9/25/19 - Warm Up Problem

1. Name a pair of adjacent angles.

∠ADB ∠BDC

2. Name a pair of vertical angles.

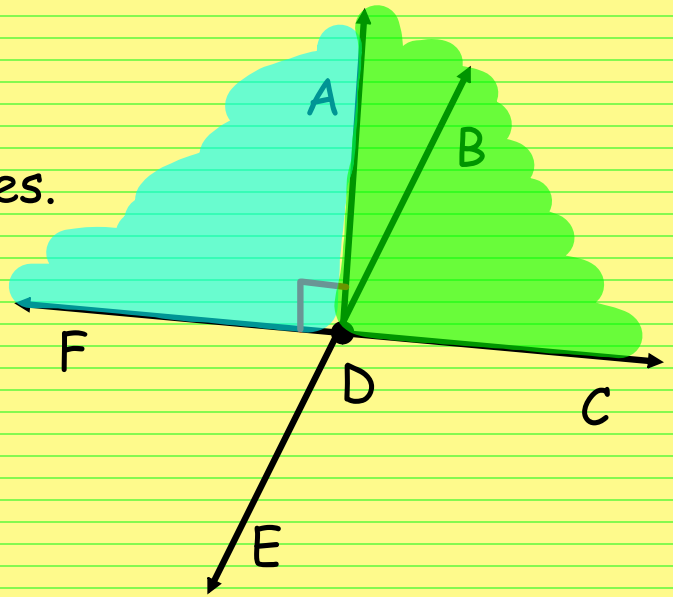
∠BDC ∠FDE

3. Name a pair of complementary angles.

∠ADB ∠BDC

4. Name a linear pair of angles.

∠FDA ∠ADC



Section 2.5 - Reasoning in Algebra

Goals: Complete algebra proofs using the Properties of Equality

Deductive Reasoning:

Using facts, definitions, properties, and the laws of logic to form a logical argument

A **proof** is a logical argument for why a certain statement is true.

You begin a proof with some information given to you, and then must reason your way to your goal statement.

To show that your reasoning is correct, you need to justify each step along the way with a property, definition, postulate, or theorem.

The Two-Column Structure for Proofs

The first column is a series of statements that leads logically from the given statement to the fact that we are proving.

The second column contains the justification for each statement.

Given: $5x - 7 = 2x + 8$

Prove: $x = 5$

Statements	Justifications
1. $5x - 7 = 2x + 8$	Given
2. $3x - 7 = 8$	Subtraction Prop. of =
3. $3x = 15$	Addition Prop. of =
4. $x = 5$	Division Prop. of =

Line 1 should contain your given statement.

Your last line must be the statement that you were asked to prove.

Justifications can include definitions, properties, postulates, and theorems that have already been accepted as true.

These are the properties you used in algebra to solve equations. They can be used as justifications for steps in your proofs.

Properties

Property		Example
Addition Property of Equality	If $a = b$, then $a + c = b + c$.	$x - 2 = 5$ $+2 \quad +2$ $x = 7$
Subtraction Property of Equality	If $a = b$, then $a - c = b - c$.	$x + 3 = 2$ $-3 \quad -3$ $x = -1$
Multiplication Property of Equality	If $a = b$, then $ac = bc$.	$\frac{2}{1} \cdot 1/2\, x = 4 \cdot \frac{2}{1}$ $x = 8$
Division Property of Equality	If $a = b$, then $\frac{a}{c} = \frac{b}{c}$	$\frac{3x}{3} = \frac{6}{3}$ $\quad x = 2$
Distributive Property	$a(b + c) = ab + ac$	$2(x - 5) = 2x - 10$

Justifying Statements

Which Property of Equality is being used?

$x - 3 = 8$

$x = 11$

$5(x - 12) = 8$

$5x - 60 = 8$

$7x + 9 = 10$

$7x = 1$

$2m\angle ABC = 140$

$m\angle ABC = 70$

$\frac{1}{2}x = 9$

$x = 18$

Adding Justifications

- In a two-column proof your beginning statement will be the information you were given. You just write "**given**" for its justification

Given: $2x + 15 + 4x = 33$
Prove: $x = 3$

Statements	Justifications
1. $2x + 15 + 4x = 33$	Given
2. $6x + 15 = 33$	Simplify
3. $6x = 18$	Subtraction Prop.
4. $x = 3$	Division Prop.

Adding Justifications

Given: $3(x - 2) + 2x = 39$
Prove: $x = 9$

Statements	Justifications
1. $3(x - 2) + 2x = 39$	
2. $3x - 6 + 2x = 39$	
3. $5x - 6 = 39$	
$+6 \quad +6$	
4. $5x = 45$	
5. $x = 9$	

Assignment:

Concept 6 Worksheet - due Tuesday 10/8 (front)

1. Given: $\frac{4x+6}{2} = 9$

Prove: $x = 3$

Statement	Justification
1. $\frac{4x+6}{2} = 9$ ·2	Given
2. $4x+6=18$ −6 −6	Mult. Prop.
3. $4x = 12$	Subtr. Prop.
4. $x = 3$	Division Prop.

Concept 6 Worksheet #1 (front)

REASONING IN ALGEBRA

Fill in the missing justifications for each proof.

1. Given: $\frac{4x+6}{2}=9$

Prove: $x=3$

Statement	Justification
1. $\frac{4x+6}{2}=9$	
2. $4x+6=18$	
3. $4x=12$	
4. $x=3$	

2. Given: $8x-5=2x+1$

Prove: $x=1$

Statement	Justification
1. $8x-5=2x+1$	
2. $6x-5=1$	
3. $6x=6$	
4. $x=1$	

3. Given: $5(n-3)=4(2n-7)-14$

Prove: $n=9$

Statement	Justification
1. $5(n-3)=4(2n-7)-14$	
2. $5n-15=8n-28-14$	
3. $5n-15=8n-42$	
4. $5n=8n-27$	
5. $-3n=-27$	
6. $n=9$	

4. Given: $2x-15-x=21+10x$

Prove: $x=-4$

Statement	Justification
1. $2x-15-x=21+10x$	
2. $x-15=21+10x$	
3. $-15=21+9x$	
4. $-36=9x$	
5. $-4=x$	

5. Given: $5(n-1)=20$

Prove: $n=5$

Statement	Justification

6. Given: $4r-5=13+2r$

Prove: $r=9$

Statement	Justification
$4r-5=13+2r$	Given
$2r-5=13$	Subtr. Prop.
$2r=18$	Addition Prop.
$r=9$	Division Prop.