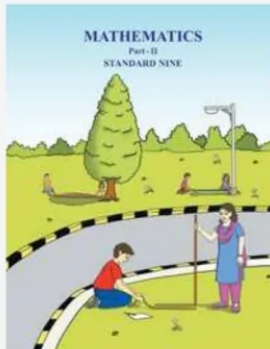


Maharashtra Board Solutions Class 9-Maths

(Part 2): Chapter 5.2- Quadrilaterals

BOOK SOLUTIONS
CLASS 9
MATHS (PART 2)

CHAPTER 5.2
Quadrilaterals



Maharashtra Board Solutions→

For any clarifications or questions you can write to info@indcareer.com

Postal Address

IndCareer.com, 52, Shilpa Nagar, Somalwada Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888, **Website:** <https://www.indcareer.com>

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>



Maharashtra Board Solutions Class 9-Maths

(Part 2): Chapter 5.2- Quadrilaterals

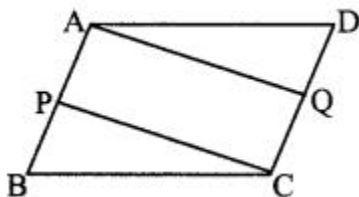
Class 9: Maths Chapter 5.2 solutions. Complete Class 9 Maths Chapter 5.2 Notes.

Maharashtra Board Solutions Class 9-Maths (Part 2): Chapter 5.2- Quadrilaterals

Maharashtra Board 9th Maths Chapter 5.2, Class 9 Maths Chapter 5.2 solutions

Question 1.

In the adjoining figure, $\square ABCD$ is a parallelogram, P and Q are midpoints of sides AB and DC respectively, then prove $\square APCQ$ is a parallelogram.



Given: $\square ABCD$ is a parallelogram. P and Q are the midpoints of sides AB and DC respectively.

To prove: $\square APCQ$ is a parallelogram.

Solution:

Proof:

$AP = \frac{1}{2} AB$ (i) [P is the midpoint of side AB]

$QC = \frac{1}{2} DC$ (ii) [Q is the midpoint of side CD]

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

$\therefore AB = DC$ [Opposite sides of a parallelogram]

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

$\therefore 12 AB = 12 DC$ [Multiplying both sides by 12]

$\therefore AP = QC$ (iii) [From (i) and (ii)]

Also, $AB \parallel DC$ [Opposite angles of a parallelogram]

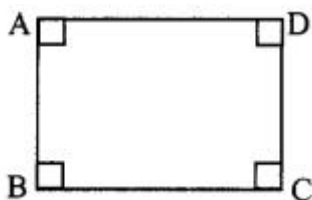
i.e. $AP \parallel QC$ (iv) [A – P – B, D – Q – C]

From (iii) and (iv),

$\square APCQ$ is a parallelogram. [A quadrilateral is a parallelogram if its opposite sides are parallel and congruent]

Question 2.

Using opposite angles test for parallelogram, prove that every rectangle is a parallelogram.



Given:

$\square ABCD$ is a rectangle.

To prove: Rectangle ABCD is a parallelogram.

Solution:

Proof:

$\square ABCD$ is a rectangle.

$\therefore \angle A \cong \angle C = 90^\circ$ [Given]

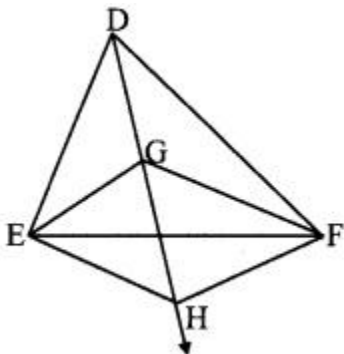
$\angle B \cong \angle D = 90^\circ$ [Angles of a rectangle]

$\therefore$ Rectangle ABCD is a parallelogram. [A quadrilateral is a parallelogram, if pairs of its opposite angles are congruent]

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

Question 3.

In the adjoining figure, G is the point of concurrence of medians of ADEF. Take point H on ray DG such that D-G-H and $DG = GH$, then prove that $\square GEHF$ is a parallelogram.



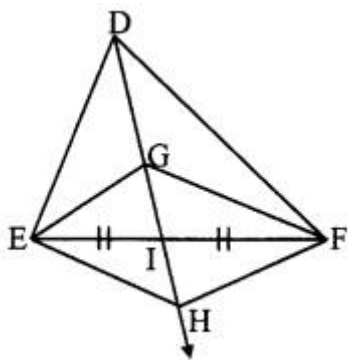
Given: Point G (centroid) is the point of concurrence of the medians of ADEF.

$DG = GH$

To prove: $\square GEHF$ is a parallelogram.

Solution:

Proof:



Let ray DH intersect seg EF at point I such that E-I-F.

$\therefore$ seg DI is the median of $\triangle DEF$.

$\therefore EI = FI$ (i)

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

Point G is the centroid of $\triangle DEF$.

$\therefore DG = 2GI$ [Centroid divides each median in the ratio 2:1]

$\therefore DG = 2(GI)$

$\therefore GH = 2(GI)$ [DG = GH]

$\therefore GI + HI = 2(GI)$ [G-I-H]

$\therefore HI = 2(GI) - GI$

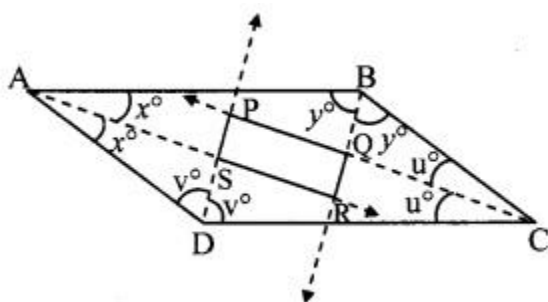
$\therefore HI = GI$ (ii)

From (i) and (ii),

$\square GEHF$ is a parallelogram [A quadrilateral is a parallelogram, if its diagonals bisect each other]

Question 4.

Prove that quadrilateral formed by the intersection of angle bisectors of all angles of a parallelogram is a rectangle.



Given: $\square ABCD$ is a parallelogram.

Rays AS, BQ, CQ and DS bisect $\angle A$, $\angle B$, $\angle C$ and $\angle D$ respectively.

To prove: $\square PQRS$ is a rectangle.

Solution:

Proof:

$\angle BAS = \angle DAS = x^\circ$... (i) [ray AS bisects $\angle A$]

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

$$\angle ABQ = \angle CBQ = y^\circ \dots (ii) \text{ [ray BQ bisects } \angle B]$$

$$\angle BCQ = \angle DCQ = u^\circ \dots (iii) \text{ [ray CQ bisects } \angle C]$$

$$\angle ADS = \angle CDS = v^\circ \dots (iv) \text{ [ray DS bisects } \angle D]$$

□ABCD is a parallelogram. [Given]

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

$$\therefore \angle BAS + \angle DAS + \angle ABQ + \angle CBQ = 180^\circ \text{ [Angle addition property]}$$

$$\therefore x^\circ + x^\circ + v^\circ + v^\circ = 180 \text{ [From (i) and (ii)]}$$

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

$$\therefore x + y = 90^\circ \dots (v) \text{ [Dividing both sides by 2]}$$

Also, $\angle A + \angle D = 180^\circ$ [Adjacent angles of a parallelogram are supplementary]

$$\therefore \angle BAS + \angle DAS + \angle ADS + \angle CDS = 180^\circ \text{ [Angle addition property]}$$

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

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

$$\therefore x^\circ + v^\circ = 90^\circ \dots (vi) \text{ [Dividing both sides by 2]}$$

In $\triangle ARB$,

$$\angle RAB + \angle RBA + \angle ARB = 180^\circ \text{ [Sum of the measures of the angles of a triangle is } 180^\circ]$$

$$\therefore x^\circ + y^\circ + \angle SRQ = 180^\circ \text{ [A - S - R, B - Q - R]}$$

$$\therefore 90^\circ + \angle SRQ = 180^\circ \text{ [From (v)]}$$

$$\therefore \angle SRQ = 180^\circ - 90^\circ = 90^\circ \dots (vi)$$

Similarly, we can prove

$$\angle SPQ = 90^\circ \dots (viii)$$

In $\triangle ASD$,

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

$\angle ASD + \angle SAD + \angle SDA = 180^\circ$ [Sum of the measures of angles a triangle is 180°]

$\therefore \angle ASD + x^\circ + v^\circ = 180^\circ$ [From (vi)]

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

$\therefore \angle ASD = 180^\circ - 90^\circ = 90^\circ$

$\therefore \angle PSR = \angle ASD$ [Vertically opposite angles]

$\therefore \angle PSR = 90^\circ$ (ix)

Similarly we can prove

$\angle PQR = 90^\circ$..(x)

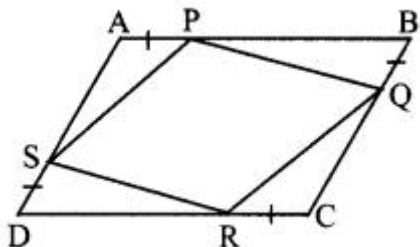
$\therefore$ In $\square PQRS$,

$\angle SRQ = \angle SPQ = \angle PSR = \angle PQR = 90^\circ$ [From (vii), (viii), (ix), (x)]

$\therefore \square PQRS$ is a rectangle. [Each angle is of measure 90°]

Question 5.

In the adjoining figure, if points P, Q, R, S are on the sides of parallelogram such that $AP = BQ = CR = DS$, then prove that $\square PQRS$ is a parallelogram.



Given: $\square ABCD$ is a parallelogram.

$AP = BQ = CR = DS$

To prove: $\square PQRS$ is a parallelogram.

Solution:

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

Proof:

□ABCD is a parallelogram. [Given]

∴ $\angle B = \angle D$ (i) [Opposite angles of a parallelogram]

Also, $AB = CD$ [Opposite sides of a parallelogram]

∴ $AP + BP = DR + CR$ [A-P-B, D-R-C]

∴ $AP + BP = DR + AP$ [$AP = CR$]

∴ $BP = DR$ (ii)

In $\triangle PBQ$ and $\triangle RDS$,

$\text{seg } BP \cong \text{seg } DR$ [From (ii)]

$\angle PBQ \cong \angle RDS$ [From (i)]

$\text{seg } BQ \cong \text{seg } DS$ [Given]

∴ $\triangle PBQ \cong \triangle RDS$ [SAS test]

∴ $\text{seg } PQ \cong \text{seg } RS$ (iii) [c.s.c.t]

Similarly, we can prove that

$\triangle PAS \cong \triangle RCQ$

∴ $\text{seg } PS \cong \text{seg } RQ$ (iv) [c.s.c.t]

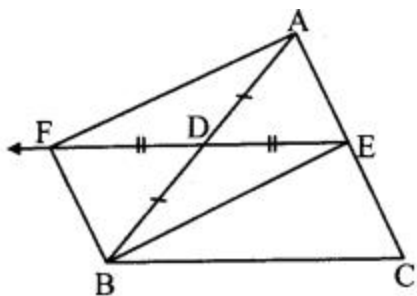
From (iii) and (iv),

□PQRS is a parallelogram. [A quadrilateral is a parallelogram, if pairs of its opposite sides are congruent]

Question 1.

Points D and E are the midpoints of side AB and side AC of $\triangle ABC$ respectively. Point F is on ray ED such that $ED = DF$. Prove that □AFBE is a parallelogram. For this example write 'given' and 'to prove' and complete the proof. (Text book pg. no. 66)

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>



Given: D and E are the midpoints of side AB and side AC respectively.

$$ED = DF$$

To prove: $\square$ AFBE is a parallelogram.

Solution:

Proof:

seg AB and seg EF are the diagonals of $\square$ AFBE.

seg AD $\cong$ seg DB [Given]

seg DE $\cong$ seg DF [Given]

$\therefore$ Diagonals of $\square$ AFBE bisect each other.

$\therefore$ $\square$ AFBE is a parallelogram. [By test of parallelogram]



Maharashtra Board Solutions

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
- Chapter 4.3- Constructions of Triangles
- Chapter 5.1- Quadrilaterals
- Chapter 5.2- Quadrilaterals
- Chapter 5.3- Quadrilaterals
- Chapter 5.4- Quadrilaterals
- Chapter 5.5- Quadrilaterals
- Chapter 6.1- Circle
- Chapter 6.2- Circle
- Chapter 6.3- Circle
- 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

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

About About Maharashtra State Board (MSBSHSE)

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.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

FAQs

Where do I get the Maharashtra State Board Books PDF For free download?

You can download the Maharashtra State Board Books from the eBalbharti official website, i.e. cart.ebalbharati.in or from this article.

Add image

How to Download Maharashtra State Board Books?

Students can get the Maharashtra Books for primary, secondary, and senior secondary classes from here. You can view or download the Maharashtra State Board Books from this page or from the official website for free of cost. Students can follow the detailed steps below to visit the official website and download the e-books for all subjects or a specific subject in different mediums.

Step 1: Visit the official website ebalbharati.in

Step 2: On the top of the screen, select "Download PDF textbooks"

Step 3: From the "Classes" section, select your class.

Step 4: From "Medium", select the medium suitable to you.

Step 5: All Maharashtra board books for class 11th will now be displayed on the right side.

Step 6: Click on the "Download" option to download the PDF book.

Who developed the Maharashtra State board books?

As of now, the MSCERT and Balbharti are responsible for the syllabus and textbooks of Classes 1 to 8, while Classes 9 and 10 are under the Maharashtra State Board of Secondary and Higher Secondary Education (MSBSHSE).

How many state boards are there in Maharashtra?

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.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>

About IndCareer

IndCareer.com is a leading developer of online career guidance resources for the Indian marketplace. Established in 2007, IndCareer.com is currently used by over thousands of institutions across India, including schools, employment agencies, libraries, colleges and universities.

IndCareer.com is designed to assist you in making the right career decision - a decision that meets your unique interests and personality.

For any clarifications or questions you can write to **info@indcareer.com**

Postal Address

IndCareer.com
52, Shilpa Nagar,
Somalwada
Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888

Website: <https://www.indcareer.com>

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-2-chapter-5-2-quadrilaterals/>