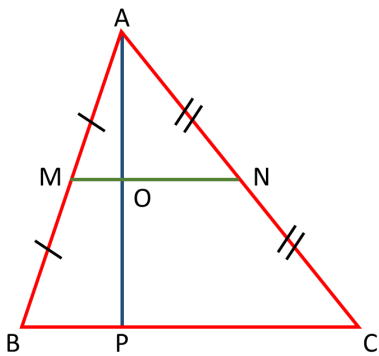


Brief Description (Objective): The students will be able to apply Mid-point theorem and its converse to solve problems

Teaching Aids Provided: Worksheet

Notes to the teacher: Teacher may present the questions and allow the students to write or say the answers before revealing them. A worksheet with application based interesting questions are provided in the document QA_LA_Solve using midpoint theorem.pdf. Teacher may choose to discuss those questions in her own time

1) In $\triangle ABC$, the midpoints of sides AB and AC are denoted as M and N respectively. The altitude AP intersects the line segment MN at point O. Prove that $AO = OP$



Given: M, N are mid-points of sides AB, AC in $\triangle ABC$. AP is the altitude from A on BC

To prove: $AO = OP$

Proof: Using mid-point theorem, MN is parallel to BC

Thus, $\angle AMO = \angle ABP$. When lines MO, BP are cut by a transversal AB, the corresponding angles are equal.

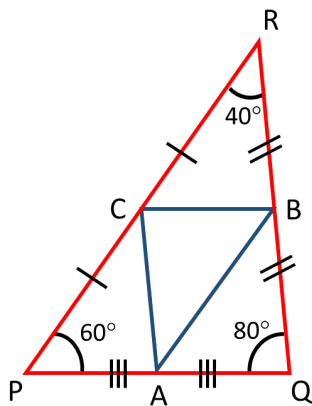
In $\triangle ABP$, MO is parallel to BP. Also, M is the midpoint of AB. Using the converse of the mid-point theorem, the point O bisects the side AP.

Thus $AO = OP$

2) In a $\triangle PQR$, $\angle P = 60^\circ$, $\angle Q = 80^\circ$ and $\angle R = 40^\circ$. Find the measures of the angles formed by joining the midpoints of the sides of the triangle.

Given: In $\triangle PQR$, $\angle P = 60^\circ$, $\angle Q = 80^\circ$ and $\angle R = 40^\circ$.

Let A, B, C be midpoints of PQ, QR, PR respectively. Join AB, BC and AC.



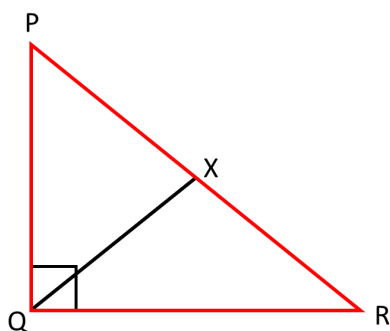
To find the angles of $\triangle ABC$.

[Note to the teacher: The teacher may ask students to prove that PABC and AQBC are parallelograms using mid-point theorem.]

PACB is a parallelogram. Thus, $\angle B = \angle P = 60^\circ$.

Similarly, in parallelogram AQBC, $\angle C = \angle Q = 80^\circ$. Now $\angle A = 180^\circ - (B + C) = 180^\circ - 140^\circ = 40^\circ$

3) In a right angled triangle, PQR, $\angle Q = 90^\circ$. X is the midpoint of side PR. Prove that $XQ = XP = \frac{1}{2}PR$.



Given: In $\triangle PQR$, $\angle Q = 90^\circ$. X is the midpoint of side PR

To prove: $XQ = XP = \frac{1}{2}PR$

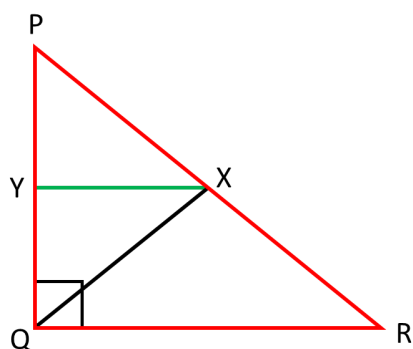
Proof:

[Note to the teacher: The teacher may ask students the following question.]

How can you use the mid-point theorem here?

Expected answer: Given that X is the midpoint of side PR. To use the mid-point theorem, consider the midpoint of one more side.

[Note to the teacher: The teacher may explain, we have to prove that $XP = XQ$. So consider the midpoint Y of PQ and join Y to X]



Using mid-point theorem, XY is parallel to RQ. But $RQ \perp PQ$. Thus, $XY \perp PQ$

[Note to the teacher: The teacher may ask students to prove that $\triangle PYX \equiv \triangle QYX$ and allow them to prove it. If the students are not able to prove the result, the teacher may give the hint to use SAS rule of congruence]

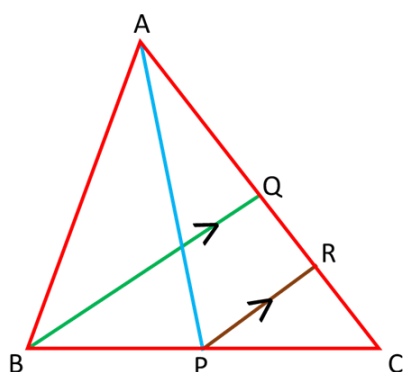
$$\triangle PYX \equiv \triangle QYX$$

Thus, $XQ = XP$

But $XP = \frac{1}{2}PR$ (X is the midpoint of PR)

Hence, $XQ = XP = \frac{1}{2}PR$

4) AP and BQ are the medians of $\triangle ABC$, and PR is parallel to BQ. Prove that $CR = \frac{1}{4}AC$.



Given: AP and BQ are the medians of $\triangle ABC$, and PR is parallel to BQ.

To prove: $CR = \frac{1}{4}AC$

[Note to the teacher: The teacher may ask students to choose a triangle with CR as part of its side and prove the result. If the students are not able to prove it, she can ask them to apply the converse of mid-point theorem in that triangle]

Proof: In $\triangle BQC$, PR is the line drawn through the midpoint P of side BC and it's parallel to side BQ. Using the converse of the mid-point theorem, it bisects the third side CQ. In other words R is the midpoint of the side CQ of $\triangle BQC$.

$$\begin{aligned} \text{Thus, } CR &= \frac{1}{2}CQ = \frac{1}{2}\left(\frac{1}{2}AC\right) \text{ (Q is the midpoint of AC)} \\ &= \frac{1}{4}AC \end{aligned}$$

Images: Self created



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Annexure to Master Lesson Plan

What is the purpose of this Master lesson Plan?	This Master Lesson Plan (MLP) prepared by Sri Sathya Sai Vidya Vahini (SSSVV), covers the entire chapter for the given board. The MLP for the chapter given in the textbook is broken down into smaller modules known as assets. Any chapter can be taught using the 7 asset types in SSSVV methodology. Several different assets together complete the entire chapter. Depending on the requirement, each asset is supported by teaching aids such as animated presentation, audio, video, and learning aids such as worksheets. The MLP is for the teacher's preparation and the teaching aids are for use in the classroom.
How to use it?	You can prepare for your class with this MLP by following 3 simple steps: 1. Read your textbook; 2. Go through the information given in the assets (document & multimedia); 3. Prepare your teaching notes. Great! Now you are ready to transact the chapter.
Duration	Kindly note the duration given for each asset. Due care has been taken in planning the assets, to ensure the chapter is completed within the time specified by the Board. Note: Preparation time is not included in the asset duration. The teaching time depends on the duration of the teaching aids and is not impacted by the length of the MLP.
What is a 'Main Script' (MS) Asset?	The Main Script asset is there for explaining the main concepts of the chapter clearly. The information given in the textbook is simplified, organised and structured to give more clarity. Additionally, you may find a video or mnemonics or a graphic organiser to deepen the understanding of the concept.
How to teach using the MS asset?	Please use the blackboard, slides and interaction to develop the concept.
What is an 'Inquisitive Questions' (IQ) asset?	The Inquisitive Questions asset uses questions to promote higher order thinking like the n th why, what-if, new perspectives, cause-effect, and others, creating curiosity.
How to teach using the IQ asset?	You may use the questions to connect with the students, encourage exploration to engage them in the learning process. You may allow multiple responses and instead of rejecting any of the responses, ask why, before revealing the suggested answer or hints.
What is a 'Day to day Relevance' (DD) Asset?	The Day to Day Relevance asset helps students understand the practical relevance of every topic, making them eager participants in the classroom. If students connect the concepts to their environment, they would learn meaningfully without dislike or simply memorizing for exams.
How to teach using the DD	You may use the asset by asking questions about their experience and use it to establish why they are learning the topic. If necessary you may substitute with a

asset?	recent or local example.
What is an 'Interesting Aside' (IA) asset?	The Interesting Aside asset uses attention grabbing tidbits or anecdotes to bring joy and satisfy the child's hunger to know more. This is a quick/short asset intended to bring attention back to the main concept being taught.
How to teach using the IA asset?	You may use this asset to give a piece of interesting information relevant to the topic, without prolonged explanation/discussion. You may suggest appropriate books for further reading.
What is a 'Suggested Activity' (SA) Asset?	The Suggested Activity asset provides a detailed step by step procedure for the teacher to conduct a hands-on activity. This promotes Activity Based Learning.
How to teach using the SA asset?	You may use this asset to energise your students to learn by doing simple, fun-filled activities based on the topic. The asset includes - preparation, activity, and follow-up. You may engage the students in the preparation and follow-up stages to develop collaboration and responsibility. You could try it once, yourself, before the actual delivery to be more comfortable with it. Note: The duration mentioned in the asset is usually for the activity part only.
What is a 'Value Content' (VC) Asset?	The Value Content asset integrates Universal Human Values (such as empathy, inclusivity, respect for nature that translates into responsible behaviour) seamlessly into the curriculum, as the "End of education is character".
How to teach using the VC asset?	You may use this asset to engage with the students to bring out their innate values and connect with the intrinsic values in the topic/concept. The asset includes pointers on the specific pedagogical technique followed.
What is a 'Questions to Assess' (QA) asset?	The Questions to Assess asset uses an interactive approach to check learning of different types of learners, and provides feedback to the teacher for appropriate action. The questions cater to all the levels of Bloom's Taxonomy. Questions from 'Apply' level and above enable students to reflect on their learning.
How to teach using the QA asset?	You may go through the slides to understand its flow and know when to click for the answer (slides include suggested answers). While presenting in the class, you may display the question and encourage multiple responses, before revealing the answer. In some cases, this asset may include extra questions/worksheet that can be given as homework.