Review:

CONCEPT SUMMARY *Properties of Real Numbers*

The following properties are true for any numbers a, b, and c.

Reflexive Property	$a = a$
Symmetric Property	If $a = b$, then $b = a$.
Transitive Property	If $a = b$ and $b = c$, then $a = c$.
Addition and Subtraction Properties	If $a = b$, then $a + c = b + c$ and $a - c = b - c$.
Multiplication and Division Properties	If $a = b$, then $a \cdot c = b \cdot c$ and if $c \neq 0$, $\frac{a}{c} = \frac{b}{c}$.
Substitution Property	If $a = b$, then a may be replaced by b in any equation or expression.
Distributive Property	$a(b + c) = ab + ac$

Practice 1: State the property that justifies each statement.

1. If w + 5 = 9, then w = 4. ____________________
2. If 10m = 50, then m = 5. ____________________
3. If c = a and a = t, then c = t. _________________
4. If x = 9, then 9 = x. ________________________
5. z = z ____________________________________
6. If 3(x – 4) = 6, then 3x – 12 = 6 ______________
7. If x = 8, then 3x + 2 = 3(8) + 2 _______________
8. If x = 7 and y = 7, then x = y. ________________

Algebraic Proofs

In Geometry, we use two column proofs to prove step-by-step that something is true. It's like a lawyer developing a case using logical arguments based on evidence to lead the jury to a conclusion favorable to their case. This is a form of deductive reasoning.

We can write proofs in Algebra, as well. We solve an equation, and we justify every step with properties of equality. The statements do not show every detail, they only show the results from one step to another; therefore, it is useful to first solve the equation on the side to see what operations you had to use; it will then be easier to determine the reason that justifies every statement. When you combine like terms, you can write "combine like terms" or "simplify".

Example 1: Given: $\frac{7x+3}{4} = 6$ Prove: x = 3

Statement	Reason
1. $\frac{7x+3}{4} = 6$	1.
2. $7x+3=24$	2.
3. $7x=21$	3.
4. x = 3	4.

Practice 2: Given: 3(x – 2) = 42 Prove: x = 16

Statement	Reason
1. 3(x – 2) = 42	1.
2. 3x – 6 = 42	2.
3. 3x = 48	3.
4. x = 16	4.

Practice 3: Given: 2(5 – 3a) – 4(a + 7) = 92 Prove: a = -11

Match each statement with the correct reason.

Statement	Answer	Reason
1. 2(5 – 3a) – 4(a + 7) = 92		A. Distributive Property
2. 10 – 6a – 4a – 28 = 92		B. Division Property
3. -10a – 18 = 92		C. Addition Property
4. -10a = 110		D. Given
5. a = -11		E. Simplify (combine like terms)

Example 2: Write a two-column proof to show that: If $3\left(x-\frac{5}{3}\right)=1$, then x = 2.

Practice 4: Write a two-column proof to show that: if 5(x + 2) = -3x – 6, then x= -2.