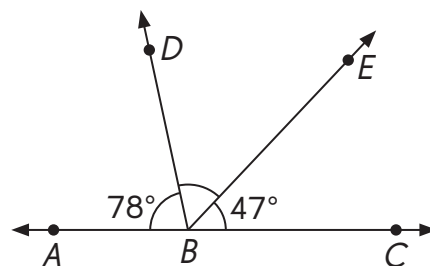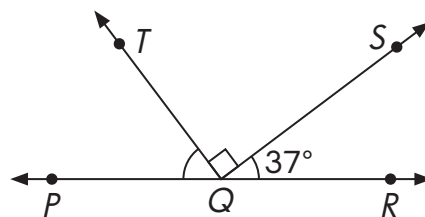## CHAPTER 12 Angles

Lesson 12.1 Angles on a Line

Find the unknown marked angles. The diagrams are not drawn to scale.

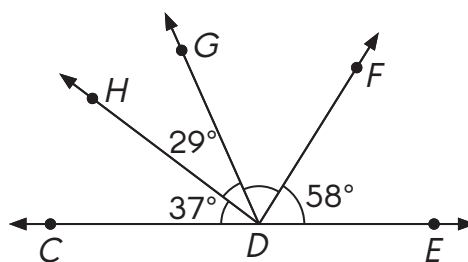**1.** $\overleftrightarrow{AC}$ is a line. Find the measure of $\angle DBE$.

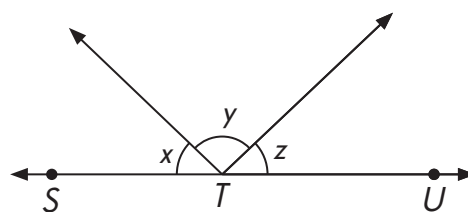**2.** $\overleftrightarrow{PR}$ is a line. Find the measure of $\angle PQT$.

3. $\overleftrightarrow{CE}$ is a line. Find the measure of $\angle FDG$.

4. $\overleftrightarrow{SU}$ is a line. The measure of $\angle y$ is twice as big as the measure of $\angle x$ and the measure of $\angle z$ is half the measure of a right angle. Find the measure of $\angle y$.
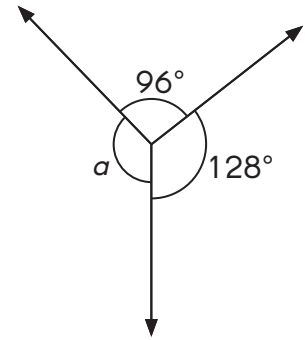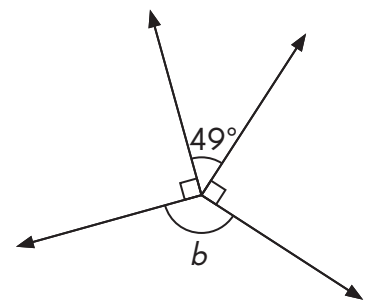
Lesson 12.2   Angles at a Point

Find the unknown marked angles. The diagrams are not drawn to scale.
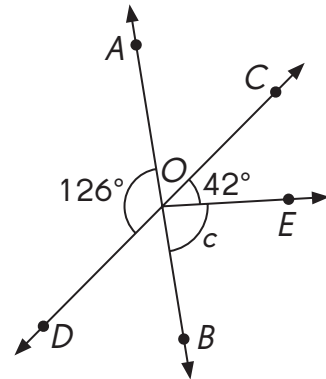
1.   Find the measure of $\angle a$.

96°

128°

a

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

49°

b

3. $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ meet at O. Find the measure of $\angle c$.
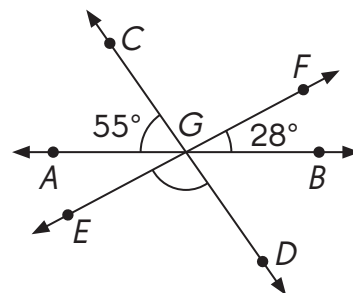

4. $\overleftrightarrow{AB}$ is a line. The measure of $\angle e$ is 2 times the measure of $\angle d$.
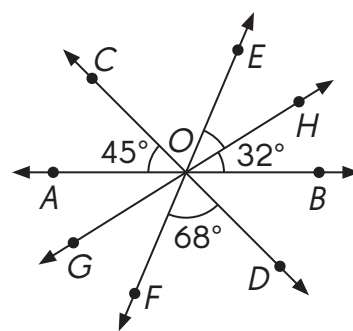Find the measures of $\angle d$ and $\angle e$.
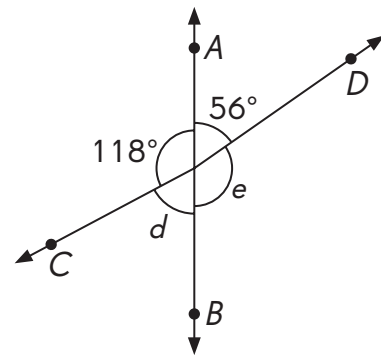
Lesson 12.3   Vertical Angles

Find the unknown marked angles. The diagrams are not drawn to scale.

1. $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, and $\overleftrightarrow{EF}$ meet at G. Find the measure of $\angle DGE$.

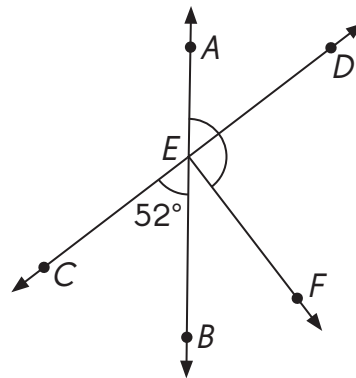**2.** $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, $\overleftrightarrow{EF}$, and $\overleftrightarrow{GH}$ meet at O. Find the measure of $\angle EOH$.
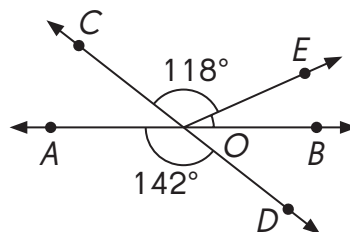
3. $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ meet at E and $\overrightarrow{EF}$ is perpendicular to $\overleftrightarrow{CD}$. Find the measure of $\angle AEF$.
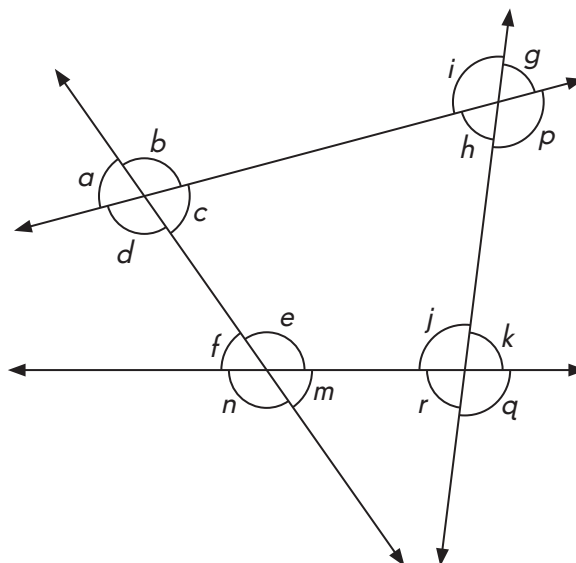

4. $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ meet at O. Find the measure of $\angle BOE$.

5. Look at the marked angles in the diagram. In the table below, write all sets of:

a. angles at a point,
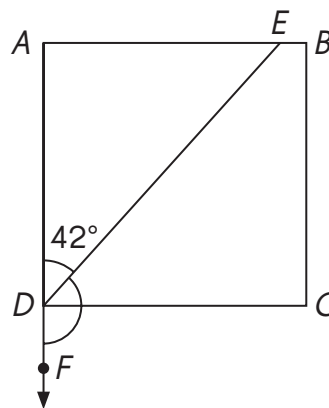
b. vertical angles, and

c. angles on a line

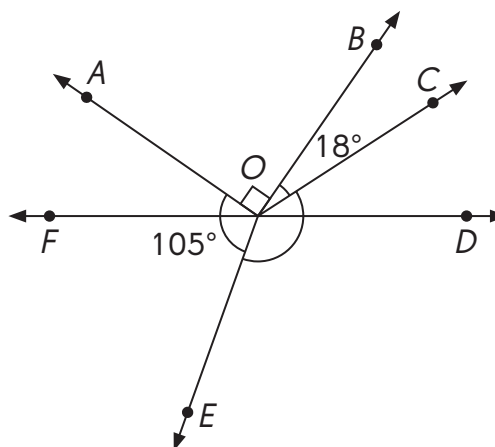| Angles at a Point	Vertical Angles	Angles on a Line
∠a, ∠b, ∠c, and ∠d	∠b and ∠d	∠b and ∠c

Find the unknown marked angles. The diagrams are not drawn to scale.

6. *ABCD* is a square. The measure of ∠*ADE* is 42°. Find the measure of ∠*EDF*.

7. $\overleftrightarrow{DF}$ is a line and $\overrightarrow{OA}$ is perpendicular to $\overrightarrow{OB}$.
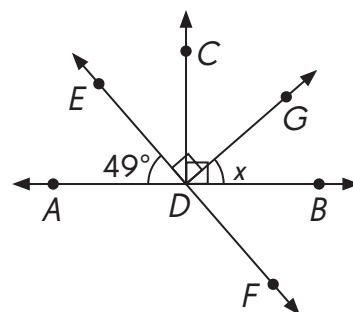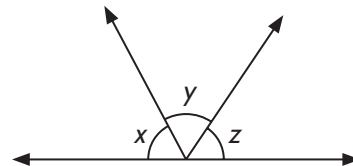Find the measure of ∠*COE*.

Put on Your Thinking Cap!

Find the measures of the unknown angles.

1. $\overleftrightarrow{AB}$ and $\overleftrightarrow{EF}$ meet at D. $\overrightarrow{DC}$ is perpendicular to $\overleftrightarrow{AB}$ and $\overrightarrow{DG}$ is perpendicular to $\overleftrightarrow{EF}$. Find the measure of $\angle x$.
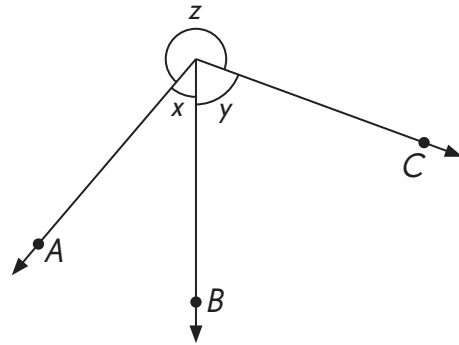

2. In the diagram, the sum of $\angle x$ and $\angle y$ is 124°, the sum of $\angle y$ and $\angle z$ is 142°, and the sum of $\angle x$ and $\angle z$ is 94°. Find the measures of $\angle x$, $\angle y$, and $\angle z$.

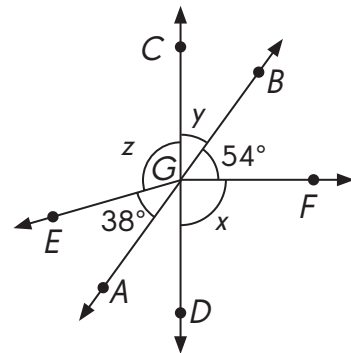**3.** In the diagram, the ratio of the measures of $\angle x$ to $\angle y$ is 3 : 4.
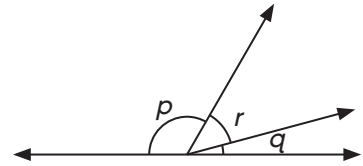The measure of $\angle x$ is 51°.
Find the measure of $\angle z$.

4. $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ meet at G. The ratio of the measures of $\angle x$ to $\angle y$ is 5 : 2.
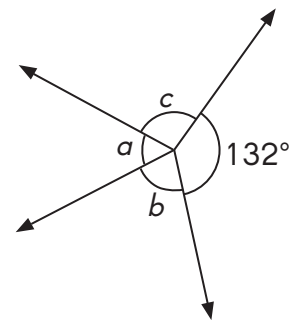Find the measure of $\angle z$.

5.   In the diagram, the measure of $\angle p$ is 7 times the measure of $\angle q$ and the measure of $\angle r$ is 4 times the measure of $\angle q$.
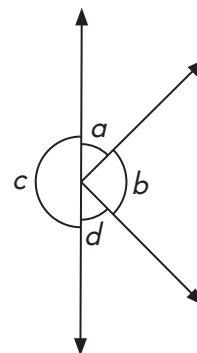Find the measures of $\angle p$ and $\angle r$.

6.   In the diagram, the measures of $\angle a$, $\angle b$, and $\angle c$ are in the ratio 3 : 4 : 5.
Find the measures of $\angle a$, $\angle b$, and $\angle c$.

7. In the diagram, $\angle c$ lies on a line. The measure of $\angle a$ is $\frac{2}{3}$ of $\angle d$, the measure of $\angle d$ is $\frac{3}{4}$ of $\angle b$, and the measure $\angle b$ is $\frac{4}{9}$ of $\angle c$. Find the measures of $\angle a$, $\angle b$, $\angle c$, and $\angle d$.

8. $\overleftrightarrow{AF}$ is a line. $\angle AOB$ and $\angle COD$ are right angles. The measure of $\angle EOC$ is 130° and the measure of $\angle EOF$ is 108°. What can you say about the measures of $\angle BOC$ and $\angle DOF$?