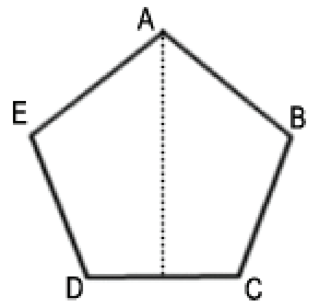
Guided Practice 5.1.3

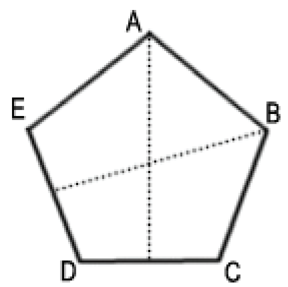
Example 1

Given a regular pentagon *ABCDE*, draw the lines of symmetry.

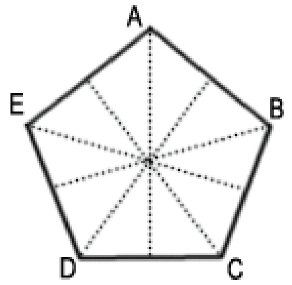
1. First, draw the pentagon and label the vertices. Note the line of symmetry from *A* to $\overline{DC}$.



2. Now move to the next vertex, *B*, and extend a line to the midpoint of $\overline{DE}$.



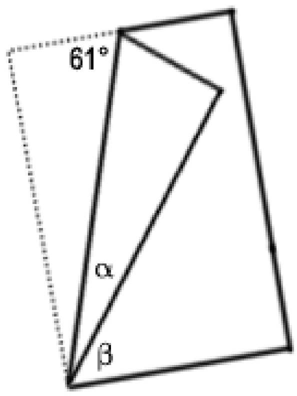
3. Continue around to each vertex, extending a line from the vertex to the midpoint of the opposing line segment.



Note that a regular pentagon has five sides, five vertices, and five lines of reflection.

Example 2

A piece of rectangular paper is folded in the following way:



Find the angles alpha, α, and beta, β.

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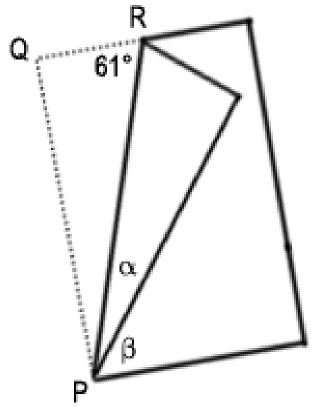
1. First, label the vertices.



2. Find the measure of $\angle QPR$.

   We know the sum of the interior angles of a triangle is 180°. We also know $m\angle Q$ is 90° because we are told the paper is rectangular. Therefore, subtract 61 + 90 from 180 to find the measure of $\angle QPR$.

   $180 - (61 + 90) = 180 - (151) = 29$

3. Now we know $m\angle QPR$ is 29°. Because of the symmetry of the folded paper, we know $m\angle\alpha$ must also be 29°.

4. Finally, we know the measures of $\angle QPR$, $\angle\alpha$, and $\angle\beta$ total 90° because the paper is rectangular, so $m\angle\beta = 90 - 2(29) = 90 - 58 = 32$.

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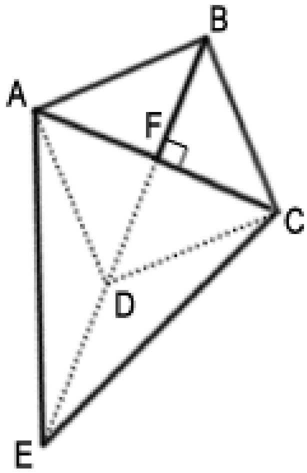
Example 3

Given the quadrilateral *ABCE*, the square *ABCD*, and the information that *F* is the same distance from *A* and *C*, show that *ABCE* is symmetrical along $\overline{BE}$.



1. Recall the definition of line symmetry.

   Line symmetry exists for a figure if for every point on one side of the line of symmetry, there is a corresponding point the same distance from the line.

   We are given that *ABCD* is square, so we know $\overline{AB} \cong \overline{BC}$.

   We also know that $\square ABCD$ is symmetrical along $\overline{BD}$.

   We know $\overline{AF} \cong \overline{FC}$.

2. Since $\overline{AB} \cong \overline{BC}$ and $\overline{AF} \cong \overline{FC}$, $\overline{BF}$ is a line of symmetry for $\triangle ABC$ where $\triangle ABF \cong \triangle CBF$.

3. ΔAFE has the same area as ΔCFE because they share a base and have equal height. $\overline{AF} \cong \overline{FC}$, so $\triangle AFE \cong \triangle CFE$.

4. We now know $\overline{FE}$ is a line of symmetry for $\triangle ACE$ and $\overline{BF}$ is a line of symmetry for $\triangle ABC$, so $\triangle ABE \cong \triangle CBE$ and quadrilateral *ABCE* is symmetrical along $\overline{BE}$. ✓

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