

**Mizoram Board  
Class IX  
Mathematics  
Sample Paper – 1 Solution**

**Time: 3 hrs**

**Total Marks: 80**

**Section A**

1. Correct answer: C  
 $n - 10$

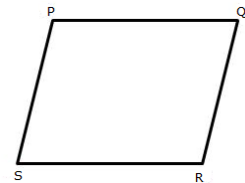
2. Correct answer: C  
 $p(x) = x^3 + 10x^2 + px$   
 $(x - 1)$  is the factor of  $p(x)$   
So  $p(1) = 0$   
 $1 + 10 + p = 0$   
 $P = -11$

3. Correct answer: B  
Two triangles will be congruent by SAS axiom if 2 sides and the included angle of one triangle are equal to the two sides and included angle of the other triangle. Thus, the triangles will be congruent when  $AC=DE$ .

4. Correct answer: C  
An inconsistent system of two linear equations in two variables will have no solution.

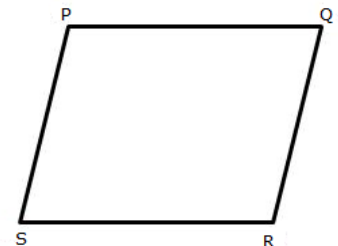
5. Correct answer: C  
Arranging the data in the ascending order: 35, 36, 39, 40, 41, 55, 61, 62, 65, 70, 71, 75  
Range = Maximum value - Minimum value =  $75 - 35 = 40$

6. Correct answer: B  
 $\angle R$  and  $\angle S$  are consecutive interior angles on the same side of the transversal SR.  
Therefore,  $m\angle R + m\angle S = 180^\circ$



7. Correct answer: C  
Arranging the data in the ascending order: 35, 36, 39, 40, 41, 55, 61, 62, 65, 70, 71, 75  
Range = Maximum value - Minimum value =  $75 - 35 = 40$

8. Correct answer: B  
 $\angle R$  and  $\angle S$  are consecutive interior angles on the same side of the transversal SR.  
Therefore,  $m\angle R + m\angle S = 180^\circ$



9. Correct answer: C

$$AE = \frac{1}{2} AB \Rightarrow AE = 8 \text{ cm}$$

$$CF = \frac{1}{2} CD \Rightarrow CF = 6 \text{ cm}$$

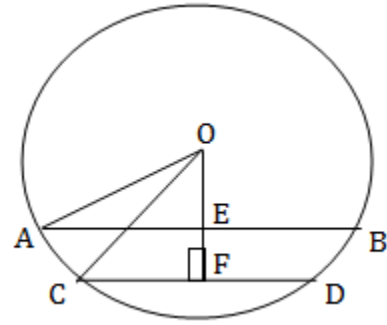
Let  $EF = x$ .

We have, Radius =  $OA = 10 \text{ cm}$

$$OE = \sqrt{(10)^2 - (8)^2} = \sqrt{100 - 64} = \sqrt{36} = 6 \text{ cm}$$

$$OF = \sqrt{(10)^2 - (6)^2} = \sqrt{100 - 36} = \sqrt{64} = 8 \text{ cm}$$

$$\Rightarrow x = OF - OE = 8 - 6 = 2 \text{ cm}$$



10. Correct answer: C

An inconsistent system of two linear equations in two variables will have no solution

11. Correct answer: B

Let,

$$a = \frac{5}{7} = 0.\overline{714285}$$

$$b = \frac{7}{9} = 0.\overline{7}$$

We observe that in the first decimal place 'a' has digit 7 and 'b' has digit 7. In the second decimal place 'a' has digit 1 and 'b' has digit 7. So, irrational between them is 0.750750075000...

12. Correct answer: B

The remainder theorem tells us that if a polynomial  $p(x)$  is divided by  $x - a$ , then the remainder is equal to  $p(a)$ .

So, here the remainder is

$$\begin{aligned} p(-2) &= 2(-2)^3 - (-2)^2 + (-2) - 1 \\ &= -16 - 4 - 2 - 1 \\ &= -23 \end{aligned}$$

13. Correct answer: A

The distance of a point from y- axis is the length of its x coordinate.

Here x coordinate is 2. Therefore, distance of a point (2, 3) from the y- axis is 2 units.

14. Correct answer: B

$$\text{Substitute } (x,y) \text{ as } (-1,5) \text{ in the linear equation } \frac{1}{2}x = \frac{3}{2}y - 8$$

$$\text{LHS} = -\frac{1}{2}$$

$$\text{RHS} = \frac{15}{2} - 8 = \frac{15-16}{2} = \frac{-1}{2}$$

Since L.H.S=R.H.S, so (-1,5) is the solution of

$$\frac{1}{2}x = \frac{3}{2}y - 8$$

**15.** Correct answer: B

Only two equilateral triangles can be formed on a given line segment one on the top and the other on the bottom.

**16.** Correct answer:D

Sum of complementary angles is  $90^\circ$ ,

Sum of supplementary angles is  $180^\circ$ .

Let the required angle be x

According to the question  $90^\circ - x = \frac{1}{3}(180^\circ - x)$ .  
Solving the equation for x to get  $x = 45^\circ$ .

**17.** Correct answer: C

A quadrilateral can be divided into two triangles. Sum of the angles of a triangle is  $180^\circ$  hence the sum of the angles of a quadrilateral is  $360^\circ$ .

**18.** Correct answer: A

Area of a parallelogram = base x height =  $4 \times 5 = 20 \text{ cm}^2$

**19.** Correct answer: A

If the sum of a pair of opposite angles of a quadrilateral is  $180^\circ$ , the quadrilateral is:

**20.** Correct answer: A

Required construction is not possible when difference of two sides is greater than the third side.

**21.** Correct answer: A

Perimeter of rhombus =  $4 \times \text{Side} = 32$

Side = 8

The cost of painting the square = Area of square X the rate of painting per  $\text{m}^2$ .  
=  $64 \times 5 = \text{Rs. } 320$

**22.** Correct answer: C

Class size is the difference between two successive class marks.

i.e.  $10 - 6 = 4$

**23.** Correct answer: B

$$\text{Number of pins landing point down} = 100 - 73 = 27$$

$$\text{Probability of pin landing point down} = \frac{27}{100} = 0.27$$

**24.** Correct answer: C

$$\text{Range} = \text{maximum value} - \text{minimum value}$$

$$\text{Thus, } 32 = \text{Maximum value} - 86$$

$$\text{Then, maximum value} = 32 + 86 = 118$$

### Section B

**25.**

$$\begin{aligned} & \left(\frac{81}{16}\right)^{-3/4} \times \left(\frac{25}{9}\right)^{-3/2} \\ &= \left[\left(\frac{3}{2}\right)^4\right]^{-3/4} \times \left[\left(\frac{5}{3}\right)^2\right]^{-3/2} \\ &= \left(\frac{3}{2}\right)^{-3} \times \left(\frac{5}{3}\right)^{-3} \\ &= \left(\frac{2}{3}\right)^3 \times \left(\frac{3}{5}\right)^3 \\ &= \frac{2^3}{3^3} \times \frac{3^3}{5^3} = \frac{2^3}{5^3} = \frac{8}{125} \end{aligned}$$

**26.**

$$\begin{aligned} & x^2 + \frac{1}{x^2} + 2 - 2x - \frac{2}{x} \\ &= \left(x^2 + \frac{1}{x^2} + 2\right) - 2\left(x + \frac{1}{x}\right) \\ &= \left(x + \frac{1}{x}\right)^2 - 2\left(x + \frac{1}{x}\right) \\ &= \left(x + \frac{1}{x}\right)\left(x + \frac{1}{x} - 2\right) \end{aligned}$$

**27.**

(A) Point of the form (a, 0) lie on the x axis.

The point  $(-4, 0)$  will lie on the negative side of the x axis.

(B)  $(-, +)$  are the sign of the coordinate of points in the II quadrant.

$\therefore$  The point  $(-10, 2)$  lies in the II quadrant.

(C) Point of the form  $(0, a)$  lie on the y axis.

So, the point  $(0, 8)$  will lie on the positive side of y axis.

(D)  $(+, +)$  are the sign of the coordinates of points in the I quadrant.

$\therefore$  The point  $(10, 4)$  lies in the I quadrant.

**28.**  $\triangle ACB$  and  $\triangle ACF$  lie on the same base AC and are between the same parallel lines AC and BF.

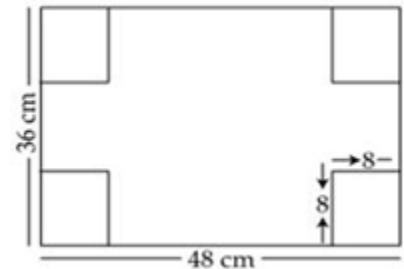
$\therefore \text{area}(\triangle ACB) = \text{area}(\triangle ACF)$

**29.** Length of the box =  $l = 48 - 8 - 8 = 32$  cm

Breadth of the box =  $b = 36 - 8 - 8 = 20$  cm

Height =  $h = 8$  cm

Volume of the box formed =  $l \times b \times h = 32 \times 20 \times 8 = 5120 \text{ cm}^3$



**30.**

$$\begin{aligned} & \frac{(25)^{\frac{3}{2}} \times (343)^{\frac{3}{5}}}{16^{\frac{5}{4}} \times 8^{\frac{4}{3}} \times 7^{\frac{3}{5}}} \\ &= \frac{(5^2)^{\frac{3}{2}} \times (7^3)^{\frac{3}{5}}}{(2^4)^{\frac{5}{4}} \times (2^3)^{\frac{4}{3}} \times 7^{\frac{3}{5}}} \\ &= \frac{5^3 \times 7^{\frac{9}{5}}}{2^5 \times 2^4 \times 7^{\frac{3}{5}}} \\ &= \frac{5^3 \times 7^{\frac{9}{5}}}{2^9 \times 7^{\frac{3}{5}}} \\ &= \frac{5^3 \times 7^{\frac{6}{5}}}{2^9} \end{aligned}$$

**31.** Let  $p(x) = x^3 + 13x^2 + 32x + 20$

$$p(-1) = -1 + 13 - 32 + 20 = -33 + 33 = 0$$

Therefore  $(x + 1)$  is a factor of  $p(x)$ .

On dividing  $p(x)$  by  $(x + 1)$  we get

$$p(x) \div (x + 1) = x^2 + 12x + 20$$

Thus,

$$x^3 + 13x^2 + 32x + 20 = (x + 1)(x^2 + 12x + 20)$$

$$= (x + 1)(x^2 + 10x + 2x + 20)$$

$$= (x + 1)[x(x + 10) + 2(x + 10)]$$

$$= (x + 1)(x + 2)(x + 10)$$

$$\text{Hence, } x^3 + 13x^2 + 32x + 20 = (x + 1)(x + 2)(x + 10).$$

**32.**

$$LM = MN \text{ \& Given}$$

$$\Rightarrow \angle MLN = \angle MNL \quad (\text{angles opposite equal sides are equal})$$

$$\Rightarrow \angle MLQ = \angle MNP$$

$$LP = QN \quad (\text{Given})$$

$$\Rightarrow LP + PQ = PQ + QN \quad (\text{adding PQ on both sides})$$

$$\Rightarrow LQ = PN$$

In  $\triangle LMQ$  and  $\triangle NMP$

$$LM = MN$$

$$\angle MLQ = \angle MNP$$

$$LQ = PN$$

$$\triangle LMQ \cong \triangle NMP \quad (\text{SAS congruence rule})$$

**33.**

When  $p(x) = ax^3 + 3x^2 - 3$  is divided by  $(x - 4)$ , the remainder is given by

$$R_1 = a(4)^3 + 3(4)^2 - 3 = 64a + 45$$

When  $q(x) = 2x^3 - 5x + a$  is divided by  $(x - 4)$ , the remainder is given by

$$R_2 = 2(4)^3 - 5(4) + a = 108 + a$$

$$\text{Given: } R_1 + R_2 = 0$$

$$\Rightarrow 65a + 153 = 0$$

$$\Rightarrow a = \frac{-153}{65}$$

By hit and trial we find  $x = 3$  is factor of given polynomial, as

$$2(3)^3 - 9 - 39 - 6 = 54 - 54 = 0$$

By dividing  $2x^3 - x^2 - 13x - 6$  by  $x - 3$  we get

$$2x^2 + 5x + 2 \text{ as quotient.}$$

Factorising this further

$$2x^2 + 5x + 2 = 2x^2 + 4x + x + 2 = 2x(x + 2) + 1(x + 2) = (2x + 1)(x + 2)$$

$$\text{So, } 2x^3 - x^2 - 13x - 6 = (2x + 1)(x + 2)(x - 3)$$

**34.**

In  $\triangle DCB$ ,  $\angle DBC = \angle DCB$  (given)

$DC = DB$  [Side opp. To equal  $\angle$ 's are equal].....(i)

In  $\triangle ABD$  and  $\triangle ACD$

$AB = AC$  (given)

$BD = CD$  [from (i) ]

AD = AD common  
 $\triangle ABD \cong \triangle ACD$  [SSS Rule]  
 $\angle BAD = \angle CAD$  (CPCT)  
 Hence, AD is bisector of  $\angle BAC$

**Section C**

**35.** Total number of outcomes =  $n(S) = 52$

(a) Let A be the event when the card drawn is a queen.

Total number of queen cards = 4

$$\therefore n(A) = 4$$

$$\therefore P(A) = \frac{n(A)}{n(S)} = \frac{4}{52} = \frac{1}{13}$$

(b) Let B be the event when the card drawn is a non-ace card.

Non-ace cards =  $52 - 4 = 48$

$$\therefore n(B) = 48$$

$$\therefore P(B) = \frac{n(B)}{n(S)} = \frac{48}{52} = \frac{12}{13}$$

(c) Let C be the event when the card drawn is a black card.

Number of black cards = 26

$$\therefore n(C) = 26$$

$$\therefore P(C) = \frac{n(C)}{n(S)} = \frac{26}{52} = \frac{1}{2}$$

**Or**

Total number of times the coins were tossed = 200

Number of times 2 heads come up = 72

$$P(2 \text{ heads will come up}) = \frac{\text{Number of times 2 heads come up}}{\text{Total number of times the coins were tossed}}$$

$$= \frac{72}{200}$$

$$= \frac{9}{25}$$

**36.** Let ABCD be a quadrilateral. P, Q, R, and S are the mid points of AB, BC, CD and DA respectively.

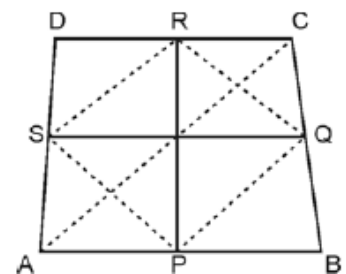
Join PQ, QR, RS and SP.

Join AC.

In  $\triangle DAC$ ,  $SR \parallel AC$

And  $SR = \frac{1}{2} AC$  (Mid-point theorem)

In  $\triangle BAC$ ,  $PQ \parallel AC$



And  $PQ = \frac{1}{2} AC$

Clearly,  $PQ \parallel SR$  and  $PQ = SR$

In quadrilateral PQRS, one pair of opposite sides is equal and parallel to each other and hence it is a parallelogram.

Now, PR and SQ are the diagonals of PQRS and hence PR and SQ bisect each other.

- 37.** Given: ABCD is a cyclic quadrilateral in which AC and BD are diagonals.  
 $m\angle DBC = 55^\circ$  and  $m\angle BAC = 45^\circ$

To find:  $m\angle BCD$

Proof:  $m\angle CAD = m\angle DBC = 55^\circ$  (Angles in the same segment)

Therefore,  $m\angle DAB = m\angle CAD + m\angle BAC$

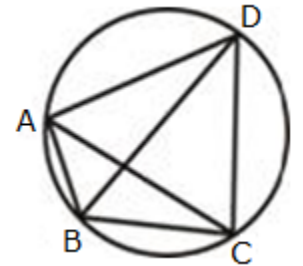
$$= 55^\circ + 45^\circ$$

$$= 100^\circ$$

However,  $m\angle DAB + m\angle BCD = 180^\circ$

( $\because$  opposite angles of a cyclic quadrilateral)

$$\text{So, } m\angle BCD = 180^\circ - 100^\circ = 80^\circ$$



- 38.** The roller is cylindrical in shape.

Height (h) of cylindrical roller = Length of roller = 120 cm

$$\text{Radius (r) of the circular end of roller} = \left(\frac{84}{2}\right) \text{ cm} = 42 \text{ cm}$$

$$\text{C.S.A. of roller} = 2\pi rh = 2 \times \frac{22}{7} \times 42 \times 120 = 31680 \text{ cm}^2$$

$$\text{Area of field} = 500 \times \text{C.S.A. of roller} = (500 \times 31680) \text{ cm}^2 = 15840000 \text{ cm}^2$$

$$\text{Area of field} = 1584 \text{ m}^2.$$

- 39.** Total observations in the given data set,  $n = 10$  (even)



$$\therefore \text{Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{ observation} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ observation}}{2}$$

$$\therefore 63 = \frac{\left(\frac{10}{2}\right)^{\text{th}} \text{ observation} + \left(\frac{10}{2} + 1\right)^{\text{th}} \text{ observation}}{2}$$

$$\therefore 63 = \frac{5^{\text{th}} \text{ observation} + 6^{\text{th}} \text{ observation}}{2}$$

$$\therefore 63 = \frac{(x) + (x + 2)}{2}$$

$$\therefore 63 = \frac{2x + 2}{2}$$

$$\therefore 63 = x + 1$$

$$\therefore x = 62$$

**Or**

According to the given condition,

$$x + y = 100 \quad \dots(i)$$

Now, put the value  $x = 0$  in equation (i).

$$0 + y = 100 \Rightarrow y = 100.$$

The solution is (0, 100)

Putting the value  $x = 50$  in equation (i)

We get,

$$50 + y = 100 \Rightarrow y = 100 - 50 \Rightarrow y = 50.$$

The solution is (50, 50).

Put the value  $x = 100$  in equation (i).

$$100 + y = 100,$$

$$y = 100 - 100 \Rightarrow y = 0.$$

The solution is (100, 0).

x	0	50	100
y	100	50	0

Now, plot the points (0, 100), (50, 50), (100, 0) and draw lines passing through the points.



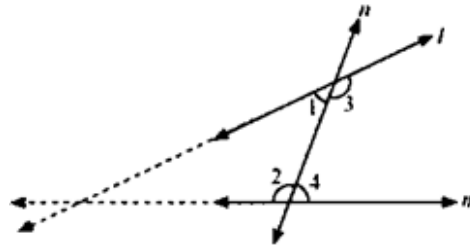
40.

$$\begin{aligned} \frac{1}{3-\sqrt{8}} &= \frac{1}{3-\sqrt{8}} \times \frac{3+\sqrt{8}}{3+\sqrt{8}} = \frac{3+\sqrt{8}}{9-8} = 3+\sqrt{8} \\ \frac{1}{\sqrt{8}-\sqrt{7}} &= \frac{1}{\sqrt{8}-\sqrt{7}} \times \frac{\sqrt{8}+\sqrt{7}}{\sqrt{8}+\sqrt{7}} = \frac{\sqrt{8}+\sqrt{7}}{8-7} = \sqrt{8}+\sqrt{7} \\ \frac{1}{\sqrt{7}-\sqrt{6}} &= \frac{1}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}} = \frac{\sqrt{7}+\sqrt{6}}{7-6} = \sqrt{7}+\sqrt{6} \\ \frac{1}{\sqrt{6}-\sqrt{5}} &= \frac{1}{\sqrt{6}-\sqrt{5}} \times \frac{\sqrt{6}+\sqrt{5}}{\sqrt{6}+\sqrt{5}} = \frac{\sqrt{6}+\sqrt{5}}{6-5} = \sqrt{6}+\sqrt{5} \\ \frac{1}{\sqrt{5}-2} &= \frac{1}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2} = \frac{\sqrt{5}+2}{5-4} = \sqrt{5}+2 \\ \frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2} \\ &= 3+\sqrt{8} - (\sqrt{8}+\sqrt{7}) + (\sqrt{7}+\sqrt{6}) - (\sqrt{6}-\sqrt{5}) + (\sqrt{5}+2) \\ &= 5 \end{aligned}$$

41. Euclid's 5<sup>th</sup> postulate states that:

If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than two right angles.

This implies that if  $n$  intersects lines  $l$  and  $m$  and if  $\angle 1 + \angle 2 < 180^\circ$ , then  $\angle 3 + \angle 4 > 180^\circ$ . In that case, producing line  $l$  and further will meet in the side of  $\angle 1$  and  $\angle 2$  which is less than  $180^\circ$



If  $\angle 1 + \angle 2 < 180^\circ$ , then  $\angle 3 + \angle 4 > 180^\circ$

In that case, the lines  $l$  and  $m$  neither meet at the side of  $\angle 1$  and  $\angle 2$  nor at the side of  $\angle 3$  and  $\angle 4$  implying that the lines  $l$  and  $m$  will never intersect each other. Therefore, the lines are parallel.

**Section D**

**42.**

Consider 
$$\frac{(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3}{(a - b)^3 + (b - c)^3 + (c - a)^3}$$

We know that,

If  $x + y + z = 0$  then  $x^3 + y^3 + z^3 = 3xyz$

Now,  $a^2 - b^2 + b^2 - c^2 - a^2 = 0$

And,  $a - b + b - c + c - a = 0$

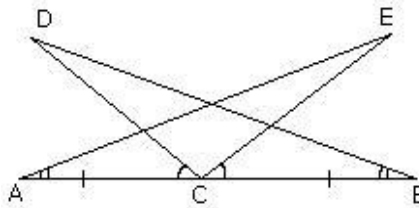
$$\therefore \frac{(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3}{(a - b)^3 + (b - c)^3 + (c - a)^3}$$

$$= \frac{3(a^2 - b^2)(b^2 - c^2)(c^2 - a^2)}{3(a - b)(b - c)(c - a)}$$

$$= \frac{3(a - b)(a + b)(b - c)(b + c)(c - a)(c + a)}{3(a - b)(b - c)(c - a)}$$

$$= (a + b)(b + c)(c + a)$$

**43.**



Given that  $\angle DCA = \angle ECB$

$$\Rightarrow \angle DCA + \angle ECD = \angle ECB + \angle ECD$$

$$\Rightarrow \angle ECA = \angle DCB \dots\dots(i)$$

Now in  $\triangle DBC$  and  $\triangle EAC$

$$\angle DCB = \angle ECA \text{ [from (i)]}$$

$$BC = AC \text{ (Given)}$$

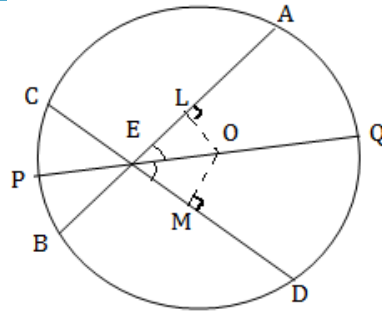
$$\angle DBC = \angle EAC \quad \text{(Given)}$$

$\triangle DBC \cong \triangle EAC$  (ASA Congruence)

Therefore,  $BD = AE$  (CPCT)

**Or**

Given that  $AB$  and  $CD$  are two chords of a circle with centre  $O$ , intersecting at a point  $E$ .  $PQ$  is the diameter through  $E$ , such that  $\angle AEQ = \angle DEQ$ .



To prove that  $AB = CD$ .

Draw perpendiculars  $OL$  and  $OM$  on chords  $AB$  and  $CD$  respectively.

Now,  $m\angle LOE = 180^\circ - 90^\circ - m\angle LEO$  ... [Angle sum property of a triangle]

$$= 90^\circ - m\angle LEO$$

$$\Rightarrow m\angle LOE = 90^\circ - m\angle AEO$$

$$\Rightarrow m\angle LOE = 90^\circ - m\angle DEO$$

$$\Rightarrow m\angle LOE = 90^\circ - m\angle MEO$$

$$\Rightarrow \angle LOE = \angle MOE$$

In  $\triangle OLE$  and  $\triangle OME$ ,

$$\angle LEO = \angle MEO$$

$$\angle LOE = \angle MOE$$

$$EO = EO$$

$$\triangle OLE \cong \triangle OME$$

$$OL = OM$$

Therefore, chords  $AB$  and  $CD$  are equidistant from the centre.

Hence  $AB = CD$

**44.** Let the radius of the cylinder be 'r' cm.

$$\therefore \text{Volume of cylinder} = \pi r^2 h = \frac{22}{7} \times r^2 \times 28$$

$$\therefore 6358 = 88r^2$$

$$\therefore r^2 = \frac{6358}{88} = \frac{289}{4}$$

$$\therefore r = \frac{17}{2} \text{ cm} = 8.5 \text{ cm}$$

$$\text{Curved surface area of cylinder} = 2\pi rh = 2 \times \frac{22}{7} \times \frac{17}{2} \times 28 = 1496 \text{ cm}^2.$$

Thus, the radius of the cylinder is 8.5 cm and its curved surface area is 1796  $\text{cm}^2$ .

**Or**

Edge of the cubical tank = 1.5 m = 150 cm

Surface area of the tank =  $5 \times 150 \times 150 \text{ cm}^2$

Area of each square tile = side  $\times$  side =  $25 \times 25 \text{ cm}^2$

$\therefore$  Number of tiles required =  $\frac{\text{Surface area of the tank}}{\text{area of each tile}} = \frac{5 \times 150 \times 150}{25 \times 25} = 180$

Cost of 1 dozen tiles, i.e. cost of 12 tiles = Rs. 360

Cost of one tile = Rs.  $\frac{360}{12} = \text{Rs. } 30$

Thus, the cost of 180 tiles =  $180 \times 30 = \text{Rs. } 5400$