Unit 1 - Equations and Inequalities - Study Guide

Inequalities

Symbol	Meaning	Graph
<	Less than	←——o
>	Greater than	o——→
≤	Less than or equal to	←——●
≥	Greater than or equal to	●——→

- If you multiply or divide by a negative, **FLIP** the inequality sign
- Write the variable on the **LEFT**

Compound Inequalities

- ∧ means AND
- two points are connected by a line segment
- arrows point at each other
- EXAMPLES:

  $[-3, 9)$

  $7 < x \le 25$

  $x > -12 \ \wedge \ x < 0$
- ∨ means OR
- arrows point different directions
- EXAMPLES:

  $(-\infty, -2) \ \vee \ [5, \infty)$

  $x < -3 \ \vee \ x \ge 7$

Interval Notation

(   ) for open points, $> or <$

[   ] for closed points, $\ge or \le$

∞ and $-\infty$ always use (   )

Order of Operations

P	Parenthesis/Groupings (absolute value, brackets	G
E	Exponents/Square Roots (whichever comes first)	E
M D	Multiply/Divide (whichever comes first)	M
A S	Add/Subtract (whichever comes first)	S

The Real Number System

RATIONAL NUMBERS

any number that **CAN** be written as a fraction
- Decimals that repeat (0.333...)
- Decimals that end (−2.5643)
- The square roots of perfect squares ($\sqrt{49}$)
- fractions ($\frac{2}{3}, -\frac{7}{2}$, etc.)

IRRATIONAL NUMBERS

any number that **CAN'T** be written as a fraction
- Decimals that don't repeat and don't terminate (1.23462...)
- The square roots of non-perfect square ($\sqrt{10}$)

Real Numbers → Rational, Irrational

Rational → Integers → Whole Numbers → Counting Numbers

rational • rational = rational

rational + irrational = irrational

rational • irrational = irrational

Use your calculator to help ☺
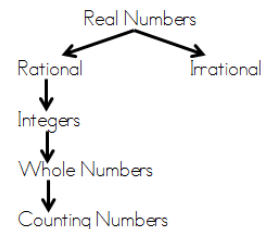
Solving Equations and Inequalities

1. Distribute (when necessary)
2. Get rid of fractions by multiplying by the denominator (when necessary)
3. Sort (variables to the left, constants to the right)
4. Combine like terms
5. Divide by the coefficient
6. Check using your calculator

Cross multiply to solve proportions

Checking Answers Using the TI-Nspire

1. Store the value you got for the variable into the variable

   x = 2 looks like 2 **STO** x

   for x > 7 you could use 8, 9, 10, etc. but NOT 7

   Press CTRL → VAR to get the **STO** key
2. Type the whole equation or inequality into your calculator and press enter
3. **TRUE** means you solved it correctly, **FALSE** means you made a mistake

Differences between Equations, Expressions and Equations

- Expressions <u>DO NOT</u> have $=, >, <, \ge, or \ \le$ symbols
- Equations <u>ALWAYS</u> have =
- Inequalities have $>, <, \ge, or \ \le$ symbols
- A <u>TERM</u> is an expression joined by multiplication or division

  EX: x, 2xy, AB   EX: 2x + 1 is 2 TERMS

Intepreting Solutions

- If you solve an **equation** and your solution is a variable equal to a number, you have ONE solution. EX: x = −3
- If you salve an **inequality**, be careful of what actually is a solution. It must make the inequality statement TRUE. EX: x < 4 the number 4 NOT a solution because 4 is not less than 4 but 3, 2, 1, −50, etc. are all solutions.
- If you solve an **equation** and your solution has no variables and neither side is the same, you have NO solutions. EX: 7 = −2
- If you solve an **equation** and both sides of your solution are the same, you have INFINITELY many solutions. EX: 0 = 0

Properties of Real Numbers

- The Commutative Property: Addition OR Multiplication
  - Changes the **order** of the terms
  - $a + b = b + a$ or $a \cdot b = b \cdot a$
- The Associative Property: Addition OR Multiplication
  - Changes **groupings**
  - $(a + b) + c = a + (b + c)$ or $(a \cdot b) \cdot c = a \cdot (b \cdot c)$
- The Identity Property
  - After the operation, the number (or variable) **stays the same**
  - Addition – Always 0
    - $a + 0 = a$
  - Multiplication – Always 1
    - $a \cdot 1 = a$
- The Inverse Property
  - Trying to get back to the **identity**
  - Addition – always the "opposite" sign of a
    - $a + -a = 0$
    - Add to get 0
  - Multiplication – always the reciprocal of a
    - $a \cdot \frac{1}{a} = 1$
    - Multiply to get 1
- The Distributive Property
  - **gets rid of parenthesis** through multiplication
  - $a(b + c) = ab + ac$ or $a(b − c) = ab − ac$
  - You can also pull out a variable as well (backwards distributing/factoring)
- The Properties of Equality: Addition and Multiplicative
  - if you add the same number to both sides of an equation, the sides remain equal
  - if you multiply (or divide) a number to both sides of an equation, the sides remain equal

Solving Word Problems

1. Read and underline key info
2. Define variables/Draw a picture/ Make a table)
3. Write and solve an equation
4. Does your answer make sense?
5. Answer the question

Consecutive Integer: x, x+1, x+2, x+3, …
Consecutive EVEN: x, x+2, x+4, x+6, …
Consecutive ODD: x, x+2, x+4, x+6, …

Age – set up a table

Money – use parenthesis and never forget to multiply the quantity by the value of the coin

Perimeter – draw a picture

Pythagorean Theorem – use $a^2 + b^2 = c^2$

- If you don't know 3 things you need 3 LET statements, 2 things 2 LET statements, etc.
- Always define variables first – that will help you get an equation or inequality

Converting Units

- Always write as a form of 1   EX: $\frac{1\ foot}{12\ inches}$
- Know your conversions
- Make the units "cross cancel" when converting

- EXAMPLE: Convert 2 ft/sec to inches per minute

$$\frac{2\ ft}{1\ sec} \bullet \frac{12\ in}{1\ ft} \bullet \frac{60\ sec}{1\ min} = 1{,}440\ in/min$$

Equivalent Equations

→Re-writing formulas
- Follow the same steps as solving a regular equation
- Use INVERSE OPERATIONS
- Get variable specified ALONE
- Answers will usually look messy

EX: Solve for r in terms of V and h.
$V = \pi r^2 h$ divide both sides by πh
$\frac{V}{\pi h} = r^2$ take square root of both sides
$\sqrt{\frac{V}{\pi h}} = r$ final answer ☺