

# Unit 1 - Equations and Inequalities - Algebra Review Sheet



## Inequalities

| Symbol | Meaning                  | Graph                 |
|--------|--------------------------|-----------------------|
| $<$    | Less than                | $\leftarrow \circ$    |
| $>$    | Greater than             | $\circ \rightarrow$   |
| $\leq$ | Less than or equal to    | $\leftarrow \bullet$  |
| $\geq$ | Greater than or equal to | $\bullet \rightarrow$ |

- If you multiply or divide by a negative  $\rightarrow$  flip the inequality sign
- Write the variable on the LEFT

## Compound Inequalities

- $\wedge$  means AND
- two points are connected by a line segment
- arrows point at each other
- examples:
  - $[-3, 9)$
  - $7 < x \leq 25$
  - $x > -12 \wedge x < 0$
- $\vee$  means OR
- arrows point different directions
- examples:
  - $(-\infty, -2) \vee [5, \infty)$
  - $x < -3 \vee x \geq 7$

## Interval Notation

( ) for open circles  
 [ ] for closed points  
 $\infty$  and  $-\infty$  always use ( )

## Order of Operations

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

## The Real Number System

### RATIONAL NUMBERS

any number that CAN be written as a fraction

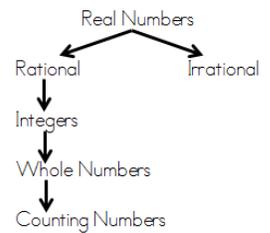
- Decimals that repeat (0.333...)
- Decimals that end (-2.5643)
- The square roots of perfect squares ( $\sqrt{49}$ )
- fractions ( $\frac{2}{3}$ ,  $-\frac{7}{2}$ , etc.)

### IRRATIONAL NUMBERS

any number that CANT be written as a fraction

- Decimals that don't repeat or terminate (1.23462...)
- The square roots of non-perfect square ( $\sqrt{10}$ )

*Rational  $\times$  Rational = Rational*  
*Rational + Irrational = Irrational*  
*Rational  $\times$  Irrational = Irrational*



Use your calculator to help determine if a number is rational or irrational ☺

## Solving Equations and Inequalities

- Distribute (if necessary)
- Get rid of fractions by multiplying by the denominator (if necessary)
- Sort (variables to the left, constants to the right)
- Combine like terms
- Divide by the coefficient
- Check using your calculator

Cross multiply to solve proportions

## Checking Answers Using the TI-Nspire

- 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  $\rightarrow$  VAR to get the STO key
- Type the whole equation or inequality into your calculator and press enter
- TRUE means you solved it correctly, FALSE means you made a mistake

## Differences Between Equations, Expressions and Equations

- Expressions DO NOT have  $=, >, <, \geq,$  or  $\leq$  symbols
- Equations ALWAYS have an equal sign
- Inequalities have  $>, <, \geq,$  or  $\leq$  symbols
- A TERM is an expression joined by multiplication or division  
 EX:  $x, 2xy, AB$  EX:  $2x + 1$  is 2 TERMS

## Interpreting 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 solve 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 or inequality** and your solution has no variables and neither side is the same, you have NO solutions. EX:  $7 = -2$
- If you solve an **equation or inequality** and both sides of your solution are the same, you have INFINITELY many solutions. EX:  $0 = 0$

## Properties of Real Numbers

- The Commutative Property
  - Changes the **order** of the terms
  - Only works for addition and multiplication
  - $a + b = b + a$  or  $a \cdot b = b \cdot a$
- The Associative Property
  - Changes **groupings** (associates – think friends)
  - Only works for addition and multiplication
  - $(a + b) + c = a + (b + c)$  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
  - Always in the form  $a(b + c)$  or  $a(b - c)$
  - $a(b + c) = ab + ac$  or  $a(b - c) = ab - ac$
  - You can also pull out a variable as well (backwards distributing)

## Equivalent Equations

- Re-writing equations with lots of variables  
EX:  $AB + C = D$  solve for A  
 $AB = D - C$   
Divide both sides by B  
 $A = \frac{D-C}{B}$   
DONE 😊
- Follow the same steps as solving a regular equation
  - Move all **TERMS** (EX: AX, 4WQ, x, etc.) with the variable you need to solve for to one side and all other terms to the other, then divide or multiply (use the opposite operation)
  - Answers will usually look messy

## Solving Word Problems

1. Read and underline key info
2. Define variables (or draw a picture OR table)
3. Write and solve an equation
4. Does your answer make sense?
5. Write a sentence that answers the question

**Consecutive Integer:**  $x, x+1, x+2, x+3, \dots$

**Consecutive EVEN:**  $x, x+2, x+4, x+6, \dots$

**Consecutive ODD:**  $x, x+2, x+4, x+6, \dots$

**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, 2 things 2 LET statements, etc.
- Always define variables first – that will help you get an equation or inequality
- NEVER leave blank – you can get tons of partial credit!