

Name _____

Join and Separate Angles

Essential Question How can you determine the measure of an angle separated into parts?



Measurement and Data—
4.MD.C.7

MATHEMATICAL PRACTICES
MP2, MP4, MP5



Investigate

Materials ■ construction paper ■ scissors ■ protractor

- A.** Use construction paper. Draw an angle that measures exactly 70° . Label it $\angle ABC$.
- B.** Cut out $\angle ABC$.
- C.** Separate $\angle ABC$ by cutting it into two parts. Begin cutting at the vertex and cut between the rays.

What figures did you form? _____

- D.** Use a protractor to measure the two angles you formed. Record the measures. _____

- E.** Find the sum of the angles you formed.

$$\underline{\hspace{1cm}} + \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

part + part = whole

- F.** Join the two angles. Compare $m\angle ABC$ to the sum of the measures of its parts. Explain how they compare.



Math Idea

You can think of $\angle ABC$ as the whole and the two angles you formed as the parts of the whole.

Draw Conclusions

1. What if you cut $\angle ABC$ into two different angles? What can you conclude about the sum of the measures of these two angles? Explain.

2. **THINK SMARTER** Seth cut $\angle ABC$ into 3 parts. Draw a model that shows two different ways he could have separated his angle.

3. Write a sentence that compares the measure of an angle to the sum of its parts.

Make Connections

Materials ■ protractor

You can write the measure of the angles shown in a circle as a sum.

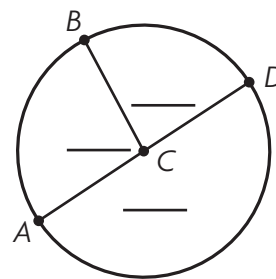
STEP 1 Use a protractor to find the measure of each angle.

STEP 2 Label each angle with its measure.

STEP 3 Write the sum of the angle measures as an equation.

$$\underline{\quad} + \underline{\quad} + \underline{\quad} = \underline{\quad}$$

part + part + part = whole



Math Talk

MATHEMATICAL PRACTICES 6

Use Math Vocabulary

Describe the angles shown in the circle above using the words *whole* and *part*.

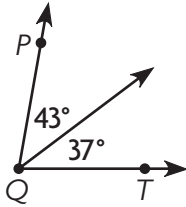
Name _____

Share and Show



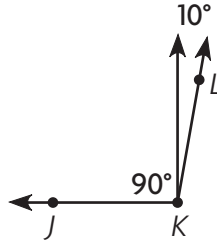
Add to find the measure of the angle. Write an equation to record your work.

1.



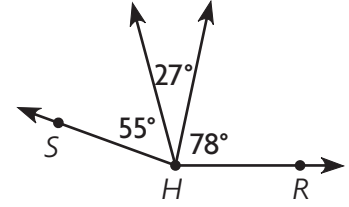
$m\angle PQT = \underline{\hspace{2cm}}$

2.



$m\angle JKL = \underline{\hspace{2cm}}$

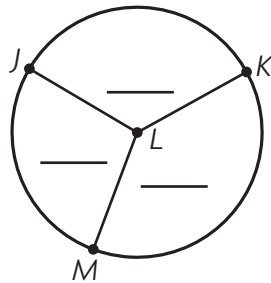
3.



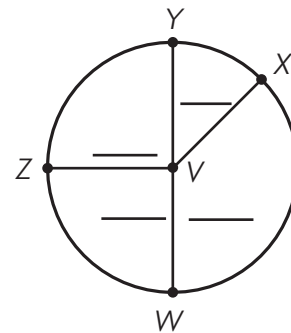
$m\angle RHS = \underline{\hspace{2cm}}$

Use a protractor to find the measure of each angle. Label each angle with its measure. Write the sum of the angle measures as an equation.

4.



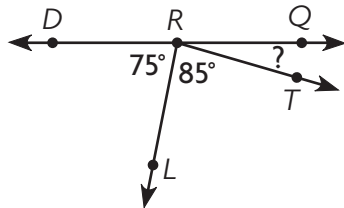
5.



Problem Solving • Applications



6. **MATHEMATICAL PRACTICE 4** Use Diagrams What is $m\angle QRT$?



7. **GO DEEPER** Look back at Exercise 1. Suppose you joined an angle measuring 10° to $\angle PQT$. Draw the new angle, showing all three parts. What type of angle is formed?

Unlock the Problem Real World

8. **THINK SMARTER** Stephanie, Kay, and Shane each ate an equal-sized piece of a pizza. The measure of the angle of each piece was 45° . When the pieces were together, what is the measure of the angle they formed?



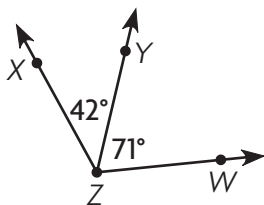
a. What are you asked to find? _____

b. What information do you need to use? _____

c. Tell how you can use addition to solve the problem. _____

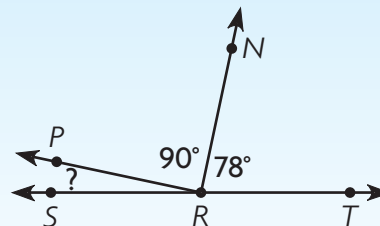
d. Complete the sentence. The three pieces of pizza formed a _____ angle.

9. What is the measure of $\angle XZW$? Write an equation to record your work.



Personal Math Trainer

10. **THINK SMARTER +** What is $m\angle PRS$? Use equations to explain and check your answer.



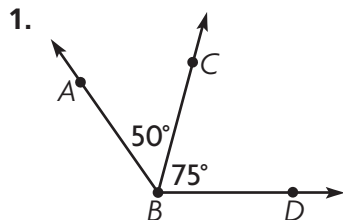
Name _____

Join and Separate Angles



COMMON CORE STANDARD—4.MD.C.7
Geometric measurement: understand concepts of angle and measure angles.

Add to find the measure of the angle. Write an equation to record your work.

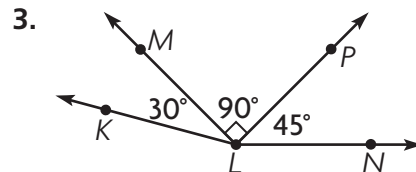


$50^\circ + 75^\circ = 125^\circ$

$m\angle ABD = 125^\circ$



$m\angle FGJ =$ _____



$m\angle KLN =$ _____

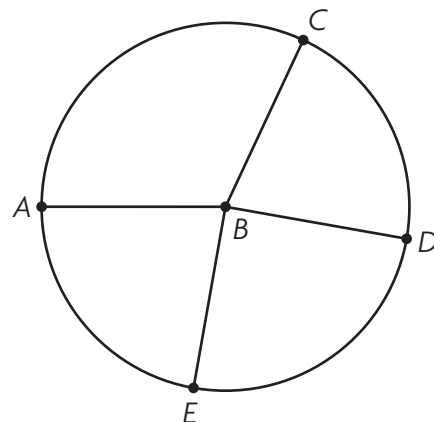
Use a protractor to find the measure of each angle in the circle.

4. $m\angle ABC =$ _____

5. $m\angle DBE =$ _____

6. $m\angle CBD =$ _____

7. $m\angle EBA =$ _____



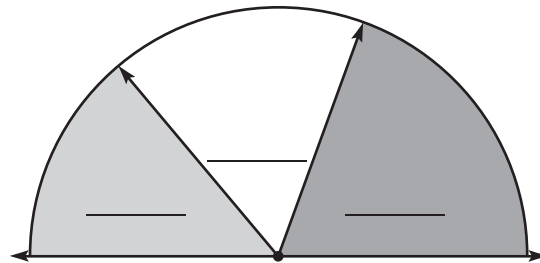
Problem Solving



8. Ned made the design at the right. Use a protractor. Find and write the measure of each of the 3 angles.

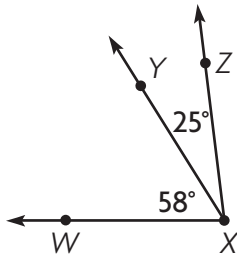
9. Write an equation to find the measure of the total angle.

10. **WRITE** *Math* How can you use addition and subtraction to put together and separate measures of an angle and its parts?

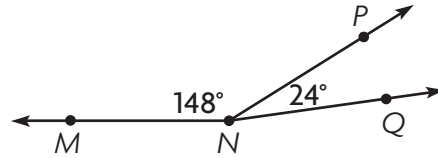


Lesson Check (4.MD.C.7)

1. What is the measure of $\angle WXZ$?



2. Write an equation that you can use to find the $m\angle MNQ$.



Spiral Review (4.NBT.B.5, 4.NF.B.3d, 4.MD.C.5a, 4.MD.C.5b, 4.G.A.2)

3. Joe bought 6 packages of envelopes. Each package contains 125 envelopes. How many envelopes did he buy?
4. Bill hiked $\frac{3}{10}$ mile on the Lake Trail. Then he hiked $\frac{5}{10}$ mile on the Rock Trail to get back to where he started. How many miles did he hike?

5. Ron drew a quadrilateral with 4 right angles and 4 sides with the same length. What figure did he draw?
6. How many degrees are in an angle that turns through $\frac{3}{4}$ of a circle?
