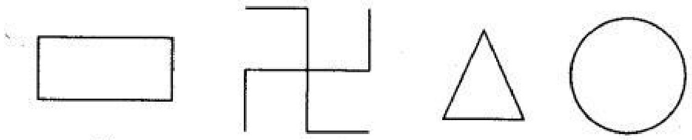
Unit 9 (Symmetry & Practical Geometry)

Multiple Choice Questions (MCQs)

Question 1:

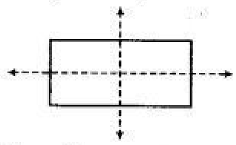
In the following figures, the figure that is not symmetric with respect to any line is



(i) (ii) (iii) (iv)

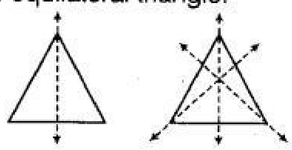
Solution:

(i) Rectangle has two lines of symmetry.

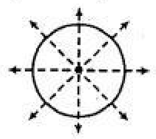


(ii) 卍, This figure has no line of symmetry.

(iii) Triangle has one line of symmetry in case of isosceles triangle and three lines of symmetry in case of equilateral triangle.



(iv) Circle has infinite lines of symmetry.



Question 2:

The number of lines of symmetry in a scalene triangle is

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3

Solution:

(a) Since, scalene triangle has no lines of symmetry.

Question 3:

The number of lines of symmetry in a circle is

(a) 0 **(b)** 2 **(c)** 4 **(d)** More than 4

Solution:

(d) Since, a circle has infinite number of lines of symmetry all along the diameters.

Question 4:

Which of the following letters does not have vertical line of symmetry?

(a) M **(b)** H **(c)** E **(d)** V

Solution:

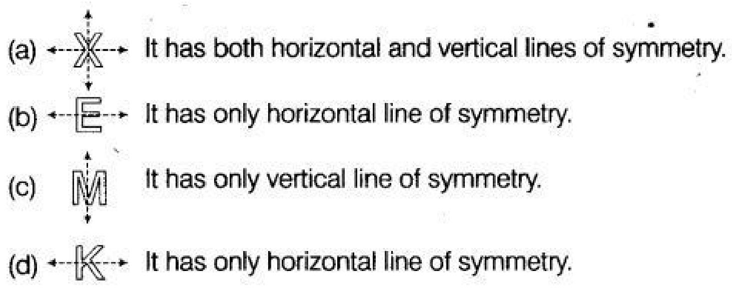
(c) Since, the letter E has horizontal line of symmetry.

Question 5:

Which of the following letter have both horizontal and vertical lines of symmetry?

(a) X **(b)** E **(c)** M **(d)** K

Solution:



Question 6:

Which of the following letters does not have any line of symmetry?

(a) M **(b)** S **(c)** K **(d)** H

Solution:

(b) Since, the letter S has no line of symmetry.

Question 7:

Which of the following letters has only one line of symmetry?

(a) H **(b)** X **(c)** Z **(d)** T

Solution:

(d) Since, the letter T has only one line of symmetry.

Question 8:

The instrument to measure an angle is a

(a) ruler **(b)** protractor **(c)** divider **(d)** compass

Solution:

(b) Protractor is used to measure an angle.

Question 9:

The instrument to draw a circle is

(a) ruler **(b)** protractor **(c)** divider **(d)** compass

Solution:

(d) Compass is used to draw a circle.

Question 10:

Number of set squares in the geometry box is

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3

Solution:

(c) A geometry box has two set squares.

Question 11:

The number of lines of symmetry in a ruler is

(a) 0 **(b)**1 **(c)** 2 **(d)** 4

Solution:

(c) Since, a ruler is generally rectangular in shape. Therefore, it has two lines of symmetry.

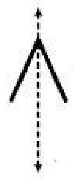
Question 12:

The number of lines of symmetry in a divider is

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3

Solution:

(b) Since, a divider has one line of symmetry.



Divider

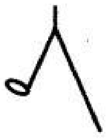
Question 13:

The number of lines of symmetry in a compass is

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3

Solution:

(a) Since, a compass has no line of symmetry.



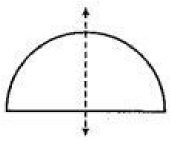
Question 14:

The number of lines of symmetry in a protractor is

(a) 0 **(b)** 1 **(c)** 2 **(d)** More than 2

Solution:

(b) Since, a protractor has a shape of semi-circle and a semi-circle has one line of symmetry.



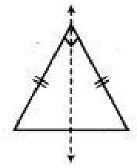
Question 15:

The number of lines of symmetry in a 45°- 45°- 90° set square is

(a) 0 **(b)** 1 **(c)** 2 **(d)** 3

Solution:

(b) Since, a 45°- 45°- 90° set square has a shape of isosceles triangle and
an isosceles triangle has one line of symmetry.



Note: In the given set square two angles are same, it means two sides will be same. So, the shape of set square is an isosceles triangle.

Question 16:
The number of lines of symmetry in a 30°- 60°- 90° set square is
(a) 0 **(b)** 1 **(c)** 2 **(d)** 3
Solution:
(a) Since, a 30°- 60°- 90° set square has a shape of scalene triangle and a scalene triangle has no line of symmetry.
Note In the given set square all three angles are different, it means all sides will be differ. So, the shape of set square is a scalene triangle.

Question 17:
The instrument in the geometry box having shape of a triangle is called a
(a) protractor **(b)** compass **(c)** divider **(d)** set square
Solution:
(d) On observing the instruments in the geometry box, we find that a set square has a shape of a triangle.

Fill in the Blanks

In questions 18 to 42, fill in the blanks to make the statements true.

Question 18:
The distance of the image of a point (or an object) from the line of symmetry (mirror) is …………….. as that of the point (object) from the line (mirror).
Solution:
Same
The distance of the image of a point from the line of symmetry is same as that of the point from the line.

Question 19:
The number of lines of symmetry in a picture of Taj Mahal is ………….
Solution:
One
The number of line of symmetry in a picture of Taj Mahal is one.

Question 20:
The number of lines of symmetry in a rectangle and a rhombus are ………………. (equal/unequal).
Solution:
Equal
Both rectangle and rhombus have two lines of symmetry.

Question 21:
The number of lines of symmetry in a rectangle and a square are …………… (equal/unequal).

Solution:

Unequal

Since, rectangle has two lines of symmetry, whereas square has four lines of symmetry.

Question 22:

If a line segment of length 5 cm is reflected in a line of symmetry (mirror), then its reflection (image) is a ……….of length …………

Solution:

Line segment, 5 cm

Because its reflection is a line segment of length 5 cm.

Question 23:

If an angle of measure 80° is reflected in a line of symmetry, then the reflection is an of measure ……………

Solution:

Angle, 80°

The reflection is an angle of measure 80°.

Question 24:

The image of a point lying on line l with respect to the line of symmetry l lies on …………

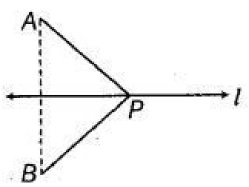
Solution:

Line l

The image of a point lying on line l with respect to the line of symmetry l lies on line l.

Question 25:

In figure, if B is the image of the point A with respect to the line l and P is any point lying on l, then the lengths of the line segments PA and PB are ……………



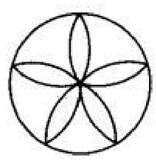
Solution:

Equal

Since, B is the image of points, then PA must be equal to PB.

Question 26:

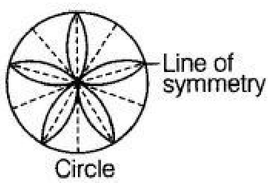
The number of lines of symmetry in given figure is ……………



Solution:

5

In the given figure of circle, we can draw 5 lines of symmetry to bisect the figure in equal parts. Hence, the lines of symmetry of given circle is 5.



Question 27:

The common properties in the two set squares of a geometry box are that they have …………….. angle they are of the shape of a ………………

Solution:

Right, Triangle

Two set squares of a geometry box have a right angle and they are of the shape of a triangle.

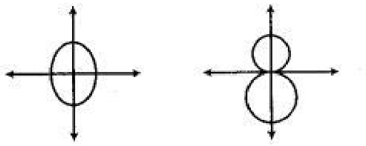
Question 28:

The digits having only two lines of symmetry are …………. and …………..

Solution:

0,8

Since, zero and eight both have two lines of symmetry.



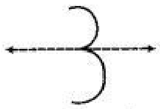
Question 29:

The digit having only one line of symmetry is ……………

Solution:

3

The digit 3 has only one line of symmetry.



Question 30:

The number of digits having no line of symmetry is …………..

Solution:

7

Since, digit 1, 2, 4, 5, 6, 7 and 9 have no lines of symmetry.

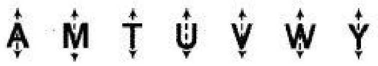
Question 31:

The number of capital letters of the English alphabets having only vertical line of symmetry is ……………

Solution:

7

Since, alphabets A, M, T, U, V, W, and Y have only vertical line of symmetry.



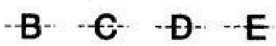
Question 32:

The number of capital letters of the English alphabets having only horizontal line of symmetry is ……………

Solution:

4

Since, alphabets B, C, D and E have only horizontal line of symmetry.



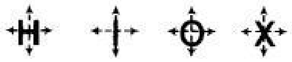
Question 33:

The number of capital letters of the English alphabets having both horizontal and vertical lines of symmetry is …………..

Solution:

4

Since, alphabets H, I O and X have both horizontal and vertical lines of symmetry.



Question 34:

The number of capital letters of the English alphabets having no line of symmetry is ………………..

Solution:

10

Alphabets F, G, J, L, N, R Q, R, S and Z have no line of symmetry.

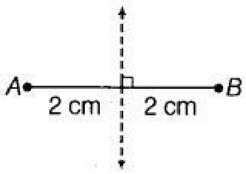
Question 35:

The line of symmetry of a line segment is the …………… bisector of the line segment.

Solution:

Perpendicular

Since, a perpendicular bisector divides a line segment into two equal and identical parts.



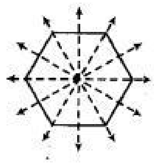
Question 36:

The number of lines of symmetry in a regular hexagon is …………….

Solution:

6

Since, all sides of regular hexagon are equal and each of its angles measures 120°. Therefore, it has six lines of symmetry, three along the lines joining the mid-points of opposite sides and three along the diagonals.



Question 37:

The number of lines of symmetry in a regular polygon of n sides is ………………..

Solution:

n

Since, a regular polygon has as many lines of symmetry as the number of its sides.

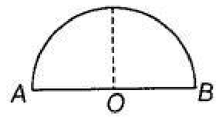
Question 38:

A protractor has …………….. line/lines of symmetry.

Solution:

One line

Since, a protractor has a shape of a semi-circle and a semi-circle has only one line of symmetry.



Question 39:

A 30°- 60°- 90° set square has ………………… line/lines of symmetry.

Solution:

No line

Since, a 30°- 60°- 90° set square has a shape of scalene triangle and a scalene triangle have no line of symmetry because all its sides and angles are of different measures.

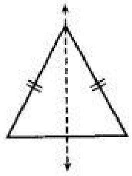
Question 40:

A 45°- 45°- 90° set square has ……………. line/lines of symmetry.

Solution:

One line

Since, a 45°- 45°- 90° set square has a shape of isosceles triangle and an isosceles triangle has one line of symmetry.



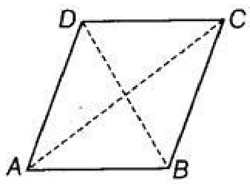
Question 41:

A rhombus is symmetrical about ……………..

Solution:

Diagonals

A rhombus has two lines of symmetry along its diagonals.



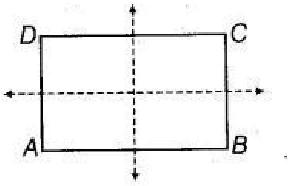
Question 42:

A rectangle is symmetrical about the lines joining the …………… of the opposite sides.

Solution:

Mid-points

A rectangle has two lines of symmetry along the line segments joining the mid-points of the opposite sides.



True/False

In questions 43 to 61, state whether the statements are True or False.

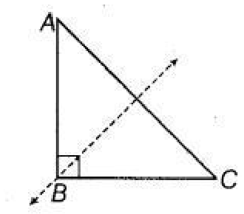
Question 43:

A right angled triangle can have atmost one line of symmetry.

Solution:

True

A right-angled triangle can have one line of symmetry, if it is an isosceles triangle.



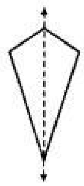
Question 44:

A kite has two lines of symmetry.

Solution:

False

Because a kite has one line of symmetry, i.e.



Question 45:

A parallelogram has no line of symmetry.

Solution:

True

Parallelogram has no line of symmetry.

Question 46:

If an isosceles triangle has more than one line of symmetry, then it need not be an equilateral triangle.

Solution:

False

Since, if an isosceles triangle has more than one line of symmetry, then it must be an equilateral triangle. –

Question 47:

If a rectangle has more than two lines of symmetry, then it must be a square.

Solution:

True

Because a square has four lines of symmetry.

Question 48:

With ruler and compass, we can bisect any given line segment.

Solution:

True

We can bisect any given line segment, using ruler and compass.

Question 49:

Only one perpendicular bisector can be drawn to a given line segment.

Solution:

True

A line segment has only one perpendicular bisector.

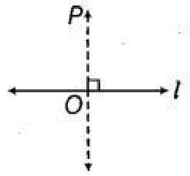
Question 50:

Two perpendiculars can be drawn to a given line from a point not lying on it.

Solution:

False

We can draw only one perpendicular from a point, not lying on the line.



Question 51:

With a given centre and a given radius, only one circle can be drawn.

Solution:

True

With a given radius and a centre, only one circle can be drawn.

Question 52:

Using only the two set squares of the geometry box, an angle of 40° can be drawn.

Solution:

False

An angle of 40° cannot be drawn by two set squares of the geometry box.

Question 53:

Using only the two set squares of the geometry box, and angle of 15° can be drawn.

Solution:

True

An angle of 15° can be drawn using only the two set squares.

Question 54:

If an isosceles triangle has more than one line of symmetry, then it must be an equilateral triangle.

Solution:

True

Because an equilateral triangle has three lines of symmetry.

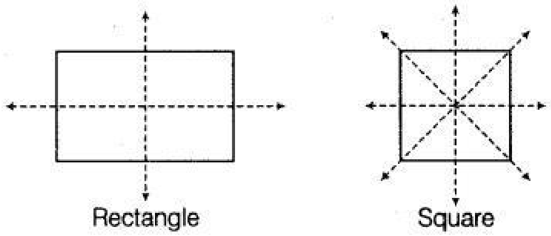
Question 55:

A square and a rectangle have the same number of lines of symmetry.

Solution:

False

We know that, rectangle has two lines of symmetry but square has four lines of symmetry.



Question 56:

A circle has only 16 lines of symmetry.

Solution:

False

A circle has infinite number of lines of symmetry all along the diameters.

Question 57:

A 45°- 45°- 90° set square and a protractor have the same number of lines of symmetry.

Solution:

True

Both have one line of symmetry.

Question 58:

It is possible to draw two bisectors of a given angle.

Solution:

False

We can draw only one bisector of a given angle.

Question 59:

A regular octagon has 10 lines of symmetry.

Solution:

False

Since, a regular polygon has as many lines of symmetry as the number of its sides.

Therefore, a regular octagon has 8 lines of symmetry.

Question 60:

Infinitely many perpendiculars can be drawn to a given ray.

Solution:

True

Since, a ray has infinite length, therefore infinitely many perpendiculars can be drawn to it.

Question 61:

Infinitely many perpendicular bisectors can be drawn to a given ray.

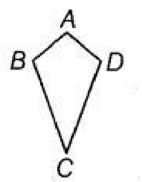
Solution:

True

A ray has infinite length and hence, it can be considered that perpendicular line to the given ray divide the ray into two equal halves (parts).

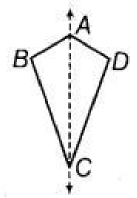
Question 62:

Is there any line of symmetry in the figure? If yes, draw all the lines of symmetry.



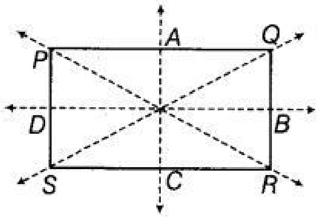
Solution:

Yes, there is one line of symmetry.



Question 63:

In figure, PQRS is a rectangle. State the lines of symmetry of the rectangle.



Solution:

As we know that, a rectangle has two lines of symmetry along the line segments joining the mid-points of the opposite sides.

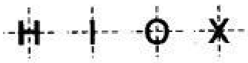
So, in the given rectangle, lines AC and BD are the lines of symmetry.

Question 64:

Write all the capital letters of the English alphabets which have more than one line of symmetry.

Solution:

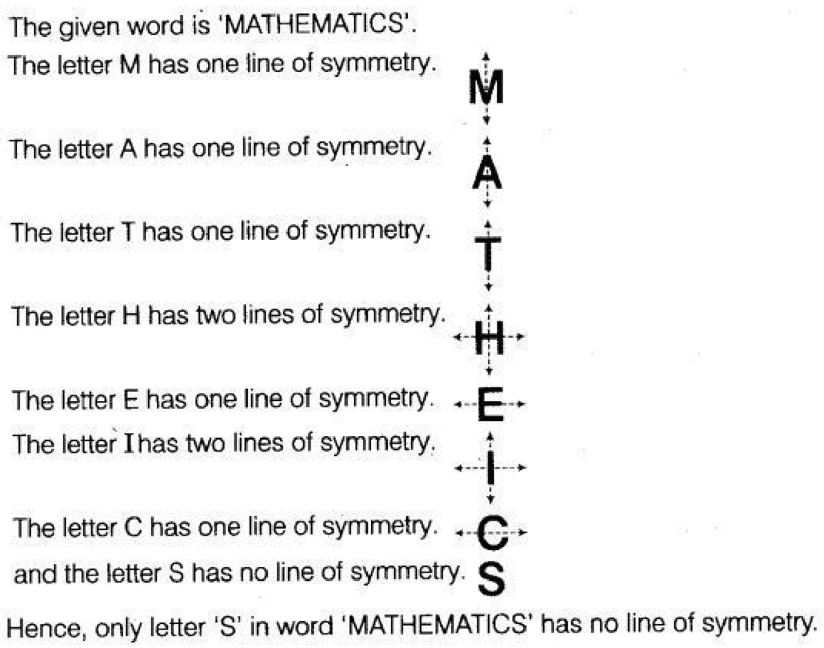
The capital letters H,I,O and X have more than one line of symmetry.



Question 65:

Write the letters of word ‘MATHEMATICS’ which have no line of symmetry.

Solution:


The given word is 'MATHEMATICS'.

The letter M has one line of symmetry.

The letter A has one line of symmetry.

The letter T has one line of symmetry.

The letter H has two lines of symmetry.

The letter E has one line of symmetry.

The letter I has two lines of symmetry.

The letter C has one line of symmetry.

and the letter S has no line of symmetry.

Hence, only letter 'S' in word 'MATHEMATICS' has no line of symmetry.

Question 66:

Write the number of lines of symmetry in each letter of word ‘SYMMETRY’.

Solution:

The given word is 'SYMMETRY'.

The letter S has no line of symmetry. **S**

The letter Y has one line of symmetry. **Y** l

The letter M has one line of symmetry. **M** l

The letter E has one line of symmetry. **E** l

The letter T has one line of symmetry. **T** l

The letter R has no line of symmetry. **R**

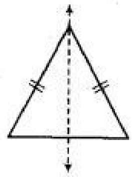
Question 67:

Match the following:

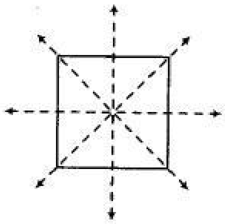
	Shape		Number of lines of symmetry
(i)	Isosceles triangle	(a)	6
(ii)	Square	(b)	5
(iii)	Kite	(c)	4
(iv)	Equilateral triangle	(d)	3
(v)	Rectangle	(e)	2
(vi)	Regular hexagon	(f)	1
(vii)	Scalene triangle	(g)	0

Solution:

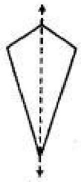
(i) An isosceles triangle has 1 line of symmetry.



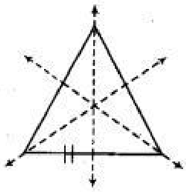
(ii) A square has 4 lines of symmetry.



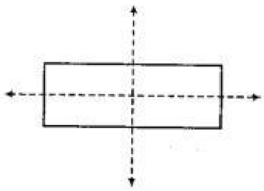
(iii) A kite has 1 line of symmetry.



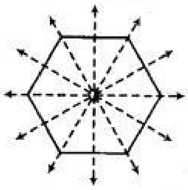
(iv) An equilateral triangle has 3 lines of symmetry.



(v) A rectangle has 2 lines of symmetry.



(vi) A regular hexagon has 6 lines of symmetry.



(vii) A scalene triangle has no line of symmetry, i.e. 0

$\therefore$ (i) $\rightarrow$ f, (ii) $\rightarrow$ c, (iii) $\rightarrow$ f, (iv) $\rightarrow$ d, (v) $\rightarrow$ e, (vi) $\rightarrow$ a, (vii) $\rightarrow$ g

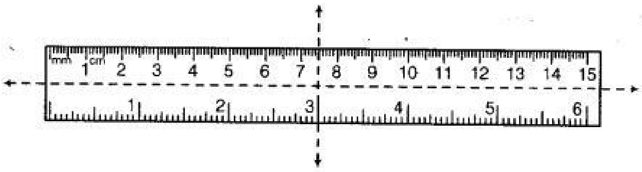
Question 68:

Open your geometry box. There are some drawing tools. Observe them and complete the following table.

	Name of the tool	Number of lines of symmetry
(i)	The Ruler	___
(ii)	The Divider	___
(iii)	The Compass	___
(iv)	The Protractor	___
(v)	Triangular piece with two equal sides	___
(vi)	Triangular piece with unequal sides	___

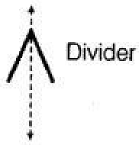
Solution:

(i) **Ruler**



It has two lines of symmetry.

(ii) **Divider**

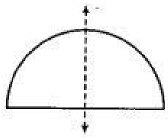


It has one line of symmetry.

(iii) **Compass**

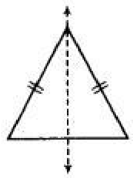
Since, both the sides of a compass are not identical. Therefore, it has no line of symmetry.

(iv) **Protractor**



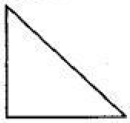
Since, a protractor has a shape of semi-circle and a semi-circle has only one line of symmetry.

(v) **Triangular piece with two equal sides**



It has one line of symmetry.

(vi) **Triangular piece with unequal sides**

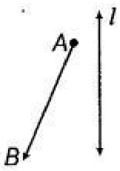


Since, all the sides are unequal. Therefore, it has no line of symmetry.

	Name of the tool	Number of lines of symmetry
(i)	The Ruler	2
(ii)	The Divider	1
(iii)	The Compass	0
(iv)	The Protractor	1
(v)	Triangular piece with two equal sides	1
(vi)	Triangular piece with unequal sides	0

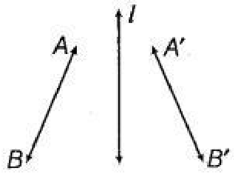
Question 69:

Draw the images of points A and B in line l of figure and name them as A' and B', respectively. Measure AB and A'B'. Are they equal?



Solution:

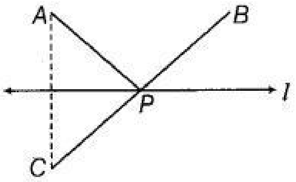
Image of line segment AB is A'B' as shown below in figure.



Now, it is clear that the length of line segment AB is equal to length of a line segment A'B'.

Question 70:

In figure, the point C is the image of point A in line l and line segment BC intersects the line l at P.



(a) Is the image of P in line l the point P itself?

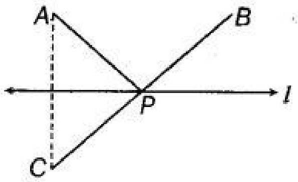
(b) Is PA = PC?

(c) Is PA+PB=PC+PB?

(d) Is P that point on line l from which the sum of the distances of points A and B is minimum?

Solution:

Given, in figure, the image of the point A is C, in the line l.



(a) Yes, the image of P in line l is the point itself.

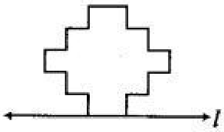
(b) Yes, PA=PC

(c) Yes, PA+PB=PC + PB because the distance, PA=PC

(d) Yes, from the point P in the line l, the sum of the distances of points A and B is minimum.

Question 71:

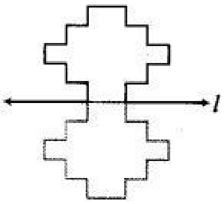
Complete the figure, so that line l becomes the line of symmetry of the whole figure.



Solution:

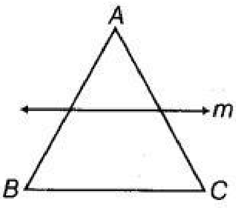
As we know that, a line of symmetry divides a figure into two parts, such that when the figure is folded about the line, the two parts of the figure coincide.

The complete figure is shown below



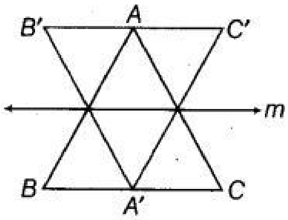
Question 72:

Draw the images of the points A, B and C in the line m (figure). Name them as A',B' and C respectively and join them in pair. Measure AB, BC, CA, A'B', B'C' and C'A'. Is AB = A'B', BC=B'C' and CA = C'A'



Solution:

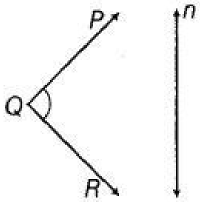
The images of the points A, B and C in the line m are A',B' and C' respectively as shown below



It is clear that, AB=A'B', BC=B'C' and CA=C'A'.

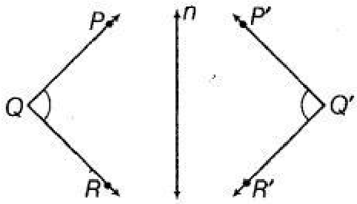
Question 73:

Draw the images P', Q' and R' of the points P, Q and R respectively in the line n. Join P'Q' and Q' R' to form an angle P'Q'R'. Measure ∠PQR and ∠P'Q'R'. Are the two angles equal?



Solution:

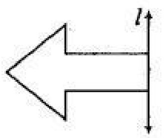
The images of the points P, Q and R in the line n are P', Q' and R', respectively.



It is clear that, ∠PQR=∠P'Q'R'

Question 74:

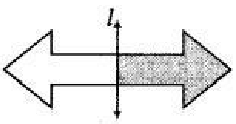
Complete the figure by taking l as the line of symmetry of the whole figure.



Solution:

As we know that, a line of symmetry divides a figure into two parts, such that when the figure is folded about the line, the two parts of the figure coincide.

∴ The complete figure is as shown below



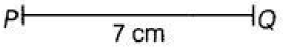
Question 75:

Draw a line segment of length 7 cm. Draw its perpendicular bisector, using ruler and compass.

Solution:

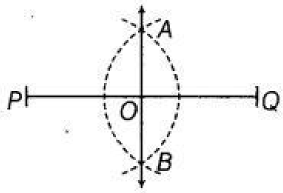
Steps of construction are as follows:

Step I Draw a line segment, PQ=7 cm



Step II With P as centre and a convenient radius (more than ½ PQ), draw arc.

Step III With Q as centre and same radius, draw another arc, such that it intersects the previous arc at A and B.



Step IV Join A and B.

Thus, AB is perpendicular bisector of PQ i.e. OP=OQ=3.5 cm

Question 76:

Draw a line segment of length 6.5 cm and divide it into four equal parts, using ruler and compass.

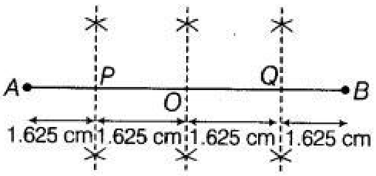
Solution:

First of all, we construct AB of length 6.5 cm.

Now, steps of construction are as follows:

Step I Draw a line segment AB = 6.5 cm

Step II Draw perpendicular bisector of AB, which meets AB at O (∴ O is the mid-point of AB), i.e. AO = OB.



Step III Now, draw perpendicular bisector of AO which meet AB at P, such that AP=PO

Step IV Then, draw perpendicular bisector of BO which meet AB at Q, such that BQ=OQ

Step V The line segment AB is divided into 4 equal parts at P O and Q.

Step VI By actual measurement,we have AP=PO=OQ=QB=1.625 cm.

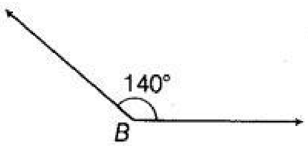
Question 77:

Draw an angle of 140° with the help of a protractor and bisect it using ruler and compass.

Solution:

Step of construction are as follows:

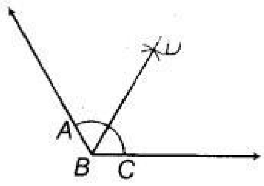
Step I Draw an angle ∠B=140°.



Step II With 6 as a centre and using compass, draw an arc which cuts both rays of ∠B, at A and C.

Step III With A as centre, draw (in the interior of ∠B) an arc, whose radius is more than half the length AC.

Step IV With C as centre the same radius and draw another arc, in the interior of ∠B. Let the two arcs intersect at D. Then, BD is the required bisector of ∠B.

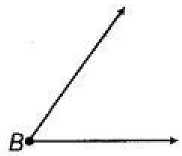


Question 78:

Draw an angle of 65° and draw an angle equal to this angle, using ruler and compass.

Solution:

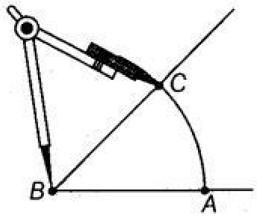
Given, $\angle B = 65°$



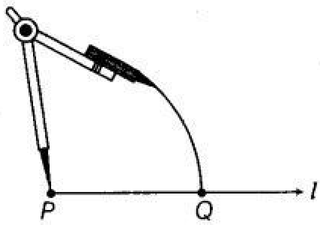
Step of construction are as follows:

Step I Draw a line l and choose a point P on it.

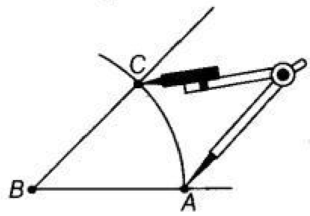
Step II Place the compass at B and draw an arc to cut the rays of $\angle B$ at A and C.



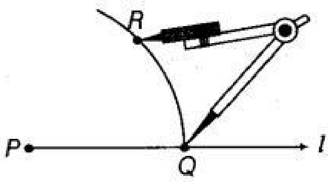
Step III Use the same compass setting to draw an arc with P as centre, cutting l at Q.



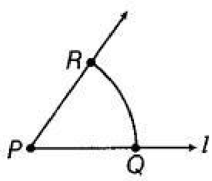
Step IV Set your compass to the length AC.



Step V Place the compass pointer at Q and draw the arc to cut the previous arc in R.



Step VI Join PR. This gives us $\angle P$. It has the same measure as $\angle B$.



This means $\angle QPR$ has same measure as $\angle ABC$.

Question 79:

Draw an angle of 80° using a protractor and divide it into four equal parts, using ruler and compass. Check your construction by measurement.

Solution:

Here, to divide an angle of measure 80° into four equal parts, we use the following steps of construction:

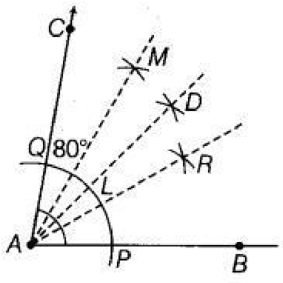
Step I Draw a line segment AB of any length. Place the centre of the protractor at A and the zero edge along AB.

Step II Start with zero near B and mark C at 80°.

Step III Join AC, then ∠BAC is an angle of measure 80°.

Step IV With A as centre and using compass, draw an arc that cuts both the rays of ∠A at P and Q.

Step V With P as centre, draw (in the interior of ∠A) an arc, whose radius is more than half the length of PQ.



Step VI With Q as centre and the same radius, draw another arc in the interior of A A. Let the two arcs intersect at D. Join AD, cutting arc PQ at L. Then, AD divides the ∠BCA into two equal parts.

Step VII Now, taking P and L as centre, having radius more than half of length PL, draw two arcs respectively, which cut each other at R.

Step VIII Join AR, which divides ∠BAD into two equal parts.

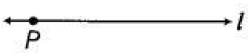
Step IX Now, taking Q and L as centre, having radius more than half of length QL, draw two arcs respectively, which cut each other at M.

Step X Join AM, which divide ∠CAD into two equal parts.

Thus, AM, AD and AR divide ∠BAC into four equal parts.

Question 80:

Copy figure on your notebook and draw a perpendicular to l through P, using (i) set squares (ii) protractor (iii) ruler and compass. How many such perpendiculars are you able to draw?



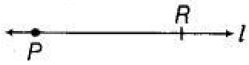
Solution:

We draw perpendicular to l through P, using

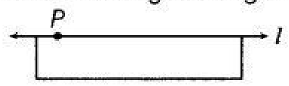
(i) Set square

Steps of construction are as follows:

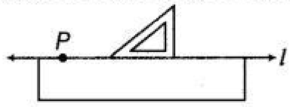
Step I A line l and a point P are given. Note that P is on the line l.



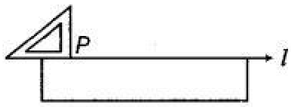
Step II Place a ruler with one of its edges along l. Hold it firmly.



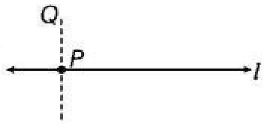
Step III Place a set square with one of its edges along the already aligned edge of the ruler, such that the right angled corner is in contact with the ruler.



Step IV Slide the set square along the edge of ruler until its right angled corner coincides with P.



Step V Hold the set square firmly in this position. Draw $\overline{PQ}$ along the edge of the set square.



(ii) **Protractor**

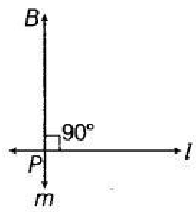
Step I A line l and a point P are given. Note that P is on the line l.

Step II Place the protractor on the line, such that its base line coincides with l and its centre falls on P.

Step III Mark a point B against the 90° mark on the protractor.

Step IV Remove the protractor and draw a line m passing through P and B.

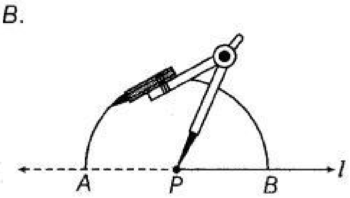
Then, $PB \perp l$.



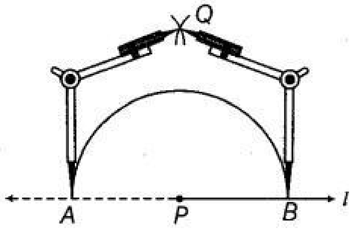
(iii) **Ruler and Compass**

Step I Given, a point P on a line l.

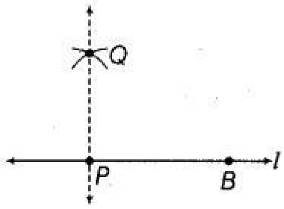
Step II With P as centre and a convenient radius, construct an arc intersecting the line l at two points A and B.



Step III With A and B as centres and a radius greater than AP construct two arcs, which cut each other at Q.



Step IV Join PQ. Then, PQ is perpendicular to l.



Hence, we are able to draw one perpendicular line.

Question 81:

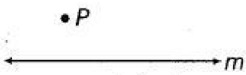
Copy figure on your notebook and draw a perpendicular from P to line m using (i) set squares (ii) protractor (iii) ruler and compass. How many such perpendicular are you able to draw?

Solution:

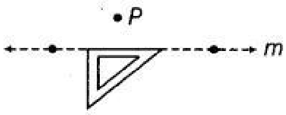
We draw perpendicular to m from P, using

(i) **Set Squares**

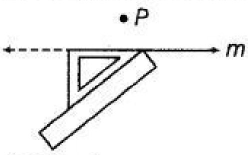
Step I Let m be the given line and P be a point outside m. Now, extend line m on both the sides.



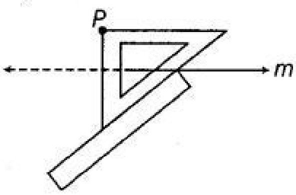
Step II Place a set square on m, such that one arm of its right angle aligns along m.



Step III Place a ruler along the edge opposite to the right angle of the set square.

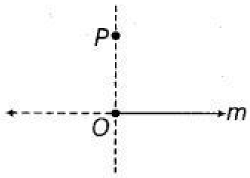


Step IV Hold the ruler fixed. Slide the set square along the ruler till the point P touches the other arm of the set square.



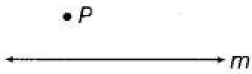
Step V Join *PM* along the edge through *P*, meeting *m* at *O*.

Now, $PO \perp m$.



(ii) **Protractor**

Step I Let *m* be the given line and *P* be a point outside *m*.

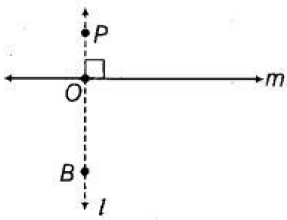


Step II Place the protractor on point *P*, such that its centre coincides with point *P*.

Step III Mark a point *B* against the 90° mark on the protractor.

Step IV Remove the protractor and draw a line *l* passing through *P* and *B* which intersects line *m* at *O*.

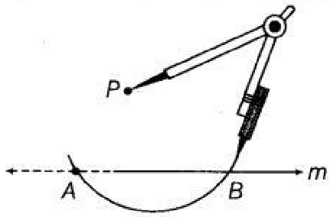
Then, $PO \perp m$.



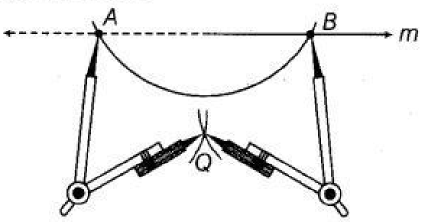
(iii) **Ruler and compass**

Step I Given, a line *m* and a point *P*, not on it. Extend the given line in both directions.

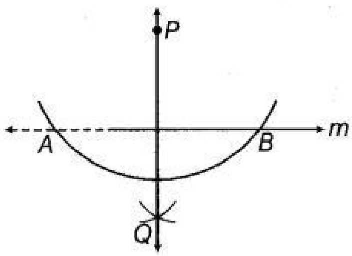
Step II With *P* as centre, draw an arc which intersects line *m* at two points *A* and *B*.



Step III With *A* and *B* as centres and the same radius draw two arcs which intersect at a point, say *Q*, on the other side.



Step IV Join *PQ*.



Thus, *PQ* is perpendicular to *m*.

We are able to draw one perpendicular line.

Question 82:

Draw a circle of radius 6 cm using ruler and compass. Draw one of its diameters. Draw the perpendicular bisector of this diameter. Does this perpendicular bisector contains another diameter of the circle?

Solution:

Steps of construction are as follows:

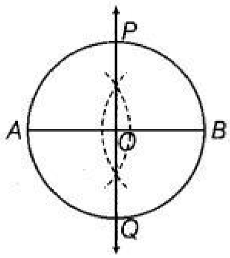
Step I Open the compass for the required radius 6 cm by putting the pointer on 0 and open the pencil upto 6 cm.

Step II Place the pointer of the compass at O.

Step III Turn the compass slowly to draw the circle.

Step IV Draw a diameter AS.

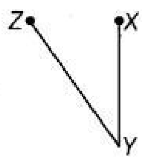
Step V Draw the perpendicular bisector of AS, which intersect AS at 0.



Clearly, the perpendicular bisector of AS, i.e. PQ is another diameter of the circle. Yes, the perpendicular bisector of AS contain another diameter of the circle.

Question 83:

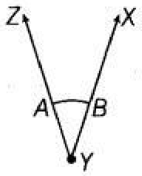
Bisect ∠XYZ of figure.



Solution:

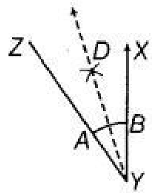
Steps of construction are as follows:

Step I With Y as a centre and using compass, draw an arc that cuts both rays of ∠Y. Label point of intersection as A and 8.



Step II With A as centre, draw (in the interior of ∠Y) an arc, whose radius is more than half the length AB.

Step III With B as centre and the same radius draw another arc in the interior of ∠Y. Let the two arcs intersect at D. Join YD Then, YD is the required bisector of ∠XYZ.



Question 84:

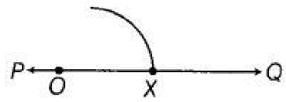
Draw an angle of 60° using ruler and compass and divide it into four equal parts. Measure each part.

Solution:

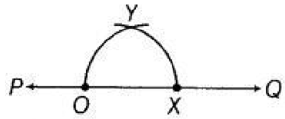
Steps of construction are as follows:

***Step* I** Draw a line segment $\overline{PQ}$ and mark a point O on it.

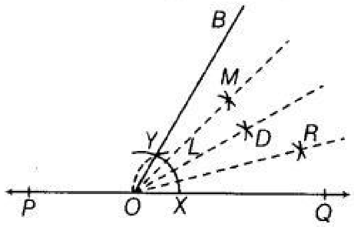
***Step* II** Place the pointer of the compass at O (as center) and draw an arc of convenient radius, which cuts the line PQ at a point X.



***Step* III** With the pointer at X (as centre) and same radius, draw an arc that passes through O, which intersect at Y.



***Step* IV** Join OY and produce it to B. We get $\angle BOX$, whose measure is 60°.



Step V With 0 as a centre and using compass draw an arc that cuts both rays of ∠O at X and Y.

Step VI With X as centre, draw (in the interior of ∠O) an arc, whose radius is more than half the length of XY

Step VII With the same radius with Y as centre, draw another arc in the interior of ∠O. Let the two arcs intersects at D. Join OD, cutting arc XY at L. Then, OD divides the (∠XOB or ∠QOB) into two equal parts.

Step VIII Now, taking X and L as centre, having radius more than half of length XL, draw two arcs respectively, which cut each other at R.

Step IX Join OR, which divides ∠XOD into two equal parts.

Step X Now, taking Y and L as centre, having radius more than half of length YL, draw two arcs respectively, which cut each other at M.

Step XI Join OM, which divide ∠BOD into two equal parts.

Thus, OM, OR and OD divide ∠XOB (or ∠QOB) into four equal parts.

Question 85:

Bisect a straight angle, using ruler and compass. Measure each part.

Solution:

Steps of construction are as follows:

Step I Draw an angle ∠ABC=180°

Step II With S as a centre and using compass, draw an arc which cuts both rays of ∠B. Label point of intersection as P and Q.

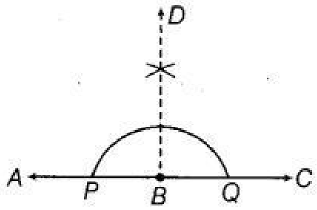
Step III With P as centre, draw an arc whose radius is more than half the length PQ.

Step IV With Q as centre and the same radius draw another arc. Let the two arcs intersect at D. Then, BD is the required bisector of ∠B.

Thus, the required angles are ∠ABD and ∠CBD.

On measuring,

∠ABD=∠CBD=90°



Question 86:

Bisect a right angle, using ruler and compass. Measure each part. Bisect each of these parts. What will be measure of each of these parts?

Solution:

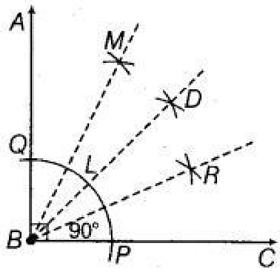
Steps of construction are as follows:

Step I Construct an angle, ∠ABC= 90°

Step II With B as centre, using compass, draw an arc which cuts both rays of ∠B at P and Q.

Step III With P as centre, draw (in the interior of ∠B) an arc, whose radius is more than half of PQ.

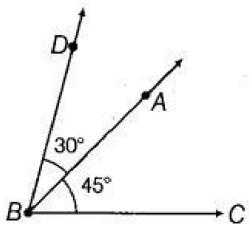
Step IV With Q as centre and the same radius, draw another arc in the interior of ∠B. Let the two arcs intersect at D. Join BD, cutting arc PQ at L. Then, BD divides the ∠ABC into two equal parts.



Step V Now, taking P and L as centre having radius more than half of PL, draw two arcs respectively, which cut each other at R.

Question 87:

Draw an ∠ABC of measure 45°, using ruler and compass. Now draw and ∠DBA of measure 30°, using ruler and compass as shown in figure. What is the measure of ∠DBC?

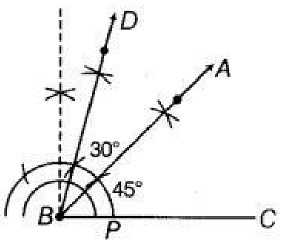


Solution:

To draw an angle, we use following steps of construction:

Step I Draw a line segment BC of any length.

Step II Place the compass pointer at B and draw a right angle (90°).



Step III Draw the angle bisector of the right angle, such that ∠ABC= ½(90°)=45°

Step IV Place the compass pointer at B and draw an angle of 30° on the base BA (∠DBA).

Step V By the help of protractor, we get ∠DBC =75°

Question 88:

Draw a line segment of length 6 cm. Construct its perpendicular bisector. Measure the two parts of the line segment.

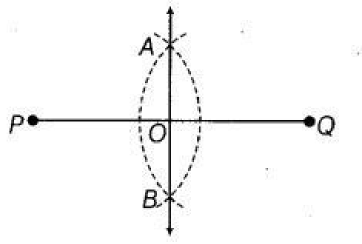
Solution:

Steps of construction are as follows:

Step I Draw a line segment PQ=6 cm

Step II With P as centre and a convenient radius (more than ½ PQ), draw an arc.

Step III With O as centre and same radius, draw another arc, such that it intersects the previous arc at A and B.



Step IV Join A and B.

Thus, AB is perpendicular bisector of PQ

i.e. OP = OQ =(½) x PQ =(½) x 6=3 cm

Question 89:

Draw a line segment of length 10 cm. Divide it into four equal parts. Measure each of these parts.

Solution:

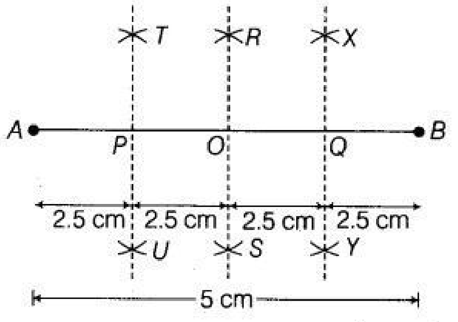
Steps of construction are as follows:

Step I Firstly, draw a line segment AB=10cm.

Step II With A and B as centre and the radius more than half of AS, cut the arc both sides of AS at R and S. Join RS, it is the bisector of AS, i.e. AO = OB

Step III Now, with A and O as centre and the radius more than half of AO, cut the arc both sides of AO at T and U. Join TU, it is the bisector of AO, i.e. AP = PO

Step IV Again, with 0 and B as centre and the radius more than half of OB, cut the arc both sides of OS at X and Y. Join XY, it is the bisector of OB, i.e. OQ = QB



Step V The line segment AB is divided into 4 equal parts; such that AP, PO, OQ and QB.

Step VI By actual measurement, we have AP = PO = QB = 2.5 cm