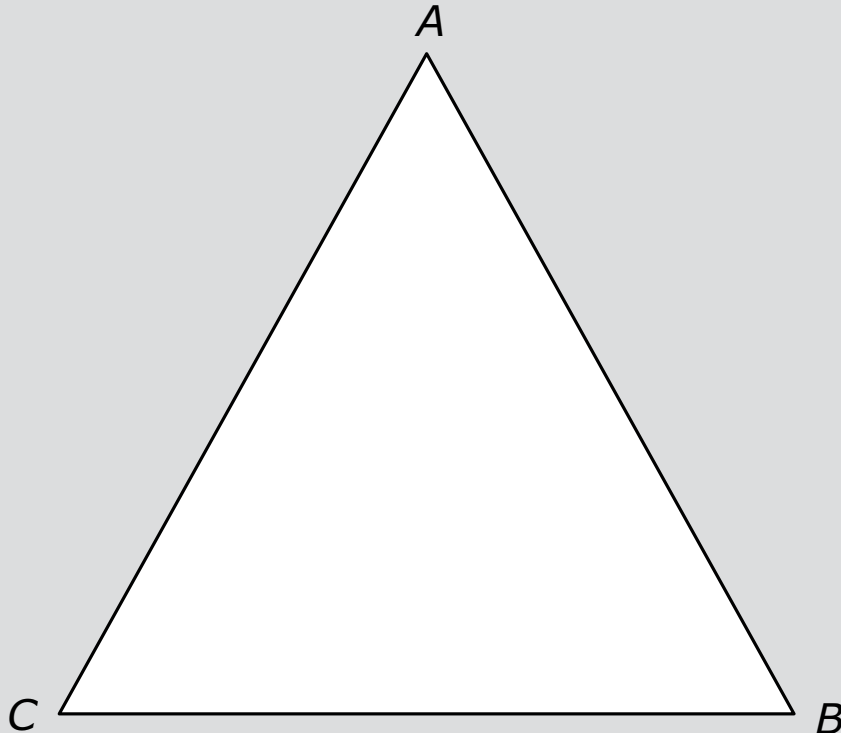


LESSON 23: Drawing and Constructing Triangles

Warm-Up

Directions: Use your ruler and protractor to measure the three sides and three angles of the triangle shown below.



1. What is the measure of Side AB ?
2. What is the measure of Side BC ?
3. What is the measure of Side CA ?
4. What is the measure of Angle A ?
5. What is the measure of Angle B ?
6. What is the measure of Angle C ?

LESSON 23: Drawing and Constructing Triangles

Directions: Complete the following SOLVE problem with your teacher. You will only complete the S step.

Stacy and Mario are working on a geometry project for math class. They are creating a presentation on constructions and triangles. Their presentation must include examples of three line segments that can form a triangle. Stacy suggests using the line segments of 6 centimeters, 10 centimeters, and 10 centimeters. Can a triangle be formed using these measurements?

- S** Underline the question.
This problem is asking me to find

Directions: Complete this page with a teacher and partner.

Using Protractors to Draw Triangles with Given Angle Measures

1. Use a protractor to draw a triangle with the given angle measures of 40° , 68° , 72° .
 - a. Draw a horizontal line segment of 3 inches. This will be the base of the triangle. Label the base as \overline{AC} .
 - b. Place your protractor on \overline{AC} with the center point at the left end of the line segment. Make a mark at 40° which will be the measure of Angle A. Mark the vertex as A.
 - c. Draw a second line segment to form an angle of 40° . Label the second line segment as \overline{AB} .
 - d. Rotate your protractor and place it on \overline{AB} .
 - e. Draw a line from the center point to Side AC through the 68° mark. Label the center point as Point B.
 - f. If you have correctly measured the first two angles, what will be the measure of the third angle?
 - g. Measure the third angle and label it as C.
 - h. Measure line segment AB and record the length of \overline{AB} in the chart on S297.
 - i. Measure line segment BC and record the length of \overline{BC} in the chart on S297.

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your teacher and partner.

	Measure of Angle A	Measure of Angle B	Measure of Angle C	Measure of \overline{AC}	Measure of \overline{AB}	Measure of \overline{BC}
Triangle 1	40°	68°	72°	3 inches		
Triangle 2	40°	68°	72°	2 inches		
Triangle 3	40°	68°	72°	6 centimeters		

- Follow the same steps and draw a triangle that has a measurement of 2 inches for \overline{AC} . Use graph paper. Complete the table for the measure of \overline{AB} and \overline{BC} .
- Work with your partner to create a third triangle using your grid paper. Start with a measurement of 6 centimeters for \overline{AC} .

Conclusion: There are many triangles that can be drawn with the same angle values. Describe the relationship between the triangles that were drawn. The triangles are

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your teacher and partner.

	Measure of Angle A	Measure of Angle B	Measure of Angle C	Measure of \overline{AC}	Measure of \overline{AB}	Measure of Side \overline{BC}
Triangle 4	90°	60°	30°	4 centimeters		
Triangle 5				8 centimeters		
Triangle 6				12 centimeters		

Use a protractor to draw a triangle with angle measures of 90° , 60° , and 30° and base \overline{AC} measure of 4 centimeters.

Follow the steps from Problem 1 on S296.

- Fill in the measure of \overline{AB} and \overline{BC} in the chart.
- On your graph paper create a scale drawing of Triangle 4 using a scale factor of 2.
- Fill in the measure of \overline{AB} and \overline{BC} in the chart.
- On your graph paper create a scale drawing of Triangle 4 using a scale factor of 3.
- Fill in the measure of \overline{AB} and \overline{BC} in the chart.
- What do you notice about the three triangles?
- The sides of the triangles have a _____ and you can write _____ to represent that relationship.
- If the three triangles are similar, what prediction can you make about the angle measures of the triangles?
- Use your protractor and measure Angle A , Angle B , and Angle C in both Triangles 5 and 6 and record the measures in the table.

Conclusion: If triangles have the same angle measurements then the sides of the triangle will be _____ to each other. When a triangle is a scale drawing of another triangle, the two triangles will have the same _____. The total number of degrees in any triangle is _____.

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your teacher and partner.

Drawing Triangles with Three Given Sides

1. Work with your partner to use a ruler to measure and cut three pieces of string that are the following lengths: 6 cm, 8 cm, and 10 cm.
2. Experiment with the three pieces of yarn to see how many different triangles you can make.
3. Paste the piece of string that is 6 cm long as the base of a triangle and glue it on the paper below.
4. Label the two endpoints as Point *A* and Point *B*.
5. Take the piece of string that is 8 centimeters in length and glue it on the triangle so that one end is on Point *A*.
6. Label the end of the 8 centimeter piece of yarn as Point *C*.
7. Take the third piece of string and put it in place to complete a triangle.

Triangle 1

8. What do you notice about the triangle?

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your teacher and partner.

Triangle Lengths	Triangle Model	What do you notice?
Triangle 2: 3 cm, 4 cm, 5 cm		
Triangle 3: 3 cm, 4 cm, 9 cm		

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your teacher and partner.

Triangle Lengths	Triangle Model	What do you notice?
<p>Triangle 4: 6 cm, 9 cm, 9 cm</p>		
<p>Triangle 5: 6 cm, 3 cm, 1 cm</p>		

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your teacher and partner.

Drawing Triangles with Three Given Sides

What do you notice about Triangles 2 and 4?

What do you notice about Triangles 3 and 5?

Let's look at the side lengths of the four triangles:

Triangle	Side 1	Side 2	Side 3	Sum of two sides	Third Side	What do you notice?
Triangle 2						
Triangle 3						
Triangle 4						
Triangle 5						

Conclusion: When the third side of a triangle is less than the sum of the first two sides, you can construct
 When the third side of a triangle is greater than the sum of the first two sides,

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your teacher and partner.

Drawing Triangles Given Side, Angle, and Side

1. You will need a ruler and a protractor to draw this triangle. In this example, we have a side with a measure of 5 centimeters, an angle of 75° , and a side of 8 centimeters.
 - a. Draw a line segment with a length of 5 centimeters. (\overline{AB})
 - b. Swing your protractor and draw a second line segment of 8 centimeters (\overline{BC}) that creates a 75° angle. (Angle B)
 - c. Label the end point of the second line segment Point C .
 - d. Connect Point C and Point A .

2. Use your grid paper to complete the following activity with your partner.
 - a. Create two different triangles on the grid paper with the same directions as in Question 1.
 - Draw one triangle with a vertical 5 centimeter line segment to start.
 - Draw a second triangle with a horizontal 5 centimeter line segment but measure the angle from the left side of the protractor.

3. Cut out the two triangles from the grid paper and position them on top of the triangle on S303. What do you notice?

Conclusion: When we are constructing a triangle given the side measure, the angle measure, and the side measure,

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your partner.

Triangle Constructions:

Situation	Examples	Conclusion
When the three angles of a triangle are given:	S296 - S298	<ul style="list-style-type: none"> • _____ of possible triangles. • Triangles are _____ • Triangles are _____ of each other.
When the three sides of a triangle are given:	S299 - S302	<ul style="list-style-type: none"> • _____ triangle can be constructed. • If the third side is less than the sum of the first two sides, • If the third side is more than the sum of the first two sides,
When a side, angle, side is given:	S303	<ul style="list-style-type: none"> • _____ triangle can be constructed. • The angle is between the _____

LESSON 23: Drawing and Constructing Triangles

Directions: Complete the following SOLVE problem with your teacher.

Stacy and Mario are working on a geometry project for math class. They are creating a presentation on constructions and triangles. Their presentation must include examples of three line segments that can form a triangle. Stacy suggests using the line segments of 6 centimeters, 10 centimeters, and 10 centimeters. Can a triangle be formed using these measurements?

S Underline the question.

This problem is asking me to find

O Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts.

L Write in words what your plan of action will be.

Choose an operation or operations.

V Estimate your answer.

Carry out your plan.

E Does your answer make sense? (Compare your answer to the question.)

Is your answer reasonable? (Compare your answer to the estimate.)

Is your answer accurate? (Check your work.)

Write your answer in a complete sentence.

LESSON 23: Drawing and Constructing Triangles

Directions: Complete the following SOLVE problem with your partner.

If possible, use your tools to construct a triangle with angle measurements 20° , 55° , and 105° and provide evidence of your construction. If it is not possible, explain why.

S Underline the question.

This problem is asking me to find

O Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts.

L Write in words what your plan of action will be.

Choose an operation or operations.

V Estimate your answer.

Carry out your plan.

E Does your answer make sense? (Compare your answer to the question.)

Is your answer reasonable? (Compare your answer to the estimate.)

Is your answer accurate? (Check your work.)

Write your answer in a complete sentence.

LESSON 23: Drawing and Constructing Triangles

Directions: Complete the following SOLVE problem with your partner.

Is it possible to construct two different triangles that have the same angle measurements? If it is, construct examples that demonstrate this condition and label all angle and length measurements. If it is not possible, explain why.

S Underline the question.

This problem is asking me to find

O Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts.

L Write in words what your plan of action will be.

Choose an operation or operations.

V Estimate your answer.

Carry out your plan.

E Does your answer make sense? (Compare your answer to the question.)

Is your answer reasonable? (Compare your answer to the estimate.)

Is your answer accurate? (Check your work.)

Write your answer in a complete sentence.

LESSON 23: Drawing and Constructing Triangles

Directions: Complete the following SOLVE problem with your partner.

Draw a right triangle, according to the following conditions, and label the provided information. If it is not possible to draw the triangle according to the conditions, explain why. Include a description of the kind of figure the current measurements allow. Provide a change to the conditions that makes the drawing feasible.

Construct a right triangle $\triangle ABC$ so that $AB=3$ cm, $BC=4$ cm, and $CA=5$ cm; the measure of Angle B is 90° .

S Underline the question.

This problem is asking me to find

O Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts.

L Write in words what your plan of action will be.

Choose an operation or operations.

V Estimate your answer.

Carry out your plan.

E Does your answer make sense? (Compare your answer to the question.)

Is your answer reasonable? (Compare your answer to the estimate.)

Is your answer accurate? (Check your work.)

Write your answer in a complete sentence.

LESSON 23: Drawing and Constructing Triangles

Directions: Complete the following SOLVE problem with your partner.

Draw a triangle, according to the following conditions, and label the provided information. If it is not possible to draw the triangle according to the conditions, explain why. Include a description of the kind of figure the current measurements allow. Provide a change to the conditions that makes the drawing feasible.

Construct triangle $\triangle DEF$ so that $\overline{DE}=4$ cm, $\overline{EF}=5$ cm, and $\overline{FD}=11$ cm; the measure of Angle D is 50° .

S Underline the question.

This problem is asking me to find

O Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts.

L Write in words what your plan of action will be.

Choose an operation or operations.

V Estimate your answer.

Carry out your plan.

E Does your answer make sense? (Compare your answer to the question.)

Is your answer reasonable? (Compare your answer to the estimate.)

Is your answer accurate? (Check your work.)

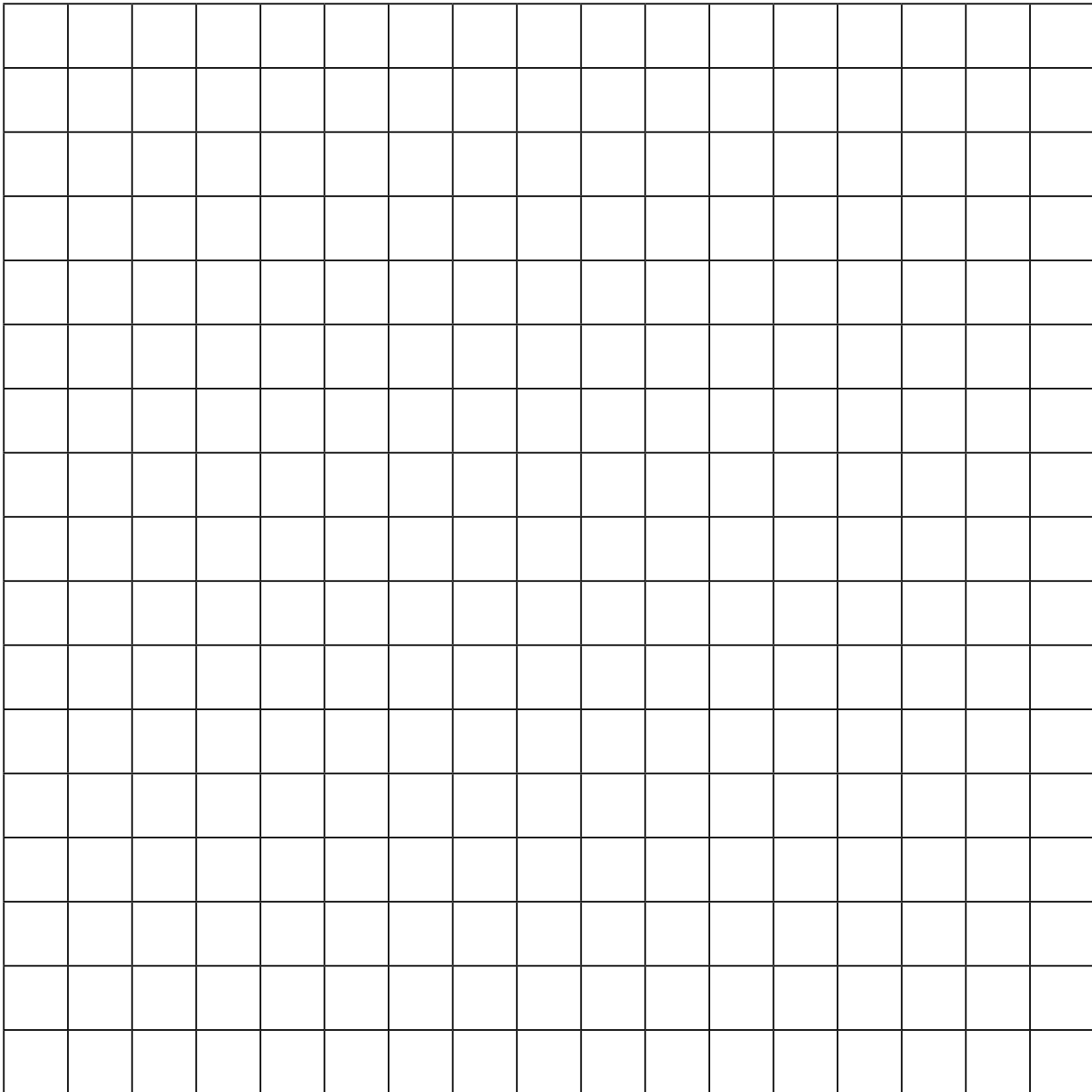
Write your answer in a complete sentence.

LESSON 23: Drawing and Constructing Triangles

Directions: Complete this page with your partner.

Go back and look at the SOLVE Problem on S309.

- Using what you learned in the lesson and reviewing the chart on S302, modify the dimensions given on S309 so that you can construct a triangle in the space below.



- Explain the changes that you made in the dimensions given on S309 in order to be able to construct a triangle and justify your answer.

LESSON 23: Drawing and Constructing Triangles

Homework.....
Name**Date**

Directions: Construct a triangle that has angle measurements of Angle *A*: 48° , Angle *B*: 60° , and Angle *C*: 72° .

Explain how you constructed the triangle by writing the steps below.

Step 1:

Step 2:

Step 3:

Step 4:

Step 5:

Will your triangle be congruent to everyone else's in the class?
Explain your answer.