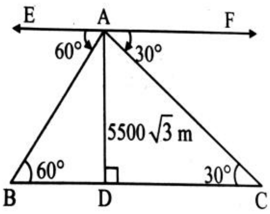
$\therefore AB^2 = AC^2 + 8 \times \frac{BC^2}{16}$

$\therefore AB^2 = AC^2 + \frac{1}{2} BC^2$

$\therefore 2AB^2 = 2AC^2 + BC^2$ …[Multiplying both sides by 2]

Q.5 Solve any ONE of the following

1)



Let A be the position of the aeroplane and AD be its height.

Let point B and point C represent Vashi bright and Worli sea-link respectively.

Through A draw line EF ∥ BC

∠EAB and ∠FAC are the angles of depression.

∠ABD = ∠EAB = 60°
∠ACD = ∠FAC = 30° ......[Alternate angles]

In right angled ΔADB,

Tan 60° = $\frac{AD}{BD}$

$\therefore \sqrt{3} = \frac{5500\sqrt{3}}{BD}$

$\therefore BD = \frac{5500\sqrt{3}}{\sqrt{3}}$

$\therefore BD = 5500$ m …….. (i)

In right angled ΔADC,

tan 30° = $\frac{AD}{CD}$

$\therefore \frac{1}{\sqrt{3}} = \frac{5500\sqrt{3}}{CD}$

$\therefore CD = 5500\sqrt{3} \times \sqrt{3}$

$\therefore CD = 5500 \times 3$

$\therefore CD = 16500$ m .... (ii)

$BC = BD + CD$ ....[B–D–C]

$\therefore BC = 5500 + 16500$ ....[From (i) and (ii)]

$\therefore BC = 22000$

$\therefore$ The distance between Vashi bridge and Worli sea-link is 22000 m.

2) i) Radius of spherical ball (r) = 3 cm

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

$= \frac{4}{3} \times \pi \times (3)^3 = \frac{4}{3} \times \pi \times 27 = 36\pi$

$\therefore$ Volume of 14 spheres $= 14 \times 36\pi = 504\ \pi$

ii) For cylindrical jar

radius (R) = 10 cm, height (H) = 15 cm

Volume of water in the jar $= \pi R^2 H$

$= \pi \times (10)^2 \times 15 = 1500\pi$

Total volume of water + Volume of 14 spheres

$= 1500\pi + 504\pi = 2004\pi$

iii) Let the new height of water be h

Volume of water in the cylinder when

Spherical balls are immersed $= 2004\pi$

$\therefore \pi r^2 h = 2004\pi$

$\therefore \ h = \frac{2004}{r^2} = \frac{2004}{(10)^2}$

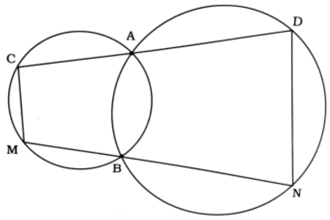
$\therefore \ h = \frac{2004}{100}$

$\therefore \ h = 20.04$ cm

∴ New level upto which water is filled in the jar is 20.04 cm.

Q.6 Solve any ONE of the following.

1) **To find:** m∠MCD + m∠CDN & to draw conclusion



m∠MCD + m∠CDN = 95° + 85° = 180°

∠MCD & ∠CDN are interior angles & these interior angles are supplementary

∴ Interior angles test

Line CM ∥ line DN.

2) **Given:** Diameter of base of right circular cylinder, d = 28 cm

∴ radius, r = $\frac{d}{2} = \frac{28}{2} = 14$ cm

Height of cylindrical bucket, h = 30 cm.

It is full of sand.

If the sand in the bucket is poured on a ground. A cone of height 14 cm is formed.

i.e. height of cone, H = 14 cm.

To find: Area of base of sand cone formed. Let R be radius of sand cone.

Volume of cylindrical shaped bucket = $\pi r^2 h$

$= \frac{22}{7} \times 14 \times 14 \times 30$

$= 22 \times 2 \times 14 \times 30$ ....(i)

Volume of sand cone = $\frac{1}{3} \pi R^2 H$

$= \frac{1}{3} \times \frac{22}{7} \times R^2 \times 14$

$= \frac{22 \times 2 \times R^2}{3}$

$= \frac{44R^2}{3}$ ....(ii)

When sand in bucket is poured on a ground, a cone is formed.

∴ Volume of cylindrical bucket = Volume of sand cone

$\therefore 22 \times 2 \times 14 \times 30 = \frac{44R^2}{3}$ ....(from (i) & (ii)

$\therefore \frac{22 \times 2 \times 14 \times 30 \times 3}{44} = R^2$

$\therefore \quad 14 \times 90 = R^2$

$\boxed{R^2 = 1260}$

Base of cone is cicular.

Area of base of sand cone = πR^2

$= \frac{22}{7} \times 1260$

$= 22 \times 180$

$= 3960$

∴ Area of base of sand cone = 3960 cm^2.