Lesson 7: Solve for Unknown Angles—Transversals



Classwork

Opening Exercise

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

$x$ = \_\_\_\_\_\_\_\_

$y$ = \_\_\_\_\_\_\_\_

Name a pair of vertical angles:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Discussion

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

* Corresponding Angles are equal in measure

Abbreviation: \_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Alternate Interior Angles are equal in measure

Abbreviation: \_\_\_\_\_\_
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Same Side Interior Angles are supplementary

Abbreviation: \_\_\_\_\_\_
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Examples**



a. b.

$∠a$ = \_\_\_\_\_\_\_\_ $∠b$ = \_\_\_\_\_\_\_\_



c. d.

 $∠c$ = \_\_\_\_\_\_\_\_ $∠d$ = \_\_\_\_\_\_\_\_



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. $∠a$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

$∠b$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

$∠c$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2.

 $∠d$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



3. $∠e$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 $∠f$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4.

 $∠g$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



5. $∠h$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



6. $∠i$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. $∠j$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 $∠k$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 $∠m$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8.

 $∠n$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



9. $∠p$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 $∠q$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



10.

$∠r$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 $L$, and $S$ be a point on $M$ such that the points $R$ and $S$ lie in opposite half-planes of $T$. Then the angle $∠RPQ$ and the angle $∠PQS$ are called *alternate interior angles* of the transversal $T$ with respect to $M$ and $L$.

**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.

$∠a$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. $∠b$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 $∠c$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



3. $∠d$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 $∠e$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



4. $∠f$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_