Notes (2.1) Equations – solving, rewriting, formulas

An **equation** is a ______________________ stating that

_________________________. If all of the variables in an equation

have an exponent of 1, then the equation is _____________.

If an equation has a variable, then the **solution** of the equation is the

_______________________ that makes the equation ________. (We

can also say that a **solution** "satisfies" the equation.)

EXAMPLES

a) Is –3 a solution of: 4x + 2 = –14?   b) Is 2.5 a solution of: 8x – 3 = 17?

Two equations are _______________ if they have the same solution(s).

*****ALGEBRAIC PROBLEM SOLVING*****

Given an equation, an ______________ equation may be formed by:

- Adding the same value to both sides of the equation
- Subtracting the same value from both sides of the equation
- Multiplying both sides of the equation by the same value
- Dividing both sides of the equation by the same value

To solve an equation, find an equivalent equation in which the variable is isolated.

Notes (2.1) Equations – solving, rewriting, formulas (cont.)

EXAMPLES

Solve each equation:

a) $x - 13 = -5$ b) $\frac{n}{4} = 12$ c) $\frac{3}{4} + a = \frac{5}{3}$ d) $-\frac{2}{5}y = 20$

When solving an equation with more than one variable, the variable to be isolated must be specified.

EXAMPLES

a) Solve $3x + y = 81$ for y.   b) Solve $d = rt$ for r.

A **formula** is an equation that relates two or more variable quantities.

*****FORMULAS YOU MUST KNOW*****

Distance:	$d = rt$	where d = distance, r = _______, t = time
Simple Interest:	$I = Prt$	where I = interest, P = ______________, r = rate, t = time
Percent:	$rb = a$	where r = ________, b = _______, and a = amount
Retail Price:	$R = w + m_u$ Or $R = w - m_d$	where R = retail price, w = wholesale cost, m_u = _________________ and m_d = ______________________.
Area (Triangle):	_____ = _____	where A = area, b = base, h = height
Area (Rectangle):	$A = \ell w$	where A = area, ℓ =_______, w = ______
Perimeter (Rect.):	P = ____+____	where P = perimeter, ℓ =______, w = ______

Notes (2.2) Solving Multi-step Equations, More Formulas

Recall that operations must happen in a certain order (P,E,M/D,A/S). In the following expression, indicate how the variable (x) is being changed:

$3x + 4$

1) First, x is being ________________.

2) Then, that result is being ________________.

When isolating a variable, we need to undo the operations that are being done to that variable. When doing this, we undo the operation in the ________________ of operations.

EXAMPLE: Solve $3x + 4 = 28$

Note: We must first undo the __________, then the __________.

If there are parentheses, we must get rid of them before dealing with what's inside.

EXAMPLE: Solve $2(x + 9) = -14$

(Note: We can get rid of the parenthesis in two ways:

(1) Divide both sides of the equation by _____, or

(2) Using the ___________________.)

First Method: $2(x + 9) = -14$

Second Method: $2(x + 9) = -14$

(Note: The second method is generally preferred with an integer multiplier – but it is not mandatory!)

Notes (2.2) Solving Multi-step Equations, More Formulas

More EXAMPLES

Solve each equation:

a) $6x + 18 = 42$ b) $19 - 3x = 37$ c) $2(13 + 5x) = -14$

Recall that a big ______________ implies parentheses.

For example, $\frac{x+4}{3}$ can be rewritten as: _______________.

EXAMPLE: Solve: $\frac{x+4}{3} = 7$

Note, we can get rid of the implied parentheses by multiplying both sides of the equation by: _____.

If there are multiple fractions, we can change them into integers by multiplying both sides of the equation by the ______________________________.

EXAMPLE: $\frac{2x}{5} + \frac{3}{10} = \frac{7}{5}$

Note: We should begin by multiplying both sides of this equation by: ______.

More Formulas to Know:

Markup: $M_u = p_u \bullet c$ Where M_u = markup, p_u = % of markup, c = cost.
(Note: Percent of markup is sometimes called "percent of increase.)

Markdown: $M_d = p_d \bullet c$ Where M_d = markdown, p_d = % of markdown, c = cost)
(Note: Markdown is sometimes called "discount".)

Notes (2.3) More complicated equations

Recall, terms can ALWAYS be combined by _______________. However, only _______________ may be combined by addition or subtraction.

EXAMPLE: Simplify the left side of the equation. Then solve.

$$5x + 12 - 13x + 18 = -10$$

We should now have all the necessary skills to solve linear equations:

1) Clear the equation of big fraction bars
2) Use the distributive property to remove parentheses
3) Combine like terms on each side of the equation (if necessary)
4) Undo addition and subtraction to get the variable(s) on one side of the equation and the constant(s) on the other side.
   (Note: Wagner's rule of thumb – move the variable with the LOWEST coefficient)
5) Combine like terms (if necessary) and undo multiplication and division to isolate the variable.
6) Check the solution

Note: to check whether a number is a solution, plug it back in to the original equation.

More Examples:

a) $4x + 24 = 6x - 8$ b) $3(x - 5) - 4(2 - x) = 26$ c) $\frac{8(5-x)}{5} = -2x$

Occasionally, we will come across an equation for which _________________ are solutions. If this is the case, the equation is called an **identity**. In other rare cases, we will come across an equation that has _______________. If this is the case, the equation is called a **contradiction**. In BOTH of these cases, we will find that the variable ______________ in the process of solving. If the resulting equation is _______, we have an **identity**. If the resulting equation is ________, we have a **contradiction**. {Try these: a) $3(x + 4) = 7 -(-3x - 5)$ b) $5(x + 2) = 5x - 2$ }