## Unit 2 Lesson 8: The Perpendicular Bisector Theorem

### 1 Which One Doesn’t Belong: Intersecting Lines (Warm up)

#### Student Task Statement

Which one doesn’t belong?

A



B



C



D



### 2 Lots of Lines

#### Images for Launch

$\overset{¯}{AP}≅\overset{¯}{BP}$



#### Student Task Statement

Diego, Jada, and Noah were given the following task:

Prove that if a point $C$ is the same distance from $A$ as it is from $B$, then $C$ must be on the perpendicular bisector of $AB$.

At first they were really stuck. Noah asked, “How do you prove a point is on a line?” Their teacher gave them the hint, “Another way to think about it is to draw a line that you know $C$ is on, and prove that line has to be the perpendicular bisector.”

They each drew a line and thought about their pictures. Here are their rough drafts.

Diego’s approach: “I drew a line through $C$ that was perpendicular to $AB$ and through the midpoint of $AB$. That line is the perpendicular bisector of $AB$ and $C$ is on it, so that proves $C$ is on the perpendicular bisector.”



Jada’s approach: “I thought the line through $C$ would probably go through the midpoint of $AB$ so I drew that and labeled the midpoint $D$. Triangle $ACB$ is isosceles, so angles $A$ and $B$ are congruent, and $AC$ and $BC$ are congruent. And $AD$ and $DB$ are congruent because $D$ is a midpoint. That made two congruent triangles by the Side-Angle-Side Triangle Congruence Theorem. So I know angle $ADC$ and angle $BDC$ are congruent, but I still don’t know if $DC$ is the perpendicular bisector of $AB$.”





Noah’s approach: “In the Isosceles Triangle Theorem proof, Mai and Kiran drew an angle bisector in their isosceles triangle, so I’ll try that. I’ll draw the angle bisector of angle $ACB$. The point where the angle bisector hits $AB$ will be $D$. So triangles $ACD$ and $BCD$ are congruent, which means $AD$ and $BD$ are congruent, so $D$ is a midpoint and $CD$ is the perpendicular bisector.”

1. With your partner, discuss each student’s approach.
	* What do you notice that this student understands about the problem?
	* What question would you ask them to help them move forward?
2. Using the ideas you heard and the ways you think each student could make their explanation better, write your own explanation for why $C$ must be on the perpendicular bisector of $A$ and $B$.

#### Activity Synthesis

$\overset{¯}{AP}≅\overset{¯}{BP}$





$\overset{¯}{AC}≅\overset{¯}{BC}$, so $C$ is on the line through midpoint $M$ perpendicular to $\overset{¯}{AB}$



### 3 Not Too Close, Not Too Far

#### Student Task Statement

1. Work on your own to make a diagram and write a rough draft of a proof for the statement:
* If $P$ is a point on the perpendicular bisector of $AB$, prove that the distance from $P$ to $A$ is the same as the distance from $P$ to $B$.
1. With your partner, discuss each other’s drafts. Record your partner‘s feedback for your proof.
	* What do you notice that your partner understands about the problem?
	* What question would you ask them to help them move forward?

#### Images for Activity Synthesis



$\overset{¯}{AB}⊥\overset{¯}{CM},\overset{¯}{AM}≅\overset{¯}{BM},$ so $\overset{¯}{AC}≅\overset{¯}{BC}$





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