1.1 Identify Points, Lines, and Planes

Goal • Name and sketch geometric figures.

Your Notes

Rewrite the goal
as
an I can
statement:

VOCABULARY

Undefined term

Point

Line

Plane

Collinear points

Coplanar points

Defined Terms

Line segment, endpoints

Ray

Opposite rays

Intersection

UNDEFINED TERMS

Point A **point** has _____ dimension. It is represented by a _____.

A
point A

Line A **line** has _____ dimension. It is represented by a _____ with two arrowheads, but it extends without end.

A
B
ℓ

line ℓ, line AB ($\overleftrightarrow{AB}$), or line BA ($\overleftrightarrow{BA}$)

Through any _____ points, there is exactly _____ line. You can use any _____ points on a line to name it.

Plane A **plane** has _____ dimensions. It is represented by a shape that looks like a floor or wall, but it extends without end.

M B
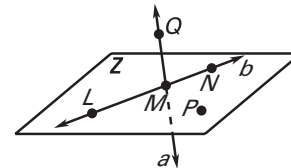A C

plane M or plane ABC

Through any _____ points not on the same line, there is exactly _____ plane. You can use _____ points that are not all on the same line to name a plane.

There is a line through points *L* and *Q* that is not shown in the diagram. Try to imagine what plane *LMQ* would look like if it were shown.

Example 1   *Name points, lines, and planes*

a. Give two other names for $\overleftrightarrow{LN}$. Give another name for plane *Z*.

Q
Z b
L N
M P
a

b. Name three points that are collinear. Name four points that are coplanar.

a. Other names for $\overleftrightarrow{LN}$ are _____ and _____. Other names for plane *Z* are plane _____ and _____.

b. Points _____ lie on the same line, so they are collinear. Points _____ lie on the same plane, so they are coplanar.
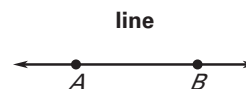

Stop and get the teacher's signature after each checkpoint, before you move on.

✔ *Checkpoint* **Use the diagram in Example 1.**

1. Give two other names for $\overleftrightarrow{MQ}$. Name a point that is not coplanar with points *L, N,* and *P*.

DEFINED TERMS: SEGMENTS AND RAYS

Line *AB* (written as _____) and points *A* and *B* are used here to define the terms below.
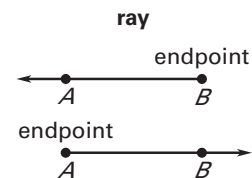
line

Segment The **line segment** *AB,* or segment *AB,* (written as _____) consists of the endpoints *A* and *B* and all points on $\overleftrightarrow{AB}$ that are _____ *A* and *B.*

Note that $\overline{AB}$ can also be named _____.

segment

endpoint   endpoint

Ray The **ray** *AB* (written as _____) consists of the endpoint *A* and all points on $\overleftrightarrow{AB}$ that lie on the same side of ____ as ___.
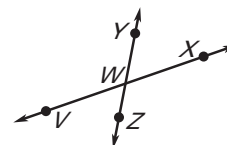
Note that $\overrightarrow{AB}$ and $\overrightarrow{BA}$ are _____ rays.

ray

endpoint

endpoint

Example 2 Name segments, rays, and opposite rays

In Example 2, $\overrightarrow{WY}$ and $\overrightarrow{WX}$ have a common _____, but are *not* _____. So they are not opposite rays.

a. Give another name for $\overline{VX}$.

b. Name all rays with endpoints *W.* Which of these rays are opposite rays?

a. Another name for $\overline{VX}$ is _____.

b. The rays with endpoint *W* are _____.

The opposite rays with endpoint *W* are _____, and _____.

✔ *Checkpoint* **Use the diagram in Example 2.**

2. Give another name for $\overline{YW}$.

_____

3. Are $\overrightarrow{VX}$ and $\overrightarrow{XV}$ the same ray? Are $\overrightarrow{VW}$ and $\overrightarrow{VX}$ the same ray? *Explain.*

Example 3 *Sketch intersections of lines and planes*

a. Sketch a plane and a line that intersects the plane at more than one point.

b. Sketch a plane and a line that is in the plane. Sketch another line that intersects the line and plane at a point.

a.   **b.**

Example 4 *Sketch intersections of planes*

Sketch two planes that intersect in a line.

Step 1 Draw one plane as if you are facing it.

Step 2 Draw a second plane that is _____.
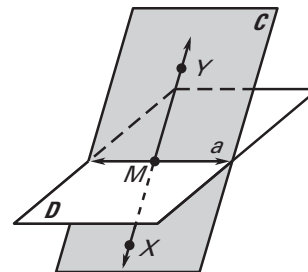Use dashed lines to show where one plane is hidden.

Step 3 Draw the line of _____.

✔ *Checkpoint* **Complete the following exercises.**

Stop and get the teacher's signature after each checkpoint, before you move on.

4. Sketch two different lines that intersect a plane at different points.

5. Name the intersection of $\overleftrightarrow{MX}$ and line *a*.

Homework

6. Name the intersection of plane *C* and plane *D*.

1.2 Use Segments and Congruence

Rewrite the Goal as an "I can" statement.

Your Notes

e

e

VOCABULARY

Postulate, axiom

_____

Theorem

_____

Coordinate
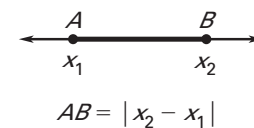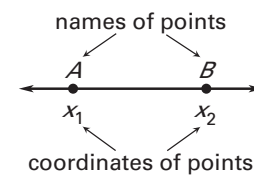
_____

Distance

_____

_____

Between

_____

Congruent segments

POSTULATE 1   RULER POSTULATE

The points on a line can be matched one to one with real numbers. The real number that corresponds to a point is the _____ of the point.

names of points

A   B

x_1 x_2

coordinates of points

The _____ between points A and B, written as AB, is the absolute value of the difference of the coordinates of A and B.
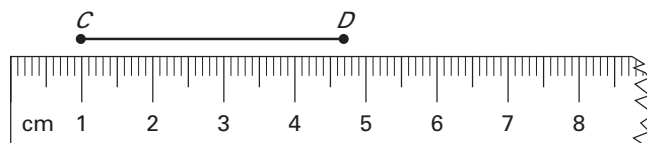
A   B

x_1 x_2

$AB = |x_2 - x_1|$

Example 1   *Apply the Ruler Postulate*

Measure the length of $\overline{CD}$ to the nearest tenth of a centimeter.

C •——————————————————• D

Solution

Align one mark of a metric ruler with *C*. Then estimate the coordinate of *D*. For example, if you align *C* with 1, *D* appears to align with _____.
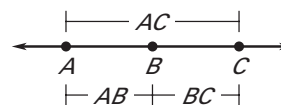
C •———————————————• D

cm   1   2   3   4   5   6   7   8

$CD = \Big|\underline{} - \underline{}\Big| = \underline{}$ **Ruler postulate**

The length of $\overline{CD}$ is about _____ centimeters.

POSTULATE 2   SEGMENT ADDITION POSTULATE

If *B* is between *A* and *C*, then
$AB + BC = AC$.

If $AB + BC = AC$, then *B* is between *A* and *C*.

|—— AC ——|

A   B   C

|— AB —+— BC —|

Example 2   *Apply the Segment Addition Postulate*

Road Trip The locations shown lie in a straight line. Find the distance from the starting point to the destination.

Starting point
S

64 mi   Rest area
R

87 mi   Destination
D

Solution

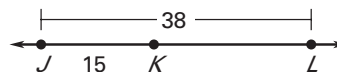The rest area lies between the starting point and the destination, so you can apply the Segment Addition Postulate.

$SD = \underline{} + \underline{}$ **Segment Addition Postulate**

$ = \underline{} + \underline{}$ **Substitute for _____ and _____.**

$ = \underline{}$ **Add.**

The distance from the starting point to the destination is _____ miles.

Example 3 *Find a length*

Use the diagram to find KL.

```
                    |————— 38 —————|
    •———————•————————•
    J    15   K        L
```

Use the Segment Addition Postulate to write an equation. Then solve the equation to find *KL*.

_____ = _____ + *KL*   Segment Addition Postulate

_____ = _____ + *KL*   Substitute for _____ and _____.

_____ = *KL*   Subtract _____ from each side.

Example 4 *Compare segments for congruence*

Plot F(4, 5), G(−1, 5), H(3, 3), and J(3, −2) in a coordinate plane. Then determine whether $\overline{FG}$ and $\overline{HJ}$ are congruent.
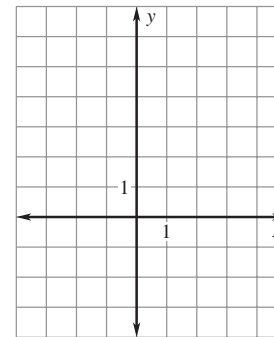
Horizontal segment: Subtract the _____ of the endpoints.

$FG = \left|\ \rule{2cm}{0.4pt}\ \right| = $ ____

Vertical segment: Subtract the _____ of the endpoints.

$HJ = \left|\ \rule{2cm}{0.4pt}\ \right| = $ ____

$\overline{FG}$ and $\overline{HJ}$ have the _____ length. So $\overline{FG}$ ____ $\overline{HJ}$.

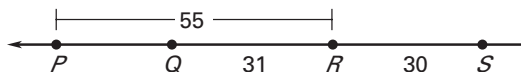✔ *Checkpoint* **Complete the following exercises.**

Homework

1. Find the length of $\overline{AB}$ to the nearest $\frac{1}{8}$ inch.

```
    A                          B
    •——————————————————————•
```

2. Find *QS* and *PQ*.

```
              |————— 55 —————|
    ←—•———————•————————•————————•——→
      P        Q    31   R    30   S
```

3. Consider the points *A*(−2, −1), *B*(4, −1), *C*(3, 0), and *D*(3, 5). Are $\overline{AB}$ and $\overline{CD}$ congruent?

1.3 Use Midpoint and Distance Formulas

Your Notes

Goal • Find lengths of segments in the coordinate plane.

VOCABULARY

Midpoint

_____

Segment bisector

Example 1 *Find segments lengths*

Find *RS*.

Solution

Point ____ is the midpoint of $\overline{RS}$. So, *RT* = ____ = 21.7.

RS = ____ + ____		Segment Addition Postulate
= ____ + ____		Substitute.
= ____		Add.

The length of $\overline{RS}$ is ____.

☑ *Checkpoint* **Complete the following exercise.**

1. Find *AB*.

Example 2   *Use algebra with segment lengths*

Point C is the midpoint of $\overline{BD}$. Find the length of $\overline{BC}$.

$$\underset{B}{\bullet}\overset{3x-2}{\dashv}\underset{C}{\bullet}\overset{2x+3}{\dashv}\underset{D}{\bullet}$$

Solution

Step 1 Write and solve an equation.

$BC = CD$		Write equation.
$\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$		Substitute.
$\underline{\hspace{1.5cm}} = \underline{\hspace{0.7cm}}$		Subtract ____ from each side.
$x = \underline{\hspace{0.7cm}}$		Add ____ to each side.

Step 2 Evaluate the expression for *BC* when $x = $ ___.
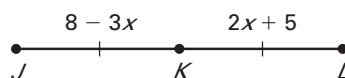
$$BC = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} = \underline{\hspace{1cm}}$$

So, the length of $\overline{BC}$ is ____.

✔ *Checkpoint* Complete the following exercise.

2. Point K is the midpoint of $\overline{JL}$. Find the length of $\overline{KL}$.

$$\underset{J}{\bullet}\overset{8-3x}{\dashv}\underset{K}{\bullet}\overset{2x+5}{\dashv}\underset{L}{\bullet}$$
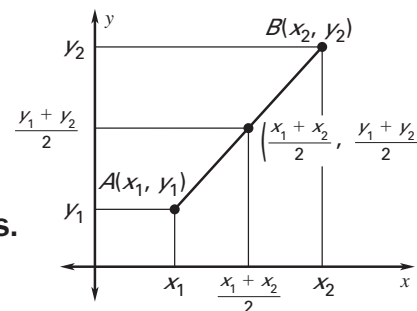

THE MIDPOINT FORMULA

The coordinates of the midpoint of a segment are the averages of the *x*-coordinates and of the *y*-coordinates of the endpoints.

If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the midpoint *M* of $\overline{AB}$ has coordinates $\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$.
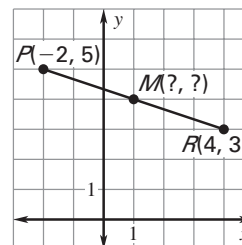
Example 3 **Use the Midpoint Formula**

a. Find Midpoint The endpoints of $\overline{PR}$ are $P(-2, 5)$ and $R(4, 3)$. Find the coordinates of the midpoint M.

b. Find Endpoint The midpoint of $\overline{AC}$ is $M(3, 4)$. One endpoint is $A(1, 6)$. Find the coordinates of endpoint C.

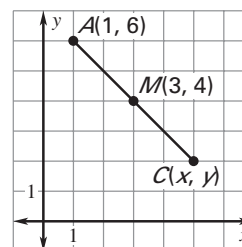**Solution**

a. Use the Midpoint Formula.

$$M\left(\frac{\boxed{} + \boxed{}}{\boxed{}}, \frac{\boxed{} + \boxed{}}{\boxed{}} \right)$$

$$= M(\underline{}, \underline{})$$

The coordinates of the midpoint of $\overline{PR}$ are _____.

b. Let (x, y) be the coordinates of endpoint C. Use the Midpoint Formula to find x and y.

> Multiply each side of the equation by the denominator to clear the fraction.

Step 1 Find x.

$$\frac{\boxed{} + x}{2} = \underline{}$$

$$\underline{} + x = \underline{}$$

$$x = \underline{}$$

Step 2 Find y.

$$\frac{\boxed{} + y}{2} = \underline{}$$

$$\underline{} + y = \underline{}$$

$$y = \underline{}$$

The coordinates of endpoint C are _____.

✔ *Checkpoint* **Complete the following exercises.**

3. The endpoints of $\overline{CD}$ are $C(-8, -1)$ and $D(2, 4)$. Find the coordinates of the midpoint M.
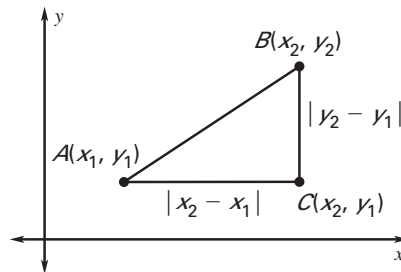
_____

4. The midpoint of $\overline{XZ}$ is $M(5, -6)$. One endpoint is $X(-3, 7)$. Find the coordinates of endpoint Z.

THE DISTANCE FORMULA
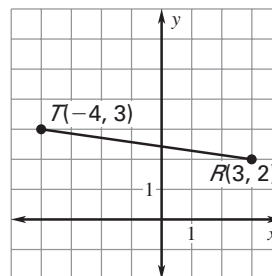
If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the distance between A and B is

$$AB = \sqrt{(\underline{\hspace{2cm}})^2 + (\underline{\hspace{2cm}})^2}$$

Example 4 *Use the Distance Formula*

What is the approximate length of $\overline{RT}$, with endpoints $R(3, 2)$ and $T(-4, 3)$?

Solution

Use the Distance Formula.

$$RT = \sqrt{(\underline{\hspace{1.5cm}})^2 + (\underline{\hspace{1.5cm}})^2} \qquad \text{Distance Formula}$$

$$= \sqrt{(\underline{\hspace{0.7cm}} - 3)^2 + (\underline{\hspace{0.5cm}} - \underline{\hspace{0.5cm}})^2} \qquad \text{Substitute.}$$

$$= \sqrt{(\underline{\hspace{0.7cm}})^2 + (\underline{\hspace{0.5cm}})^2} \qquad \text{Subtract.}$$

$$= \sqrt{\underline{\hspace{0.7cm}} + \underline{\hspace{0.5cm}}} \qquad \text{Evaluate powers.}$$

$$= \sqrt{\underline{\hspace{0.7cm}}} \qquad \text{Add.}$$

The symbol $\approx$ means "is approximately equal to."

$$\approx \underline{\hspace{1.5cm}} \qquad \text{Use a calculator.}$$

The length of $\overline{RT}$ is about _____.

✔ *Checkpoint* **Complete the following exercise.**

Stop and get the teacher's signature after each checkpoint, before you move on.

Homework

5. What is the approximate length of $\overline{GH}$, with endpoints $G(5, -1)$ and $H(-3, 6)$?

1.4 Measure and Classify Angles

Your Notes

Goal • Name, measure, and classify angles.

e

VOCABULARY

Angle

_____

Sides of an angle

_____

Vertex of an angle

_____

Measure of an angle

_____

Acute angle

_____

Right angle

_____

Obtuse angle

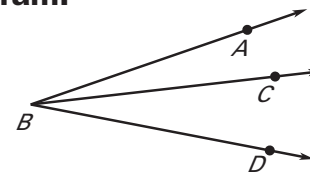_____

Straight angle

_____

Congruent angles

_____

Angle bisector

Example 1   *Name angles*

Name the three angles in the diagram.
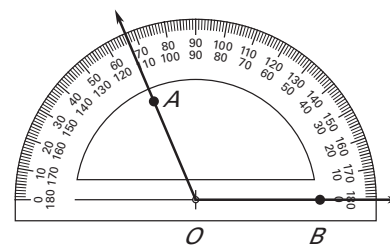
_____, or _____

_____, or _____

_____, or _____

You should not name any of these angles *B* because all three angles have *B* as their _____.

POSTULATE 3: PROTRACTOR POSTULATE

Consider $\overrightarrow{OB}$ and point A on one side of $\overrightarrow{OB}$. The rays of the form $\overrightarrow{OA}$ can be matched one to one with the real numbers from 0 to _____.

The measure of _____ is equal to _____ _____ between the real numbers for $\overrightarrow{OA}$ and $\overrightarrow{OB}$.

Example 2 — *Measure and classify angles*

Use the diagram to find the measure of the indicated angle. Then classify the angle.

a. $\angle WSR$ b. $\angle TSW$

c. $\angle RST$ d. $\angle VST$

a. $\overrightarrow{SR}$ is lined up with the 0° on the _____ scale of the protractor. $\overrightarrow{SW}$ passes through _____ on the _____ scale. So, $m\angle WSR =$ _____. It is _____ angle.

b. $\overrightarrow{ST}$ is lined up with the 0° on the _____ scale of the protractor. $\overrightarrow{SW}$ passes through _____ on the _____ scale. So, $m\angle TSW =$ _____. It is _____ angle.

c. $m\angle RST =$ _____. It is _____ angle.

d. $m\angle VST =$ _____. It is _____ angle.
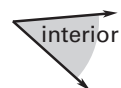
✔ *Checkpoint* Complete the following exercises.

1. Name all the angles in the diagram at the right.

_____

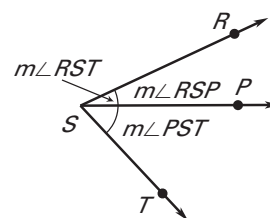2. What type of angles do the *x*-axis and *y*-axis form in a coordinate plane?

POSTULATE 4: ANGLE ADDITION POSTULATE

Words If *P* is in the interior of
∠*RST*, then the measure of
∠*RST* is equal to the sum of
the measures of ∠_____
and ∠_____.

Symbols If *P* is in the interior of ∠*RST*,
then *m*∠*RST* = *m*∠_____ + *m*∠_____.

A point is in the *interior* of an angle if it is between points that lie on each side of the angle.

interior

$m∠RST$ $m∠RSP$ *P*

R

S $m∠PST$

T

Example 3 *Find angle measures*

Given that *m*∠*GFJ* = 155°,
find *m*∠*GFH* and *m*∠*HFJ*.

H

$(4x - 1)°$

$(4x + 4)°$ *J*

G   *F*

Solution

Step 1 Write and solve an equation to find the value of *x*.

m∠*GFJ* = *m*∠_____ + *m*∠_____   Angle Addition Postulate

_____ = (_____)° + (_____)°   Substitute.

_____ = _____   Combine like terms.

_____ = ____   Subtract ____ from each side.

____ = *x*   Divide each side by ____.

Step 2 Evaluate the given expressions when *x* = ____.

m∠*GFH* = (_____)° = (_____)° = ____.

m∠*HFJ* = (_____)° = (_____)° = ____.

So, *m*∠*GFH* = ____ and *m*∠*HFJ* = ____.

✔ *Checkpoint* **Complete the following exercise.**

Stop and get the teacher's signature after each checkpoint, before you move on.

3. Given that ∠*VRS* is a right angle,
find *m*∠*VRT* and ∠*TRS*.

$(x - 4)°$

V

T

$(3x + 2)°$

R   *S*

Example 4   *Identify congruent angles*

Identify all pairs of congruent angles in the diagram. If $m\angle P = 120°$, what is $m\angle N$?

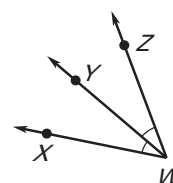**Solution**

There are two pairs of congruent angles:

$\angle P \cong$ _____ and $\angle L \cong$ _____

Because $\angle P \cong$ _____, $m\angle P =$ _____.
So, $m\angle N =$ _____.

Example 5   *Double an angle measure*

In the diagram at the right, $\overrightarrow{WY}$ bisects $\angle XWZ$, and $m\angle XWY = 29°$. Find $m\angle XWZ$.

Solution

By the Angle Addition Postulate,
$m\angle XWZ =$ _____ + _____.
Because $\overrightarrow{WY}$ bisects $\angle XWZ$, you know

_____ $\cong$ _____.

So, _____ = _____, and you can write
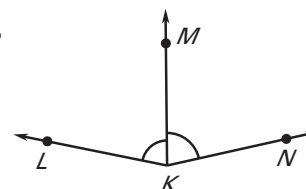$m\angle XWZ =$ _____ + _____
$=$ _____ + _____ = _____.

Stop and get the
teacher's
signature after each
checkpoint, before you
move on.

✔ *Checkpoint* **Complete the following exercises.**

4. Identify all pairs of congruent angles in the diagram. If $m\angle B = 135°$, what is $m\angle D$?

Homework

5. In the diagram below, $\overrightarrow{KM}$ bisects $\angle LKN$ and $m\angle LKM = 78°$. Find $m\angle LKN$.

1.5 Describe Angle Pair Relationships

Goal • Use special angle relationships to find angle measures.

Your Notes

VOCABULARY

Complementary angles

_____

Supplementary angles

_____

Adjacent angles

_____

Linear pair

_____

Vertical angles

Example 1 *Identify complements and supplements*

In Example 1, ∠*BDE* and ∠*CDE* share a common vertex. But they share common _____ points, so they are *not* adjacent angles.

In the figure, name a pair of complementary angles, a pair of supplementary angles, and a pair of adjacent angles.

Solution

Because _____ + _____ = 90°, _____ and _____ are _____ angles.

Because _____ + _____ = 180°, _____ and _____ are _____ angles.

Because _____ and _____ share a common vertex and side, they are _____ angles.
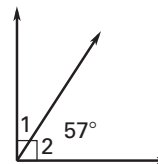

> Angles are sometimes named with numbers. An angle measure in a diagram has a degree symbol. An angle name does not.

Example 2   *Find measures of complements and supplements*

a. Given that $\angle 1$ is a complement of $\angle 2$ and $m\angle 2 = 57°$, find $m\angle 1$.

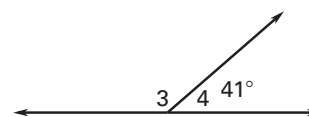**b.** Given that $\angle 3$ is a supplement of $\angle 4$ and $m\angle 4 = 41°$, find $m\angle 3$.

Solution

a. You can draw a diagram with complementary adjacent angles to illustrate the relationship.

$m\angle 1 =$ _____ $-$ _____ $=$ _____ $-$ _____ $=$ _____

b. You can draw a diagram with supplementary adjacent angles to illustrate the relationship.

$m\angle 3 =$ _____ $-$ _____ $=$ _____ $-$ _____ $=$ _____

Stop and get the teacher's signature after each checkpoint, before you move on.

✔ *Checkpoint* **Complete the following exercises.**

1. In the figure, name a pair of complementary angles, a pair of supplementary angles, and a pair of adjacent angles.

_____

2. Given that $\angle 1$ is a complement of $\angle 2$ and $m\angle 1 = 73°$, find $m\angle 2$.

_____

3. Given that $\angle 3$ is a supplement of $\angle 4$ and $m\angle 4 = 37°$, find $m\angle 3$.
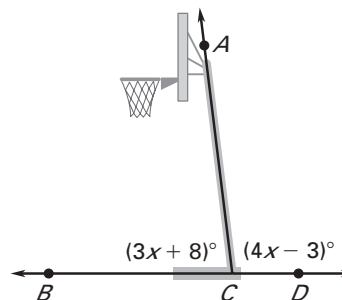
Your Notes

> In a diagram, you can assume that a line that looks straight *is* straight. In Example 3, *B*, *C*, and *D* lie on $\overleftrightarrow{BD}$. So, $\angle BCD$ is a _____ angle.

Example 3 *Find angle measures*

Basketball The basketball pole forms a pair of supplementary angles with the ground. Find $m\angle BCA$ and $m\angle DCA$.

$(3x + 8)°$ $(4x - 3)°$

B   *C* *D*   *A*

Solution

Step 1 Use the fact that _____ is the sum of the measures of supplementary angles.

$m\angle BCA + m\angle DCA =$ _____   **Write equation.**

$($_____$)° + ($_____$)° =$ _____   **Substitute.**

_____ $=$ _____   **Combine like terms.**

_____ $=$ _____   **Subtract.**

____ $=$ ____   **Divide.**

Step 2 Evaluate the original expressions when $x =$ ____.

$m\angle BCA = ($_____$)° = ($_____$)° =$ _____.

$m\angle DCA = ($_____$)° = ($_____$)° =$ _____.

The angle measures are _____ and _____.

✔ *Checkpoint* **Complete the following exercise.**

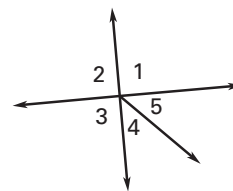**4.** In Example 3, suppose the angle measures are $(5x + 1)°$ and $(6x + 3)°$. Find $m\angle BCA$ and $m\angle DCA$.

Stop and get the teacher's signature after each checkpoint, before you move on.

Example 4 *Identify angle pairs*

Identify all of the linear pairs and all of the vertical angles in the figure at the right.

In the diagram, one side of ∠1 and one side of ∠4 are opposite rays. But the angles are not a linear pair because they are not

_____ .

Solution

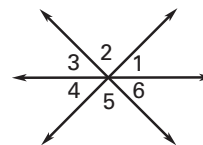To find vertical angles, look for angles formed by _____ .

_____ and _____ are vertical angles.

To find linear pairs, look for adjacent angles whose noncommon sides are _____ .

_____ and _____ are a linear pair. _____ and _____ are a linear pair.

✔ *Checkpoint* **Complete the following exercise.**

5. Identify all of the linear pairs and all of the vertical angles in the figure.

Example 5 *Find angle measures in a linear pair*

Two angles form a linear pair. The measure of one angle is 4 times the measure of the other. Find the measure of each angle.

You may find it useful to draw a diagram to represent a word problem like the one in Example 5.

Solution

Let $x°$ be the measure of one angle. The measure of the other angle is _____. Then use the fact that the angles of a linear pair are _____ to write an equation.

___ + _____ = _____   Write an equation.

_____ = _____   Combine like terms.

___ = ____   Divide each side by ___ .

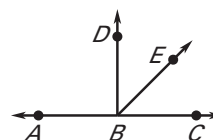The measures of the angles are _____ and

_____ = _____ .

Stop and get the
teacher's
signature after each
checkpoint, before you
move on.

✔ *Checkpoint* **Complete the following exercise.**

6. Two angles form a linear pair. The measure of one angle is 3 times the measure of the other. Find the meaure of each angle.
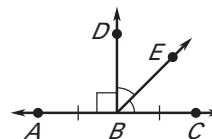
CONCEPT SUMMARY: INTERPRETING A DIAGRAM

There are some things you can conclude from a diagram, and some you cannot. For example, here are some things that you can conclude from the diagram at the right.

- All points shown are _____.

- Points *A*, *B*, and *C* are _____, and *B* is between *A* and *C*.

- $\overleftrightarrow{AC}$, $\overrightarrow{BD}$, and $\overrightarrow{BE}$ _____ at point *B*.

- ∠*DBE* and ∠*EBC* are _____ angles, and ∠*ABC* is a _____.

- Point *E* lies in the _____ of ∠*DBC*.

In the diagram above, you cannot conclude that $\overline{AB} \cong \overline{BC}$, that ∠*DBE* ≅ ∠*EBC*, or that ∠*ABD* is a right angle. This information must be indicated, as shown at the right.

Homework

Find Perimeter, Circumference, and Area

Goal • Find dimensions of polygons.

Your Notes

e

FORMULAS FOR PERIMETER *P*, AREA *A*, AND CIRCUMFERENCE *C*

Square
side length *s*

$P =$ _____
$A =$ _____

Rectangle
length ℓ and width *w*

$P =$ _____
$A =$ _____

Triangle
side lengths *a*, *b*, and *c*, base *b*, and height *h*.

$P =$ _____
$A =$ _____

Circle
radius *r*

$C =$ _____
$A =$ _____

Pi (π) is the ratio of a circle's circumference to its diameter.

Example 1 *Find the perimeter and area of a rectangle*

Tennis The in-bounds portion of a singles tennis court is shown. Find its perimeter and area.

Perimeter

$P = 2\ell + 2w$
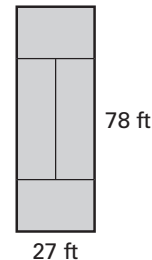
$= 2(\underline{\quad}) + 2(\underline{\quad})$

$=$ _____

Area

$A = \ell w$

$=$ _____$(\underline{\quad})$

$=$ _____

The perimeter is _____ ft and the area is _____ ft².

78 ft

27 ft

✔ *Checkpoint* **Complete the following exercise.**

1. In Example 1, the width of the in-bounds rectangle increases to 36 feet for doubles play. Find the perimeter and area of the in-bounds rectangle.

> The approximations 3.14 and $\frac{22}{7}$ are commonly used as approximations for the irrational number π. Unless told otherwise, use 3.14 for π.

Example 2 *Find the circumference and area of a circle*

Archery The smallest circle on an Olympic target is 12 centimeters in diameter. Find the approximate circumference and area of the smallest circle.

Solution

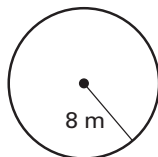First find the radius. The diameter is 12 centimeters, so the radius is $\frac{1}{2}$(____) = ____ centimeters.

Then find the circumference and area. Use 3.14 for π.

$P = 2\pi r \approx 2($_____$)($___$) = $ _____

$A = \pi r^2 \approx$ _____$($___$)^2 = $ _____

Stop and get the teacher's signature after each checkpoint, before you move on.

✔ *Checkpoint* **Find the approximate circumference and area of the circle.**

2.

8 m

Example 3 *Using a coordinate plane*

Triangle *JKL* has vertices *J*(1, 6), *K*(6, 6), and *L*(3, 2). Find the approximate perimeter of triangle *JKL*.

Solution

First draw triangle *JKL* in a coordinate plane. Then find the side lengths. Because $\overline{JK}$ is horizontal, use the _____ to find *JK*. Use the _____ to find *JL* and *LK*.
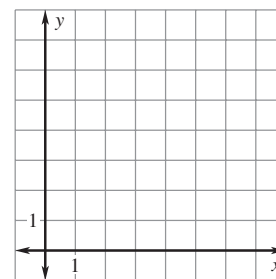
> Write down your calculations to make sure you do not make a mistake substituting values in the Distance Formula.

$JK = \left|\,\underline{\quad} - \underline{\quad}\,\right| = \underline{\quad}$ units

$JL = \sqrt{(\underline{\quad} - 1)^2 + (2 - \underline{\quad})^2} = \sqrt{\underline{\quad}} \approx \underline{\quad}$ units

$LK = \sqrt{(\underline{\quad} - 3)^2 + (\underline{\quad} - 2)^2} = \sqrt{\underline{\quad}} = \underline{\quad}$ units

Then find the perimeter.

$P = JK + JL + LK \approx \underline{\quad} + \underline{\quad} + \underline{\quad} = \underline{\quad}$ units.

Example 4 *Solve a multi-step problem*

Lawn care You are using a roller to smooth a lawn. You can roll about 125 square yards in one minute. About how many minutes does it take to roll a lawn that is 120 feet long and 75 feet wide?

Solution

You can roll the lawn at a rate of 125 square yards per minute. So, the amount of time it takes you to roll the lawn depends on its _____ .

Step 1 **Find** the area of the rectangular lawn.

Area $= \ell w = $ _____ (_____) = _____ ft^2

The rolling rate is in square yards per minute. Rewrite the area of the lawn in square yards. There are ____ feet in 1 yard, and ___ ^{2} = ___ square feet in one square yard.

$$9000 \text{ ft}^2 \cdot \frac{1 \text{ yd}^2}{\boxed{} \text{ ft}^2} = \underline{\hspace{1cm}} \text{ yd}^2 \quad \textbf{Use unit analysis.}$$

Step 2 **Write** a verbal model to represent the situation. Then write and solve an equation based on the verbal model.

Let *t* represent the total time (in minutes) needed to roll the lawn.

Area of lawn (yd^2)	=	Rolling rate (yd^2 per min)	×	Total time (min)

$\underline{\hspace{2cm}} = \underline{\hspace{1.5cm}} \cdot t$ **Substitute.**

$\underline{\hspace{1cm}} = t$ **Divide each side by _____ .**

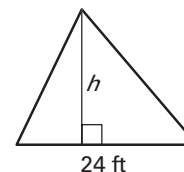It takes about ____ minutes to roll the lawn.

Example 5   *Find unknown length*

The base of a triangle is **24 feet**. Its area is **216 square feet**. Find the height of the triangle.

Solution

$A = $ _____   **Area of a triangle**

_____ $= $ _____   **Substitute.**

_____ $= $ _____   **Multiply.**

_____ $= h$ **Solve for h.**

The height is _____ feet.

24 ft

h

✔ *Checkpoint* **Complete the following exercises.**

Stop and get the teacher's signature after each checkpoint, before you move on.

3. Find the perimeter of the triangle shown at the right.

$B(7, 6)$
$C(7, 3)$
$A(1, 1)$

4. Suppose a lawn is half as long and half as wide as the lawn in Example 4. Will it take half the time to roll the lawn? *Explain.*

Homework

5. The area of a triangle is 96 square inches, and its height is 8 inches. Find the length of its base.