

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
 ∞ and $-\infty$ always use ()

Order of Operations

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

The Real Number System

RATIONAL NUMBERS

any number that CAN be written as a fraction

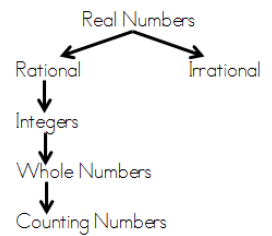
- Decimals that repeat (0.333...)
- Decimals that end (-2.5643)
- The square roots of perfect squares ($\sqrt{49}$)
- fractions ($\frac{2}{3}$, $-\frac{7}{2}$, etc.)

IRRATIONAL NUMBERS

any number that 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!