Pavlo and Nestor are camping with their families at different campsites in Mount Robson Provincial Park. They want to find a meeting spot that is the same distance from both of their campsites.

How can Pavlo and Nestor determine a meeting spot?
Example 1 Using a fold

How can Pavlo and Nestor choose a meeting spot that is the same distance from both of their campsites?

Pavlo’s Solution

I labelled the campsites X and Y on a map of the park. I drew a line segment from X to Y.

I folded the map so that X was on top of Y. Then I drew a line along the crease.
In a diagram, perpendicular line segments are indicated by a little square. In writing, perpendicular line segments are indicated by the symbol \( \perp \). For example, \( AB \perp CD \).

**Communication Tip**

In a diagram, perpendicular line segments are indicated by a little square. In writing, perpendicular line segments are indicated by the symbol \( \perp \). For example, \( AB \perp CD \).

I placed the centre of my protractor at the **intersection point** of the crease and \( XY \). The angle between the crease and \( XY \) measures 90°.

I used a ruler to check that the crease divides \( XY \) in half. The crease is the **perpendicular bisector** of \( XY \).

I also used a ruler to measure the distance from other points on the crease to \( X \) and \( Y \). All the points are the same distance from both campsites.

It looks like we can choose a meeting place anywhere on the perpendicular bisector.

**intersection point**

the point where two lines or line segments cross each other; for example, \( QR \) intersects \( ST \) at intersection point \( E \).

**perpendicular bisector**

a line that intersects a line segment at 90° and divides it into two equal lengths.
Example 2  Using a transparent mirror

How can Pavlo and Nestor choose a meeting spot that is the same distance from both of their campsites using a transparent mirror?

Nestor's Solution

I labelled the campsites $X$ and $Y$ on a map of the park. I joined $X$ and $Y$ with a line segment.

I positioned a transparent mirror across $XY$.

I moved the transparent mirror until the reflection of $X$ lined up with $Y$. Then I drew along the edge of the mirror. Since this is the reflection line, I know that it divides $XY$ in half.

I used a protractor to check that the angle is 90°. The line of reflection is the perpendicular bisector of $XY$.

The point where the reflection line crosses $XY$ is the same distance from both campsites.
**Reflecting**

**A.** Why does it make sense that the perpendicular bisector of a line segment reflects one end of the line segment onto the other end?

**B.** How are Pavlo’s method and Nestor’s method for creating a perpendicular bisector alike? How are they different?

**WORK WITH the Math**

**Example 3 | Using a compass**

How can Pavlo and Nestor choose a meeting spot using a compass?

**Solution**

Label the campsites X and Y on the map. Draw a line segment between them.

Using a compass, draw two overlapping circles with the same radius centred at X and Y.

The two points where the circles cross are the same distance from X as they are from Y since the circles have the same radius.

Draw a line segment through the two points. Check that the line segment meets XY at a 90° angle and divides XY into two equal lengths. If it does, it is the perpendicular bisector.

The meeting spot can be one of the points where the circles cross or the point on XY that crosses the line through them.
Example 4 | Using a protractor

Yan and Julie want to choose a practice field that is about the same distance from both of their dorms at soccer camp. How can Julie use a protractor to construct the perpendicular bisector?

Solution

Label the dorms X and Y. Connect X and Y with a line segment. Measure the length of XY. Mark the centre.

Place your protractor on XY, with its centre at the midpoint. Mark 90°.

Draw a line from the midpoint of XY to the 90° mark. This is the perpendicular bisector of XY.
**A Checking**

1. Draw each line segment. Then construct the perpendicular bisector.
   a) \( \overline{AB} \) 6 cm  
   b) \( \overline{CD} \) 7 cm  
   c) \( \overline{XY} \) 18 cm  
   d) \( \overline{ST} \) 4 cm

**B Practising**

2. Which diagram shows a perpendicular bisector?
   a)  
   b)  
   c)  
   d) 

3. Draw a line segment that is each length. Then construct the perpendicular bisector.
   a) 10 cm  
   b) 6.5 cm  
   c) 8.75 cm  
   d) 5.5 cm
4. a) Draw a triangle and label the vertices A, B, and C.
   
b) Construct the perpendicular bisector of each side of the triangle.
   
c) Use the intersection point of the perpendicular bisectors as the centre of a circle that passes through A. What do you notice?

5. Describe a situation in which you could use each method to construct a perpendicular bisector.
   
a) folding paper   c) using a protractor and ruler
   
b) using a compass and ruler   d) using a transparent mirror

6. Draw a line segment of any length and label the end points.
   
a) Construct the perpendicular bisector.
   
b) List the steps you followed in part (a).
   
c) How can you prove that the line segment you created in part (a) is the perpendicular bisector?