

Integrated Math day 129

**Topic:** Justifying steps in solving equations

**Big Ideas:** Every step in a mathematical solution has a justification. Justifying steps strengthens solutions and gives proof of the solution.

**Literacy Methods:** vocabulary word wall, math notebook, writing explanations to solutions in words

- **Homework quiz 5**

Vocabulary development

Using the word wall, use "deductive reasoning" in a sentence with as many other words from the word wall as possible. The words must be used correctly and show their meanings. The student with the most will get extra credit. Everyone must write a sentence.

Giving justification in solving equations

**Tell** students that we are going to talk about justifying what we are doing when we solve problems in preparation for proving theorems.

**Show** vertical angles and tell students that their measures are equal. In math, we can't just SAY they are equal, we must prove it and we must use properties and postulates to do that. Same with triangle sum theorem.

**Have** students do LL11 in preparation for the lesson.

**Have students** solve the following two problems on the back of LL11.

1.  $3x + 2 = 5$

2.  $\frac{2}{3}x - 4 = 6$

**Ask for a student** to write their solution on the board showing all steps and only one step per line.

Ask another student to come up and explain the solution in words.

**We just gave *justification* for our answers. Let's list other properties we know about equalities.**

**Does  $4 + 4 = 2 + 6$ ?**

**To simplify let's work with  $8 = 8$**

**Ask** What can we do to this to equality mathematically and still have an equality?

Have them manipulate the equality on the back of the LL. Only one manipulation at a time.

(They should answer: multiply, divide, add, subtract)

**Have** students give examples and create a list

$$8 = 8 \quad \text{Reflexive}$$

$$8 + 2 = 8 + 2 \quad \text{Addition}$$

$$8 - 2 = 8 - 2 \quad \text{Subtraction}$$

$$8 * 2 = 8 * 2 \quad \text{Multiplication}$$

$$8/2 = 8/2 \quad \text{Division}$$

**These are called properties of equality.** We can observe these properties to be true, we do not have to prove them! We use these properties to justify what we are doing.

Let's work with  $x = 2$ , is that the same as  $2 = x$ ? **symmetric property.**

What if  $x = 2$  and  $2 = y$ , what does  $x = y$ ? **transitive property.**

So if  $x = 2$  and  $4x + 1 = y$ , can I solve for  $y$ ? how? **substitution property**

What does  $2(x+2)$  equal? **distributive property**

**Fill in** properties of equality worksheet.

**Redo** LL11 on the board, giving justification for each step.

**Do** another example with segment addition postulate.

**Do** pg. 91 #1-4

LL 11:

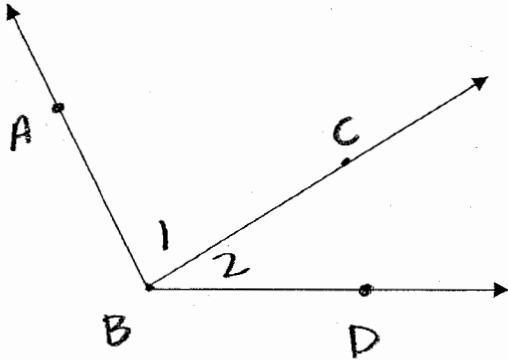
Look at your vocabulary from chpt 1 to:

a. Define postulate: \_\_\_\_\_

b. Write the names of two postulates that you already know:

1. \_\_\_\_\_

2. \_\_\_\_\_



Use the diagram above to answer the following questions:

1. Name  $\angle 1$  in another way. \_\_\_\_\_

2. Name  $\angle 2$  in another way. \_\_\_\_\_

3. Write  $\angle ABD$  as the sum of the two other angles.

4. What is the name of the postulate that you used in step 3?

5. Find the  $m\angle 2$  in the figure above if  $m\angle ABD = 110$ ,  $m\angle 1 = 85$  and  $m\angle 2 = x + 1$ .

6. Explain your steps above in words.

Deductive Reasoning is:

You use this EVERY time you solve problems in mathematics.

**Simplify:** combining like terms on one side of the equation

**Properties of equality**

**Addition property:** if  $\underline{\quad} = \underline{\quad}$ , then  $\underline{\hspace{2cm}}$

**Subtraction property:** if  $\underline{\quad} = \underline{\quad}$ , then  $\underline{\hspace{2cm}}$

**Multiplication property:** if  $\underline{\quad} = \underline{\quad}$ , then  $\underline{\hspace{2cm}}$

**Division property:** if  $a = b$ , and  $c \underline{\hspace{1cm}}$ , then  $\underline{\hspace{2cm}}$

**Reflexive property:**  $\underline{\hspace{2cm}}$

**Symmetric property:** if  $a = b$ , then  $\underline{\hspace{2cm}}$

**Transitive property:** if  $a = b$  and  $b = c$ , then  $\underline{\hspace{2cm}}$

**Substitution property:** if  $a = b$ , then  $b$  can  $\underline{\hspace{1cm}}$  in any expression.

**Distributive property:**  $a(b + c) = \underline{\hspace{2cm}}$

**Properties of congruence**

**Reflexive property =**  $\underline{\hspace{2cm}}$

$\underline{\hspace{2cm}}$

**Symmetric property =**  $\underline{\hspace{2cm}}$

$\underline{\hspace{2cm}}$

**Transitive property =**  $\underline{\hspace{2cm}}$

$\underline{\hspace{2cm}}$