Lesson 7: Solve for Unknown Angles—Transversals

Classwork

Opening Exercise

Use the diagram at the right to determine $x$ and $y$. $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are straight lines.

$x=$

$y=$

Name a pair of vertical angles:

Find the measure of $∠BOF$. Justify your calculation.

Discussion

Given line $AB$ and line $CD$ in a plane (see the diagram below), a third line $EF$is called a *transversal* if it intersects $\overleftrightarrow{AB}$ at a single point and intersects $\overleftrightarrow{CD}$ at a single but different point. Line $AB$ and line $CD$ are parallel if and only if the following types of angle pairs are congruent or supplementary.

* Corresponding angles are equal in measure

* Alternate interior angles are equal in measure

* Same side interior angles are supplementary

**Examples**

|  |  |
| --- | --- |
| 1.
 | 1.
 |
| $m∠a$ =  | $m∠b$ =  |
| 1.
 | 1.
 |
| $m∠c$ =  | $m∠d$ =  |

1. An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is sometimes useful when solving for unknown angles.

In this figure, we can use the auxiliary line to find the measures of $∠e$ and $∠f$ (how?), then add the two measures together to find the measure of $∠W$.

What is the measure of $∠W$?

Exercises

In each exercise below, find the unknown (labeled) angles. Give reasons for your solutions.

|  |  |
| --- | --- |
| 1.
 | $m∠a$ = $m∠b$ = $m∠c$ =  |
| 1.
 | $m∠d$ =  |
| 1.
 | $m∠e$ = $m∠f$ =  |
| 1.
 | $m∠g$ =  |
| 1.
 | $m∠h$ =  |
| 1.
 | $m∠i$ =  |
| 1.
 | $m∠j$ = $m∠k$ = $m∠m$=  |
| 1.

**MP.7** | $m∠n$ =  |
| 1.
 | $m∠p$ = $m∠q$ =  |
| 1.
 | $m∠r$ =  |

Relevant Vocabulary

**Alternate Interior Angles:**  Let line $t $be a transversal to lines $l$ and $m$ such that $t $intersects $l$ at point $P $and intersects $m$ at point $Q$. Let $R$ be a point on line $l$ and $S$ be a point on line $m$ such that the points $R$ and $S$ lie in opposite half-planes of $t$. Then $∠RPQ$ and $∠PQS$ are called *alternate interior angles* of the transversal $t$ with respect to line $m$ and line $l$.

**Corresponding Angles*:*** Let line $t $be a transversal to lines $l$ and $m$.If $∠x$ and $∠y$ are alternate interior angles, and $∠y$ and $∠z$ are vertical angles, then $∠x$ and $∠z$ are *corresponding angles*.

Problem Set

Find the unknown (labeled) angles. Give reasons for your solutions.

|  |  |
| --- | --- |
| 1.
 | $m∠a$ =  |
| 1.
 | $m∠b$ = $m∠c$ =  |
| 1.
 | $m∠d$ = $m∠e$ =  |
| 1.
 | $m∠f$ =  |