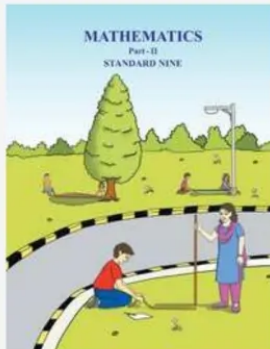


Maharashtra Board Solutions Class 9-Maths

(Part 2): Chapter 5.1- Quadrilaterals

BOOK SOLUTIONS
CLASS 9
MATHS (PART 2)

CHAPTER 5.1
Quadrilaterals



Maharashtra Board Solutions→

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Maharashtra Board Solutions Class 9-Maths

(Part 2): Chapter 5.1- Quadrilaterals

Class 9: Maths Chapter 5.1 solutions. Complete Class 9 Maths Chapter 5.1 Notes.

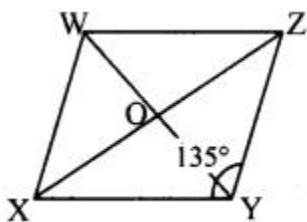
Maharashtra Board Solutions Class 9-Maths (Part 2): Chapter 5.1- Quadrilaterals

Maharashtra Board 9th Maths Chapter 5.1, Class 9 Maths Chapter 5.1 solutions

Question 1.

Diagonals of a parallelogram WXYZ intersect each other at point O. If $\angle XYZ = 135^\circ$, then measure of $\angle XWZ$ and $\angle YZW$? If $l(OY) = 5$ cm, then $l(WY) = ?$

Solution:



i. $\angle XYZ = 135^\circ$

□WXYZ is a parallelogram.

$$\angle XWZ = \angle XYZ$$

$$\therefore \angle XWZ = 135^\circ \dots (i)$$

ii. $\angle YZW + \angle XYZ = 180^\circ$ [Adjacent angles of a parallelogram are supplementary]

$$\therefore \angle YZW + 135^\circ = 180^\circ \text{ [From (i)]}$$

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$$\therefore \angle YZW = 180^\circ - 135^\circ$$

$$\therefore \angle YZW = 45^\circ$$

$$\text{iii. } l(OY) = 5 \text{ cm [Given]}$$

$l(OY) = \frac{1}{2} l(WY)$ [Diagonals of a parallelogram bisect each other]

$$\therefore l(WY) = 2 \times l(OY)$$

$$= 2 \times 5$$

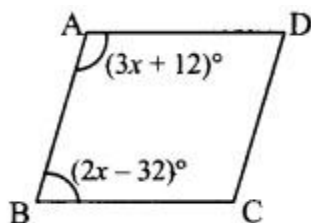
$$\therefore l(WY) = 10 \text{ cm}$$

$$\therefore \angle XWZ = 135^\circ, \angle YZW = 45^\circ, l(WY) = 10 \text{ cm}$$

Question 2.

In a parallelogram ABCD, if $\angle A = (3x + 12)^\circ$, $\angle B = (2x - 32)^\circ$, then find the value of x and the measures of $\angle C$ and $\angle D$.

Solution:



□ABCD is a parallelogram. [Given]

$$\therefore \angle A + \angle B = 180^\circ \text{ [Adjacent angles of a parallelogram are supplementary],}$$

$$\therefore (3x + 12)^\circ + (2x - 32)^\circ = 180^\circ$$

$$\therefore 3x + 12 + 2x - 32 = 180$$

$$\therefore 5x - 20 = 180$$

$$\therefore 5x = 180 + 20$$

$$\therefore 5x = 200$$

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$$\therefore x = 2005$$

$$\therefore x = 40$$

$$\text{ii. } \angle A = (3x + 12)^\circ$$

$$= [3(40) + 12]^\circ$$

$$= (120 + 12)^\circ = 132^\circ$$

$$\angle B = (2x - 32)^\circ$$

$$= [2(40) - 32]^\circ$$

$$= (80 - 32)^\circ = 48^\circ$$

$$\therefore \angle C = \angle A = 132^\circ$$

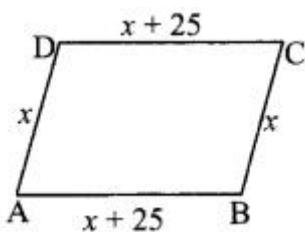
$$\angle D = \angle B = 48^\circ \text{ [Opposite angles of a parallelogram]}$$

$\therefore$ The value of x is 40, and the measures of $\angle C$ and $\angle D$ are 132° and 48° respectively.

Question 3.

Perimeter of a parallelogram is 150 cm. One of its sides is greater than the other side by 25 cm. Find the lengths of all sides.

Solution:



i. Let $\square ABCD$ be the parallelogram and the length of AD be x cm.

One side is greater than the other by 25 cm.

$$\therefore AB = x + 25 \text{ cm}$$

$$AD = BC = x \text{ cm}$$

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$AB = DC = (x + 25)$ cm [Opposite sides of a parallelogram]

ii. Perimeter of $\square ABCD = 150$ cm [Given]

$$\therefore AB + BC + DC + AD = 150$$

$$\therefore (x + 25) + x + (x + 25) + x = 150$$

$$\therefore 4x + 50 = 150$$

$$\therefore 4x = 150 - 50$$

$$\therefore 4x = 100$$

$$\therefore x = 100/4$$

$$\therefore x = 25$$

iii. $AD = BC = x = 25$ cm

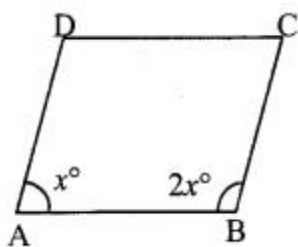
$$AB = DC = x + 25 = 25 + 25 = 50 \text{ cm}$$

$\therefore$ The lengths of the sides of the parallelogram are 25 cm, 50 cm, 25 cm and 50 cm.

Question 4.

If the ratio of measures of two adjacent angles of a parallelogram is $1 : 2$, find the measures of all angles of the parallelogram.

Solution:



i. Let $\square ABCD$ be the parallelogram.

The ratio of measures of two adjacent angles of a parallelogram is $1 : 2$.

Let the common multiple be x .

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$$\therefore \angle A = x^\circ \text{ and } \angle B = 2x^\circ$$

$$\angle A + \angle B = 180^\circ \text{ [Adjacent angles of a parallelogram are supplementary]}$$

$$\therefore x + 2x = 180$$

$$\therefore 3x = 180$$

$$\therefore x = 180/3$$

$$\therefore x = 60$$

$$\text{ii. } \angle A = x^\circ = 60^\circ$$

$$\angle B = 2x^\circ = 2 \times 60^\circ = 120^\circ$$

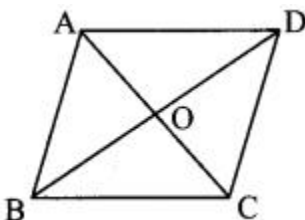
$$\angle A = \angle C = 60^\circ$$

$$\angle B = \angle D = 120^\circ \text{ [Opposite angles of a parallelogram]}$$

$\therefore$ The measures of the angles of the parallelogram are 60° , 120° , 60° and 120° .

Question 5.

Diagonals of a parallelogram intersect each other at point O. If $AO = 5$, $BO = 12$ show that $\square ABCD$ is a rhombus.



Given: $AO = 5$, $BO = 12$ and $AB = 13$.

To prove: $\square ABCD$ is a rhombus.

Solution:

Proof:

$AO = 5$, $BO = 12$, $AB = 13$ [Given]

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$$AO^2 + BO^2 = 5^2 + 12^2$$

$$= 25 + 144$$

$$\therefore AO^2 + BO^2 = 169 \dots(i)$$

$$AB^2 = 13^2 = 169 \dots(ii)$$

$$\therefore AB^2 = AO^2 + BO^2 \text{ [From (i) and (ii)]}$$

$\therefore \triangle AOB$ is a right-angled triangle. [Converse of Pythagoras theorem]

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

$$\therefore \text{seg AC} \perp \text{seg BD} \dots(iii) \text{ [A-O-C]}$$

$\therefore$ In parallelogram ABCD,

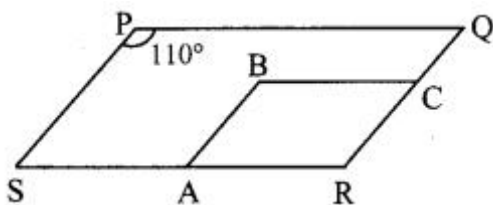
$$\therefore \text{seg AC} \perp \text{seg BD} \text{ [From (iii)]}$$

$\therefore \square ABCD$ is a rhombus. [A parallelogram is a rhombus perpendicular to each other]

Question 6.

In the adjoining figure, $\square PQRS$ and $\square ABCR$ are two parallelograms. If $\angle P = 110^\circ$, then find the measures of all the angles of $\square ABCR$.

Solution:



$\square PQRS$ is a parallelogram. [Given]

$$\therefore \angle R = \angle P \text{ [Opposite angles of a parallelogram]}$$

$$\therefore \angle R = 110^\circ \dots(iii)$$

$\square ABCR$ is a parallelogram. [Given]

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$\therefore \angle A + \angle R = 180^\circ$ [Adjacent angles of a parallelogram are supplementary]

$\therefore \angle A + 110^\circ = 180^\circ$ [From (i)]

$\therefore \angle A = 180^\circ - 110^\circ$

$\therefore \angle A = 70^\circ$

$\therefore \angle C = \angle A = 70^\circ$

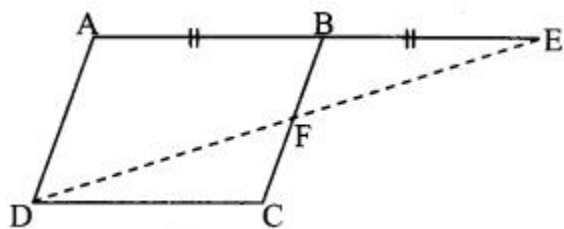
$\therefore \angle B = \angle R = 110^\circ$ [Opposite angles of a parallelogram]

$\therefore \angle A = 70^\circ, \angle B = 110^\circ,$

$\therefore \angle C = 70^\circ, \angle R = 110^\circ$

Question 7.

In the adjoining figure, $\square ABCD$ is a parallelogram. Point E is on the ray AB such that $BE = AB$, then prove that line ED bisects seg BC at point F.



Given: $\square ABCD$ is a parallelogram.

$BE = AB$

To prove: Line ED bisects seg BC at point F i.e. $FC = FB$

Solution:

Proof:

$\square ABCD$ is a parallelogram. [Given]

$\therefore \text{seg } AB \cong \text{seg } DC$ (i) [Opposite sides of a parallelogram]

$\text{seg } AB \cong \text{seg } BE$ (ii) [Given]

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seg DC $\cong$ seg BE(iii) [From (i) and (ii)]

side DC $\parallel$ side AB [Opposite sides of a parallelogram]

i.e. side DC $\parallel$ seg AE and seg DE is their transversal. [A-B-E]

$$\therefore \angle CDE \cong \angle AED$$

$$\therefore \angle CDF \cong \angle BEF \text{(iv) [D-F-E, A-B-E]}$$

In $\triangle DFC$ and $\triangle EFB$,

seg DC = seg EB [From (iii)]

$$\angle CDF \cong \angle BEF \text{ [From (iv)]}$$

$$\angle DFC \cong \angle EFB \text{ [Vertically opposite angles]}$$

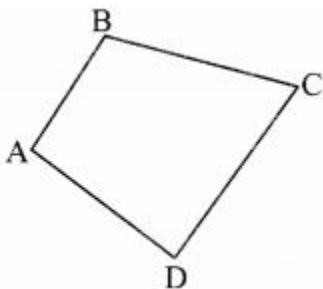
$$\therefore \triangle DFC \cong \triangle EFB \text{ [SAA test]}$$

$$\therefore FC \cong FB \text{ [c.s.c.t]}$$

$\therefore$ Line ED bisects seg BC at point F.

Question 1.

Write the following pairs considering $\square ABCD$. (Textbook pg. no 57)



Pairs of adjacent sides:

i. AB, AD

ii. AD, DC

iii. DC, BC

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iv. BC, AB

Pairs of adjacent angles:

i. $\angle A$, $\angle B$

ii. $\angle C$, $\angle D$

iii. $\angle B$, $\angle C$

iv. $\angle D$, $\angle A$

Pairs of opposite sides:

i. AB, DC

ii. AD, BC

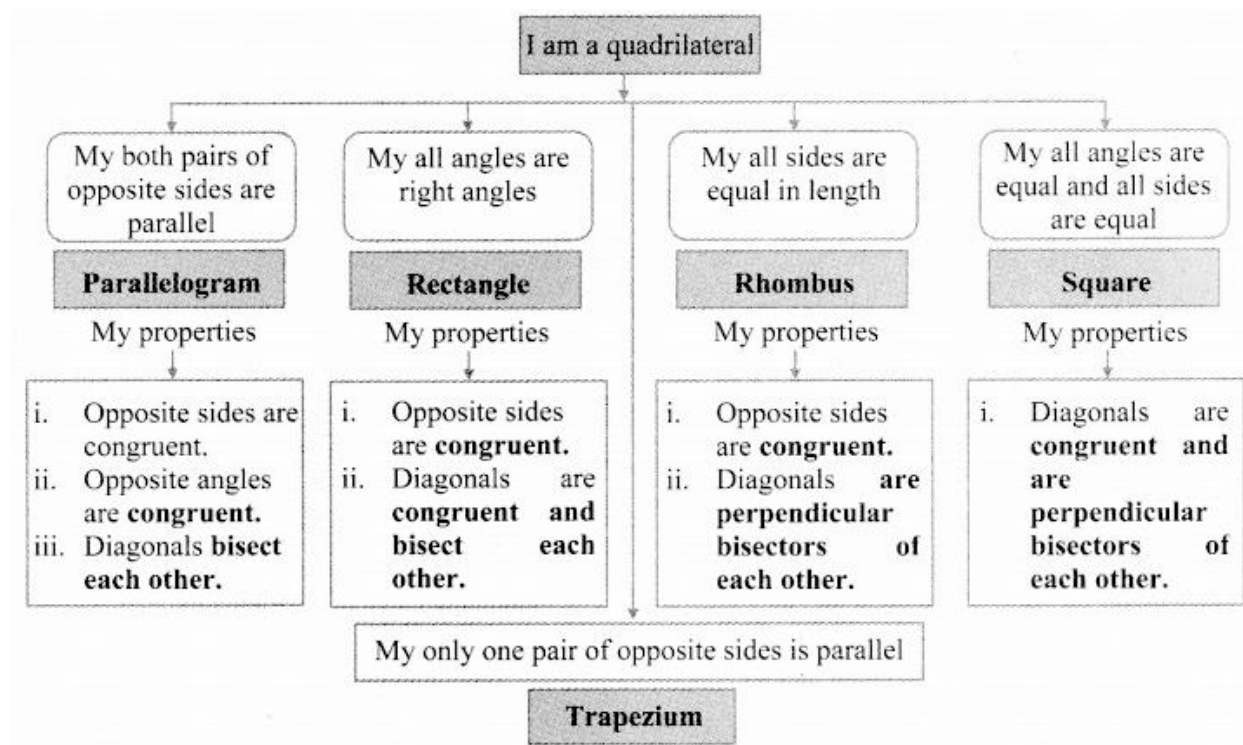
Pairs of opposite angles:

i. $\angle A$, $\angle C$

ii. $\angle B$, $\angle D$

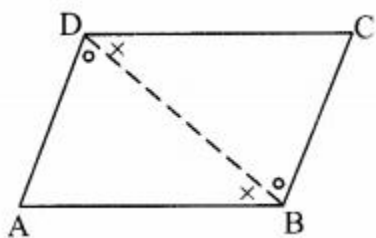
Question 2.

Complete the following tree diagram. (Textbook pg. no 57)



Question 3.

In the above theorem, to prove $\angle DAB \cong \angle BCD$, is any change in the construction needed? If so, how will you write the proof making the change? (Textbook pg. no. 60)



Solution:

Yes

Construction: Draw diagonal BD.

Proof:

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side AB || side CD and diagonal BD is their transversal. [Given]

$\therefore \angle ABD \cong \angle CDB$ (i) [Alternate angles]

side BC || side AD and diagonal BD is their transversal. [Given]

$\therefore \angle ADB \cong \angle CBD$ (ii) [Alternate angles]

In $\triangle DAB$ and $\triangle BCD$,

$\angle ABD \cong \angle CDB$ [From (i)]

seg BD $\cong$ seg DB [Common side]

$\therefore \angle ADB \cong \angle CBD$ [From (ii)]

$\therefore \triangle DAB \cong \triangle BCD$ [ASA test]

$\therefore \angle DAB \cong \angle BCD$ [c.a.c.t.]

Note: $\angle DAB$ s $\angle BCD$ can be proved using the same construction as in the above theorem.

$\angle BAC \cong \angle DCA$ (i)

$\angle DAC \cong \angle BCA$ (ii)

$\therefore \angle BAC + \angle DAC \cong \angle DCA + \angle BCA$ [Adding (i) and (ii)]

$\therefore \angle DAB \cong \angle BCD$ [Angle addition property]



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Class 9 Maths

Part 2

- Chapter 1.1- Basic Concepts in Geometry
- Chapter 1.2- Basic Concepts in Geometry
- Chapter 1.3- Basic Concepts in Geometry
- Chapter 2.1- Parallel Lines
- Chapter 2.2- Parallel Lines
- Chapter 3.1- Triangles
- Chapter 3.2- Triangles
- Chapter 3.3- Triangles
- Chapter 3.4- Triangles
- Chapter 3.5- Triangles
- Chapter 4.1- Constructions of Triangles
- Chapter 4.2- Constructions of Triangles
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- Chapter 5.1- Quadrilaterals
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- Chapter 5.5- Quadrilaterals
- Chapter 6.1- Circle
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- Chapter 7.1- Co-ordinate Geometry
- Chapter 7.2- Co-ordinate Geometry
- Chapter 8.1- Trigonometry
- Chapter 8.2- Trigonometry
- Chapter 9.1- Surface Area and Volume
- Chapter 9.2- Surface Area and Volume
- Chapter 9.3- Surface Area and Volume

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The Maharashtra State Board of Secondary and Higher Secondary Education or MSBSHSE (Marathi: महाराष्ट्र राज्य माध्यमिक आणि उच्च माध्यमिक शिक्षण मंडळ), is an **autonomous and statutory body established in 1965**. The board was amended in the year 1977 under the provisions of the Maharashtra Act No. 41 of 1965.

The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

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The Maharashtra State Board of Secondary & Higher Secondary Education, conducts the HSC and SSC Examinations in the state of Maharashtra through its nine Divisional Boards located at Pune, Mumbai, Aurangabad, Nasik, Kolhapur, Amravati, Latur, Nagpur and Ratnagiri.

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