पुUना International School

Shree Swaminarayan Gurukul, Zundal

Class -VIII

Mathematics

Year- 2020-21

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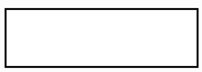
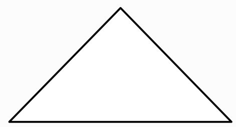
CHAPTER – 3 UNDERSTANDING QUADRILATERALS

- **Summary**
- **Introduction**
- **Convex and concave polygon**
- **Regular and irregular polygon**
- **Angle and property**
- **Sum of the exterior angles**
- **Kinds of quadrilaterals**

INTRODUCTION :

POLYGON : A simple closed curved made up of only line segment is called a polygon .





Classification of polygon :

NUMBER OF SIDES	CLASSIFICATION	SAMPLE FIGURE
3	TRIANGLE	
4	QUADRILATERALS	
5	PENTAGON	
6	HEXAGON	
7	HEPTAGON	
8	OCTAGON	
9	NONAGON	

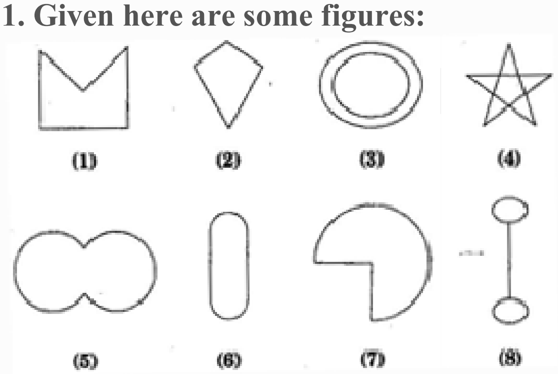
Kinds of quadrilateral :

QUADRILATERALS	DEFINE	FIGURE	PROPERTIES
1.PARALLELOGRAM:	A quadrilateral with each pair of		1.Opposite sides are equal.

	opposite sides parallel.		**2.Opposite angles are equal. 3.Diagonals bisect one each other .**
2.RHOMBUS :	**A parallelogram with sides of equal length .**		**1.All the properties of parallogram. 2.Diagonals are perpendicular to each other .**
3.RECTANGLE	**A parallelogram with a right angle .**		**1.All the properties of parallelogram. 2. Each of angles is a right angle . 3. Diagonals are equal .**
4. SQUARE	**A rectangle with sides of equal length.**		**1.All the properties of parallelogram . 2.Rhombus and angle .**
5.KITE	**A quadrilateral with exactly two pairs of equal consecutive sides .**		**1.The diagonals areperpen-dicular to one other. 2.One of the diagonals bisects the other .**

(Exercise. 3.1)

1. Given here are some figures:



Classify each of them on the basis of the following:
(a) Simple curve

(b) Simple closed curve
(c) Polygon
(d) Convex polygon
(e) Concave polygon
Ans. (a) Simple curve

(b) Simple closed curve

(c) Polygons

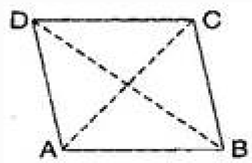
(d) Convex polygons

(e) Concave polygon

---

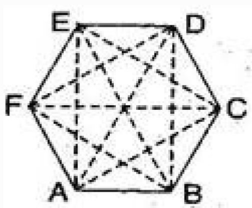
2. How many diagonals does each of the following have?
(a) A convex quadrilateral
(b) A regular hexagon
(c) A triangle
Ans. (a) A convex quadrilateral has two diagonals.

Here, AC and BD are two diagonals.



(b) A regular hexagon has 9 diagonals.

Here, diagonals are AD, AE, BD, BE, FC, FB, AC, EC and FD.



(c) A triangle has no diagonal.

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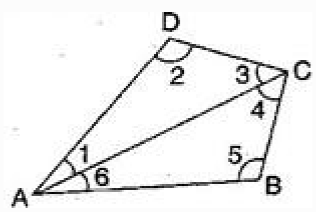
3. What is the sum of the measures of the angles of a convex quadrilateral? Will this property hold if the quadrilateral is not convex? (Make a non-convex quadrilateral and try)
Ans. Let ABCD is a convex quadrilateral, then we draw a diagonal AC which divides the quadrilateral in two triangles.
$\angle A + B + \angle C + \angle D$

$= \angle 1 + \angle 6 + \angle 5 + \angle 4 + \angle 3 + \angle 2$

$= (\angle 1 + \angle 2 + \angle 3) + (\angle 4 + \angle 5 + \angle 6)$



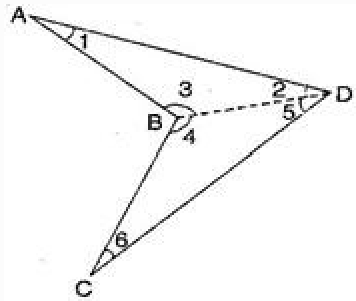
$= 180^\circ + 180^\circ$

[By Angle sum property of triangle]
$= 360^\circ$

Hence, the sum of measures of the triangles of a convex quadrilateral is 360°.

Yes, if quadrilateral is not convex then, this property will also be applied.

Let ABCD is a non-convex quadrilateral and join BD, which also divides the quadrilateral in two triangles.



Using angle sum property of triangle,

In Δ ABD, $\angle 1 + \angle 2 + \angle 3 = 180^\circ$ ……….(i)

In Δ BDC, $\angle 4 + \angle 5 + \angle 6 = 180^\circ$ ……….(i)

Adding eq. (i) and (ii),

$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 = 360^\circ$

$\Rightarrow \angle 1 + \angle 2 + (\angle 3 + \angle 4) + \angle 5 + \angle 6$

$= 360^\circ$

$\Rightarrow \angle A + \angle B + \angle C + \angle D = 360^\circ$

Hence proved.

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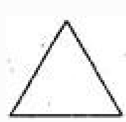
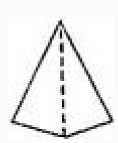
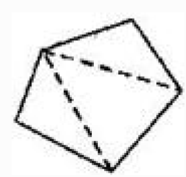
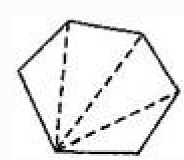
4. Examine the table. (Each figure is divided into triangles and the sum of the angles deduced from that.)

Figure				
Side	**3**	**4**	**5**	**6**
Angle sum	$1\times180^\circ = (3-2)\times180^\circ$	$2\times180^\circ = (4-2)\times180^\circ$	$3\times180^\circ = (5-2)\times180^\circ$	$4\times180^\circ = (6-2)\times180^\circ$

What can you say about the angle sum of a convex polygon with number of sides?
Ans. (a) When n = 7, then

Angle sum of a polygon = $(n-2)\times180^\circ$

$=(7-2)\times 180^\circ = 5\times 180^\circ = 900^\circ$

(b) When n = 8, then

Angle sum of a polygon = $(n-2)\times 180^\circ$

$=(8-2)\times 180^\circ = 6\times 180^\circ = 1080^\circ$

(c) When n = 10, then

Angle sum of a polygon = $(n-2)\times 180^\circ$

$=(10-2)\times 180^\circ = 8\times 180^\circ = 1440^\circ$

(d) When n = $n,$ then

Angle sum of a polygon = $(n-2)\times 180^\circ$

---

5. What is a regular polygon? State the name of a regular polygon of:
(a) 3 sides
(b) 4 sides
(c) 6 sides
Ans. A regular polygon: A polygon having all sides of equal length and the interior angles of equal size is known as regular polygon.
(i) 3 sides

Polygon having three sides is called a **triangle**.
(ii) 4 sides

Polygon having four sides is called a **quadrilateral**.
(iii) 6 sides

Polygon having six sides is called a **hexagon**.

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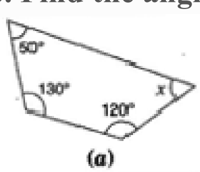
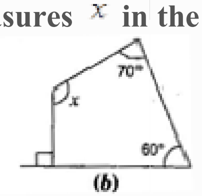
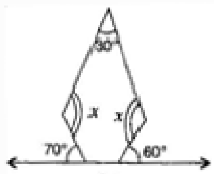
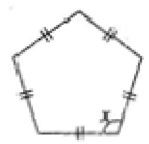
6. Find the angle measures x in the following figures:





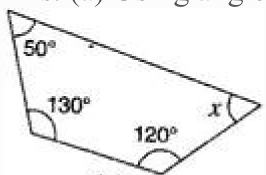


(c)



(d)

Ans. (a) Using angle sum property of a quadrilateral,



(a)

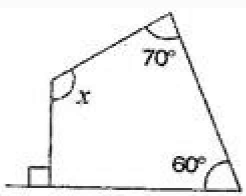
$50^\circ + 130^\circ + 120^\circ + x = 360^\circ$

$\Rightarrow\ 300^\circ + x = 360^\circ$

$\Rightarrow\ x = 360^\circ - 300^\circ$

$\Rightarrow\ x = 60^\circ$

(b) Using angle sum property of a quadrilateral,



(b)

$90^\circ + 60^\circ + 70^\circ + x = 360^\circ$

$\Rightarrow\ 220^\circ + x = 360^\circ$

$\Rightarrow\ x = 360^\circ - 220^\circ$

$\Rightarrow\ x = 140^\circ$

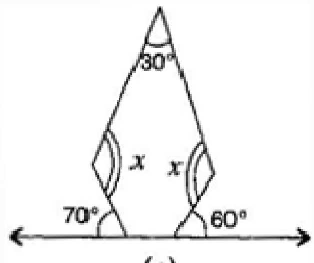
(a) First base interior angle

$= 180^\circ - 70^\circ = 110^\circ$

Second base interior angle

$= 180^\circ - 60^\circ = 120^\circ$

There are 5 sides, $n = 5$



(c)

$\therefore$ Angle sum of a polygon = $(n-2)\times180^\circ$

$= (5-2)\times180^\circ = 3\times180^\circ = 540^\circ$

$\therefore\ 30^\circ + x + 110^\circ + 120^\circ + x = 540^\circ$

$\Rightarrow\ 260^\circ + 2x = 540^\circ$

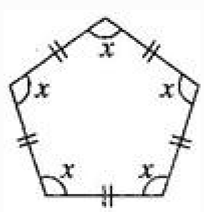
$\Rightarrow\ 2x = 540^\circ - 260^\circ$

$\Rightarrow\ 2x = 280^\circ$

$\Rightarrow\ x = 140^\circ$

(b) Angle sum of a polygon = $(n-2)\times180^\circ$

$= (5-2)\times180^\circ = 3\times180^\circ = 540^\circ$



(d)

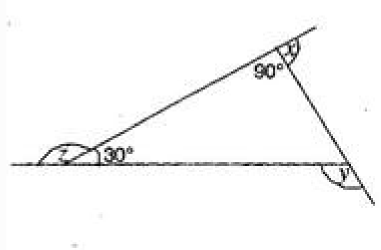
$\therefore\ x+x+x+x+x = 540^\circ$

$\Rightarrow\ 5x = 540^\circ$

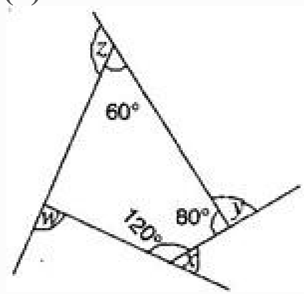
$\Rightarrow\ x = 108^\circ$

Hence each interior angle is 108°.

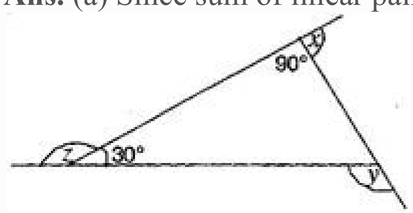
7. (a) Find $x+y+z$



(b) Find $x+y+z+w$



Ans. (a) Since sum of linear pair angles is 180°.



$\therefore \quad 90^\circ + x = 180^\circ$

$\Rightarrow \quad x = 180^\circ - 90^\circ = 90^\circ$

And $z + 30^\circ = 180^\circ$

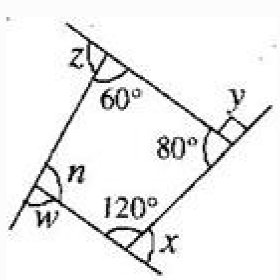
$\Rightarrow \quad z = 180^\circ - 30^\circ = 150^\circ$

Also $y = 90^\circ + 30^\circ = 120^\circ$

[Exterior angle property]

$\therefore \quad x + y + x = 90^\circ + 120^\circ + 150^\circ = 360^\circ$

(b) Using angle sum property of a quadrilateral,



$60^\circ + 80^\circ + 120^\circ + n = 360^\circ$

$\Rightarrow 260^\circ + n = 360^\circ$

$\Rightarrow n = 360^\circ - 260^\circ$

$\Rightarrow n = 100^\circ$

Since sum of linear pair angles is 180°.

$\therefore w + 100 = 180^\circ$ ……….(i)

$x + 120^\circ = 180^\circ$ ……….(ii)

$y + 80^\circ = 180^\circ$ ……….(iii)

$z + 60^\circ = 180^\circ$ ……….(iv)

Adding eq. (i), (ii), (iii) and (iv),

$\Rightarrow x + y + z + w + 100^\circ + 120^\circ + 80^\circ + 60^\circ$

$= 180^\circ + 180^\circ + 180^\circ + 180^\circ$

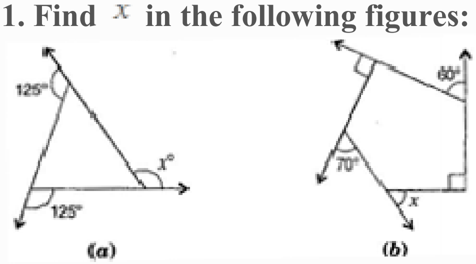
$\Rightarrow x + y + z + w + 360^\circ = 720^\circ$

$\Rightarrow x + y + z + w = 720^\circ - 360^\circ$

$\Rightarrow x + y + z + w = 360^\circ$

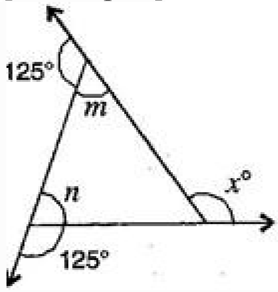
(Exercise- 3.2)

1. Find x in the following figures:



Ans. (a) Here, $125^\circ + m = 180^\circ$

[Linear pair]



$\Rightarrow \quad m = 180° - 125° = 55°$

And $125° + n = 180°$

[Linear pair]

$\Rightarrow \quad n = 180° - 125° = 55°$

$\because$ Exterior angle $x°$

= Sum of opposite interior angles

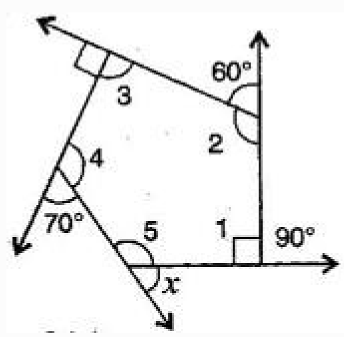
$\therefore \quad x° = 55° + 55° = 110°$

(b) Sum of angles of a pentagon

$= (n-2) \times 180°$

$= (5-2) \times 180°$

$= 3 \times 180° = 540°$



By linear pairs of angles,

$\angle 1 + 90° = 180°$ ……….(i)

$\angle 2 + 60° = 180°$ ……….(ii)

$\angle 3 + 90° = 180°$ ……….(iii)

$\angle 4 + 70^\circ = 180^\circ$ ……….(iv)

$\angle 5 + x = 180^\circ$ ……….(v)

Adding eq. (i), (ii), (iii), (iv) and (v),

$x + (\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5) + 310^\circ = 900$

$\Rightarrow \quad x + 540^\circ + 310^\circ = 900^\circ$

$\Rightarrow \quad x + 850^\circ = 900^\circ$

$\Rightarrow \quad x = 900^\circ - 850^\circ = 50^\circ$

---

2. Find the measure of each exterior angle of a regular polygon of:

(a) 9 sides
(b) 15 sides

Ans. (i) Sum of angles of a regular polygon = $(n-2) \times 180^\circ$
= $(9-2) \times 180^\circ = 7 \times 180^\circ = 1260^\circ$

Each interior angle = $\dfrac{\text{Sum of interior angles}}{\text{Number of sides}} = \dfrac{1260^\circ}{9} = 140^\circ$

Each exterior angle = $180^\circ - 140^\circ = 40^\circ$

(ii) Sum of exterior angles of a regular polygon = 360°

Each interior angle = $\dfrac{\text{Sum of interior angles}}{\text{Number of sides}} = \dfrac{360^\circ}{15} = 24^\circ$

---

3. How many sides does a regular polygon have, if the measure of an exterior angle is 24°?
Ans. Let number of sides be n.
Sum of exterior angles of a regular polygon = 360°

Number of sides = $\dfrac{\text{Sum of exterior angles}}{\text{Each interior angle}} = \dfrac{360^\circ}{24^\circ} = 15$

Hence, the regular polygon has 15 sides.

4. How many sides does a regular polygon have if each of its interior angles is $165°$?

Ans. Let number of sides be n.

Exterior angle = $180° - 165° = 15°$

Sum of exterior angles of a regular polygon = $360°$

Number of sides = $\frac{\text{Sum of exterior angles}}{\text{Each interior angle}} = \frac{360°}{15°} = 24$

Hence, the regular polygon has 24 sides.

---

5. (a) Is it possible to have a regular polygon with of each exterior angle as $22°$?
(b) Can it be an interior angle of a regular polygon? Why?

Ans. (a) No. (Since 22 is not a divisor of $360°$)

(b) No, (Because each exterior angle is $180° - 22° = 158°$, which is not a divisor of $360°$)

---

6. (a) What is the minimum interior angle possible for a regular polygon? Why?
(b) What is the maximum exterior angle possible for a regular polygon?

Ans. (a) The equilateral triangle being a regular polygon of 3 sides has the least measure of an interior angle of 60∘.60∘.

∵∵ Sum of all the angles of a triangle

= 180∘180∘

∴∴ $x + x + x = 180°$

$\Rightarrow\ 3x = 180°$

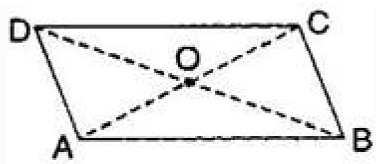
$\Rightarrow\ x = 60°$

(b) By (a), we can observe that the greatest exterior angle is $180° - 60°$

$= 120°$.

(Exercise. 3.3)

1. Given a parallelogram ABCD. Complete each statement along with the definition or property used.



(i) AD = ________________

(ii) ∠DCB = ________________

(iii) OC = _______________

(iv) $m\angle$ DAB + $m\angle$ CDA = _________

Ans. (i) AD = BC

[Since opposite sides of a parallelogram are equal]

(ii) ∠DCB = ∠DAB

[Since opposite angles of a parallelogram are equal]

(iii) OC = OA

[Since diagonals of a parallelogram bisect each other]

(iv) $m\angle$ DAB + $m\angle$ CDA = 180°

[Adjacent angles in a parallelogram are supplementary]

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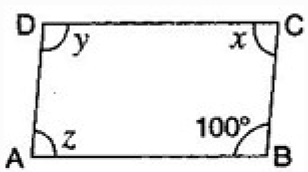
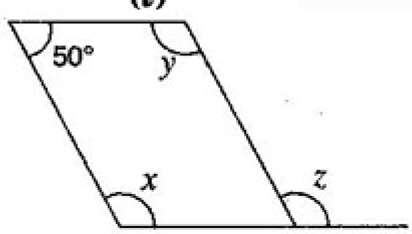
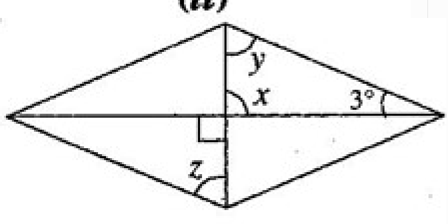
2. Consider the following parallelograms. Find the values of the unknowns x, y, z.



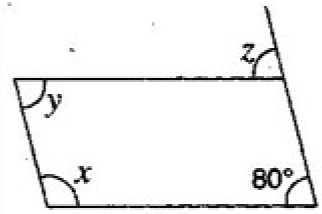
(i)



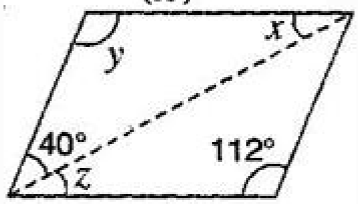
(ii)



(iii)



(iv)

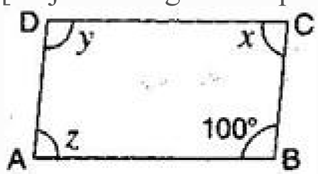


(v)

Note: For getting correct answer, read $3^\circ = 30^\circ$ in figure (iii)

Ans. (i) $\angle B + \angle C = 180^\circ$

[Adjacent angles in a parallelogram are supplementary]



$\Rightarrow 100^\circ + x = 180^\circ$

$\Rightarrow x = 180^\circ - 100^\circ = 80^\circ$

And $z = x = 80^\circ$

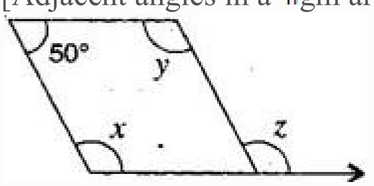
[Since opposite angles of a parallelogram are equal]

Also $y = 100^\circ$

[Since opposite angles of a parallelogram are equal]

(ii) $x + 50^\circ = 180^\circ$

[Adjacent angles in a $\parallel$gm are supplementary]



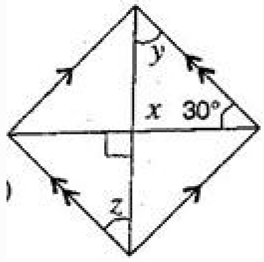
$\Rightarrow x = 180^\circ - 50^\circ = 130^\circ$

$\Rightarrow z = x = 130^\circ$

[Corresponding angles]

(iii) $x = 90^\circ$

[Vertically opposite angles]



$\Rightarrow y+x+30^\circ=180^\circ$

[Angle sum property of a triangle]

$\Rightarrow y+90^\circ+30^\circ=180^\circ$

$\Rightarrow y+120^\circ=180^\circ$

$\Rightarrow y=180^\circ-120^\circ=60^\circ$

$\Rightarrow z=y=60^\circ$

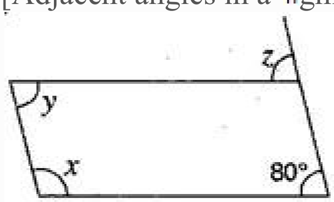
[Alternate angles]

(iv) $z=80^\circ$

[Corresponding angles]

$\Rightarrow x+80^\circ=180^\circ$

[Adjacent angles in a $\parallel$gm are supplementary]



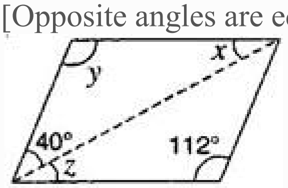
$\Rightarrow x=180^\circ-80^\circ=100^\circ$

And $y=80^\circ$

[Opposite angles are equal in a $\parallel$gm]

(v) $y=112^\circ$

[Opposite angles are equal in a $\parallel$gm]



$\Rightarrow 40^\circ+y+x=180^\circ$

[Angle sum property of a triangle]

$\Rightarrow 40^\circ + 112^\circ + x = 180^\circ \Rightarrow 152^\circ + x = 180^\circ$

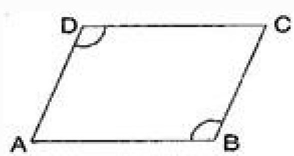
$\Rightarrow x = 180^\circ - 152^\circ = 28^\circ$

And $z = x = 28^\circ$

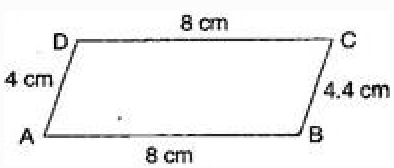
[Alternate angles]

---

3. Can a quadrilateral ABCD be a parallelogram, if:
(i) $\angle$D + $\angle$B = 180°?
(ii) AB = DC = 8 cm, AD = 4 cm and BC = 4.4 cm?
(iii) $\angle$A = 70° and $\angle$C = 65°?
Ans. (i) $\angle$D + $\angle$B = 180°
It can be, but here, it needs not to be.

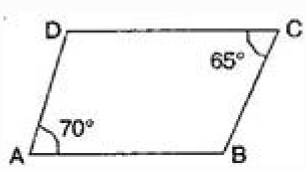


(ii) No, in this case because one pair of opposite sides are equal and another pair of opposite sides are unequal. So, it is not a parallelogram.



(iii) No. $\angle A \neq \angle C$.

Since opposite angles are equal in parallelogram and here opposite angles are not equal in quadrilateral ABCD. Therefore it is not a parallelogram.

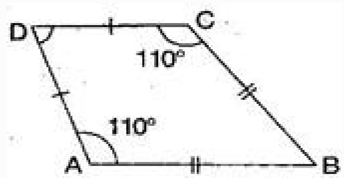


---

4. Draw a rough figure of a quadrilateral that is not a parallelogram but has exactly two opposite angles of equal measures.

Ans. ABCD is a quadrilateral in which angles $\angle A = \angle C = 110^\circ$

Therefore, it could be a kite.



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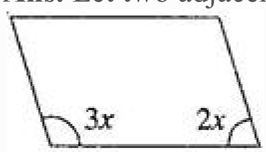
5. The measure of two adjacent angles of a parallelogram are in the ratio 3 : 2. Find the measure of each of the angles of the parallelogram.

Ans. Let two adjacent angles be $3x$ and $2x$.



Since the adjacent angles in a parallelogram are supplementary.

$\therefore 3x + 2x = 180^\circ$

$\Rightarrow 5x = 180^\circ$

$\Rightarrow x = \frac{180^\circ}{5} = 36^\circ$

$\therefore$One angle = $3x = 3 \times 36^\circ = 108^\circ$

And Another angle = $2x = 2 \times 36^\circ = 72^\circ$

---

6. Two adjacent angles of a parallelogram have equal measure. Find the measure of the angles of the parallelogram.

Ans. Let each adjacent angle be x.

Since the adjacent angles in a parallelogram are supplementary.

$\therefore x + x = 180^\circ$

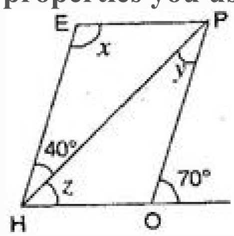
$\Rightarrow 2x = 180^\circ$

$\Rightarrow x = \frac{180^\circ}{2} = 90^\circ$

Hence, each adjacent angle is 90°.

---

7. The adjacent figure HOPW is a parallelogram. Find the angle measures x, y and z. State the properties you use to find them.



$\angle$**HOP** + $70^\circ = 180^\circ$

Ans. Here $\angle$HOP = $180^\circ - 70^\circ = 110^\circ$

[Angles of linear pair]

And $\angle$E = $\angle$HOP

[Opposite angles of a $\parallel$gm are equal]

$\Rightarrow x = 110^\circ$

$\angle$PHE = $\angle$HPO

[Alternate angles]

$\therefore y = 40^\circ$

Now $\angle$EHO = $\angle$O = 70°

[Corresponding angles]

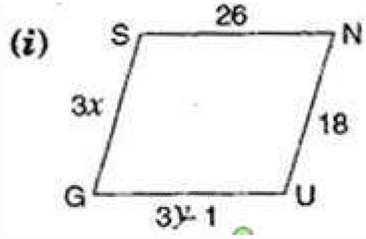
$\Rightarrow 40^\circ + z = 70^\circ$

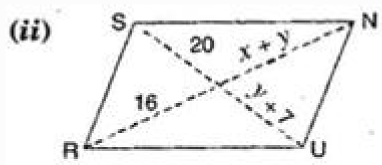
$\Rightarrow z = 70^\circ - 40^\circ = 30^\circ$

Hence, $x = 110^\circ, y = 40^\circ$ and $z = 30^\circ$

---

8. The following figures GUNS and RUNS are parallelograms. Find x and y. (Lengths are in cm)





Ans. (i) In parallelogram GUNS,
GS = UN

[Opposite sides of parallelogram are equal]
$\Rightarrow 3x = 18$

$\Rightarrow x = \frac{18}{3} = 6$ cm

Also GU = SN

[Opposite sides of parallelogram are equal]
$\Rightarrow 3y - 1 = 26$

$\Rightarrow 3y = 26 + 1$

$\Rightarrow 3y = 27$

$\Rightarrow y = \frac{27}{3} = 9$ cm

Hence, x = 6 cm and x = 9 cm.

(ii) In parallelogram RUNS,

$y + 7 = 20$

[Diagonals of $\parallel$gm bisects each other]
$\Rightarrow y = 20 - 7 = 13$ cm

And $x + y = 16$

$\Rightarrow x + 13 = 16$

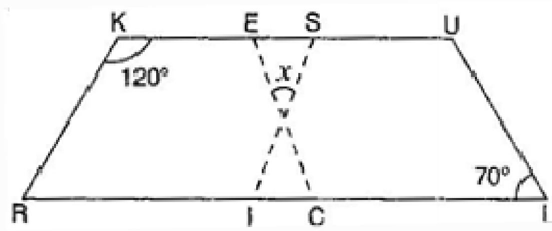
$\Rightarrow x = 16 - 13$

$\Rightarrow x = 3$ cm

Hence, $x = 3$ cm and $y = 13$ cm.

---

9. In the figure, both RISK and CLUE are parallelograms. Find the value of x.



Ans. In parallelogram RISK,
$\angle$RIS = $\angle$K = $120°$

[Opposite angles of a $\parallel$gm are equal]
$\angle m + 120° = 180°$ [Linear pair]

$\Rightarrow \angle m = 180° - 120° = 60°$

And $\angle$ECI = $\angle$L = $70°$

[Corresponding angles]
$\Rightarrow m + n + \angle ECI = 180°$

[Angle sum property of a triangle]
$\Rightarrow 60° + n + 70° = 180°$

$\Rightarrow 130° + n = 180°$

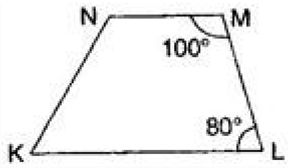
$\Rightarrow n = 180° - 130° = 50°$

Also $x = n = 50°$

[Vertically opposite angles]

---

10. Explain how this figure is a trapezium. Which is its two sides are parallel?

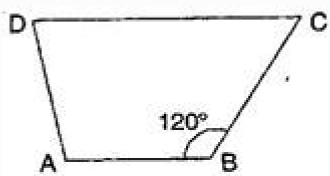


Ans. Here, $\angle$M + $\angle$L = $100^\circ + 80^\circ = 180^\circ$
[Sum of interior opposite angles is 180°]
$\therefore$NM and KL are parallel.

Hence, KLMN is a trapezium.

---

11. Find $m\angle$C in figure , if $\overline{AB} \parallel \overline{DC}$



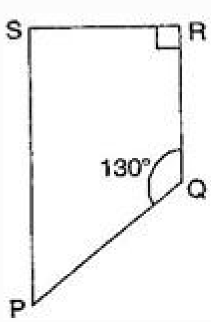
Ans. Here, $\angle$B + $\angle$C = 180°
[$\because \overline{AB} \parallel \overline{DC}$]
$\therefore 120^\circ + m\angle C = 180^\circ$

$\Rightarrow m\angle C = 180^\circ - 120^\circ = 60^\circ$

---

12. Find the measure of $\angle$P and $\angle$S if $\overline{SP} \parallel \overline{RQ}$ in given figure.

(If you find $m\angle$ R is there more than one method to find $m\angle$ P)



Ans. Here, $\angle$P + $\angle$Q = 180°
[Sum of co-interior angles is 180°]

$\Rightarrow \angle P + 130^\circ = 180^\circ$

$\Rightarrow \angle P = 180^\circ - 130^\circ$

$\Rightarrow \angle P = 50^\circ$

$\because \angle R = 90^\circ$ [Given]

$\therefore \angle S + 90^\circ = 180^\circ$

$\Rightarrow \angle S = 180^\circ - 90^\circ$

$\Rightarrow \angle S = 90^\circ$

Yes, one more method is there to find $\angle P$.

$\angle S + \angle R + \angle Q + \angle P = 360^\circ$

[Angle sum property of quadrilateral]

$\Rightarrow 90^\circ + 90^\circ + 130^\circ + \angle P = 360^\circ$

$\Rightarrow 310^\circ + \angle P = 360^\circ$

$\Rightarrow \angle P = 360^\circ - 310^\circ$

$\Rightarrow \angle P = 50^\circ$

Exercise - 3.4

1. State whether true or false:
(a) All rectangles are squares.
(b) All rhombuses are parallelograms.
(c) All squares are rhombuses and also rectangles.
(d) All squares are not parallelograms.
(e) All kites are rhombuses.
(f) All rhombuses are kites.
(g) All parallelograms are trapeziums.
(h) All squares are trapeziums.

Ans. (a) False. Since, squares have all sides are equal.
(b) True. Since, in rhombus, opposite angles are equal and diagonals intersect at mid-point.

(c) True. Since, squares have the same property of rhombus but not a rectangle.

(d) False. Since, all squares have the same property of parallelogram.

(e) False. Since, all kites do not have equal sides.

(f) True. Since, all rhombuses have equal sides and diagonals bisect each other.

(g) True. Since, trapezium has only two parallel sides.

(h) True. Since, all squares have also two parallel lines.

---

2. Identify all the quadrilaterals that have:
(a) four sides of equal lengths.
(b) four right angles.
Ans. (a) Rhombus and square have sides of equal length.
(b) Square and rectangle have four right angles.

---

3. Explain how a square is:

(a) a quadrilateral
(b) a parallelogram
(c) a rhombus
(d) a rectangle
Ans. (i) A square is a quadrilateral, since it has four equal lengths of sides.
(ii) A square is a parallelogram, since it contains both pairs of opposite sides equal.

(iii) A square is already a rhombus. Since, it has four equal sides and diagonals bisect at 90° to each other.

(iv) A square is a parallelogram, since having each adjacent angle a right angle and opposite sides are equal.

---

4. Name the quadrilateral whose diagonals:
(i) bisect each other.
(ii) are perpendicular bisectors of each other.
(iii) are equal.
Ans. (i) If diagonals of a quadrilateral bisect each other then it is a rhombus, parallelogram, rectangle or square.

(ii) If diagonals of a quadrilateral are perpendicular bisector of each other, then it is a rhombus or square.

(iii) If diagonals are equal, then it is a square or rectangle.

---

5. Explain why a rectangle is a convex quadrilateral.

Ans. A rectangle is a convex quadrilateral since its vertex are raised and both of its diagonals lie in its interior.

CHAPTER – 4 PRACTICAL GEOMETRY

- **Summary**
- **Introduction**
- **Constructing a quadrilateral**

Exercise 4.1

1. Construct the following quadrilaterals:(i) Quadrilateral ABCD
AB = 4.5 cm, BC = 5.5 cm, CD = 4 cm,

AD = 6 cm, AC = 7 cm

(ii) Quadrilateral JUMP
JU = 3.5 cm, UM = 4 cm, MP = 5 cm,

PJ = 4.5 cm, PU = 6.5 cm

(iii) Parallelogram MORE
OR = 6 cm, RE = 4.5 cm, EO = 7.5 cm

(iv) Rhombus BEST
BE = 4.5 cm, ET = 6 cm

Ans.
(i) Given: AB = 4.5 cm, BC = 5.5 cm,
CD = 4 cm, AD = 6 cm, AC = 7 cm

To construct: A quadrilateral ABCD
Steps of construction:

(a) Draw AB = 4.5 cm.

(b) Draw an arc taking radius 5.5 cm from point B.

(c) Taking radius 7 cm, draw an another arc from point A which intersects the first arc at point C.

(d) Join BC and AC.

(e) Draw an arc of radius 6 cm from point A and draw another arc of radius 4 cm from point C which intersects at D.

(f) Join AD and CD.

It is required quadrilateral ABCD.

(ii) Given: JU = 3.5 cm, UM = 4 cm,
MP = 5 cm, PJ = 4.5 cm, PU = 6.5 cm

To construct: A quadrilateral JUMP
Steps of construction:

(a) Draw JU = 3.5 cm.

(b) Draw an arc of radius 4.5 cm taking centre J and then draw another arc of radius 6.5 cm taking U as centre. Both arcs intersect at P.

(c) Join PJ and PU.

(d) Draw arc of radius 5 cm and 4 cm taking P and U as centres respectively, which intersect at M.

(e) Join Mp and MU.

It is required quadrilateral JUMP.

(iii) Given: OR = 6 cm, RE = 4.5 cm,
EO = 7.5 cm

To construct: A parallelogram MORE.
Steps of construction:

(a) Draw OR = 6 cm.

(b) Draw arcs of radius 7.5 cm and radius 4.5 cm taking O and R as centres respectively, which intersect at E.

(c) Join OE and RE.

(d) Draw an arc of 6 cm radius taking E as centre.

(e) Draw another arc of 4.5 cm radius taking O as centre, which intersects at M.

(f) Join OM and EM.

It is required parallelogram MORE.

(iv) Given: BE = 4.5 cm, ET = 6 cm
To construct: A rhombus BEST.
Steps of construction:

(a) Draw TE = 6 cm and bisect it into two equal parts.

(b) Draw up and down perpendiculars to TE.

(c) Draw two arcs of 4.5 cm taking E and T as centres, which intersect at S.

(d) Again draw two arcs of 4.5 cm taking E and T as centres, which intersects at B.

(e) Join TS, ES, BT and EB.

It is the required rhombus BEST.

(Ex. 4.2)

1. Construct the following quadrilaterals:

(i) Quadrilateral LIFT
LI = 4 cm, IF = 3 cm, TL = 2.5 cm, LF = 4.5 cm, IT = 4 cm
(ii) Quadrilateral GOLD
OL = 7.5 cm, GL = 6 cm, GD = 6 cm, LD = 5 cm, OD = 10 cm
(iii) Rhombus BEND
BN = 5.6 cm, DE = 6.5 cm
Ans.

(i) Given: **LI = 4 cm, IF = 3 cm, TL = 2.5 cm, LF = 4.5 cm, IT = 4 cm**

To construct: A quadrilateral LIFT
Steps of construction:

(a) Draw a line segment LI = 4 cm.

(b) Taking radius 4.5 cm, draw an arc taking L as centre.

(c) Draw an arc of 3 cm taking I as centre which intersects the first arc at F.

(d) Join FI and FL.

(e) Draw another arc of radius 2.5 cm taking L as centre and 4 cm taking I as centre which intersect at T.

(f) Join TF, Tl and TI.

It is the required quadrilateral LIFT.

(ii) Given**: OL = 7.5 cm, GL = 6 cm, GD = 6 cm, LD = 5 cm, OD = 10 cm**

To construct: A quadrilateral GOLD
Steps of construction:

(a) Draw a line segment OL = 7.5 cm

(b) Draw an arc of radius 5 cm taking L as centre and another arc of radius 10 cm taking O as centre which intersect the first arc point at D.

(c) Join LD and OD.

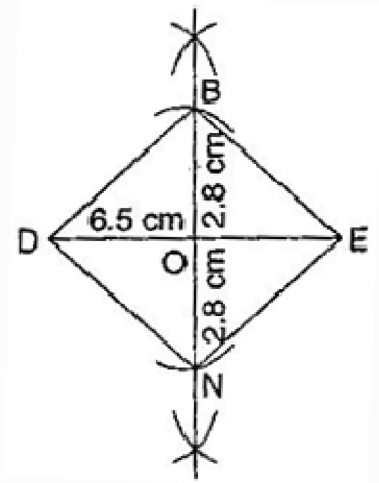
(d) Draw an arc of radius 6 cm from D and draw another arc of radius 6 cm taking L as centre, which intersects at G.

(e) Join GD and GO.

It is the required quadrilateral GOLD.

(iii) Given**: BN = 5.6 cm, DE = 6.5 cm**

To construct: A rhombus BEND.
Steps of construction:



(a) Draw DE = 6.5 cm.

(b) Draw perpendicular bisector of line segment DE.

(c) Draw two arcs of radius 2.8 cm from intersection point O, which intersects the line KN at B and N.

(d) Join BE, BD as well as ND and NE.

It is the required rhombus BEND.

(Ex. 4.3)

1. Construct the following quadrilaterals:

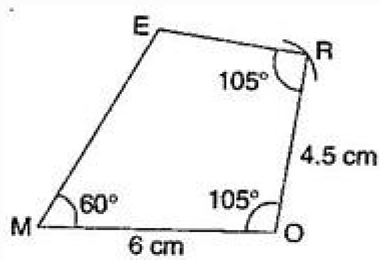
(i) Quadrilateral MORE

MO = 6 cm, OR = 4.5 cm,
$\angle$ **M =** 60°, $\angle$ **O =** 105°, $\angle$ **R =** 105°
(ii) Quadrilateral PLAN
PL = 4 cm, LA = 6.5 cm,
$\angle$ **P =** 90°, $\angle$ **A =** 110°, $\angle$ **N =** 85°
(iii) Parallelogram HEAR
HE = 5 cm, EA = 6 cm, $\angle$ **R =** 85°

(iv) Rectangle OKAY
OK = 7 cm, KA = 5 cm
Ans. (i) Given: MO = 6 cm, OR = 4.5 cm,
$\angle$ M = 60°, $\angle$ O = 105°, $\angle$ R = 105°

To construct: A quadrilateral MORE.

Steps of construction**:**



(a) Draw a line segment MO = 6 cm.

(b) Construct $\angle$ R = 105° and taking radius 4.5 cm, draw an arc taking O as centre, which intersects at R.

(c) Also construct an angle 105° at R and produce the side RE.

(d) Construct another angle of 60° at point M and produce the side ME. Both sides ME and RE intersect at E.

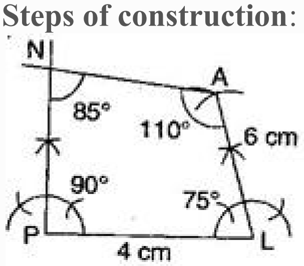
It is the required quadrilateral MORE.

(ii) Given: PL = 4 cm, LA = 6.5 cm,
$\angle$ P = 90°, $\angle$ A = 110°, $\angle$ N = 85°

To construct**: A quadrilateral PLAN.**

To find: $\angle$ L = $360^\circ - (90^\circ + 85^\circ + 110^\circ)$
$= 360^\circ - 285^\circ = 75^\circ$

Steps of construction:



(a) Draw a line segment PL = 4 cm.

(b) Construct angle of 90° at P and produce the side PN.

(c) Construct angle of 75° at L and with L as centre, draw an arc of radius 6 cm, which intersects at A.

(d) Construct $\angle$ A = 110° at A and produce the side AN which intersects PN at N.

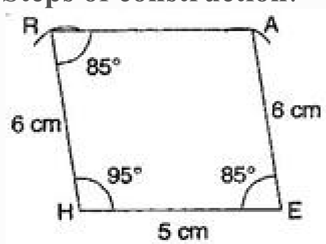
It is the required quadrilateral PLAN.

(iii) Given**: HE = 5 cm, EA = 6 cm,**

$\angle$ R = 85°

To construct: A parallelogram HEAR.
To find: $\angle$ H = $180^\circ - 85^\circ = 95^\circ$
[$\because$ Sum of adjacent angle of $\parallel$ gm is 180°]

Steps of construction:



(a) Draw a line segment HE = 5 cm.

(b) Construct $\angle$ H = 95° and draw an arc of radius 6 cm with centre H. It intersects AR at R.

(c) Join RH.

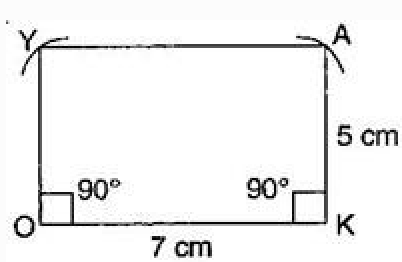
(d) Draw $\angle$ R = $\angle$ E = 85° and draw an arc of radius 6 cm with E as a centre which intersects RA at A.

(e) Join RA

It is the required parallelogram HEAR.

(iv) Given: OK = 7 cm, KA = 5 cm
To construct: A rectangle OKAY.
NCERT Solutions for Class 8 Maths Exercise 4.3

Steps of construction**:**



(a) Draw a line segment OK = 7 cm.

(b) Construct angle 90° at both points O and K and produce these sides.

(c) Draw two arcs of radius 5 cm from points O and K respectively. These arcs intersect at Y and A.

(d) Join YA.

It is the required rectangle OKAY.

(Ex. 4.4)

1. Construct the following quadrilaterals:

(i) Quadrilateral DEAR

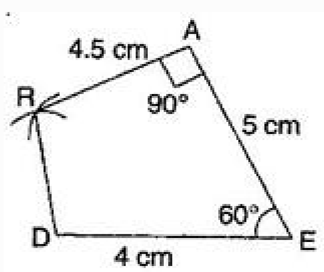
DE = 4 cm, EA = 5 cm, AR = 4.5 cm,
$\angle$ E = 60°; $\angle$ A = 90°

(ii) Quadrilateral TRUE
TR = 3.5 cm, RU = 3 cm, UE = 4 cm,
$\angle$ R = 75°; $\angle$ U = 120°

Ans.
(i) Given: DE = 4 cm, EA = 5 cm,
AR = 4.5 cm, $\angle$ E = 60°; $\angle$ A = 90°

To construct: A quadrilateral DEAR.

Steps of construction**:**



(a) Draw a line segment DE = 4 cm.

(b) At point E, construct an angle of 60°.

(c) Taking radius 5 cm, draw an arc from point E which intersects at A.

(d) Construct $\angle$ A = 90°; draw an arc of radius 4.5 cm with centre A which intersect at R.

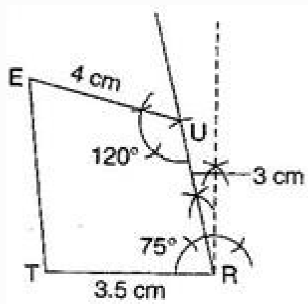
(e) Join RD.

It is the required quadrilateral DEAR.

(ii) Given: TR = 3.5 cm, RU = 3 cm,
UE = 4 cm, $\angle$ R = 75°, $\angle$ U = 120°

To construct: A quadrilateral TRUE

Steps of construction**:**



(a) Draw a line segment TR = 3.5 cm.

(b) Construct an angle 75° at R and draw an arc of radius 3 cm with R as centre, which intersects at U.

(c) Construct an angle of 120° at U and produce the side UE.

(d) Draw an arc of radius 4 cm with U as centre.

(e) Join UE and TE.

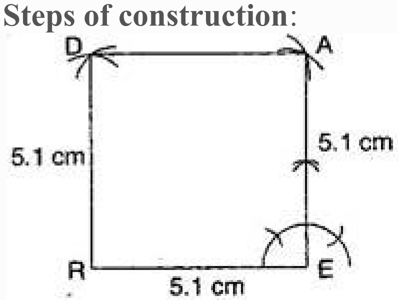
It is the required quadrilateral TRUE.

(Ex. 4.5)

Draw the following:

1. The square READ with RE = 5.1 cm.

Ans. Given: RE = 5.1 cm.
To construct: A square READ.
Steps of construction:



(i) Draw RE = 5.1 cm.

(ii) At point E, construct an angle of 90° and draw an arc of radius 5.1 cm, which intersects at point A.

(iii) At point R, draw an arc of radius 5.1 cm at point A, draw another arc of radius 5.1 cm which intersects the first arc at point D.

(iv) Join AD and RD.

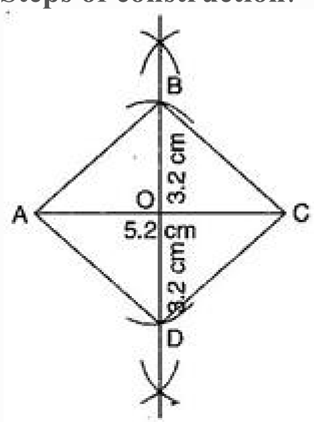
It is the required square READ.

---

2. A rhombus whose diagonals are 5.2 cm and 6.4 cm.

Ans. Given: Diagonals of a rhombus
AC = 5.2 cm and BD = 6.4 cm.

To construct: A rhombus ABCD.
Steps of construction:



(a) Draw AC = 5.2 cm and draw perpendicular bisectors on AC.

(b) Since, diagonals bisect at mid-point O, therefore get half of 6.4 cm, i.e., 3.2 cm.

(c) Draw two arcs on both sides of AC of radius 3.2 cm from intersection point O, which intersects at B and D.

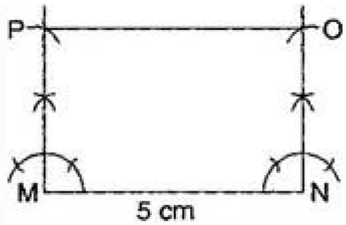
(d) Join AB, BC, CD and DA.

It is required rhombus ABCD.

---

3. A rectangle with adjacent sides of length 5 cm and 4 cm.

Ans. Given: MN = 5 cm and MP = 4 cm.
To construct: A rectangle MNOP
Steps of construction:



(a) Draw a segment MN = 5 cm.
(b) At points M and N, draw perpendiculars of lengths 4 cm and produce them.
(c) Taking centres M and N, draw two arcs of 4 cm each, which intersect P and Q respectively.
(d) Join side PO.
It is required rectangle MNOP.

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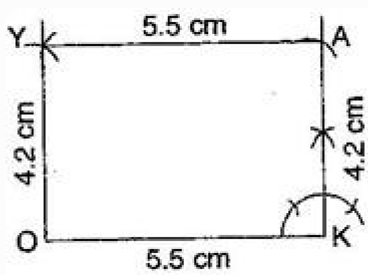
4. A parallelogram OKAY where

OK = 5.5 cm and KA = 4.2 cm.
Ans. Given: OK = 5.5 cm and KA = 4.2 cm.
To construct: A parallelogram OKAY.

Steps of construction:



(a) Draw a line segment OK = 5.5 cm.
(b) Draw an angle of 90° at K and draw an arc of radius KA = 4.2 cm, which intersects at point A.
(c) Draw another arc of radius AY = 5.5 cm and at point O, draw another arc of radius 4.2 cm which intersect at Y.
(d) Join AY and OY.
It is the required parallelogram OKAY.