MAT 222

Chapter 1: Things to Know

Section 1.2: Geometry – A Mathematical System

Objectives:	**Vocabulary:**
1. Use Logic to Recognize Patterns. 2. Understand How a Mathematical System, like Geometry, is formed.	• geometry • logic • undefined term • defined term • postulate • axiom • theorem

_____ comes from the Greek language and means "to measure the earth."

To develop geometry, we must use our reasoning skills, or _____ .

Example Sketch the next picture in this pattern:

Example Look for a pattern and predict the next number.

a. 2, 10, 50, 250, …

b. –3, 0, 3, 6, 9, …

We will use logic and reasoning to develop the mathematical system of geometry.

We will begin with _____ _____ , which we first describe.

We will use our undefined terms to create _____ _____.

We will use defined terms to create _____ or _____, which are statements that we do not prove, but accept to be true.

(The words "axiom" and "postulate" are used interchangeably in Geometry.)

Our mathematical system grows by using terms (undefined and defined) and axioms/postulates to prove _____.

What are the main differences between axioms/postulates and theorems?

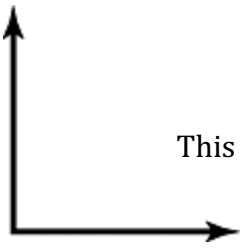
Axioms/Postulates	Theorems

Figure Assumptions

You must be EXTREMELY careful in Geometry to read symbols in figures to determine what you can and cannot assume about the figure.

Example Can you assume that…

This is a line?



This is a right angle? (measures 90^{o}?)

Example Draw a correctly marked square below.

Section 1.3: Points, Lines, Planes

Objectives:	**Vocabulary:**
1. Learn the Basic Terms and Postulates of Geometry	• point • line • plane • lie on • collinear • coplanar • space • geometric figure • between • segment or line segment • ray • opposite ray • intersection

Undefined Terms		
Description	***How to name it***	***Example***
point		
line		
plane		

Note: In this textbook,

- A line is a straight line
- A line contains an infinite number of points
- A plane contains an infinite number of lines
- Our drawings of planes appear to end and have edges, but we must remember that planes extend without end.

These types of basic assumptions may be different in other textbooks, websites, etc. that you use as a student and a teacher – so be aware!

Example

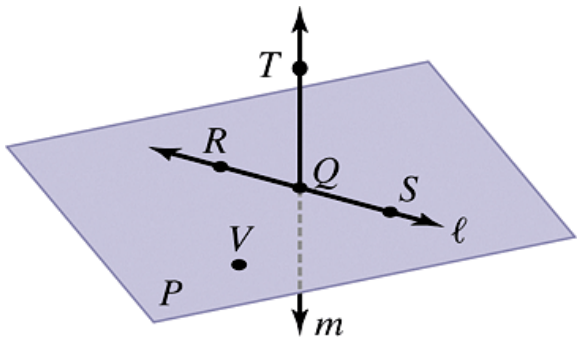
a. Write two other ways to name QT.

b. Write two other ways to name plane P.

c. Name three points that are collinear.

d. Name four points that are coplanar.

e. Name three points that are not collinear.



Undefined Terms		
Description/Definition	How to name it	Example
space	*(not named)*	
geometric figure	*(usually named only by a reference number, e.g. Figure 1.34, in textbooks)*	
between	*(not named)*	
line segment		
ray		
opposite rays		

Postulates

(1.3-1) Through any two points _____

(1.3-2) If two distinct lines intersect, _____

(1.3-3) If two distinct planes intersect, _____

(1.3-4) Through any three noncollinear points _____

Section 1.4 Segments and their Measure

Objectives:	Vocabulary:
• Understand the Measure of Segments • Use Segment Postulates and Algebra to Find Segment Lengths	• coordinate • distance • congruent segments • midpoint • bisect • segment bisector

Ruler Postulate

The points on a line can be paired, one to one, with a real number, called the _____ of the point.

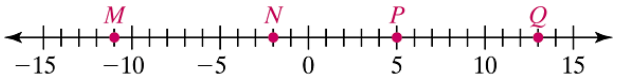
The **distance** between two points is the _____

Notation: $\overline{AB}$ refers to the _____ _____ , while

AB refers to the _____

Example

Find MP.

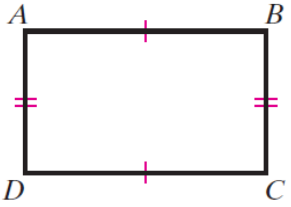


Definition
If two segments have the same length, then they are _____

Note: We call numbers **equal**, but we call geometric figures **congruent**.

Example

a. Use the figure to write pairs of congruent segments:

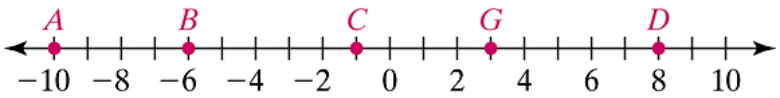


b. If $BC = 2$ feet, then $AD =$ _____

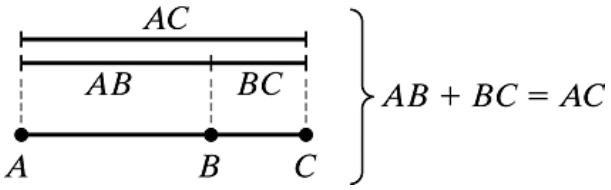
c. If $DC = 6$ feet, then $AB =$ _____

Example

In the figure, is segment $\overline{BG} \cong \overline{AC}$?



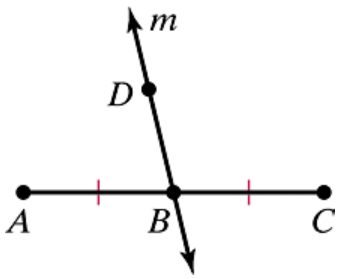
Segment Addition Postulate



If point B is between A and C, then _____.

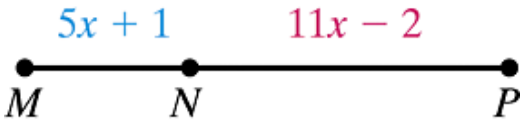
Also, if $AB + BC = AC$, then _____.

Write some true statements about this figure illustrating the definition of midpoint and bisector.



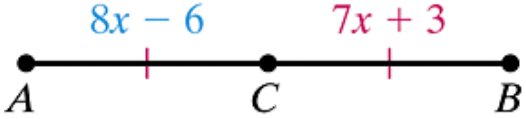
Example

If $MP = 47$ units, find MN and NP.



Example

Point C is the midpoint of segment AB.
Find AC, CB, and AB.



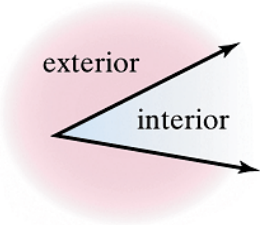
Section 1.5 Angles and their Measure

Objectives	**Vocabulary**
• Understand the Measure of Angles. • Use Algebra and the Angle Addition Postulate to Solve Applications and Find Angle Measures.	• angle • sides of an angle • vertex • interior of an angle • exterior of an angle • protractor • degrees • acute angle • right angle • obtuse angle • straight angle • congruent angles

Defined Terms		
Description/Definition	How to name it	Example
angle		
sides of an angle		
vertex		

The _____ of an angle contains all points between the two sides of the angle.

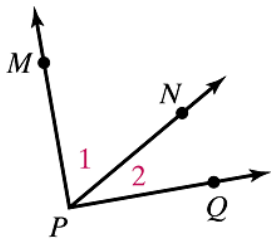
The _____ of an angle contains all points that are not in the interior of the angle and are not on the angle.



Example

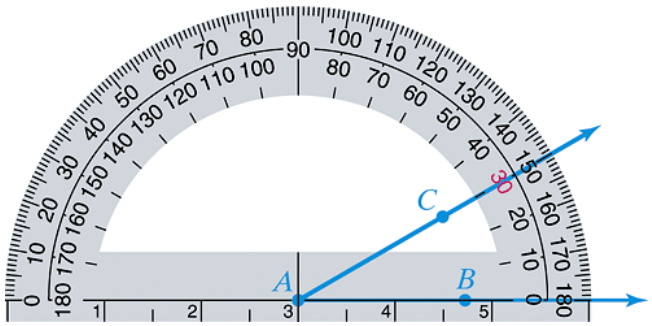
a. How many different angles are in the diagram?

b. Write two other ways to name ∠1.



Protractor Postulate

Suppose we have $\overrightarrow{AB}$ as shown and point C on one side of $\overrightarrow{AB}$. Every ray, for example, $\overrightarrow{AC}$, can be paired one-to-one with a real number from 0 to 180.

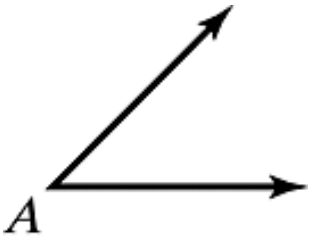
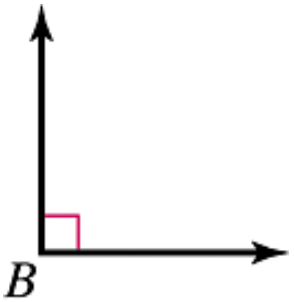
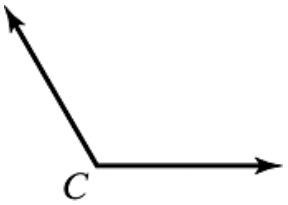


In this picture, $m\angle CAB =$ _____

In general, the measure of $\angle CAB$ (in degrees) equals _____

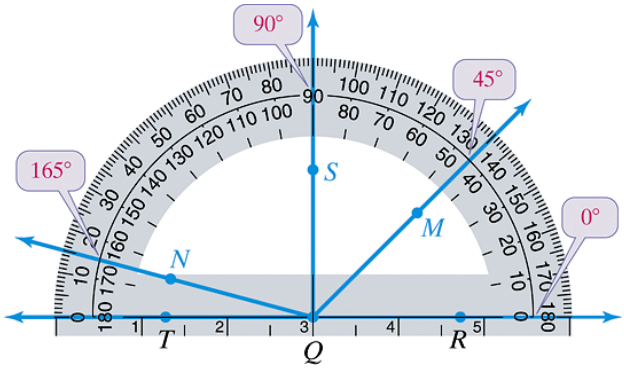
_____

Classifying Angles

Name: **Angle meas.:**				
				

Example

Find $m\angle RQM$, $m\angle RQS$, and $m\angle RQN$.
Then classify each angle as acute, right, obtuse, or straight.



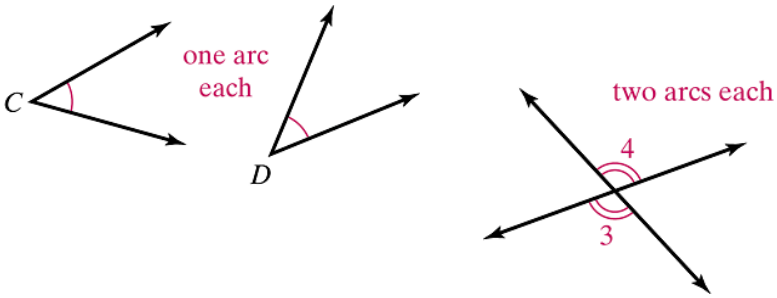
_____

Definition
Two angles that have the same measure are called _____ _____

Example

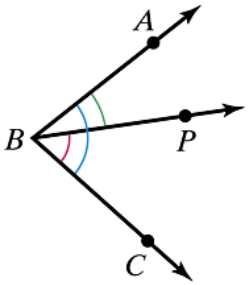
a. If $m\angle C = 45°$, find $m\angle D$.

b. If $m\angle 3 = 113°$, find $m\angle 4$.



Angle Addition Postulate

If P is in the interior of $\angle ABC$, then $m\angle ABP + m\angle PBC = m\angle ABC$.

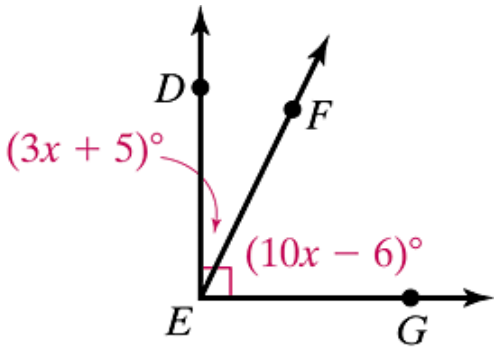


Example

Find the angle measure of a slice of pizza cut into 8 equal-size slices.

Example

If $\angle DEG$ is a right angle, find $m\angle DEF$ and $m\angle FEG$.



Section 1.6 Angle Pairs and their Relationship

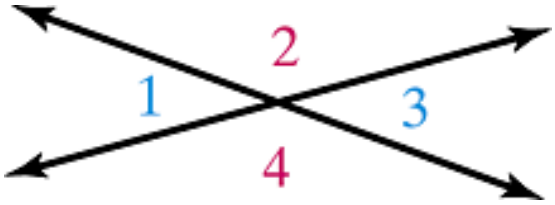
Objectives	**Vocabulary**
• Learn Special Relationships Between Pairs of Angles. • Use Algebra to Find Angle Measures.	• adjacent angles • vertical angles • linear pair • complementary angles • complement • supplementary angles • supplement • angle bisector

Example
In the figure, name at least one pair of:

adjacent angles: _____

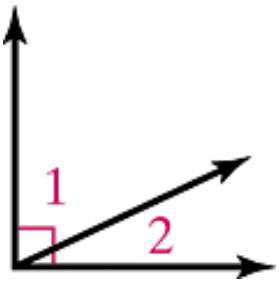
vertical angles: _____

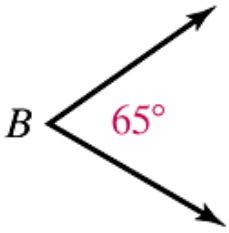
linear pair: _____



Helpful Hint: You may notice that vertical angles are congruent. This is *not* a postulate, and we will prove this in Chapter 2.

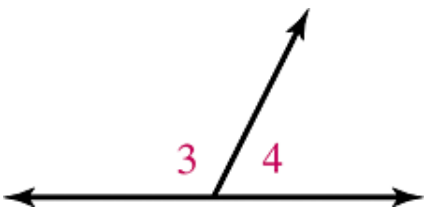
Examples of _____ Angles:

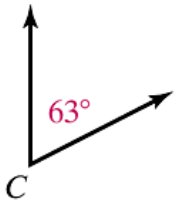


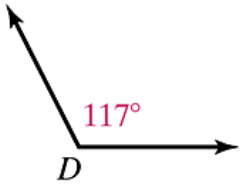


The measures of these angles have a sum of

Examples of _____ Angles:







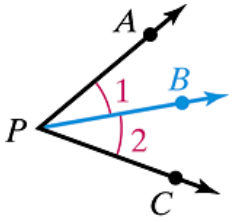
The measures of these angles have a sum of

Example
Given that $m\angle P = 73°$:

a. If $\angle A$ and $\angle P$ are supplementary angles, find $m\angle A$.

b. If $\angle B$ and $\angle P$ are complementary angles, find $m\angle B$.

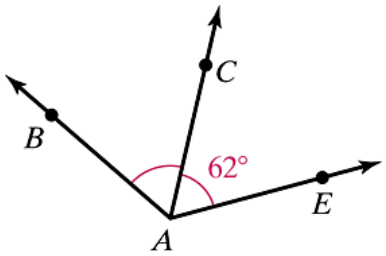
An _____ _____ is a ray that divides an angle into two adjacent angles that are congruent.



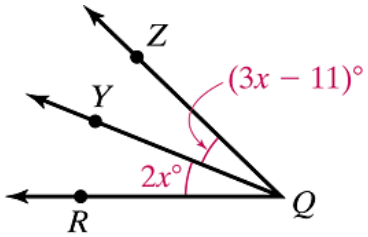
Example
Use the figure shown to find the measure of each unknown angle.

a. Find $m\angle BAC$.

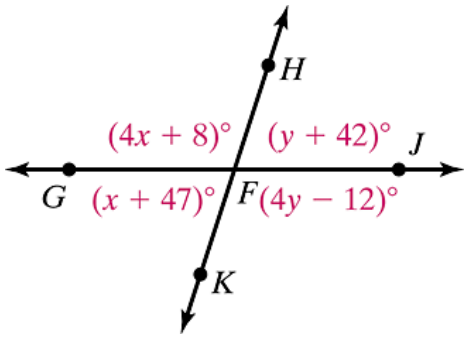
b. Find $m\angle BAE$.



Example
In the figure, ray QY bisects $\angle RQZ$. Find the value of x; then find $m\angle RQY$ and $m\angle YQZ$.

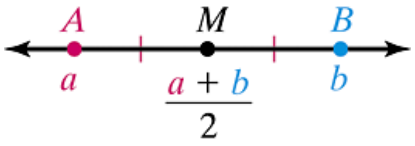
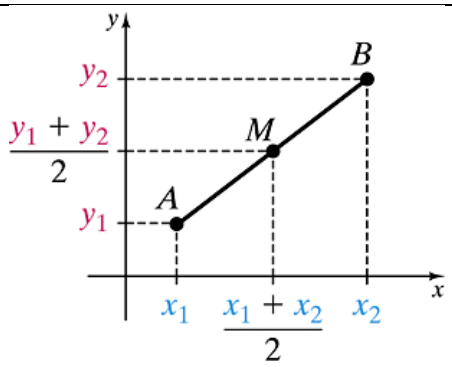


Example
Solve for x and y. Then find the measure of each angle.

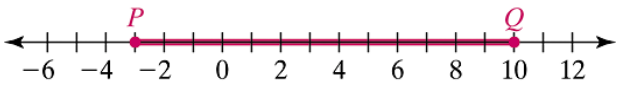


Section 1.7 Coordinate Geometry: Midpoint and Distance Formulas

Objectives	Vocabulary
• Find the Midpoint of a Segment. • Find the Distance Between Two Points on the Coordinate Plane.	• Midpoint Formula • Distance Formula

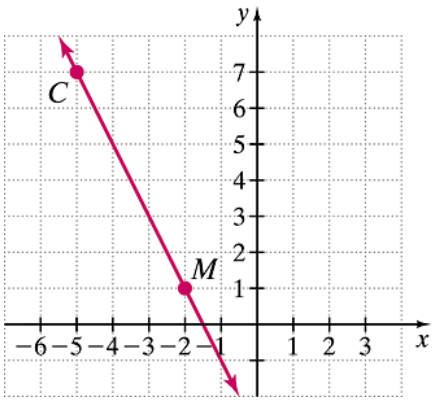
Midpoint Formulas		
	Formula	**Diagram**
On a Number Line The coordinate of the midpoint is the average or mean of the coordinates of the endpoints.		
On the Coordinate Plane The coordinates of the midpoint are the average of the x-coordinates and the average of the y-coordinates of the endpoints.		

Example
Find the coordinate of the midpoint, M, of the segment PQ.



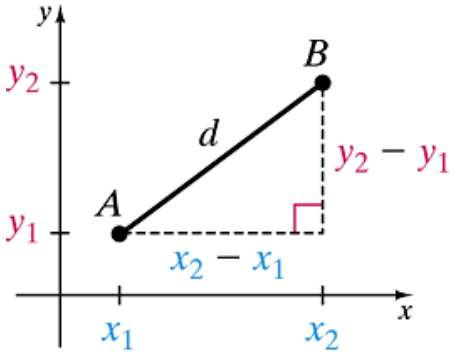
Example
Find the midpoint of the line segment PQ that joins the points $P(-3,3)$ and $Q(1,0)$.

Example
The midpoint of segment CD is $M(-2, 1)$. One endpoint is $C(-5, 7)$. What are the coordinates of the other endpoint, D?



Distance Formula
The distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is

$d =$



This formula is related to the Pythagorean Theorem, which we will study in Chapter 9.

Example
Find the distance between $A(2, -5)$ and $B(1, -4)$. Give an exact distance and a one-decimal-place approximation.

Section 1.8 Constructions: Basic Geometry Constructions

Objective	Vocabulary
• Make Basic Constructions Using a Straight Edge and a Compass.	• straight edge • compass • construction • perpendicular lines • perpendicular bisector

Definitions

A _____ _____ is a ruler with no markings on it.

> **Helpful Hint:** You may use your ruler as a straight edge, but in these constructions, make sure you are not using the markings on the ruler.

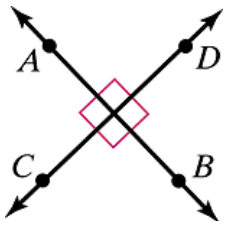
A _____ is a geometric tool used to draw circles and parts of circles called *arcs*.

> **Helpful Hint:** Most compasses come with a mechanism to "lock" the compass setting in place. Practice using the locking mechanism on your compass by drawing several circles of the same size.

A _____ is a geometric figure drawn using a straight edge and a compass.

> **Note: You should read through the constructions in this section, but you need not follow along in your TTK packet. We will practice making these constructions in class.**

_____ lines are two lines that intersect to form right angles. The symbol ⊥ means "is perpendicular to."



In the diagram, _____ and _____ .

A _____ _____ of a segment is a line, segment, ray, or even a plane that is perpendicular to the segment at its midpoint.