LAUNCH:

- Draw a square.
- Draw a circle inside the square so that the circle touches each side of the square at one point.
- Draw a segment connecting the center of the circle to the bottom right corner of the square.
- Erase the sides of the square.

What letter have you drawn?

1.5

Getting Started

Objectives:

- **Warm up to the ideas of the investigation.**
- **Use a hands-on approach to develop mathematical habits of mind.**

Practice: Using Rulers and Protractors

1. Construct a line segment that is 4in. long

2. Construct an angle that measures 45 degrees

3. Construct an angle that measures 120 degrees

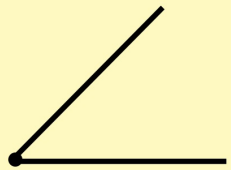
Estimate the angle

Notes

Response category: *numeric input*

Estimates

Drag the rays to set a new angle



Protractor

In your notes, complete "For you to Explore" problems 1-6 on p.25

For You to Explore

For the problems below, use whatever tools seem best. Keep track of your answers, as well as *how* you solved each problem—what tools you used and how you used them.

Use these sets of lengths for Problems 1–4.

3 in., 5 in., 7 in. 3 in., 5 in., 4 in.

3 in., 8 in., 4 in. 2 in., 3 in., 3 in.

1. For each set of lengths given above, construct a triangle with those side lengths. If a triangle is not possible, explain why.

2. For each triangle you constructed in Problem 1, do the following.
   a. Measure the angles.
   b. Compare your triangle to someone else's triangle. Are the two triangles identical? Do the angles of the two triangles match exactly?
   c. Summarize and explain what you observe.

2 in., 3 in., 3 in.

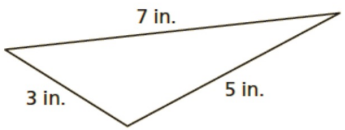
3 in., 5 in., 4 in.

3 in., 8 in., 4 in.

3 in., 5 in., 7 in.

invariants—values or relationships that stay the same while other values or relationships change.

3. For each triangle you constructed in Problem 1, find the sum of the measures of its angles. Are the sums invariant?



4. The triangles you constructed in Problem 1 may have an invariant, but you only tested a few triangles.
   a. Do you believe that your invariant holds for all triangles or only for some triangles? Explain.
   b. What will convince you that the sum of the measures of the angles of any triangle is invariant?

Use these sets of angle measures for Problems 5 and 6.

40°, 60°, 80° 60°, 70°, 80° 120°, 30°, 30°

30°, 60°, 90° 90°, 90°, 90°

5. For each set of angle measures given above, construct a triangle with those angle measures. If a triangle is not possible, explain why.

6. For each triangle you constructed in Problem 5, do the following.
   a. Measure the lengths of the sides (in inches or centimeters, whichever is more convenient).
   b. Find the ratio of the longest side to the shortest side (divide the longest side by the shortest side).
   c. Compare your triangle to someone else's triangle. Are the two triangles identical? Are the ratios from part (b) equal?
   d. Summarize and explain what you observe.

Habits of Mind

Look for a relationship. In one of the triangles you constructed, exactly two sides are the same length. Why do you think this is true?

COPY in your notes p.26

Conjecture 1.1 ***Triangle Angle-Sum Conjecture***

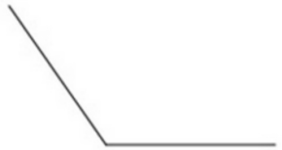
The sum of the measures of the angles of a triangle is an invariant. Regardless of the triangle, the angle sum is 180°.

1.5

Getting Started (CONTINUED)

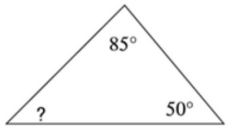
COMPLETE the ENTRANCE TICKET:

1. Measure the given angle:



2. Construct a 72° angle (use the back of the paper)

3. Solve for the missing angle:



Recall from Friday:

Conjecture 1.1 ***Triangle Angle-Sum Conjecture***

The sum of the measures of the angles of a triangle is an invariant. Regardless of the triangle, the angle sum is 180°.

EXAMPLE 1:

Assume that the Triangle Angle-Sum Conjecture is true. Explain whether it is possible to construct a triangle with each of the given angle measures.

a. 50°, 50°, 50° No
b. 60°, 60°, 60° yes
c. 45°, 45°, 90° yes
d. 72°, 72°, 36° yes
e. two 90° angles and a third angle No

EXAMPLE 2: Solve for x

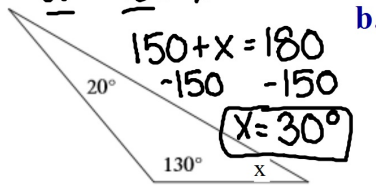
a.

$20 + 130 + x = 180$

$150 + x = 180$

$-150 \quad -150$

$x = 30°$



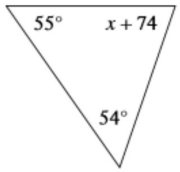
b.

$55 + x + 74 + 54 = 180$

$183 + x = 180$

$-183 \quad -183$

$x = -3$



c.

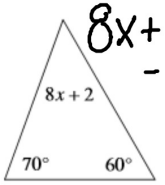
$8x + 2 + 70 + 60 = 180$

$8x + 132 = 180$

$-132 \quad -132$

$\frac{8x}{8} = \frac{48}{8}$

$x = 6$



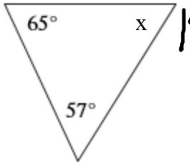
d.

$65 + 57 + x = 180$

$122 + x = 180$

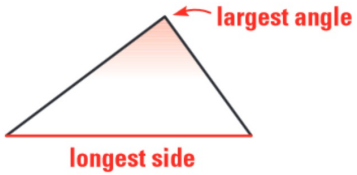
$-122 \quad -122$

$x = 58°$

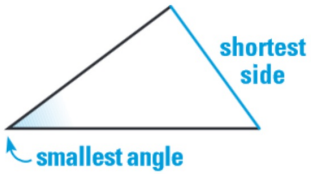


Triangle Side-Angle Relationships

- In a triangle, the largest angle is opposite the longest side

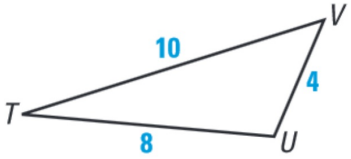


- ....and the smallest angle is opposite the shortest side



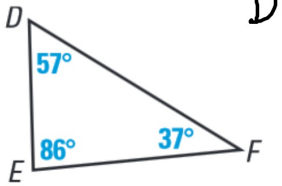
EXAMPLE 3:

a. Order the angle measures from smallest to largest



$\angle T, \angle V, \angle U$

b. Order the side lengths from shortest to longest



$\overline{DE}, \overline{EF}, \overline{DF}$

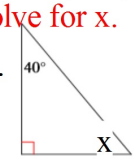
Assignment: (1-10)

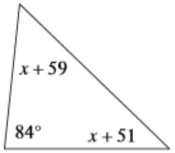
Can the given sides form a triangle? Explain.

1. 1in, 2in, 3in

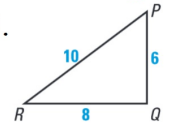
2. 6cm, 10cm, 15cm

Solve for x.

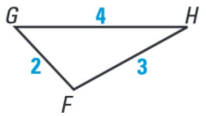
3. 

4. 

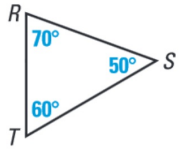
Order the angles from smallest to largest.

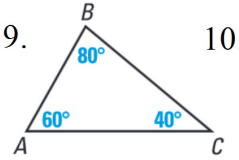
5. 

6. 

7. 

Order the sides from shortest to longest.

8. 

9. 

10.