

## Geometry 1

- This Slideshow was developed to accompany the textbook
> Larson Geometry
$>$ By Larson, R., Boswell, L., Kanold, T. D., \& Stiff, L.
> 2011 Holt McDougal
- Some examples and diagrams are taken from the textbook.

Slides created by

Richard Wright, Andrews Academy

### 1.1 Identify Points, Lines, and Planes



How is it named?

### 1.1 Identify Points, Lines, and Planes



How is it named?

What is it like?
No Thickness
Goes forever
Straight
1 Dimension
Through any two points there is exactly one line.

### 1.1 Identify Points, Lines, and Planes



### 1.1 Identify Points, Lines, and Planes

- Give two other names for $\overleftrightarrow{B D}$
- Give another name for plane $\mathcal{T}$
- Name three collinear points
- Name four coplanar points



### 1.1 Identify Points, Lines, and Planes



How is it named?

### 1.1 Identify Points, Lines, and Planes



How is it named?
If two rays have the same endpoint and go in opposite directions, they are called opposite rays.

### 1.1 Identify Points, Lines, and Planes

- Give another name for $\overline{P R}$
- Name all rays with endpoint Q
- Which of these rays are opposite rays?

The intersection of two lines is a point.


RP
QP, QR, QT, QS
QT and QS; QP and QR

### 1.1 Identify Points, Lines, and Planes

- The intersection of two planes is a line.



### 1.1 Identify Points, Lines, and Planes

- Sketch a plane and two intersecting lines that intersect the plane at separate points.
- Sketch a plane and two intersecting lines that do not intersect the plane.
- Sketch a plane and two intersecting lines that lie in the plane.


### 1.1 Identify Points, Lines, and Planes

- 5 \#1, 4-38 even, 44-58 even $=27$ total


### 1.1 Grading and Quiz

- 1.1 Answers
- 1.1 Homework Quiz


### 1.2 Use Segment and Congruence

- Postulate-Rule that is accepted without proof
- Theorem - Rule that is proven Ruler Postulate

Any line can be turned into a number line


### 1.2 Use Segment and Congruence



How is it named?
Find $A B$

$A B=3-(-1)=4$

### 1.2 Use Segment and Congruence



### 1.2 Use Segment and Congruence

Segment Addition Postulate
If $B$ is between $A$ and $C$, then $A B+B C=A C$
If $A B+B C=A C$, then $B$ is between A and C

- Find CD

42


$$
\begin{aligned}
& C D+D E=C E \\
& C D+17=42 \\
& C D=25
\end{aligned}
$$

### 1.2 Use Segment and Congruence

Graph $X(-2,-5)$ and $Y(-2,3)$.

- Find XY .

$X Y=3-(-5)=8$


### 1.2 Use Segment and Congruence



### 1.2 Use Segment and Congruence

- 12 \#4-36 even, 37-45 all = 26 total


### 1.2 Grading and Quiz

- 1.2 Answers
- 1.2 Homework Quiz


### 1.3 Use Midpoint and Distance Formulas

| What is it? |  |  | What is it like?Very middle of the |
| :---: | :---: | :---: | :---: |
| Part of a Segment |  |  |  |
| Point that divides the segment into two congruent segments. |  |  |  |
| $M$ is the midpoint of $\overline{A B}$ | $\overline{A M} \cong \overline{M B}$ |  |  |
| What are some examples? |  |  | Segment Bisector is something that intersects a segment at its midpoint. |

### 1.3 Use Midpoint and Distance Formulas

- $\overline{M O}$ bisects $\overline{N P}$ at Q . If $\mathrm{PQ}=22.6$, find PN .

- Point S is the midpoint of $\overline{R T}$. Find ST .


$$
\begin{aligned}
& P Q=1 / 2 P N \\
& 22.6=1 / 2 P N \\
& P N=45.2 \\
& 5 x-2=3 x+8 \\
& 2 x-2=8 \\
& 2 x=10 \\
& x=5 \\
& S T=3(5)+8=23
\end{aligned}
$$

### 1.3 Use Midpoint and Distance Formulas

## Midpoint Formula

$$
\text { Midpoint }=\left(\frac{x_{1}+x_{2}}{2}, \frac{y_{1}+y_{2}}{2}\right)
$$

- Find the midpoint of $\mathrm{G}(7,-2)$ and $\mathrm{H}(-5,-6)$
$((7+-5) / 2,(-2+-6) / 2)=(1,-4)$


### 1.3 Use Midpoint and Distance Formulas

- The midpoint of $\overline{A B}$ is $\mathrm{M}(5,8)$. One endpoint is $\mathrm{A}(2,-3)$. Find the coordinates of endpoint B .
$(5,8)=((x+2) / 2,(y+-3) / 2)$
$x$-coords: $5=(x+2) / 2 \rightarrow 10=x+2 \rightarrow x=8$
$y$-coords: $8=(y-3) / 2 \rightarrow 16=y-3 \rightarrow y=19$
$(8,19)$


### 1.3 Use Midpoint and Distance Formulas

## Distance Formula

$$
d=\sqrt{\left(x_{2}-x_{1}\right)^{2}+\left(y_{2}-y_{1}\right)^{2}}
$$

- What is PQ if $\mathrm{P}(2,5)$ and $\mathrm{Q}(-4,8)$ ?
- 19 \#2, 4, 6, 10-20 even, 24, 26, 28, 32, 36, 38, 42, 44, 48, 54-64 all = 29 total
- Extra Credit 22\#2, 8

$$
\begin{aligned}
& \mathrm{PQ}=\mathrm{V}\left((-4-2)^{2}+(8-5)^{2}\right) \\
& \mathrm{PQ}=\mathrm{V}\left((-6)^{2}+(3)^{2}\right) \\
& \mathrm{PQ}=\mathrm{V}(36+9) \\
& \mathrm{PQ}=\mathrm{V} 45=3 \mathrm{~V} 5 \approx 6.71
\end{aligned}
$$

### 1.3 Grading and Quiz

- 1.3 Answers
- 1.3 Homework Quiz


### 1.4 Measure and Classify Angles



### 1.4 Measure and Classify Angles

Protractor Postulate
A protractor can be used to measure angles


How is it named?

### 1.4 Measure and Classify Angles

- Classifying Angles
> Acute
- Less than $90^{\circ}$
$>$ Right
- $90^{\circ}$
$>$ Obtuse
- More than $90^{\circ}$
$>$ Straight
- $180^{\circ}$



### 1.4 Measure and Classify Angles

- Find the measure of each angle ând classify.
$>\angle \mathrm{DEC}$
$>\angle \mathrm{DEA}$
$>\angle C E B$
$>\angle \mathrm{DEB}$


$$
\begin{aligned}
& \angle \mathrm{DEC}=90 \text { right } \\
& \angle \mathrm{DEA}=180 \text { straight } \\
& \angle \mathrm{CEB}=25 \text { acute } \\
& \angle \mathrm{DEB}=115 \text { obtuse }
\end{aligned}
$$

### 1.4 Measure and Classify Angles

- Name all the angles in the diagram.
- Which angle is a right angle?

$\angle P Q R, \angle P Q S, \angle R Q S ; \angle P Q S$ is a right angle .


### 1.4 Measure and Classify Angles

## Angle Addition Postulate

If $P$ is in the interior of
$\angle R S T$, then
$m \angle R S T=m \angle R S P+m \angle P S T$

- If $m \angle R S T=72^{\circ}$, find $\mathrm{m} \angle \mathrm{RSP}$ and $\mathrm{m} \angle \mathrm{PST}$

$2 x-9+3 x+6=72$
$5 x-3=72$
$5 x=75$
$x=15$
$\mathrm{m} \angle \mathrm{RSP}=2(15)-9=21$
$\mathrm{m} \angle \mathrm{PST}=3(15)+6=51$


### 1.4 Measure and Classify Angles



### 1.4 Measure and Classify Angles

- Identify all pairs of congruent angles in the diagram.
- In the diagram, $\mathrm{m} \angle \mathrm{PQR}=130, \mathrm{~m} \angle \mathrm{QRS}=84$, and $\mathrm{m} \angle \mathrm{TSR}=121$. Find the other angle measures in the diagram.

$\angle \mathrm{T} \cong \angle \mathrm{S}, \angle \mathrm{P} \cong \angle \mathrm{R}$
$\mathrm{m} \angle \mathrm{PTS}=121, \mathrm{~m} \angle \mathrm{QPT}=84$


### 1.4 Measure and Classify Angles

Angle Bisector is a ray that divides an angle into two angles that are congruent.

- $\overrightarrow{M N}$ bisects $\angle \mathrm{PMQ}$, and $\mathrm{m} \angle \mathrm{PMQ}=122^{\circ}$. Find $\mathrm{m} \angle \mathrm{PMN}$.

- 28 \#4-26 even, 30 , 34-42 even, $48,50,52,56,60,64-72$ even $=28$ total


### 1.4 Grading and Quiz

- 1.4 Answers
- 1.4 Homework Quiz


### 1.5 Describe Angle Pair Relationships



What are examples?

### 1.5 Describe Angle Pair Relationships

Complementary Angles
Two angles whose sum is $90^{\circ}$
Supplementary Angles
Two angles whose sum is $180^{\circ}$

- Complementary and Supplementary Angles do not have to be adjacent


Both the pairs are supplementary

### 1.5 Describe Angle Pair Relationships

- In the figure, name a pair of > complementary angles,
$>$ supplementary angles, $>$ adjacent angles.

- Are $\angle \mathrm{KGH}$ and $\angle \mathrm{LKG}$ adjacent angles?
- Are $\angle \mathrm{FGK}$ and $\angle \mathrm{FGH}$ adjacent angles? Explain.

Complementary: $\angle \mathrm{FGK}$ and $\angle \mathrm{GKL}$
Supplementary: $\angle \mathrm{HGK}$ and $\angle \mathrm{GKL}$
Adjacent: $\angle \mathrm{FGK}$ and HGK

No, they do not have a common vertex
No, they are inside of each other

### 1.5 Describe Angle Pair Relationships

- Given that $\angle 1$ is a complement of $\angle 2$ and $\mathrm{m} \angle 2=8^{\circ}$, find $\mathrm{m} \angle 1$.
- Given that $\angle 3$ is a supplement of $\angle 4$ and $\mathrm{m} \angle 3=117^{\circ}$, find $\mathrm{m} \angle 4$.
$8+\mathrm{x}=90 \rightarrow \mathrm{x}=82$
$117+y=180=63$


### 1.5 Describe Angle Pair Relationships

- $\angle \mathrm{LMN}$ and $\angle \mathrm{PQR}$ are complementary angles. Find the measures of the angles if $\mathrm{m} \angle \mathrm{LMN}=(4 \mathrm{x}-2)^{\circ}$ and $\mathrm{m} \angle \mathrm{PQR}=(9 \mathrm{x}+1)^{\circ}$.

$$
\begin{aligned}
& (4 x-2)+(9 x+1)=90 \rightarrow 13 x-1=90 \rightarrow 13 x=91 \rightarrow x=7 \\
& m \angle L M N=4(7)-2=26 \\
& m \angle P Q R=9(7)+1=64
\end{aligned}
$$

### 1.5 Describe Angle Pair Relationships



### 1.5 Describe Angle Pair Relationships



What are examples?

### 1.5 Describe Angle Pair Relationships

- Do any of the numbered angles in the diagram below form a linear pair?
- Which angles are vertical angles?


No, no 2 of them form straight lines
$\angle 1$ and $\angle 4, \angle 2$ and $\angle 5, \angle 3$ and $\angle 6$

### 1.5 Describe Angle Pair Relationships

- Two angles form a linear pair. The measure of one angle is 3 times the measure of the other. Find the measure of each angle.
$x+3 x=180 \rightarrow 4 x=180 \rightarrow x=45 \rightarrow$ angles are 45 and 135


### 1.5 Describe Angle Pair Relationships

- Things you can assume in diagrams.
> Points are coplanar
$>$ Intersections
$>$ Lines are straight
> Betweenness
- Things you cannot assume in diagrams
> Congruence unless stated
> Right angles unless stated


### 1.5 Describe Angle Pair Relationships

- 38 \#4-28 even, 32-44 even, $54,58,60,62=24$ total
- Extra Credit 41 \#2, 6


### 1.5 Grading and Quiz

- 1.5 Answers
- 1.5 Homework Quiz


You get a Polly gone

### 1.6 Classify Polygons

## Convex

All angles poke out of shape.
A line containing a side does NOT go through the middle of the shape.

## Concave

Not convex. (There's a "cave".)

### 1.6 Classify Polygons

## Equilateral

All sides are the same length

Equiangular


All angles are the same measure

### 1.6 Classify Polygons

## Regular Polygon

Equilateral and Equiangular



### 1.6 Classify Polygons

| Number of <br> sides | Type of <br> Polygon |
| :---: | :--- |
| 3 | Triangle |
| 4 | Quadrilateral |

### 1.6 Classify Polygons

- Sketch an example of a convex heptagon.
- Sketch an example of a concave heptagon.
- Classify the polygon shown.


Regular quadrilateral

### 1.6 Classify Polygons

- The Pentagon Building is a regular pentagon. If two of the angles are $(2 x-14)^{\circ}$ and $(3 x-75)^{\circ}$. Find the measure of each angle.
- 44 \#4-36 even, 40, 44-54 even
= 24 total

$2 x-14=3 x-75$
$-14=x-75$
$61=x$
Angles are 2(61) $-14=108$


### 1.6 Grading and Quiz

- 1.6 Answers
- 1.6 Homework Quiz


### 1.7 Find Perimeter, Circumference, and Area <br> Perimeter ( P ) <br> Distance around a figure

Circumference (C)
Perimeter of a circle
Area (A)
Amount of surface covered by a figure
1.7 Find Perimeter, Circumference, and Area

| Square | $s$ |
| :--- | :--- |
| Side $s$ |  |
| $\bullet \mathrm{P}=4 s$ |  |
| $\bullet \mathrm{~A}=s^{2}$ |  |

$\frac{\text { Triangle }}{\text { sides } a, b, c}$ base $b$, height $h$

- $P=a+b+c$

- $A=1 / 2 b h$

$\frac{\text { Circle }}{\text { diameter } d}$
radius $r$
-C $=2 \pi r$
- $A=\pi r^{2}$



### 1.7 Find Perimeter, Circumference, and Area

- Find the area and perimeter (or circumference) of the figure. If necessary, round to the nearest tenth.


Rectangle: $A=13(5.7)=74.1 \mathrm{~m}^{2} ; P=2(13)+2(5.7)=37.4 \mathrm{~m}$
Square: $A=(1.6)^{2}=2.6 \mathrm{~cm}^{2} ; P=4(1.6)=6.4 \mathrm{~cm}$
Circle: $A=\pi(2)^{2}=4 \pi=12.6 \mathrm{yd}^{2} ; P=2 \pi 2=4 \pi=12.6 \mathrm{yd}$

### 1.7 Find Perimeter, Circumference, and Area

- Describe how to find the height from $F$ to $\overline{E G}$ in the triangle.
- Find the perimeter and area of the triangle.

- What if each side of the triangle were twice as long, would it cover twice as much area?

The height is perpendicular to the base, so it hits EG at $(1,3)$. Distance from $(1,3)$ to $(7,3)=6$

Perimeter: find the lengths of each side
EG = 4
$\mathrm{FG}=\mathrm{V}\left((7-1)^{2}+(3-2)^{2}\right)=\mathrm{V}(36+1)=\mathrm{V} 37=6.08$
$E F=V\left((7-1)^{2}+(3-6)^{2}\right)=V(36+9)=V 45=6.71$
$P=4+6.08+6.71=16.79$
Area: $1 / 2(4)(6)=12$
No, the area would be four times as big

### 1.7 Find Perimeter, Circumference, and Area

- The area of a triangle is 64 square meters, and its height is 16 meters. Find the length of its base.
- 52 \#2-42 even, 46,48 -52 all = 27 total
- Extra Credit 56 \#2, 6
$A=1 / 2 b h$
$64=1 / 2 b(16)$
$64=8 b$
b $=8$


### 1.7 Grading and Quiz

- 1.7 Answers
- 1.7 Homework Quiz


## 1.Review

## CHAPTER TEST

Use the diagram to decide whether the statement is true or false.

1. Point $A$ lies on line $m$,
2. Point $D$ lies on line $n$
3. Points R, C, E, and Qare coplanar.
4. Points $C, E$, and $B$ are collinear.
5. Another name for plane Gis plane QEC.

Find the indicated length.


$$
\text { 2. Find } x z
$$


$\begin{array}{lll}\text { 9. } \pi 3,4) \text { and } W(2,7) & \text { 10. } C(5,10) \text { and } D(6,-1) & \text { 11. } M(-8,0) \text { and } N(-1,3)\end{array}$
12. The midpoint of $\overline{A B}$ is $M(9,7)$. One endpoint is $A(3,9)$. Find the coordinates of endpoint $R$.
13. Line $r$ bisects $\overline{C D}$ at point $M, C M=3 x$, and $M D=27$. Find $C D$.

In Exercises 14 and 15, use the dingram.
14. Trace the diagram and extend the rays. Use a protractor to measure $\angle G H I$. Classify it as acute. obtuse, right, or straight.

15. Given $m \angle K H I=90^{\circ}$, find $m \angle L H I$.
16. The measure of $\angle Q R T$ is $154^{4}$, and $\overrightarrow{R S}$ bisects $\angle Q R T$. What are the measures of $/ O R \mathrm{~S}$ and $/ \mathrm{SR}$ I?

