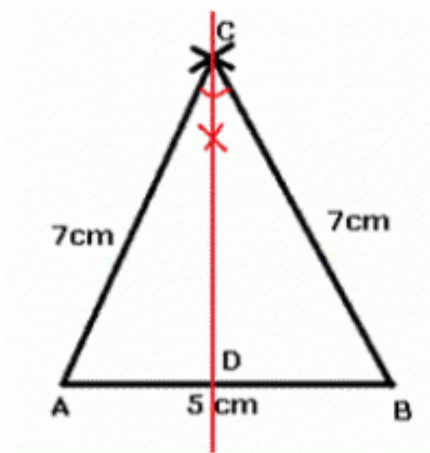


Chapter 14. Symmetry

Ex 14.1

Answer 1.

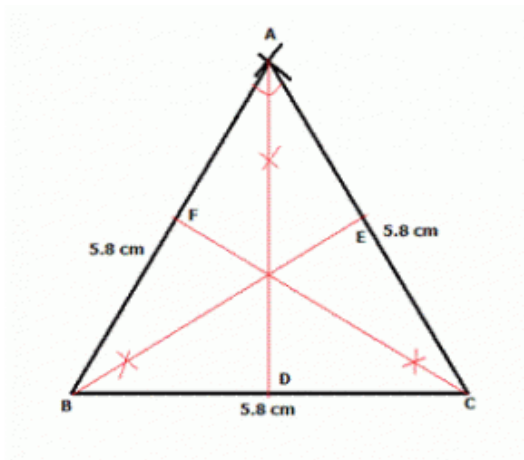


Steps of construction:

- (i) Draw a line segment $AB = 5\text{ cm}$
- (ii) With A as centre, cut an arc of 7 cm on one side of line segment AB.
- (iii) With B as centre, cut an arc of 7 cm on same side of line segment AB. Let the point be C.
- (iv) Join AC and BC. ABC is the required triangle.
- (v) Draw angle bisector of angle C meeting AB at D.
- (vi) CD is perpendicular bisector of AB and $AC=BC$. Hence CD is the line of symmetry.

Isosceles triangle has only one line of symmetry.

Answer 2.

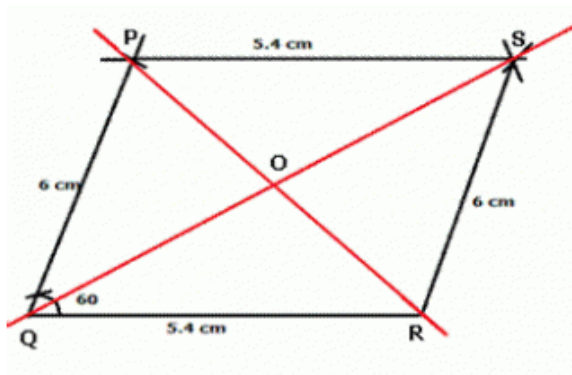


Steps of construction:

- (i) Draw a line segment $BC = 5.8$ cm.
- (ii) With B and C as centre and radius = 5.8 cm, draw two arcs which intersect each other at A.
- (iii) Join AB and AC. ABC is the required triangle.
- (iv) Draw the bisectors AD, BE and CF of $\angle A$, $\angle B$ and $\angle C$ respectively.

Hence, AD, BE and CF are the lines of symmetry of triangle ABC.

Answer 3.

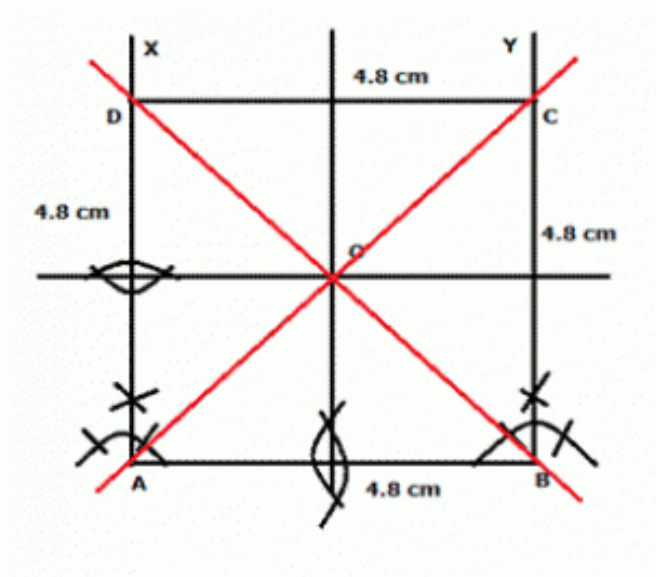


Steps of construction:

- (i) Draw a line segment $QR = 5.4$ cm
- (ii) At Q, draw a ray making an angle of 60 degrees with QR and cut $QP = SR = 6$ cm
- (iii) P as centre draw an arc equal to 5.4 cm
- (iv) R as centre draw an arc equal to 6 cm which intersects the first arc at S.
- (v) Join RS and PS. PQRS is the required parallelogram.
- (vi) Join QS and PR which intersect each other at O.

There is no line of symmetry of parallelogram PQRS but it has one point symmetry which is O, the point of intersection of its diagonals.

Answer 4.

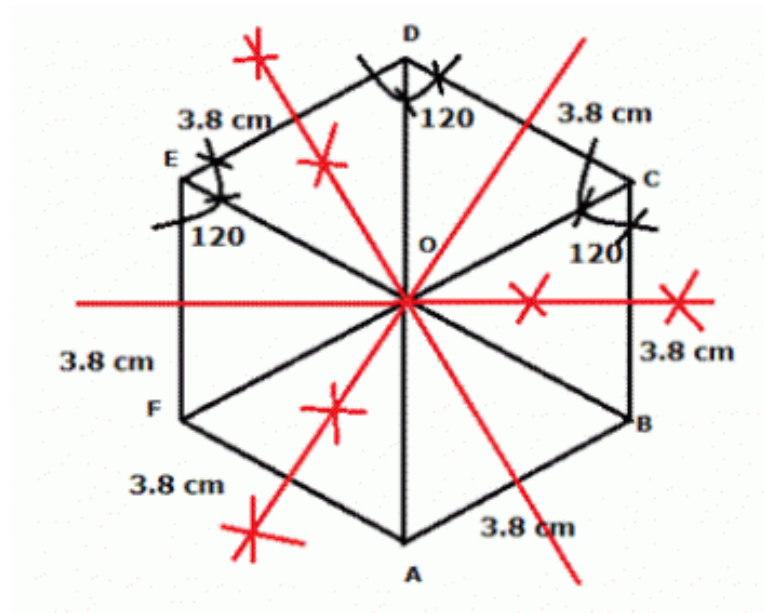


Steps of construction:

- 1) Draw a line segment $AB = 4.8 \text{ cm}$.
- 2) At A and B, draw perpendiculars AX and BY
- 3) i) From AX and BY, cut off $AD = BC = 4.8 \text{ cm}$
- 4) ii) Join DC. ABCD is the required square.
- 5) iii) Now draw perpendicular bisectors of AB and AD.
- 6) iv) Also join the diagonals AC and BD.

The perpendicular bisectors and the diagonals are the lines of symmetry.

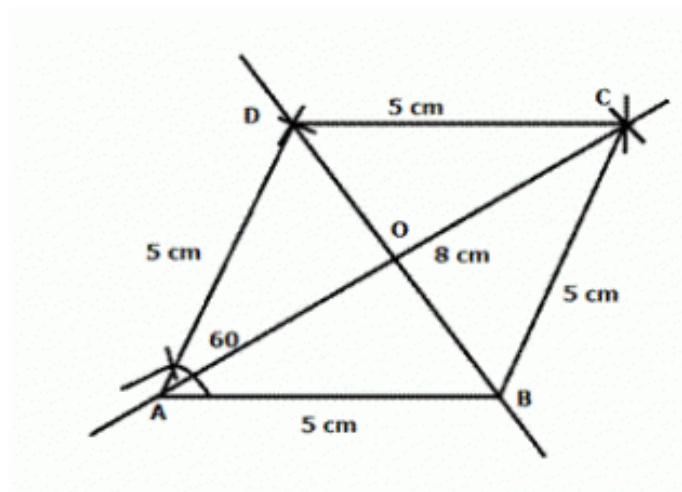
Answer 5.



Steps of construction:

- (i) Draw a line segment $AB = 3.8 \text{ cm}$
- (ii) At A and B, draw rays making an angle of 120° each and cut off $AF = BC = 3.8 \text{ cm}$
- (iii) Again at F and C, draw rays making an angle of 120° each and cut off $CD = FE = 3.8 \text{ cm}$
- (iv) Join DE. ABCDEF is the required hexagon.
- (v) Draw perpendicular bisectors of each of the opposite sides and also join AD, BE and CF. These six lines are the lines of symmetry .

Answer 6.

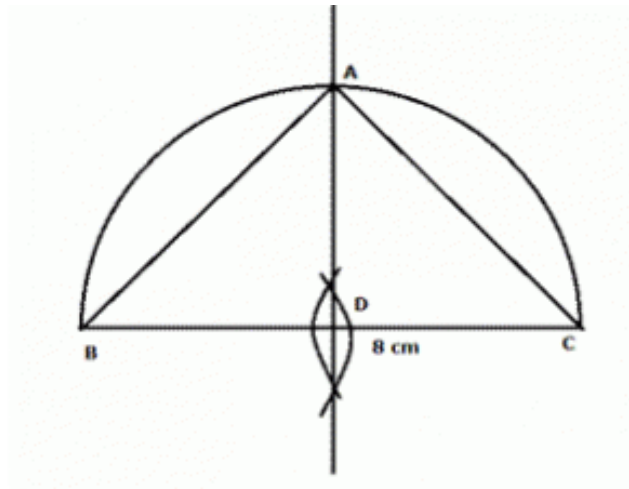


Steps of construction:

- (i) Draw a line segment $AB = 5 \text{ cm}$
- (ii) With A as centre and radius 8 cm, and B as centre and radius 5 cm, draw arcs which intersect each other at C.
- (iii) Join AC and BC.
- (iv) Again with centre A and C and radius 5 cm, draw arcs which intersect each other at D
- (v) Join AD and CD. ABCD is the required rhombus.
- (vi) Join BD.

Two diagonals AC and BD are the lines of symmetry .

Answer 7.

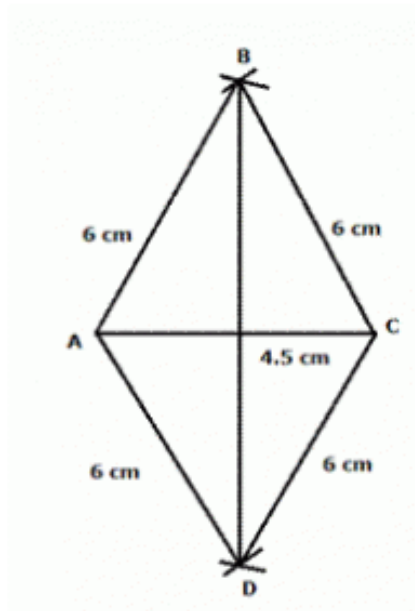


Steps of construction:

- (i) Draw a line segment $BC = 8 \text{ cm}$
- (ii) Draw its perpendicular bisector which intersects BC at D. With D as centre and BD or CD as radius, draw a semi-circle.
- (iii) Produce the perpendicular bisector of BC which intersects the circle at A.
- (iv) Join AB and AC. Triangle ABC is the required isosceles right-angled triangle.

The perpendicular bisector of hypotenuse BC is the line of symmetry.

Answer 8.

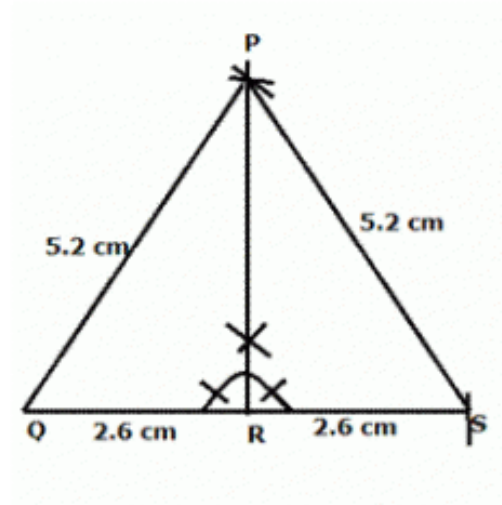


Steps of construction:

- (i) Draw a line segment $AC = 4.5$ cm
- (ii) With A and C as centres and 6 cm as radius , draw arcs which intersect each other at B.
- (iii) Join AB and BC. $\triangle ABC$ is the required triangle.
- (iv) Again with A and C as centres and 6 cm as radius , draw arcs which intersect each other at D.
- (v) Join AD and DC. $\triangle ADC$ is the triangle which is the reflection of $\triangle ABC$.

$ABCD$ is the required quadrilateral and it is a rhombus.

Answer 9.

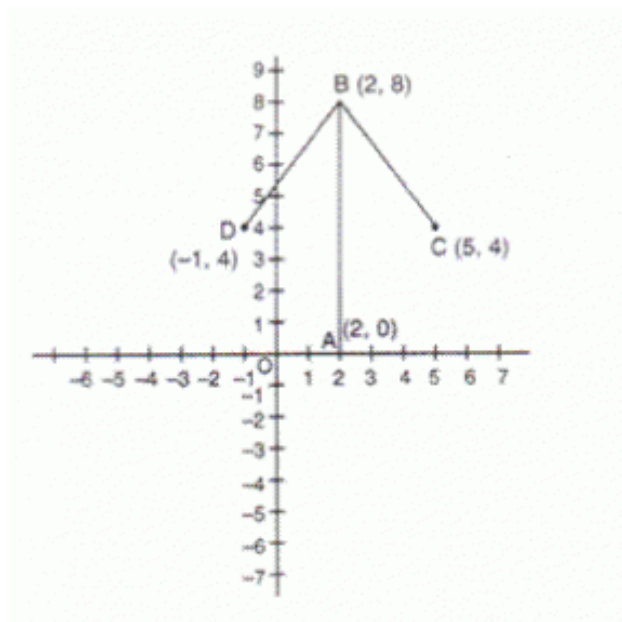


Steps of construction:

- (i) Draw a line segment $QR = 2.6 \text{ cm}$
- (ii) At R draw a perpendicular to QR.
- (iii) With Q as centre and radius 5.2 cm cut an arc on perpendicular to R at P.
- (iv) Join PQ. $\triangle PQR$ is the required triangle.
- (v) Produce QR to S such that $RS = 2.6 \text{ cm}$
- (vi) With S as centre and radius 5.2 cm cut an arc on perpendicular to R at P.
- (vii) Join PS. $\triangle PSR$ is the triangle which is the reflection of $\triangle PQR$.

$\triangle PQS$ is the required triangle and is an equilateral triangle.

Answer 10.

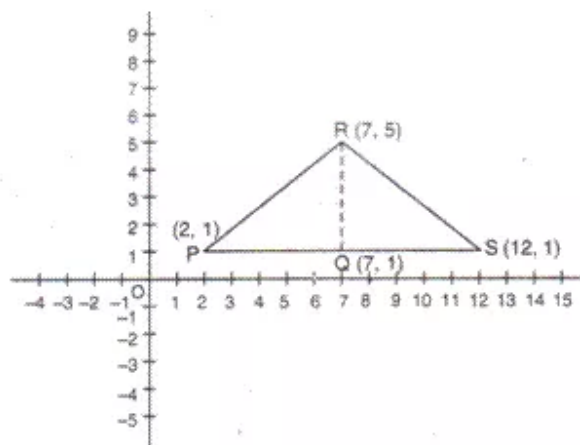


Steps of construction:

- (i) Plot the points A, B and C as per given data.
- (ii) Point D symmetrical about AB is a point with vertices $x = -1$ and $y = 4$ i.e. 3 units left of line AB.
- (iii) Plot D(-1,4)
- (iv) Join BC, AB, BD

The figure is an arrow

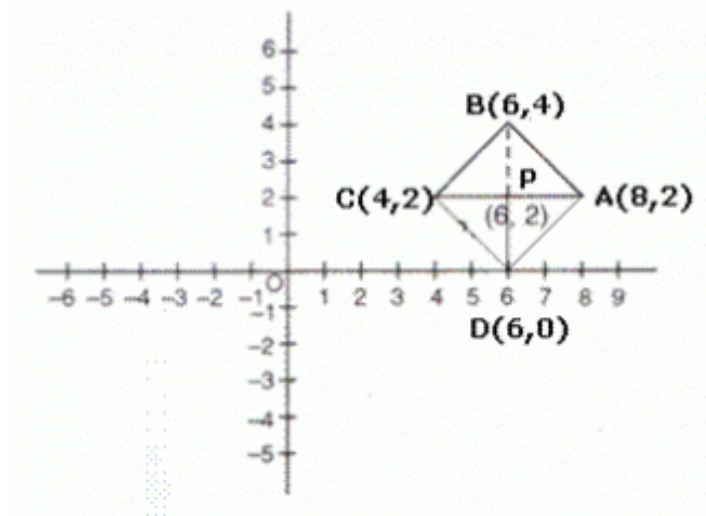
Answer 11.



Steps of construction:

- (i) Plot the points P, Q and R as per given data.
- (ii) Point S symmetrical about QR is a point with vertices $x = 12$ and $y = 1$ i.e. 5 unit right of line RQ.
- (iii) Plot S(12, 1)
- (iv) Join PR, PS and RS

Answer 12.



Steps of construction:

- (i) Plot the point A and B on the graph.
- (ii) Plot point P whose vertices are $x = 6$ and $y = 2$. P is the point of symmetry.
- (iii) Point symmetric to A(8,2) in the line $x = 6$ is C(4,2)
- (iv) Point symmetric to B(6,4) in the line $y = 2$ is D(6,0)
- (v) Join AP, PC, BP and PD.

Since $BD = 4$,

$$\begin{aligned}AD &= \sqrt{(8-6)^2 + (2-0)^2} \\&= \sqrt{2^2 + 2^2} = \sqrt{4+4} = \sqrt{8}\end{aligned}$$

$$\begin{aligned}AB &= \sqrt{(8-6)^2 + (2-4)^2} \\&= \sqrt{2^2 + (-2)^2} = \sqrt{4+4} = \sqrt{8}\end{aligned}$$

$$\therefore BD^2 = AD^2 + AB^2$$

$$4^2 = (\sqrt{8})^2 + (\sqrt{8})^2$$

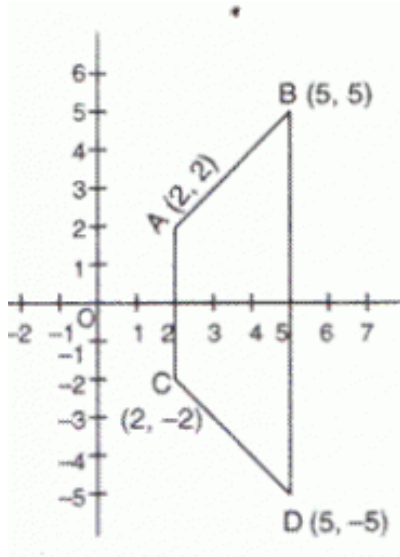
$$16 = 8 + 8$$

$$16 = 16$$

$$\therefore \angle BAD = 90^\circ$$

Clearly $AB=BC=CD=DA$, $\angle BAD = 90^\circ$ and AC and BD bisect each other at right angles . therefore ABCD is a square.

Answer 13.



struction:

oint A and B on the graph.

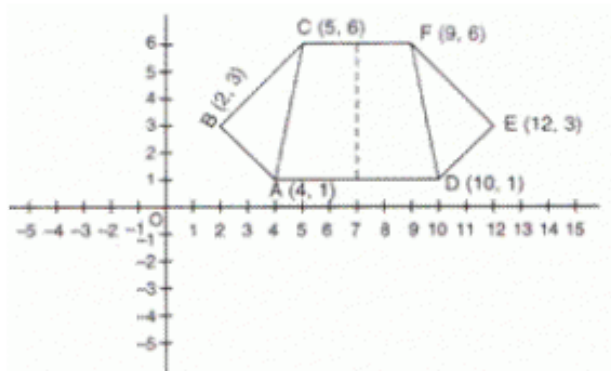
imetric to $A(2, 2)$ about x-axis is $C(2, -2)$

nmetric to $B(5, 5)$ about x-axis is $D(5, -5)$

AC, CD, BD.

rmmed is a trapezium.

Answer 14.

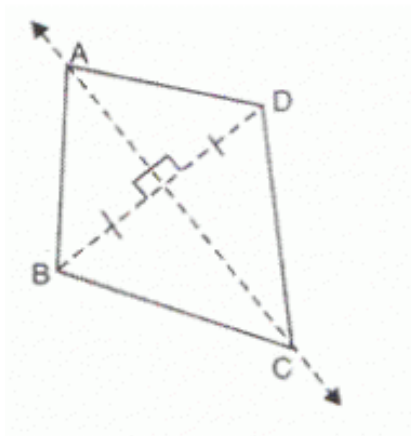


Steps of construction:

- (i) Plot the point A, B and C on the graph.
- (ii) Point symmetric to A(4,1) about $x = 7$ is D(10, 1)
- (iii) Point symmetric to B(2,3) about $x = 7$ is E(12, 3)
- (iv) Point symmetric to C(5,6) about $x = 7$ is F(9,6)
- (v) Join AB, AC, BC, AD, DE, DF, EF and CF.

The figure formed is a trapezium ADCF with two equal scalene triangles (ABC and DEF) attached to it.

Answer 15.

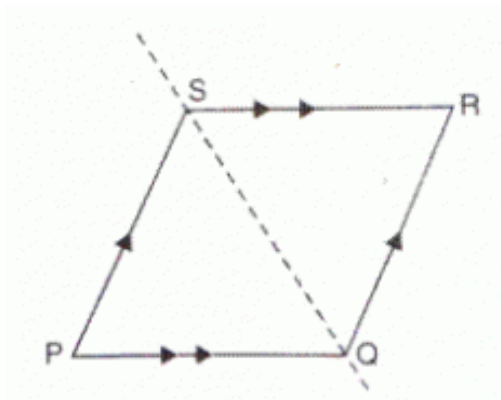


| sides about line of symmetry :

$$BC = CD$$

ding angles about line of symmetry :

$$\angle ADC$$



| sides about line of symmetry :

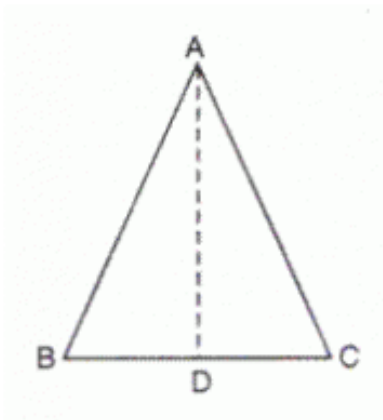
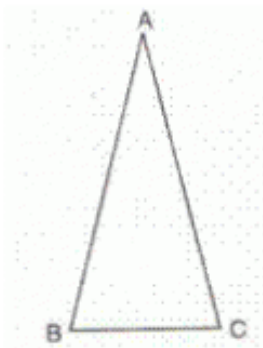
$$PQ = QR$$

ding angles about line of symmetry :

$$\angle SRQ$$

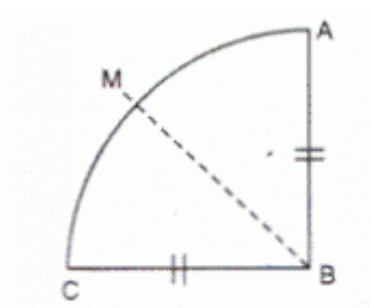
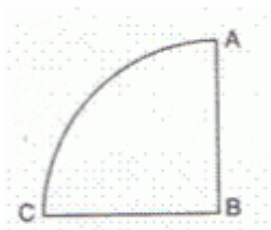
Answer 16.

(i)



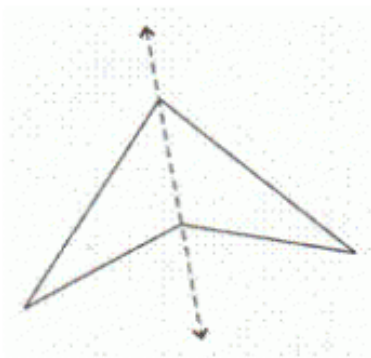
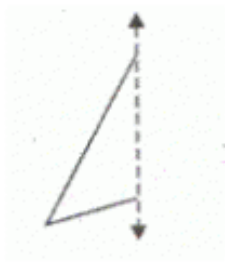
ABC is an isosceles triangle. Draw $AD \perp BC$. AD bisects $\angle A$. Here AD is the line of symmetry. There is no point of symmetry.

(ii)

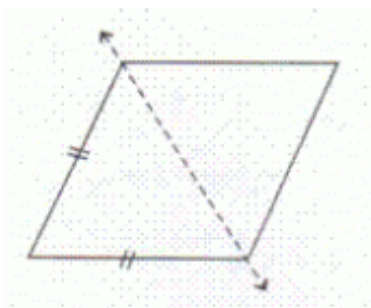
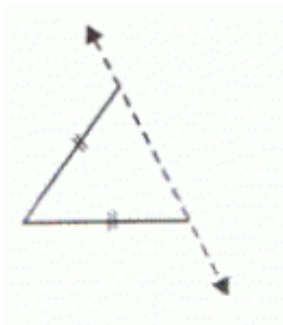


Draw the angle bisector BM of $\angle ABC$. BM is the line of symmetry. There is no point of symmetry.

Answer 17.

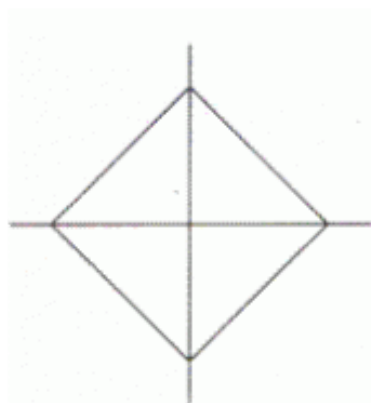
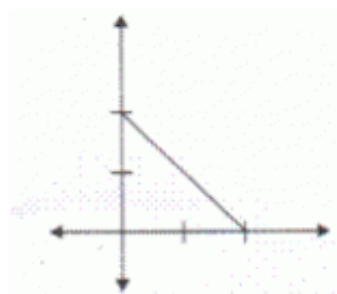


On completing the figure which is symmetrical about the given axis, it becomes an arrowhead.

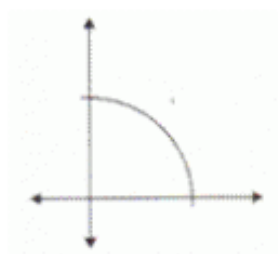


On completing the figure which is symmetrical about the given axis, it becomes a rhombus.

Answer 18.



ompleting the figure about both axes it becomes a square.



ompleteing the figure about both axes it becomes a cirde.