

Lesson 10: Angle Problems and Solving Equations

Student Outcomes:

- Students use vertical angles, adjacent angles, angles on a line, and angles at a point in a multistep problem to write and solve simple equations for an unknown angle in a figure.

Bell work:

Brand A scooter has a top speed that goes 2 miles per hour faster than Brand B. If after 3 hours, Brand A scooter traveled 24 miles at its top speed, at what rate did Brand B scooter travel at its top speed if it traveled the same distance? Write an equation to determine the solution.

x : speed, in mph, of Brand B scooter

$x + 2$: speed, in mph, of Brand A scooter

$$d = rt$$

$$24 = (x + 2)(3)$$

$$24 = 3(x + 2)$$

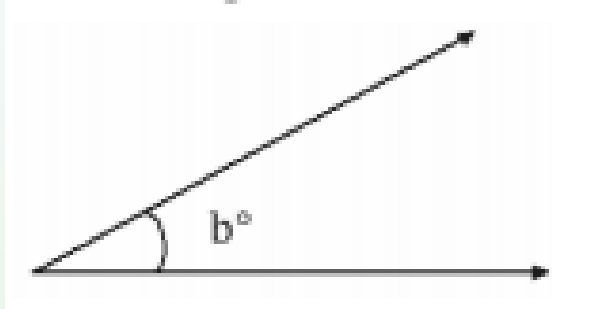
$$24 = 3x + 6$$

$$18 = 3x$$

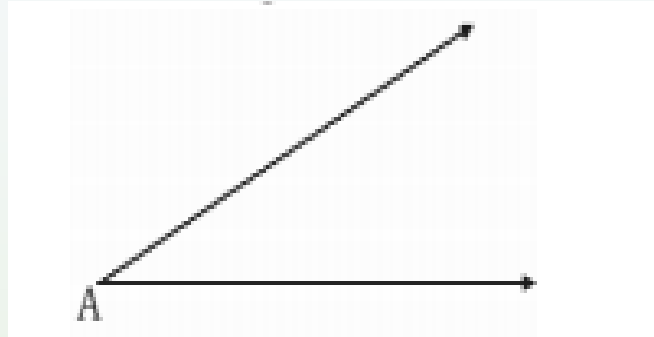
$$6 = x$$

Notes:

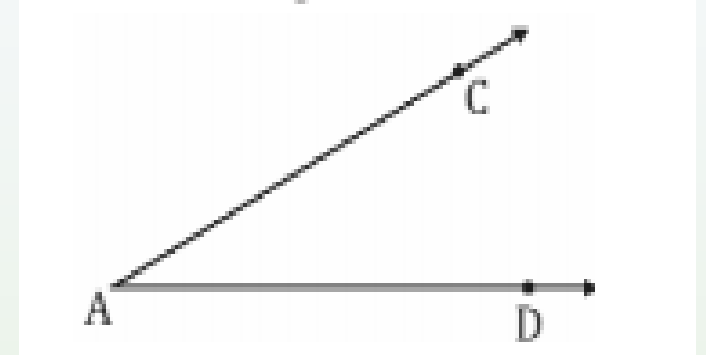
Angles can be named several different ways:



Naming by
the arc $\angle b$



Naming
by the
vertex $\angle A$



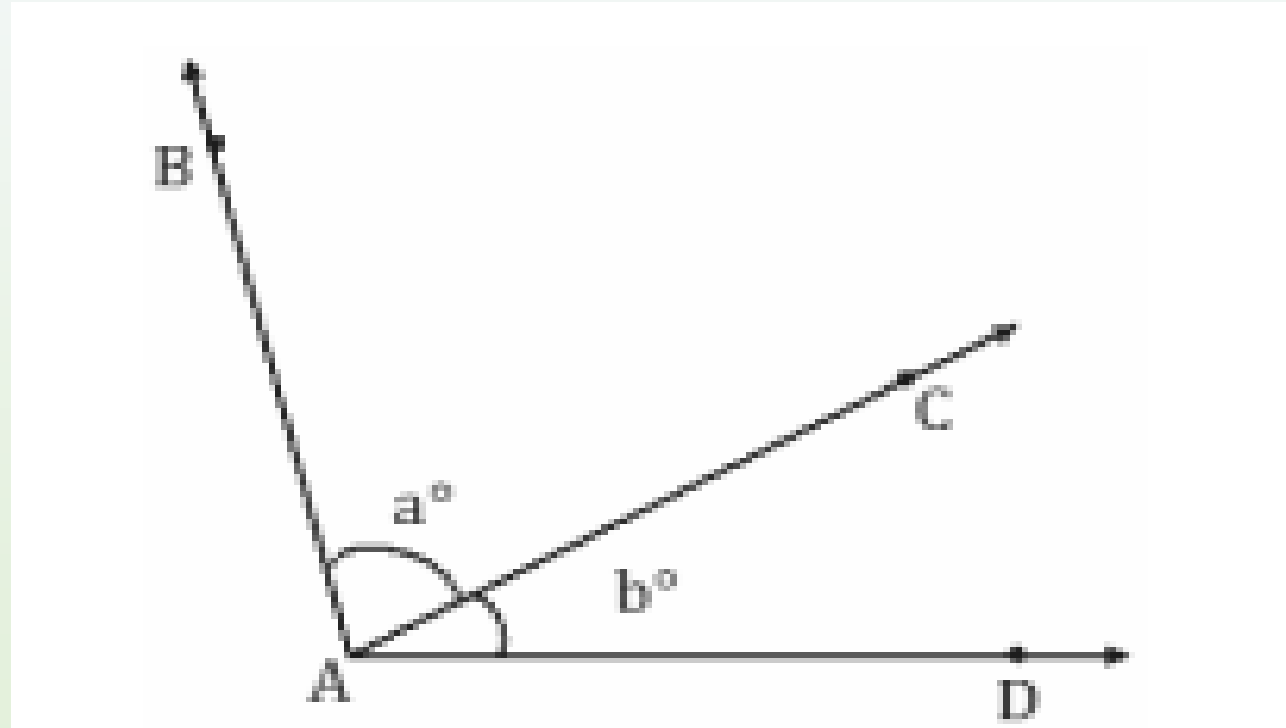
Naming by
three points
 $\angle CAD$ or $\angle DAC$

(s.63)

Angle Facts and Definitions:

Adjacent angles are angles that share a common side.

$\angle a$ and $\angle b$ are
adjacent angles
or
 $\angle BAC$ and $\angle CAD$
are adjacent
angles



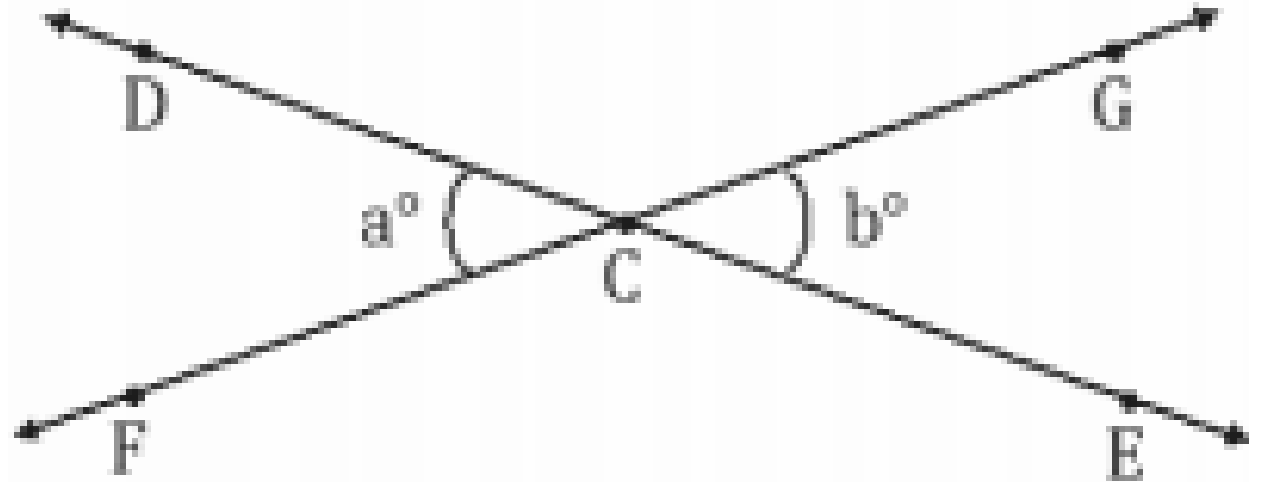
(s.63)

Vertical Angles (vert.<s) the sides form
two pairs of opposite rays.

$$a = b$$

or

$$m\angle DCF = m\angle GCE$$



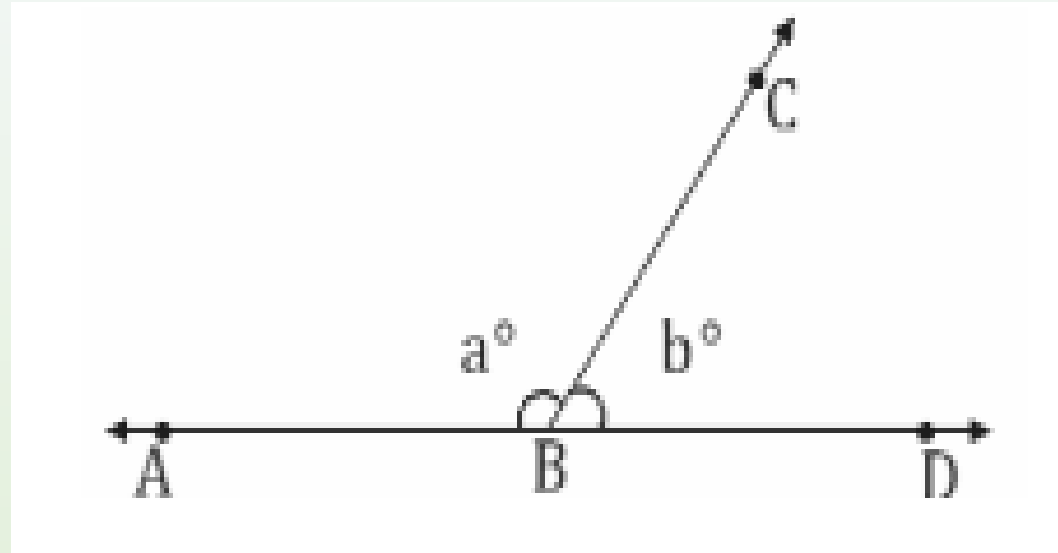
(s.63)

Angles on a line (<s on a line) The sum of two angles that share a ray and form a line is 180° .

$$a + b = 180$$

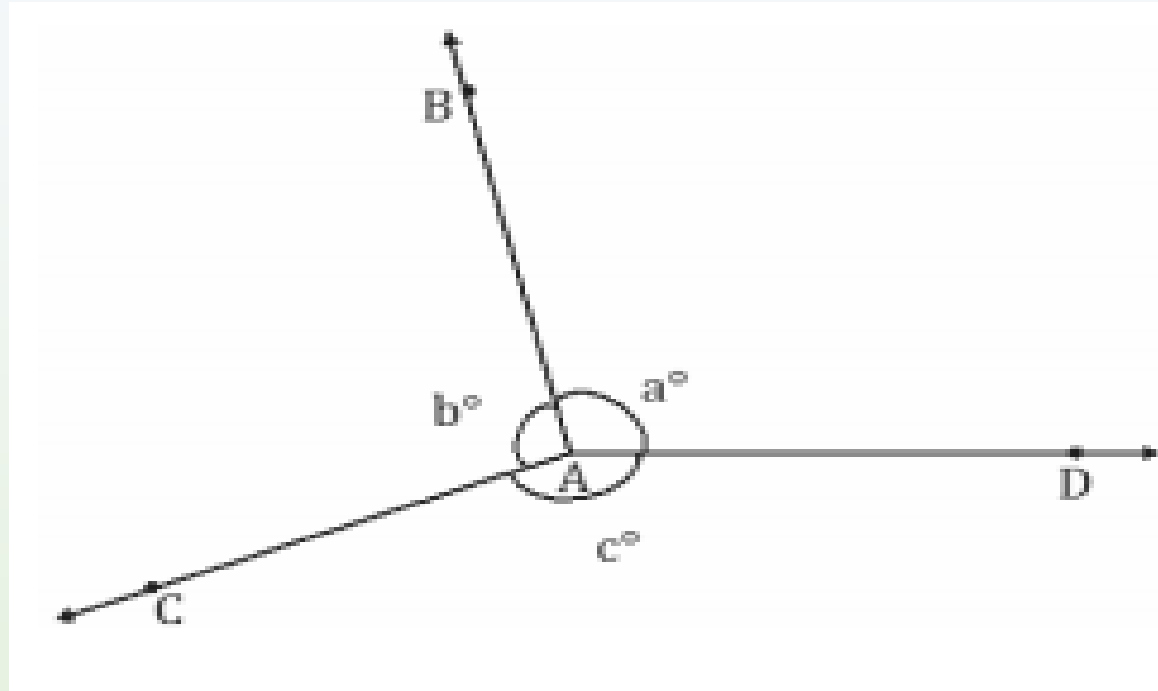
or

$$m\angle ABC + m\angle CBD = 180^\circ$$



(s.63)

Angles at a point (<s at a point) the measure of all angles formed by three or more rays with the same vertex is 360° .

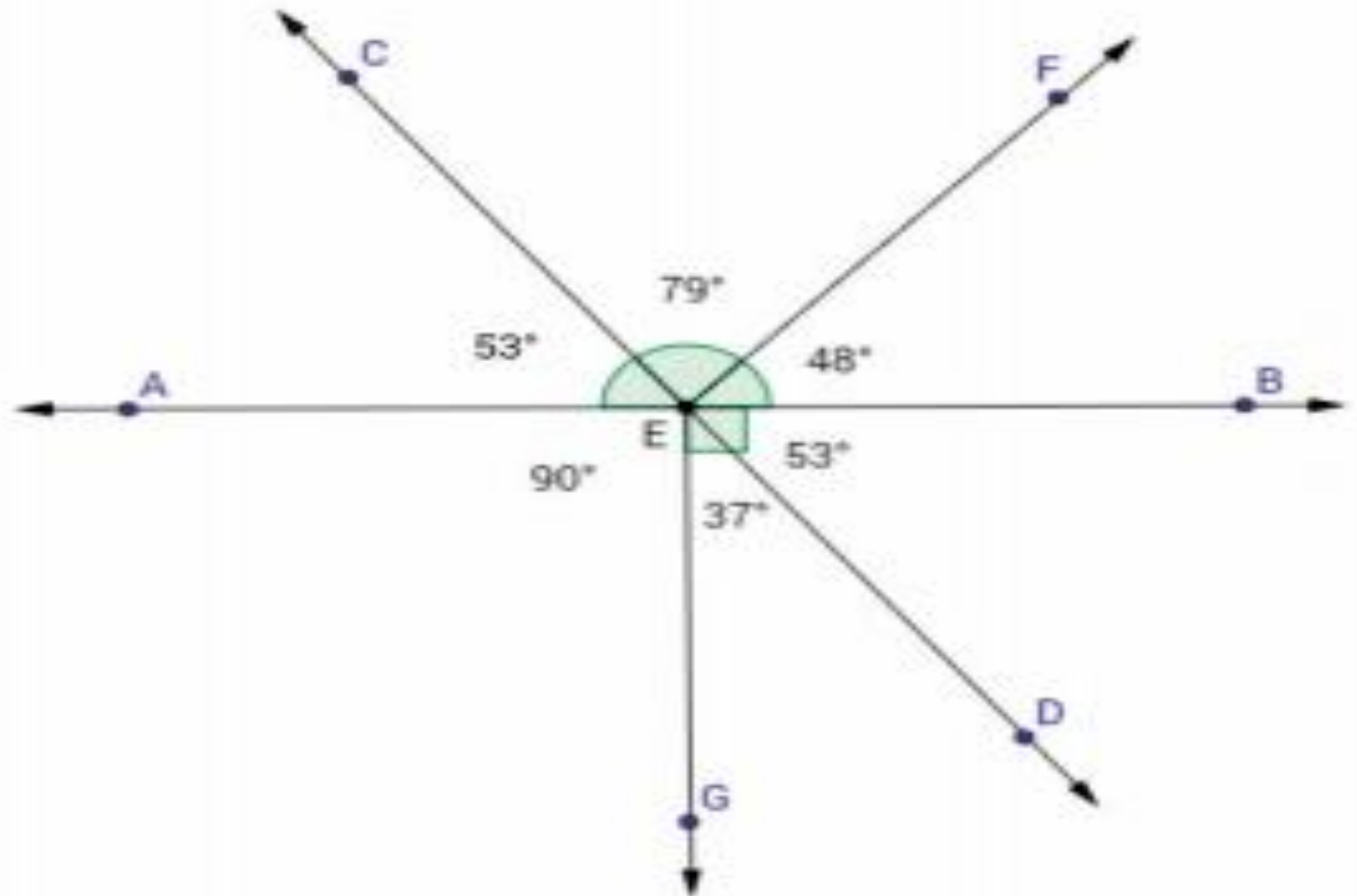


$$a + b + c = 360^\circ$$

or

$$m\angle BAC + m\angle CAD + m\angle DAB = 360$$

Opening Exercise (s.64)



Example 1: (s.64)

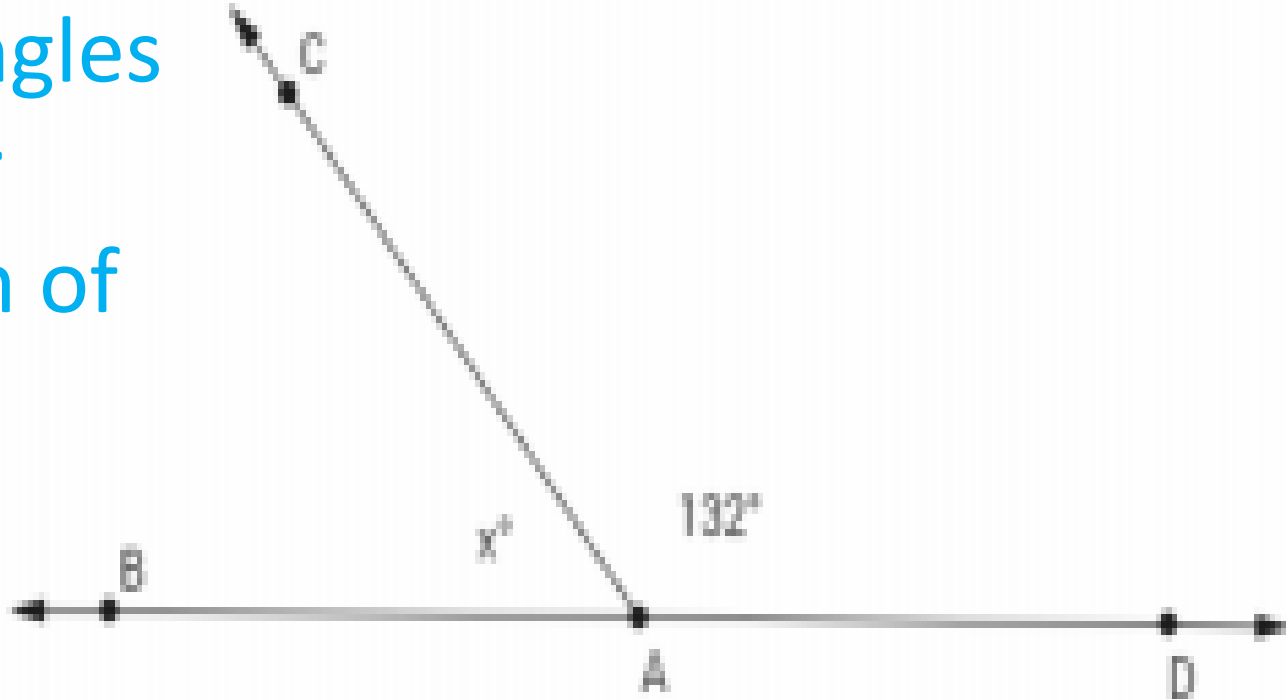
$\angle BAC$ and $\angle CAD$ are angles
on a line and their
measures have a sum of
 180° .

$$x + 132 = 180$$

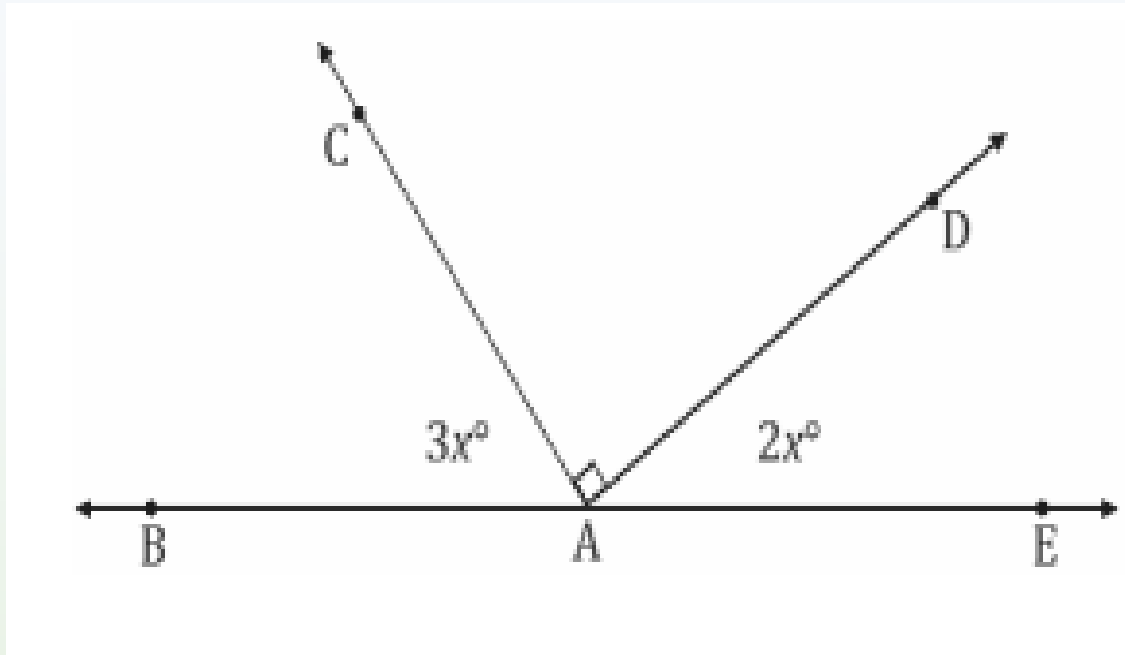
$$x + 132 - 132 = 180 - 132$$

$$x = 48$$

$$m \angle BAC = 48^\circ$$



Exercise 1: (s.65)



Find the
measurements of
 $\angle BAC$ and $\angle DAE$.

$$3x + 90 + 2x = 180$$

$$x = 18$$

$$m\angle BAC = 3(18^\circ) = 54^\circ$$

$$m\angle DAE = 2(18^\circ) = 36^\circ$$

Example 2: (s.65)

Find the $m\angle LEB$ and $m\angle KEB$

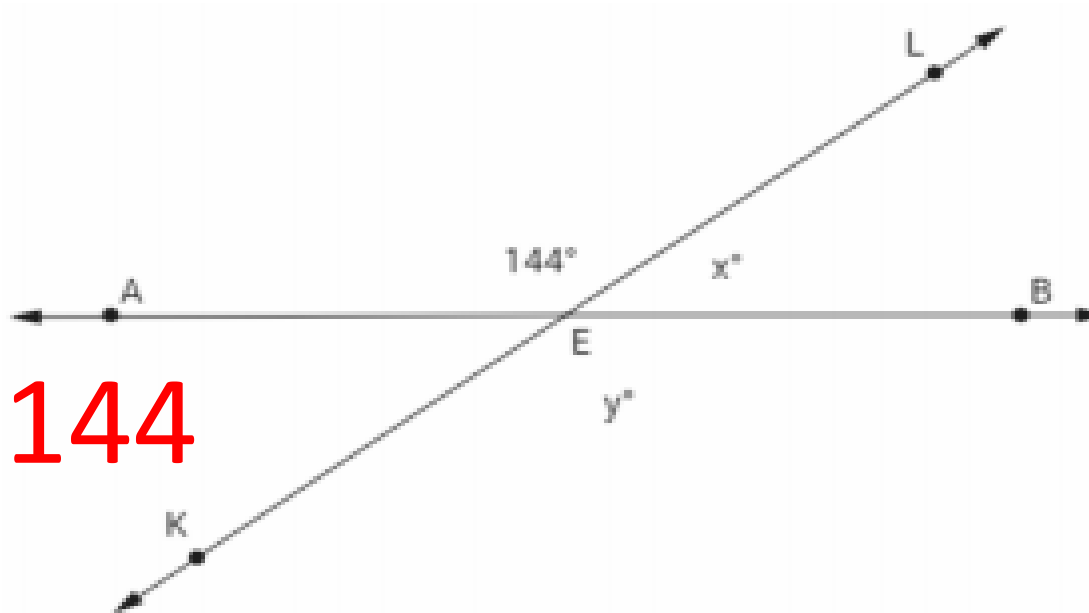
$$x + 144 = 180$$

$$x + 144 - 144 = 180 - 144$$

$$x = 36$$

$$m\angle LEB = 36^\circ$$

$$y = 144^\circ; \angle KEB = 144^\circ \text{ (or vert. } \angle\text{s are =)}$$



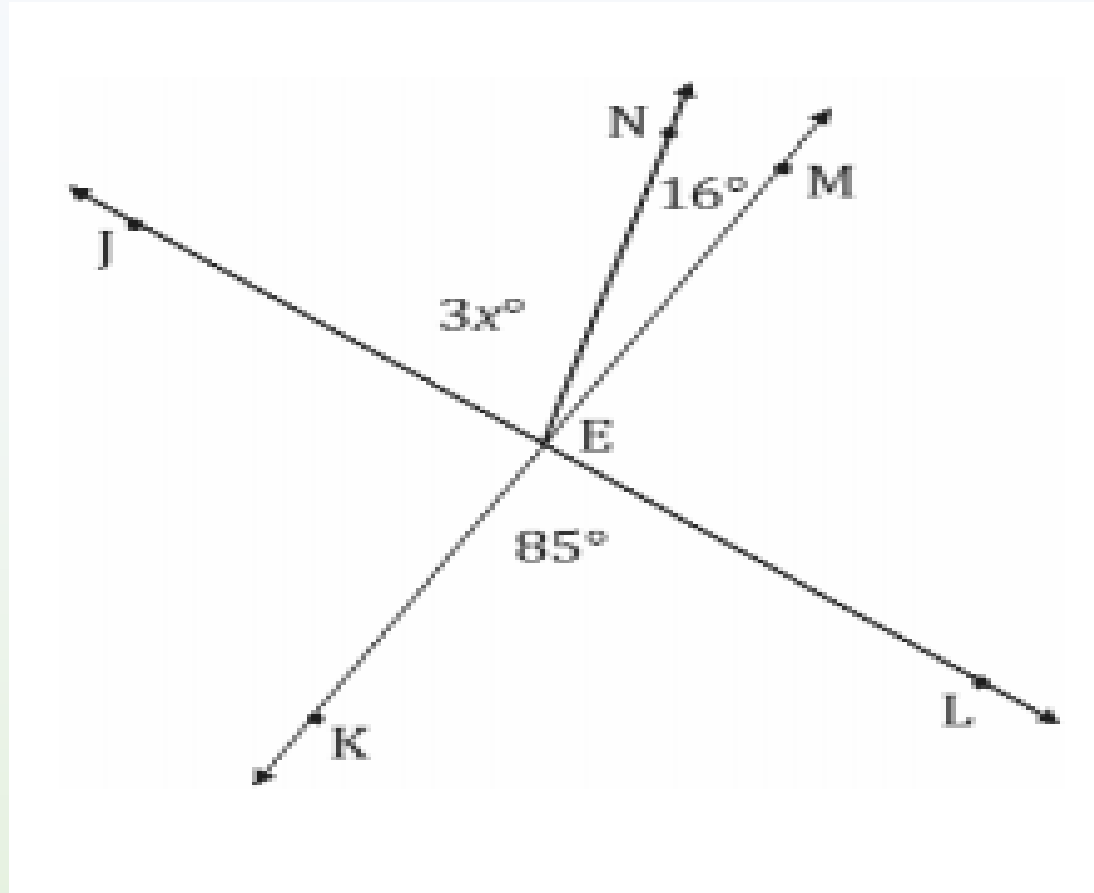
$\angle AEL$ and $\angle LEB$ are angles on a line and their measures have a sum of 180° . $\angle AEL$ and $\angle KEB$ are vertical angles and are of equal measure

Solve for x .

$$3x + 16 = 85$$

$$x = 23^{\circ}$$

$$3x = 69^{\circ}$$



Example 3: (s.66)

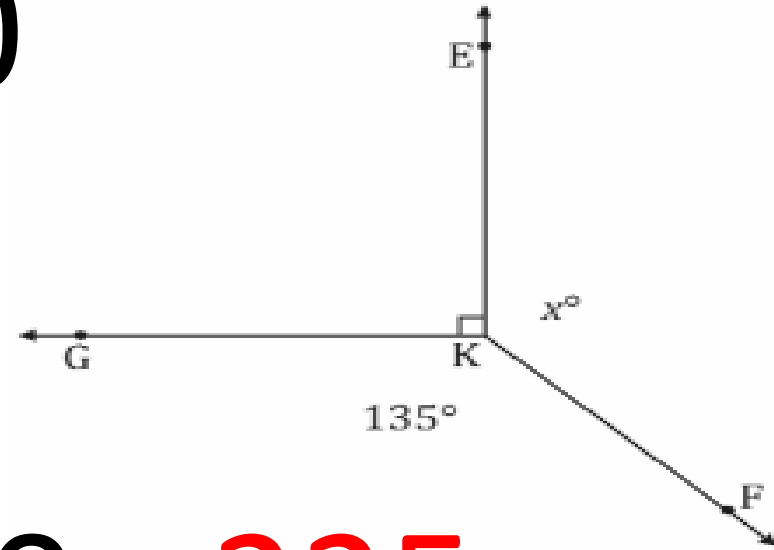
$\angle GKE$, $\angle EKF$, and $\angle GKF$ are angles at a point and their measures have a sum of 360°

$$x + 90 + 135 = 360$$

$$x + 225 = 360$$

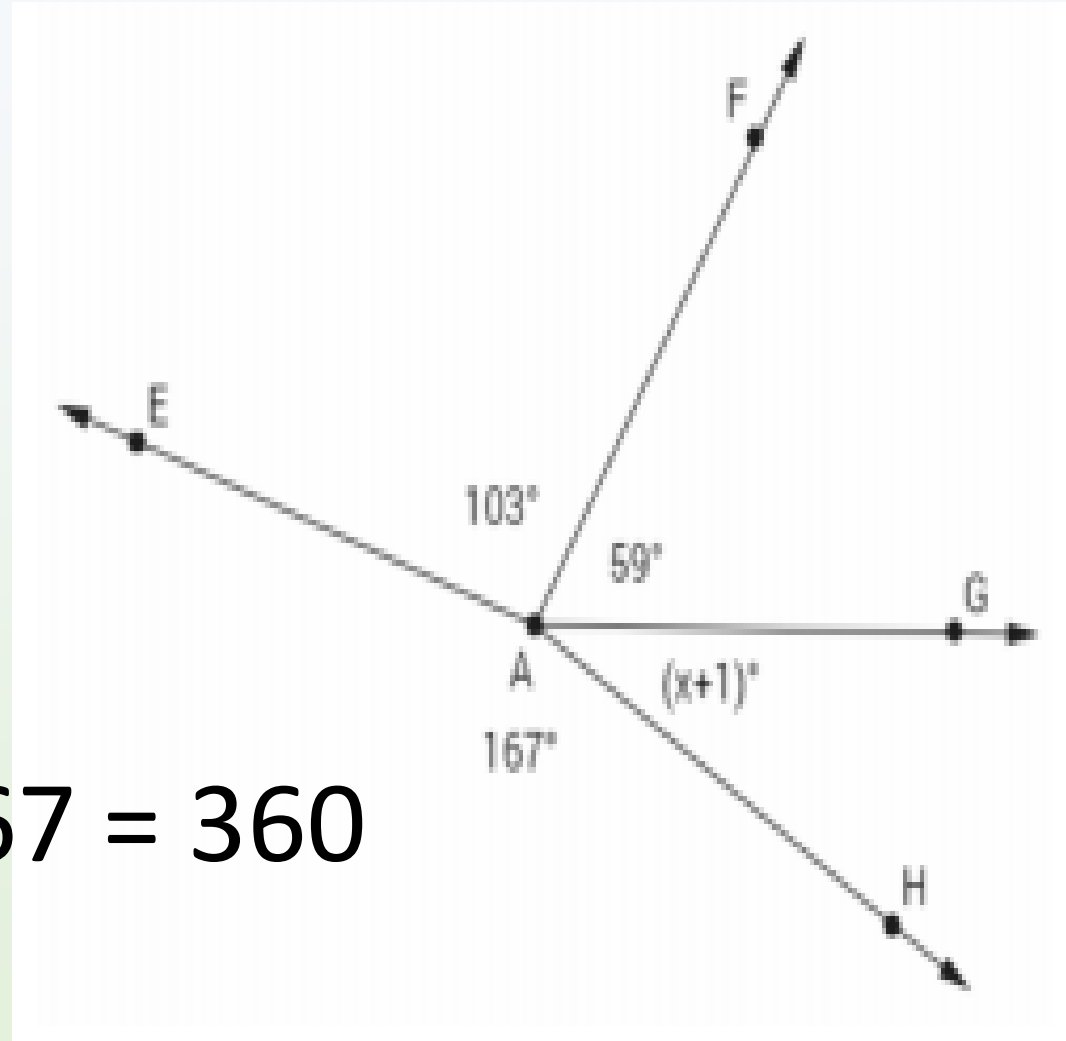
$$x + 225 - 225 = 360 - 225$$

$$x = 135^\circ$$



Exercise 3: (s.67)

Find the
measurement
of $\angle GAH$.



$$103 + 59 + (x + 1) + 167 = 360$$

$$x = 30$$

$$m\angle GAH = (30 + 1)^\circ = 31^\circ$$

Example 4: The following two lines intersect. The ratio of the measurements of the obtuse angle to the acute angle in any adjacent pair in this figure is 2:1.

The measurement of an obtuse angle is twice the measurement of an acute angle in this diagram.

$$2x + 1x = 180$$

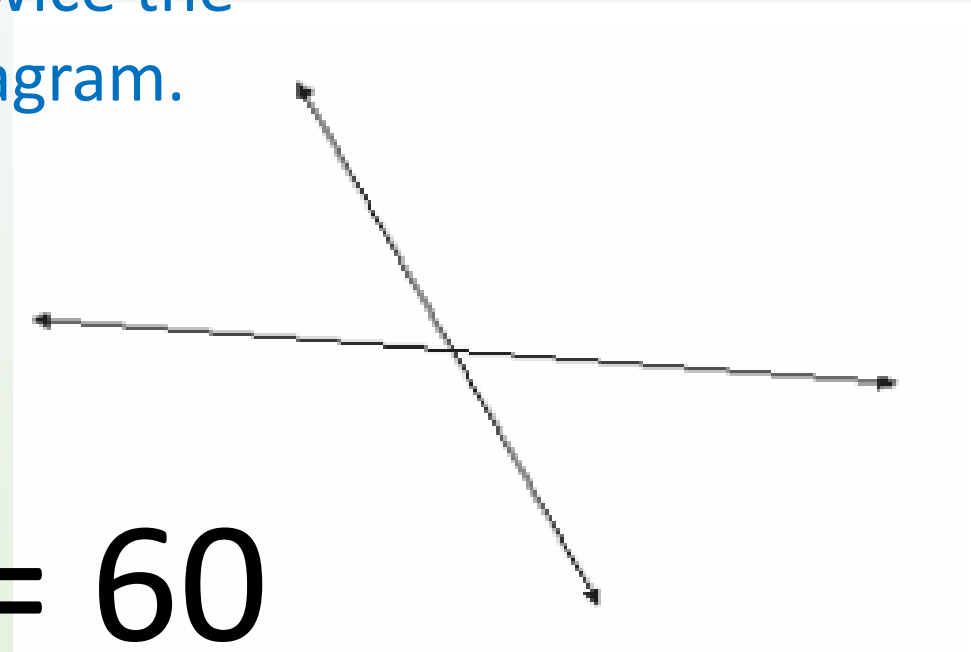
$$3x = 180$$

$$\frac{3x}{3} = \frac{180}{3}$$

$$x = 60$$

$$1x = 60$$

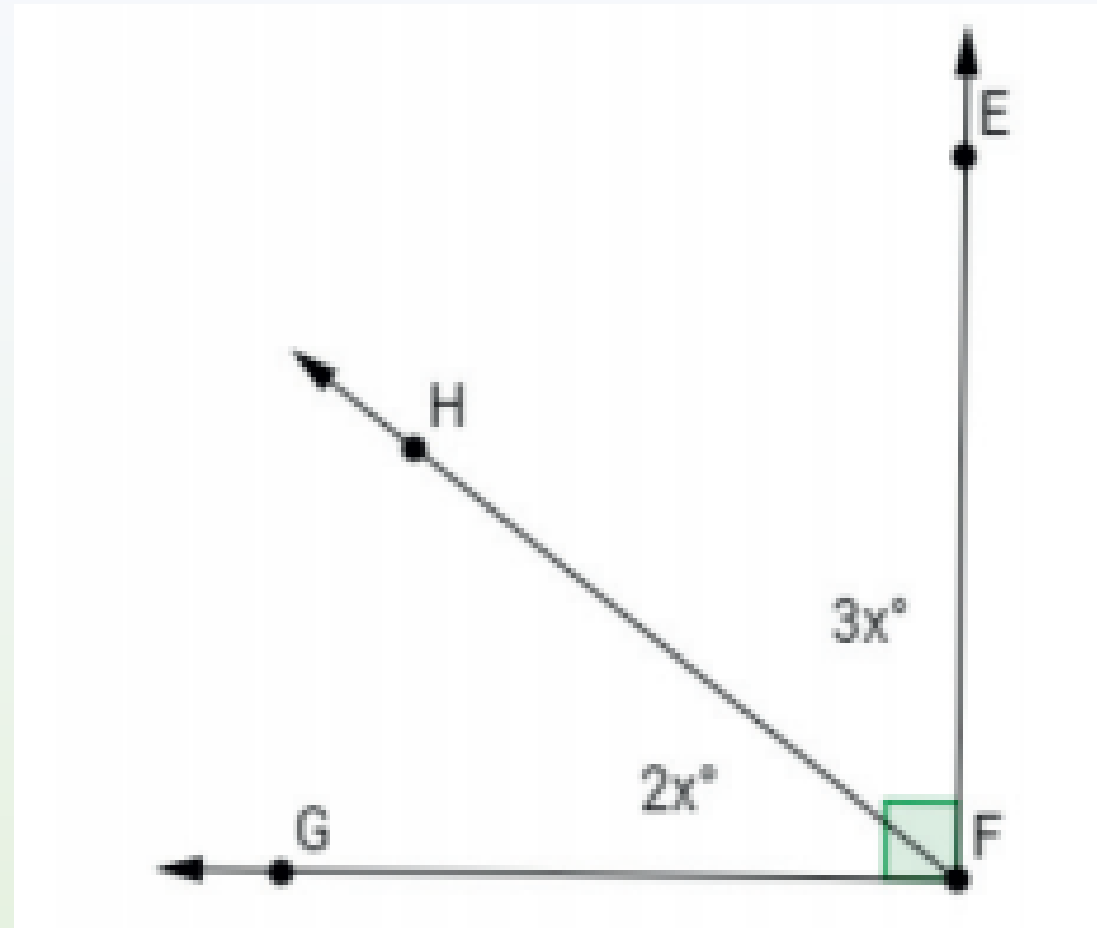
$$2x = 120$$



Find the
measures of
 $\angle GFH$ and $\angle EFH$.

$$2x + 3x = 90$$

$$x = 18$$



$$m\angle GFH = 2(18^\circ) = 36^\circ$$

$$m\angle EFH = 3(18^\circ) = 54^\circ$$

<https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-geometry/cc-7th-unknown-angle-algebra/v/solving-for-unknown-angles>

Problem Set:

(s.69 – 71)