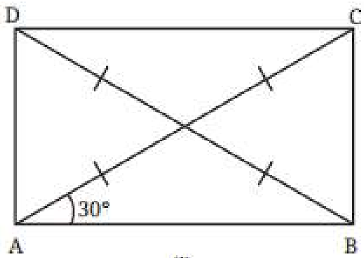
NCERT Solutions Class 8 Maths (Ganita Prakash)

Chapter 4 Quadrilaterals

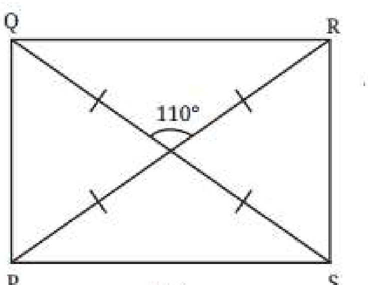
4.1 Rectangles and Squares

Figure It Out (Page 94)

Question 1. Find all the other angles inside the following rectangles.



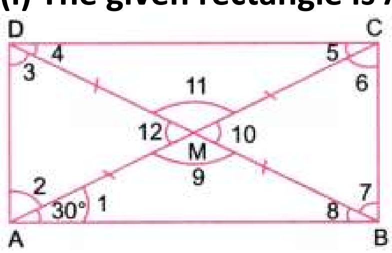
(i)



(ii)

Solution:

(i) The given rectangle is ABCD.



We have $\angle 1 = 30°$

$\angle 1 + \angle 2 = 90°$

$\therefore \angle 2 = 90° - \angle 1 = 90° - 30° = 60°$.

MD = MA

$\Rightarrow \angle 3 = \angle 2 = 60°$

$\angle 3 + \angle Z4 = 90°$

$\therefore \angle 4 = 90° - \angle 3 = 90° - 60° = 30°$

MC = MD

$\Rightarrow \angle 5 = \angle 4 = 30°$

$\angle 5 + \angle 6 = 90°$

$\therefore \angle 6 = 90° - \angle 5 = 90° - 30° = 60°$

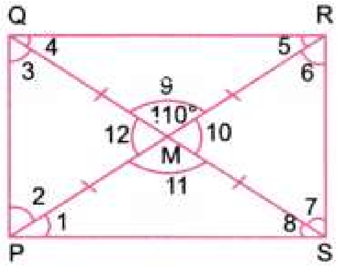
MB = MC

$\Rightarrow \angle 7 = \angle 6 = 60°$

MB = MA

⇒ ∠8 = ∠1 = 30°
In ΔAMB, we have
∠1 + ∠9 + ∠8 = 180°.
∴ 30° + ∠9 + 30° = 180°
∴ ∠9 = 180° – 60° = 120°
∠11 = ∠9 = 120° (Vertically opposite angles)
∠9 + ∠10 = 180° (Linear angles)
∴ ∠10 = 180° – 120° = 60°
∠12 = ∠10 = 60° (Vertically opposite angles)
∴ ∠2 = 60°, ∠3 = 60°, ∠4 = 30°, ∠5 = 30°, ∠6 = 60°, ∠7 = 60°, ∠8 = 30°, ∠9 = 120°, ∠10 = 60°, ∠11 = 120° and ∠12 = 60°.

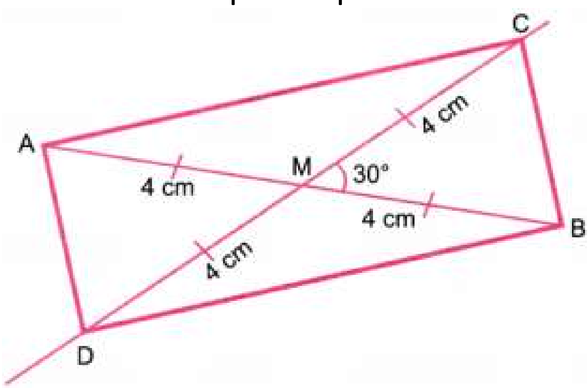
(ii) The given rectangle is PSRQ.



We have ∠9 = 110°.
∠11 = ∠9 = 110° (Vertically opposite angles)
∠9 + ∠10 = 180° (Linear angles)
∴ ∠10 = 180° – 110° = 70°
∠12 = ∠10 = 70° (Vertically opposite angles)
MP = MS
⇒ ∠1 = ∠8
In ΔPMS, we have
∠1 + ∠11 + ∠8 = 180°.
⇒ ∠1 + 110 + ∠1 = 180°
⇒ 2∠1 = 180° – 110
⇒ 2∠1 = 70°
⇒ ∠1 = 35°
∴ ∠8 is also 35°.
∴ ∠1 + ∠2 = 90°
⇒ ∠2 = 90° – ∠1
⇒ ∠2 = 90° – 35°
⇒ ∠2 = 55°
MQ = MP
⇒ ∠3 = ∠2 = 55°
∴ ∠3 + ∠4 = 90°
⇒ ∠4 = 90° – ∠3
⇒ ∠4 = 90° – 55°
⇒ ∠4 = 35°
MR = MQ
⇒ ∠5 = ∠4 = 35°

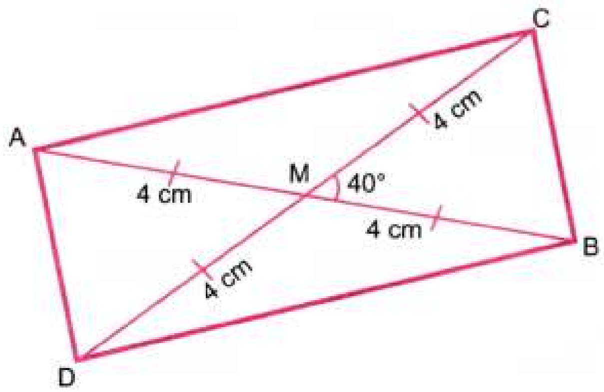
∴ ∠5 + ∠6 = 90°
⇒ ∠6 = 90° – ∠5
⇒ ∠6 = 90° – 35°
⇒ ∠6 = 55°
MS = MR
⇒ ∠7 = ∠6 = 55°
∴ ∠1 = 35°, ∠2 = 55°, ∠3 = 55°, ∠4 = 35°, ∠5 = 35°, ∠6 = 55°, ∠7 = 55°, ∠8 = 35°, ∠10 = 70°, ∠11 = 110° and ∠12 = 70°.

Question 2. Draw a quadrilateral whose diagonals have equal lengths of 8 cm that bisect each other, and intersect at an angle of:
(i) 30°
(ii) 40°
(iii) 90°
(iv) 140°
Solution: (i) Draw a line AB equal to 8 cm.
Take point M on AB such that AM = BM = 4 cm.
Using a protractor, draw an angle of 30° at M on MB.
On this line, take points C and D such that MC = MD = 4 cm.
Join AD, DB, BC, and CA.
ABCD is the required quadrilateral.



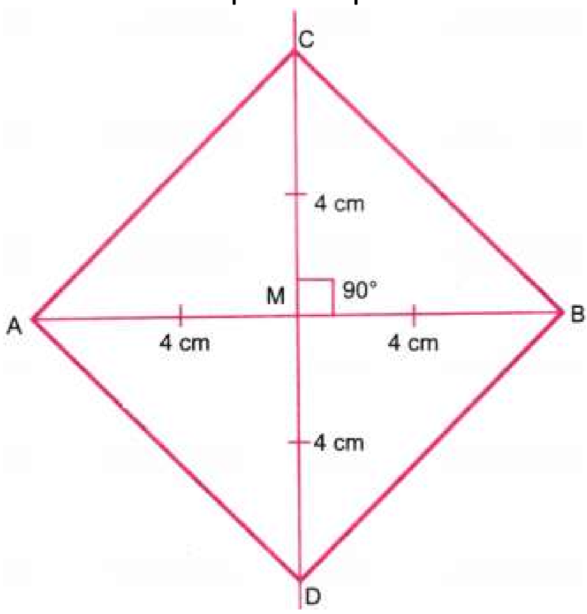
Since diagonals AB and CD are equal and are bisecting each other at M, ACBD is a rectangle.

(ii) Draw a line AB equal to 8 cm.
Take point M on AB such that AM = BM = 4 cm.
Using a protractor, draw an angle of 40° at M on MB.
On this line, take points C and D such that MC = MD = 4 cm.
Join AD, DB, BC, and CA.
ABCD is the required quadrilateral.



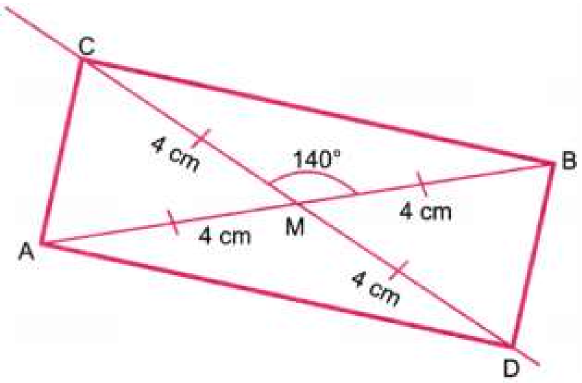
Since diagonals AB and CD are equal and are bisecting each other at M, ACBD is a rectangle.

(iii) Draw a line AB equal to 8 cm.
Take a point M on AB such that AM = BM = 4 cm.
Using a protractor, draw an angle of 90° at M on MB.
On this line, take points C and D such that MC = MD = 4 cm.
Join AD, DB, BC, and CA.
ACBD is the required square.



Since diagonals AB and CD are equal and are bisecting each other at M, and also the diagonals are perpendicular to each other, ACBD is a square.

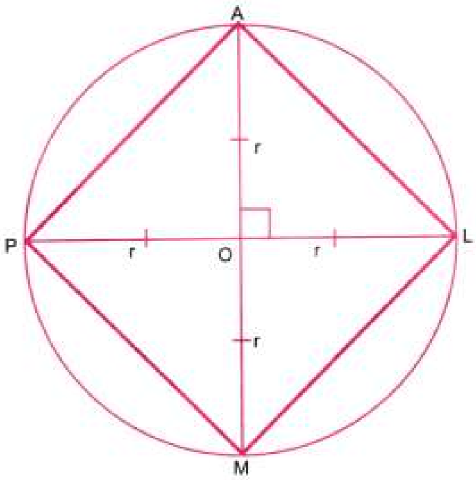
(iv) Draw a line AB equal to 8 cm.
Take a point M on AB such that AM = BM = 4 cm.
Using a protractor, draw an angle of 140° at M on MB.
On this line, take points C and D such that MC = MD = 4 cm.
Join AD, DB, BC, and CA.
ACBD is the required quadrilateral.



Since diagonals AB and CD are equal and are bisecting each other at M, ACBD is a rectangle.

Question 3. Consider a circle with centre O. Line segments PL and AM are two perpendicular diameters of the circle. What is the figure APML? Reason and/or experiment to figure this out.

Solution: In the figure, PL and AM are two perpendicular diameters of the circle.
Let r be the radius of the circle.

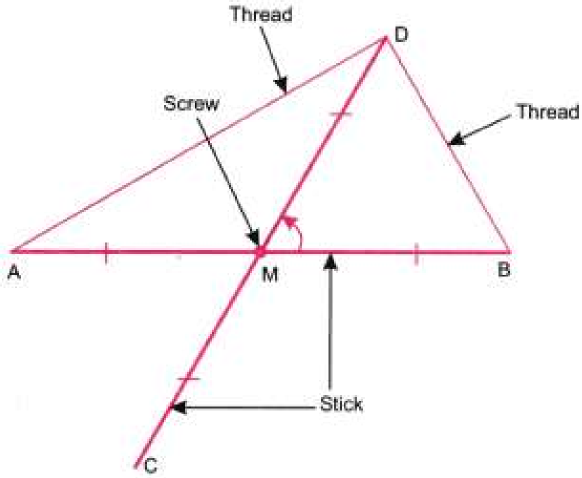


∴ PL = PO + OL
= r + r
= 2r
and AM = AO + OM
= r + r
= 2r
∴ PL = AM
∴ In the quadrilateral APML, diagonals PL and AM are equal and are perpendicular to each other.
Also, OP = OA = OL = OM = r
∴ Diameters PL and AM bisect each other at O.
∴ Quadrilateral APML is a square.

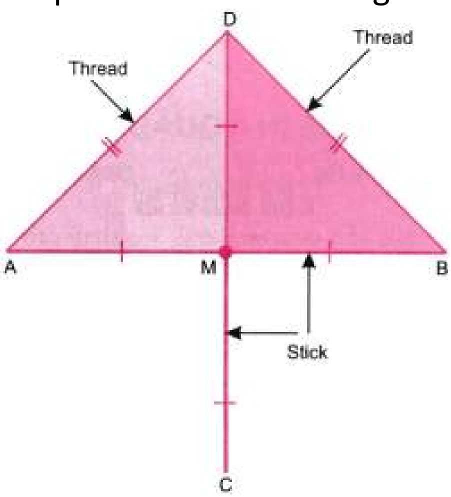
Question 4. We have seen how to get 90° using paper folding. Now, suppose we do not have any paper but two sticks of equal length and a thread. How do we make an exact 90° angle using these?

Solution:

Let AB and CD be two sticks of equal length, say 6 cm.
Mark the midpoints of the sticks using a ruler.
Fix a screw to the sticks at their midpoints.
Using a thread, measure distances AD and BD.
Keep on moving the sticks about the screw, so that the distances AD and BD are equal.



In this position, fix the sticks by tightening the screw.
The new positions of the sticks are shown in the figure.
Tie pieces of thread along AD and BD.

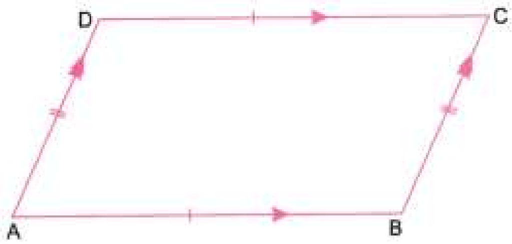


Consider ΔAMD and ΔBMD.
We have AM = BM, AD = BD
and MD is common
∴ By the SSS condition,
ΔAMD and ΔBMD are congruent.
∴ ∠AMD = ∠BMD
Also ∠AMD + ∠BMD = 180° (Linear angles)
∴ ∠AMD + ∠AMD = 180°
⇒ 2∠AMD = 180°
⇒ ∠AMD = 90°

∴ ∠AMD = ∠BMD = 90°
∴ Angle between the sticks is 90°.

Question 5. We saw that one of the properties of a rectangle is that its opposite sides are parallel. Can this be chosen as a definition of a rectangle? In other words, is every quadrilateral that has opposite sides parallel and equal a rectangle?

Solution: Let ABCD be a quadrilateral in which opposite sides are parallel and equal.
Here AB || DC and AD || BC.
Also, AB = DC and AD = BC.
In the quadrilateral ABCD, opposite sides are equal.
For ABCD to be a rectangle, we require each angle to be 90°.
Given information AB || DC and AD || BC can not help us to prove that each angle of ABCD is 90°.

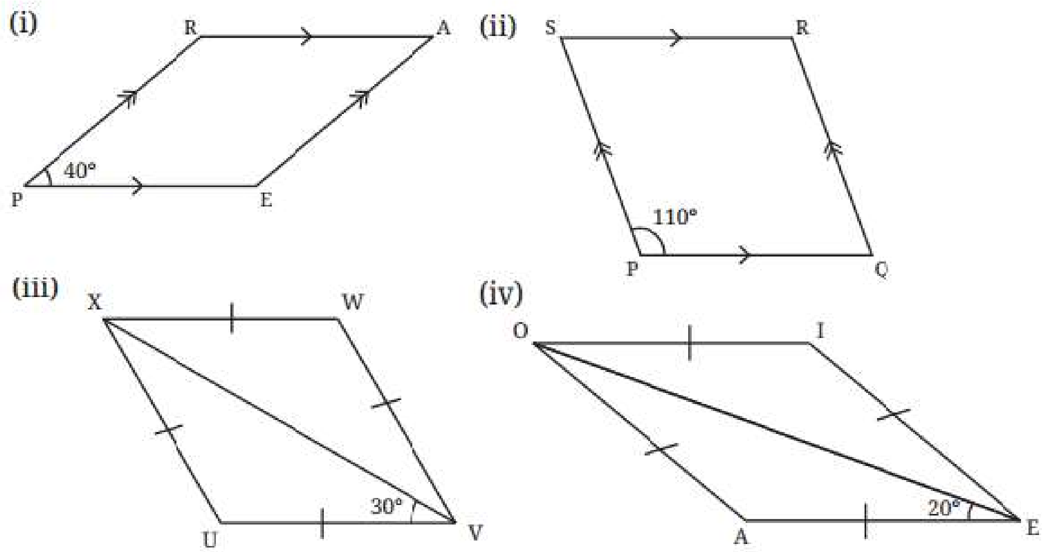


∴ ABCD may not be a rectangle.
∴ A rectangle can not be defined as a quadrilateral with equal and parallel opposite sides.

4.2 Angles in a Quadrilateral, 4.3 More Quadrilaterals with Parallel Opposite Sides, 4.4 Quadrilaterals with Equal Sidelengths

Figure It Out (Page 102)

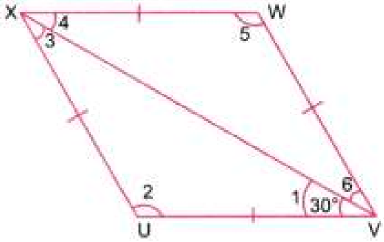
Question 1. Find the remaining angles in the following quadrilaterals.



Solution: (i) Since opposite sides of the quadrilateral PEAR are parallel, this is a

parallelogram.
In the given parallelogram, PE is a transversal to the parallel lines PR and EA.
∠RPE and ∠AEP are the internal angles on the same side of parallel lines.
∴ ∠RPE + ∠AEP = 180°
⇒ 40° + ∠AEP = 180°
⇒ ∠AEP = 180° – 40° = 140°
We know that opposite angles of a parallelogram are equal.
∴ ∠EAR = ∠EPR = 40° and ∠ARP = ∠AEP = 140°.

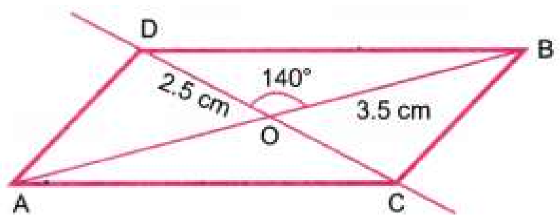
(ii) Since opposite sides of the quadrilateral PQRS are parallel, this is a parallelogram.
In the given parallelogram, PQ is a transversal to the parallel lines PS and QR.
∠SPQ and ∠RQP are the internal angles on the same sides of the parallel lines.
∴ ∠SPQ + ∠RQP = 180°
⇒ 110° + ∠RQP = 180°
⇒ ∠RQP = 180° – 110° = 70°
We know that the opposite angles of a parallelogram are equal.
∴ ∠QRS = ∠QPS = 110° and ∠PSR = ∠RQP = 70°.

(iii) Here, quadrilateral UVWX is a rhombus, because all sides are equal.
We have ∠1 = 30°.
In a rhombus, diagonals bisect the angles of the rhombus.
∴ ∠6 = 30°
In ΔUVX, ∠1 = ∠3 (∵ UV = UX)
∴ ∠3 = 30°
∴ ∠4 = 30°


In ΔUVX, ∠1 + ∠2 + ∠3 = 180°.
∴ 30° + ∠2 + 30° = 180°
⇒ ∠2 = 180° – 60° = 120°
⇒ ∠5 = ∠2 = 120° (∵ Opposite angles are equal)
∴ ∠2 = 120°, ∠3 = 30°, ∠4 = 30°, ∠5 = 120° and ∠6 = 30°.

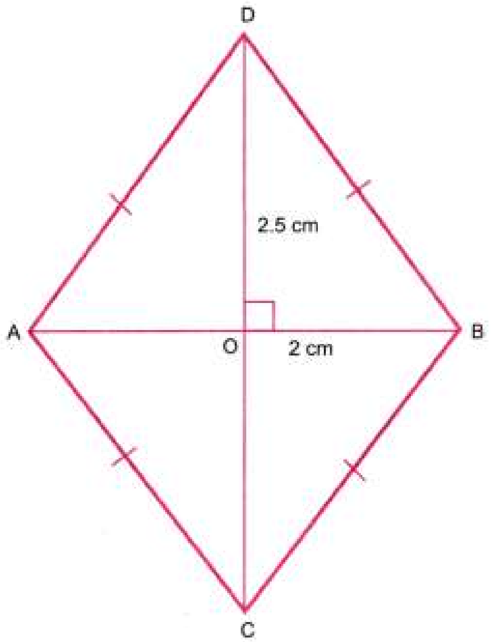
(iv) Please try yourself.

Question 2. Using the diagonal properties, construct a parallelogram whose diagonals are of lengths 7 cm and 5 cm, and intersect at an angle of 140°.
Solution: Draw a line AB equal to 7 cm.
Take point O on AB such that AO = OB = 3.5 cm.



On OB, draw an angle of 140° at O.
Take points C and D on the line of angle so that OC = OD = 2.5 cm.
∴ CD = 5 cm, and O is the midpoint of AB and AC.
Join AC, CB, BD, and DA.
ACBD is a quadrilateral, and its diagonals AB and CD bisect at O.
∴ ACBD is the required parallelogram.

Question 3. Using the diagonal properties, construct a rhombus whose diagonals are of lengths 4 cm and 5 cm.
Solution:
Draw a line AB equal to 4 cm.
Take a point O on AB such that AO = OB = 2 cm.
On AB, draw a line perpendicular to it and passing through O.
Take points C and D on this perpendicular so that OC = OD = 2.5 cm.



∴ CD = 5 cm, and O is the midpoint of AB and CD.
Join AC, CB, BD, and DA.
ACBD is a quadrilateral, and its diagonals AB and CD are bisecting at O and are also perpendicular to each other.
∴ ACBD is the required rhombus.

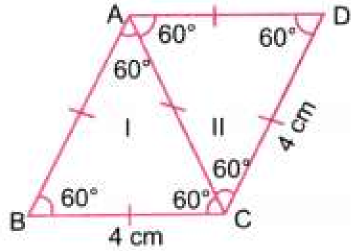
4.5 Playing with Quadrilaterals, 4.6 Kite and Trapezium

Figure It Out (Pages 107-109)

Question 1. Find all the sides and the angles of the quadrilateral obtained by joining two equilateral triangles with sides 4 cm.

Solution:

Let two equilateral triangles of sides 4 cm be joined as shown below.



The sides of the quadrilateral ABCD are 4 cm each.

The angles of the quadrilateral ABCD are ∠A = 60° + 60° = 120°, ∠B = 60°, ∠C = 60° + 60° = 120° and ∠D = 60°.

Question 2. Construct a kite whose diagonals are of lengths 6 cm and 8 cm.

Solution:

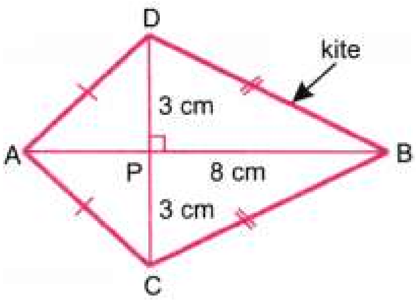
Draw a line AB equal to 8 cm.

Take a point P on the line AB.

Draw a perpendicular line to AB passing through P.

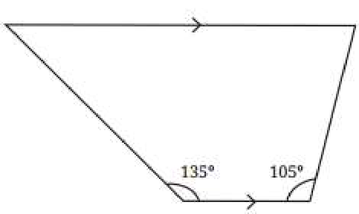
Take points C and D on this perpendicular such that PC = PD = 3 cm.

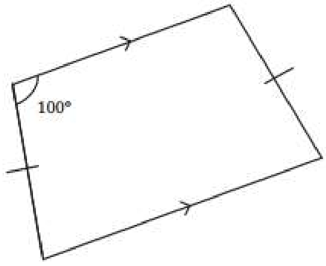
Join AC, CB, BD, and DA.



ACBD is the required kite with diagonals of lengths 6 cm and 8 cm.

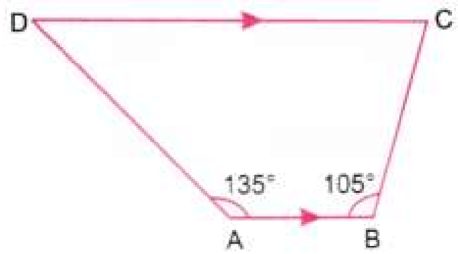
Question 3. Find the remaining angles in the following trapeziums.





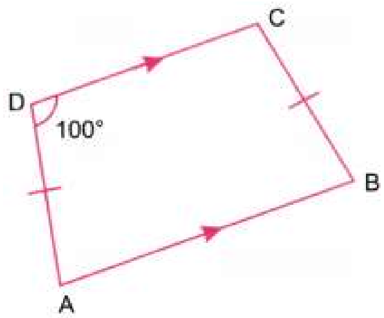
Solution: (i) Let the given trapezium be ABCD.

Lines AB and DC are Parallel



∴ ∠A + ∠D = 180° and ∠B + ∠C = 180°.
∴ ∠A + ∠D = 180°
⇒ 135° + ∠D = 180°
⇒ ∠D = 180° – 135° = 45°.
∴ ∠B + ∠C = 180°
⇒ 105° + ∠C = 180°
⇒ ∠C = 180° – 105° = 75°.
∴ The remaining angles are 45° and 75°.

(ii) Let the given trapezium be ABCD.
Since AD = BC, ABCD is an isosceles trapezium.

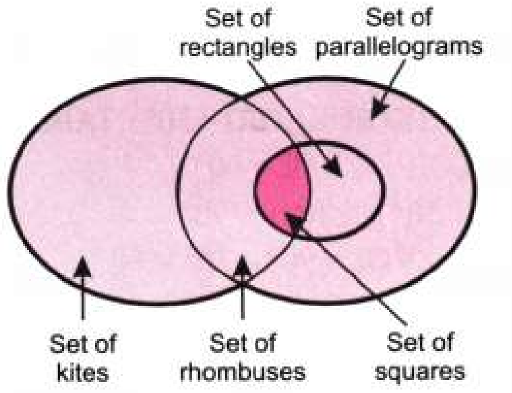


∴ Angles opposite to the equal sides are equal.
∴ ∠C = ∠D = 100°
Lines AB and DC are parallel.
∴ ∠A + ∠D = 180° and ∠B + ∠C = 180°
∴ ∠A + ∠D = 180°
⇒ ∠A + 100° = 180°
⇒ ∠A = 180° – 100°
⇒ ∠A = 80°
∴ ∠B + ∠C = 180°
⇒ ∠B + 100° = 180°
⇒ ∠B = 180° – 100°
⇒ ∠B = 80°
∴ Remaining angles are ∠A = 80°, ∠B = 80° and ∠C = 100°.

Question 4. Draw a Venn diagram showing the set of parallelograms, kites, rhombuses, rectangles, and squares. Then answer the following questions.
(i) What is the quadrilateral that is both a kite and a parallelogram?
(ii) Can there be a quadrilateral that is both a kite and a rectangle?
(iii) Is every kite a rhombus? If not, what is the correct relationship between these two types of quadrilaterals?
Solution: We know the following:

- Every rectangle is a parallelogram.
- Every square is a rectangle.
- Every square is a rhombus.
- Every rhombus is a kite.

The following Venn diagram shows the sets of parallelograms, kites, rhombuses, rectangles, and squares.

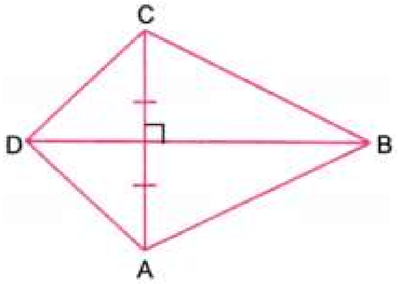


Venn diagram

(i) The set of rhombuses is common to both the set of kites and the set of parallelograms.
∴ A rhombus is both a kite and a parallelogram.

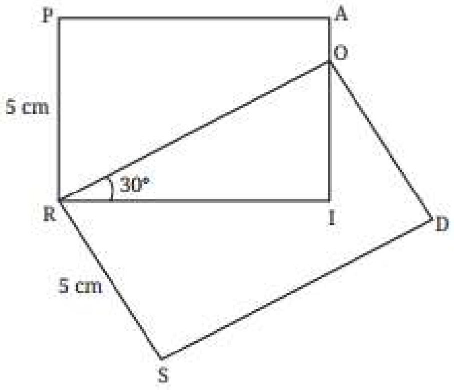
(ii) A kite is not a rectangle, and a rectangle is not a kite.
∴ There can be no quadrilateral that is both a kite and a rectangle.
Also, there is no common portion of the set of kites and the set of rectangles.

(iii) Every kite is not a rhombus.
In the given figure, the kite ABCD is not a rhombus.

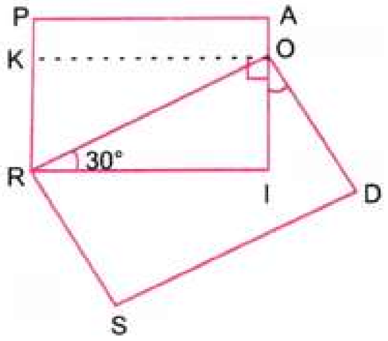


The correct relationship is that every rhombus is a kite.

Question 5. If PAIR and RODS are two rectangles, find ∠IOD.

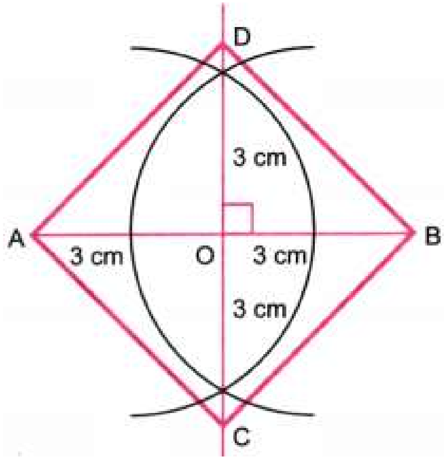


Solution:
From O, draw a line OK parallel to RI.



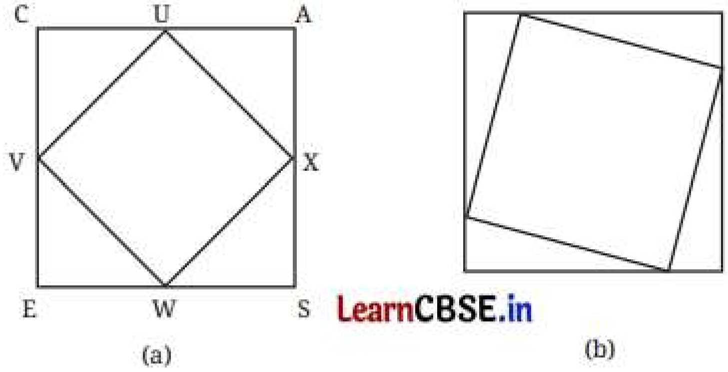
∴ ∠KOR = ∠ORI = 30° (Alternate angles)
∴ ∠KOR + ∠ROI = 90°
⇒ 30° + ∠ROI = 90°
⇒ ∠ROI = 90° – 30°
⇒ ∠ROI = 60°
Also, ∠ROI + ∠IOD = 90°
⇒ 60° + ∠IOD = 90°
⇒ ∠IOD = 90° – 60°
⇒ ∠IOD = 30°.

Question 6. Construct a square with a diagonal of 6 cm without using a protractor.
Solution:
Draw a line AB equal to 6 cm.



We have 6 ÷ 2 = 3.
With centre at A and B, draw arcs of radius slightly greater than 3 cm, say, 4 cm.
Join the points of intersection of the arcs.
Let this line intersect AB at O.
Take points C and D on the perpendicular line so that OC = OD = 3 cm.
Join AC, CB, BD, and DA.
ACBD is the required square with diagonals equal to 6 cm.

Question 7. CASE is a square. The points U, V, W, and X are the midpoints of the sides of the square. What type of quadrilateral is UVWX? Find this by using geometric reasoning, as well as by construction and measurement. Find other ways of constructing a square within a square such that the vertices of the inner square lie on the sides of the outer square, as shown in Figure (b).



Solution:

(a) U, V, W, and X are the midpoints of the sides of the square.

In ΔVCU and ΔUAX,

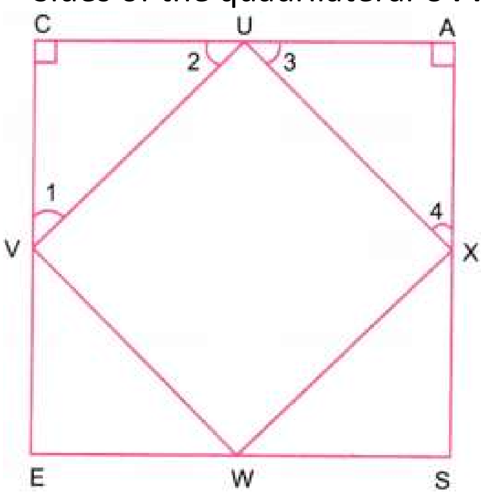
we have VC = UA, ∠VCU = ∠UAX = 90°, and CU = AX.

∴ By the SAS condition, ΔVCU and ΔUAX are congruent.

∴ VU = UX

Similarly, VU = XW, VU = WV.

∴ Sides of the quadrilateral UVWX are equal.



In ΔVCU, VC = CU

⇒∠1 = ∠2

Also, ∠1 + ∠C + ∠2 = 180°

⇒∠1 + 90° + ∠1 = 180°

⇒2∠1 = 90°

⇒∠1 = 45°

∴ ∠2 is also 45°.

Similarly, ∠3 = ∠4 = 45°

We have ∠2 + ∠VUX + ∠3 = 180°

⇒45° + ∠VUX + 45° = 180°

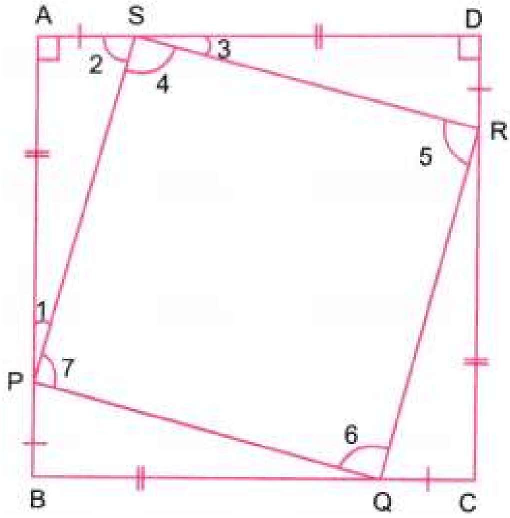
⇒∠VUX = 180° – 90°

⇒ ∠VUX = 90°

Similarly, ∠VXW = 90°, ∠XWV = 90° and ∠WVU = 90°.

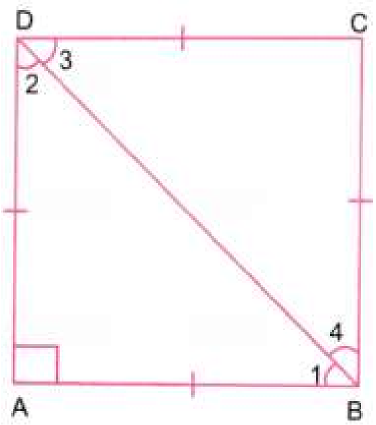
∴ By definition, the quadrilateral UVWX is a square.

(b) Let ABCD be a square.
Take points P, Q, R, and S such that AS = BP = CQ = DR.



Since the sides of squares are equal,
we have DS = AP = BQ = CR.
In ΔPAS and ΔSDR, we have
PA = SD, ∠PAS = ∠SDR = 90°, and AS = DR.
∴ By the SAS condition, ΔPAS and ΔSDR are congruent.
∴ PS = SR
Similarly, PS = RQ, PS = QP.
∴ Sides of the quadrilateral PQRS are equal.
In ΔPAS, ∠1 + ∠2 + 90° = 180°
⇒∠1 + ∠2 = 90°
⇒∠3 + ∠2 = 90° (∵ ∠1 = ∠3)
Also, ∠2 + ∠4 + ∠3 = 180°
⇒ 90° + ∠4 = 180°
⇒ ∠4 = 180° – 90°
⇒ ∠4 = 90°
∴ Similarly, ∠5 = 90°, ∠6 = 90°, and ∠7 = 90°.
By definition, the quadrilateral PQRS is a square.

Question 8. If a quadrilateral has four equal sides and one angle of 90°, will it be a square? Find the answer using geometric reasoning as well as by construction and measurement.
Solution: Let ABCD be a quadrilateral such that AB = BC = CD = DA and ∠DAB = 90°.
Join BD.



In ΔADB and ΔCDB, we have

AD = CD, AB = CB, and DB is a common side.

∴ ΔADB and ΔCDB are congruent.

∴ ∠C = ∠A = 90°

In ΔDAB, ∠1 = ∠2 (∵ AB = AD)

Also, ∠1 + 90° + ∠2 = 180°

⇒ ∠1 + ∠2 = 90°

⇒ ∠1 = 45° and ∠2 = 45° (∵ ∠1 = ∠2)

In ΔCDB, ∠3 = ∠4 (∵ CD = CB)

Also, ∠3 + 90° + ∠4 = 180°

⇒ ∠3 + ∠4 = 90°

⇒ ∠3 = ∠4 = 45° (∵ ∠3 = ∠4)

∴ ∠ABC = ∠1 + ∠4 = 45° + 45° = 90°

and ∠ADC = ∠2 + ∠3 = 45° + 45° = 90°.

∴ Each angle of the quadrilateral ABCD is 90°.

∴ ABCD is a square.

Also, by measurement, we find AB = BC = CD = DA and ∠A = ∠B = ∠C = ∠D = 90°.

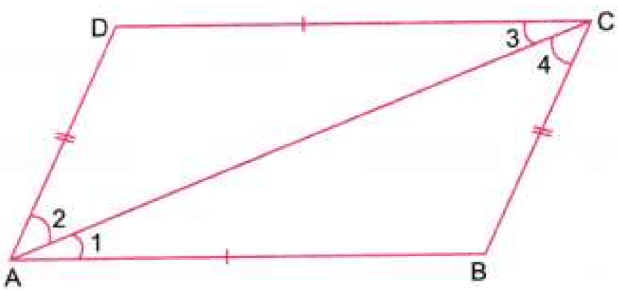
Question 9. What type of quadrilateral is one in which the opposite sides are equal? Justify your answer.

Hint: Draw a diagonal and check for congruent triangles.

Solution:

Let ABCD be a quadrilateral in which opposite sides are equal.

Join AC.



In ΔADC and ΔCBA, we have

AD = CB, DC = BA, and AC is common.

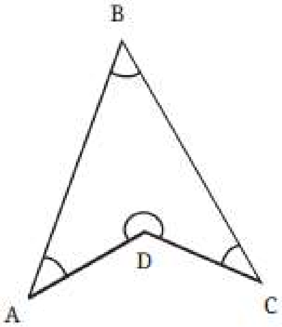
∴ By the SSS condition, AADC and ACBA are congruent.

∴ ∠1 = ∠3 and ∠2 = ∠4

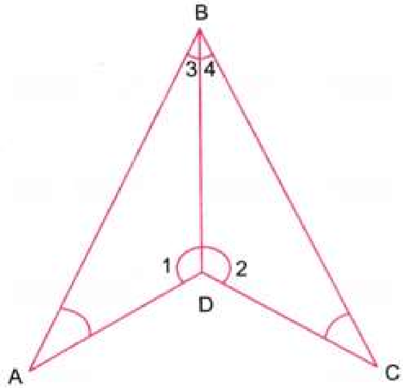
AC is a transversal of lines AB and DC, and alternate angles ∠1 and ∠3 are equal.

∴ Lines AB and DC are parallel.
AC is a transversal of lines AD and BC, and alternate angles ∠2 and ∠4 are equal.
∴ Lines AD and BC are parallel.
∴ By definition, the quadrilateral ABCD is a parallelogram.

Question 10. Will the sum of the angles in a quadrilateral, such as the following one, also be 360°? Find the answer using geometric reasoning as well as by constructing this figure and measuring.



Solution:
In the given quadrilateral, join BD.
In ΔABD, we have
∠A + ∠3 + ∠1 = 180°
In ΔCBD, we have
∠C + ∠4 + ∠2 = 180°

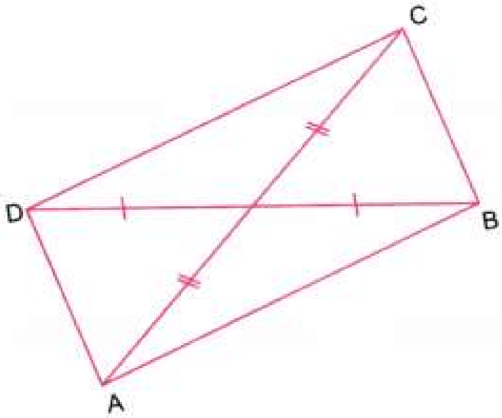


Adding, we get
(∠A + ∠3 + ∠1) + (∠C + ∠4 + ∠2) = 180° + 180°
⇒ ∠A + (∠3 + ∠4) + ∠C + (∠1 + ∠2) = 360°
⇒ ∠A + ∠B + ∠C + ∠D = 360°
∴ The sum of the angles of the quadrilateral ABCD is 360°.
Also, by using a protractor, we find that the sum of all angles is 360°.

Question 11. State whether the following statements are true or false. Justify your answers.
(i) A quadrilateral whose diagonals are equal and bisect each other must be a square.
(ii) A quadrilateral having three right angles must be a rectangle.
(iii) A quadrilateral whose diagonals bisect each other must be a parallelogram.
(iv) A quadrilateral whose diagonals are perpendicular to each other must be a rhombus.
(v) A quadrilateral in which the opposite angles are equal must be a parallelogram.

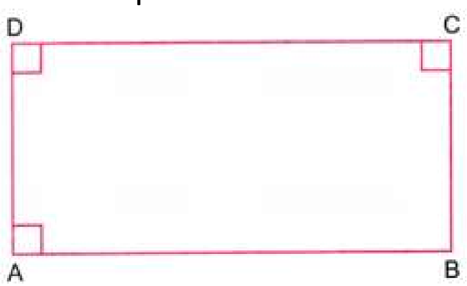
(vi) A quadrilateral in which all the angles are equal is a rectangle.
(vii) Isosceles trapeziums are parallelograms.

Solution: (i) A quadrilateral whose diagonals are equal and bisect each other need not be a square.
In the figure, diagonals AC and DB are equal and bisect each other. Such a quadrilateral is always a rectangle.



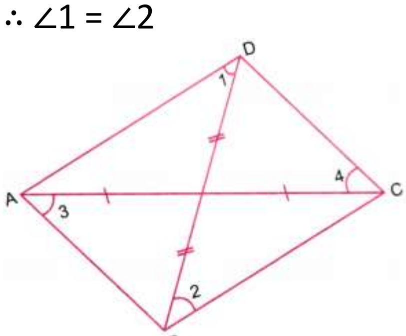
∴ The given statement is false.

(ii) Let ABCD be a quadrilateral having three right angles at A, D, and C.
We have ∠A + ∠B + ∠C + ∠D = 360°.
⇒ 90° + ∠B + 90° + 90° = 360°
⇒ ∠B = 360° – 270°
⇒ ∠B = 90°.
∴ Each angle of ABCD is 90°.
∴ Given quadrilateral is a rectangle.



∴ The given statement is true.

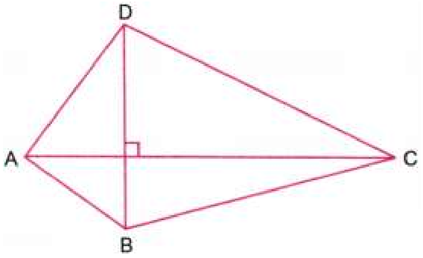
(iii) In the quadrilateral ABCD, the diagonals AC and BD bisect each other.
Here, ΔAOD and ΔCOB are congruent.
∴ ∠1 = ∠2



∴ BC is parallel to AD.

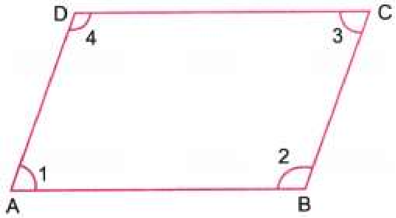
Also, ΔAOB and ΔCOD are congruent.
∴ ∠3 = ∠4
∴ AB is parallel to DC.
Since opposite sides of ABCD are parallel, it must be a parallelogram.
∴ The given statement is true.

(iv) Let ABCD be a quadrilateral whose diagonals AC and BD are perpendicular to each other.



This quadrilateral may not be a rhombus, because the diagonals AC and BC may not bisect each other.
∴ The given statement is false.

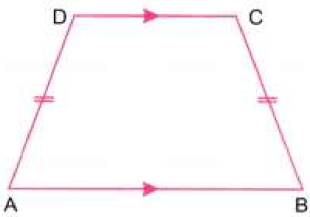
(v) Let ABCD be a quadrilateral in which ∠1 = ∠3 and ∠2 = ∠4.
We have, ∠1 + ∠2 + ∠3 + ∠4 = 360°.
⇒ ∠1 + ∠2 + ∠1 + ∠2 = 360°
⇒ 2(∠1 + ∠2) = 360°
⇒ ∠1 + ∠2 = 180°



AB is a transversal of lines AD and BC, and the sum of internal angles ∠1 and ∠2 on the same side is 180°.
∴ Lines AD and BC are parallel.
Again, ∠1 + ∠2 + ∠3 + ∠4 = 360°
⇒ ∠3 + ∠2 + ∠3 + ∠2 = 360°
⇒ 2(∠2 + ∠3) = 360°
⇒ ∠2 + ∠3 = 180°
BC is a transversal of lines AB and DC, and the sum of internal angles ∠2 and ∠3 on the same sides is 180°.
∴ Lines AB and DC are parallel.
∴ Opposite sides of quadrilateral ABCD are parallel.
∴ ABCD is a parallelogram.
∴ The given statement is true.

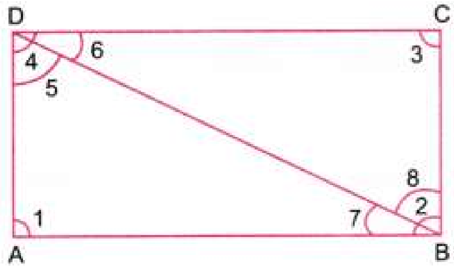
(vi) Let ABCD be a quadrilateral, where ∠1, ∠2, ∠3, and ∠4 are all equal.
We have ∠1 + ∠2 + ∠3 + ∠4 = 360°

∴ ∠1 + ∠1 + ∠1 + ∠1 = 360°
⇒ 4∠1 = 360°
⇒ ∠1 = 90°



∴ ∠2 = 90°, ∠3 = 90°, ∠4 = 90°
We have, ∠5 + ∠6 = 90°
and ∠6 + 90° + ∠8 = 180°
⇒ ∠5 + ∠6 = ∠6 + ∠8
⇒ ∠5 = ∠8
Also, ∠7 + 90° + ∠5 = 180°
⇒ ∠7 + ∠5 = 90°
⇒ ∠5 + ∠6 = ∠7 + ∠5
⇒ ∠6 = ∠7
In ΔDAB and ΔBCD, we have ∠5 = ∠8, ∠7 = ∠6, and side BD is common.
∴ By the ASA condition, ΔDAB and ΔBCD are congruent.
∴ DA = BC and AB = CD
∴ Opposite sides of ABCD are equal.
∴ ABCD is a rectangle.
∴ The given statement is true

(vii) An isosceles trapezium ABCD can not be a parallelogram because it has two non-parallel equal lines AD and BC.



∴ The given statement is false.