# Review for Final

## Unit 1: Algebra Foundations

### The Real Number System

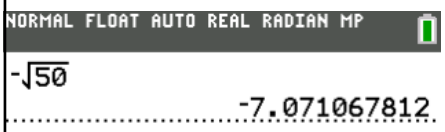
| | Definition | Example |
|---|---|---|
| **Natural (Counting) numbers** | Counting Numbers | 1, 2, 3, 4, 5, ... |
| **Whole numbers** | Counting Numbers + Zero | 0, 1, 2, 3, 4, 5, ... |
| **Integers** | Whole Numbers and their Opposites | ... -3, -2, -1, 0, 1, 2, 3, ... |
| **Rational numbers** | Any number that can be expressed as a ratio of two integers<br>$\frac{a}{b}, b \neq 0$ | Fractions, decimals that repeat or terminate<br>$\frac{1}{2}$, 0.2, $0.\overline{3}$ |
| **Irrational numbers** | Nonrepeating, Nonterminating Decimals | $\pi$<br>0.123576... |

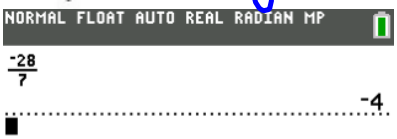
Real Numbers

- Rational #s
  - Integers
    - Whole #s
      - Counting #s
- Irrational #s

Name the smallest set to which each number belongs:

1. $\frac{2}{3}$ Rational #s
2. 13 Counting #
3. 0 Whole #
4. $-\sqrt{50}$ Irrational
5. $-\frac{28}{7}$ Integer
6. $\pi$ Irrational



| Property | Main Idea | Examples |
|---|---|---|
| Commutative Property<br>Addition or Multiplication | Order of the values does not matter! | $1+2=2+1$<br>$2\cdot3=3\cdot2$ |
| Associative Property<br>Addition or Multiplication | Grouping of the values does not matter! | $(5+3)+4=5+(3+4)$<br>$(ab)c=a(bc)$ |
| Identity Property | Stay the same! | $a+\boxed{0}=a$<br>$a\cdot\boxed{1}=a$ |
| Inverse Property<br>mult: reciprocal | Using opposite to "cancel" a value! | $a+\boxed{-a}=0$<br>$a\cdot\boxed{\frac{1}{a}}=1$ |
| Zero Product Property | Multiply by 0 always equals 0! | $a\cdot0=0$ |
| Distributive Property | multiply a value to an expression inside ( ). | $a(b+c)=ab+ac$ |
| Reflexive Property<br>"reflection" | A value will always equal itself | $a=a$<br>$2x=2x$ |
| Symmetric Property | if $a=b$ then $b=a$ | if $3=x$, then $x=3$ |
| Transitive Property | if $a=b$ and $b=c$ then $a=c$ | if $4+3=7$ and $7=\sqrt{49}$ then $4+3=\sqrt{49}$ |

**Identify the following properties:**

1. $5x + 1 = 1 + 5x$ Commutative Property
2. $17 = 17$ Reflexive Property
3. $10y^2 \cdot 0 = 0$ Zero Product Property
4. $-3(x + 8) = -3x - 24$ Distributive Property

5. If $2^5 = 32$ and $32 = 8 \cdot 4$, then $2^5 = 8 \cdot 4$ Transitive Property
6. $8k + 0 = 8k$ Identity Property of Addition
7. If $-2x = 20$, then $20 = -2x$ Symmetric Property
8. $\frac{4}{9} \cdot \frac{9}{4} = 1$ Inverse Property of Multiplication

Square Roots & cube Roots

| | | | |
|---|---|---|---|
| 1. $\sqrt{25}$ 5 | 2. $\sqrt{144}$ 12 | 3. $\sqrt{64}$ 8 | 4. $\sqrt{\frac{16}{49}} = \frac{\sqrt{16}}{\sqrt{49}} = \frac{4}{7}$ |
| 5. $\sqrt[3]{27}$ 3 | 6. $\sqrt[3]{216}$ 6 | 7. $\sqrt[3]{8}$ 2 | 8. $\sqrt[3]{1000}$ 10 |

* use calculator !!

Exponent Rules

| PRODUCT RULE | POWER RULE | QUOTIENT RULE | NEGATIVE EXPONENT RULE |
|---|---|---|---|
| $x^a \cdot x^b =$ $x^{a+b}$ | $(x^a)^b =$ $x^{ab}$ | $\frac{x^a}{x^b} =$ $x^{a-b}$ | $x^{-a} = \frac{1}{x^a}$ |

**1.** $v^4 \cdot 7v^3 \cdot 5v^1$

$35v^8$

**2.** $(3x^2y^2)^3$

$27x^6y^6$

**3.** $(-2a^6bc^3)^2 \cdot -5ab^2$

$4a^{12}b^2c^6 \cdot -5ab^2$

$-20a^{13}b^4c^6$

**4.** $(-2y^4)\cdot(xy^3)^2 - 13x^2y^{10}$

$-2y^4 \cdot x^2y^6 - 13x^2y^{10}$

$-2x^2y^{10} - 13x^2y^{10}$

$\boxed{-15x^2y^{10}}$

**5.** $\dfrac{a^6b^7c^2}{a^5b^4c^2} = a^1b^3c^0$

$= \boxed{ab^3}$

**6.** $\dfrac{(-3x^6)^2}{5x^3 \cdot 3x^3} = \dfrac{9x^{12}}{15x^6} = \boxed{\dfrac{3}{5}x^6}$

$(-3x^6)^2$

$9x^{12}$

$5x^3 \cdot 3x^3$

$15x^6$

**7.** $\left(\dfrac{4x^4y^2}{6xy}\right)^2$

$\dfrac{4x^4y^2}{6xy} \cdot \dfrac{4x^4y^2}{6xy}$

$\dfrac{16x^8y^4}{36x^2y^2} : \boxed{\dfrac{4}{9}x^6y^2}$

8. $\frac{-9n^8}{27n^{10}} = -\frac{1}{3}n^{-2} = -\frac{1}{3n^2}$

9. $\frac{a^{12}b^{-3}}{(ab)^{-4}} = \frac{a^{12}b^{-3}}{a^{-4}b^{-4}} = a^{16}b$

## Unit 2: Expressions

### Evaluating Expressions (Numerical & Algebraic)

**1.** $2^3 \cdot (9-2) + \frac{12}{4} - |-5|$

$8 \cdot 7 + 3 - 5$

$56 + 3 - 5$

$59 - 5$

$54$

NORMAL FLOAT AUTO REAL RADIAN MP

$2^3*(9-2)+\frac{12}{4}-|-5|$

54

**2.** $8 - [12 \div (\sqrt{49} - 1)] + 1$

$\sqrt{49} = 7$

$8 - [12 \div (6)] + 1$

$8 - [2] + 1$

$6 + 1$

$7$

NORMAL FLOAT AUTO REAL RADIAN MP

$8-(12/(\sqrt{49}-1))+1$

7

3. $\dfrac{5^3 - 42 \div 6}{\sqrt[3]{8}}$

$\dfrac{5^3-42/6}{\sqrt[3]{8}}$

59

$$\frac{125-42\div 6}{2}$$

$$\frac{125-7}{2}=\frac{118}{2}=59$$

4. $w^2 - 5xy$ *if x = -3, w = -2 and y = 1*

$$(-2)^2 - 5(-3)(1)$$

$$4 - 5(-3)(1)$$

$$4 + 15$$

$$\boxed{19}$$

**5.** $\frac{7c^2 + 5}{4a - b}$ *if a = 1, b = -5 and c = -4*

$$\frac{7(-4)^2+5}{4(1)-(-5)} = \frac{117}{9} = 13$$

**6.** $2|y| - x^2$ *if x = 6 and y = -3*

$$2\cdot|-3| - (6)^2$$

$$2(3) - (6)^2$$

$$2(3) - 36$$

$$6 - 36$$

$$-30$$

## Translating Equations & Inequalities

| | |
|---|---|
| **1.** The quotient of twice a number and 7 is 20. | **2.** Five less than the product of a number and 3 is 14. |
| **3.** Seven times the difference of x and 4 is -10. | **4.** The product of a number and four increased by one is at least 7. |

## Unit 3: Equations

### Equations

**1.** $18 = 3 - 3a$

**2.** $4 - \frac{1}{2}n = -12$

**3.** $\frac{3}{4}x + 17 = 23$

**4.** $9y - 4(y + 1) = 31$

**5.** $-6(w-4)+8w=2(w+9)$

**6.** $3m-(7m+12)=2(m-3)$

**7.** $2x - 2(4x - 3) = 6 - 6x$

**8.** $\frac{7}{x-8} = \frac{3}{x}$

**9.** Given $A = \frac{1}{2}bh$, solve for $h$

**10.** Given $K = \frac{mv^2}{2}$, solve for $m$

## Unit 4: Word Problems

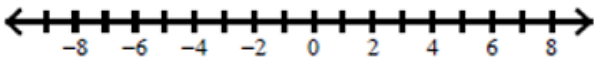
**1.** Max is making a rectangular garden that is 5 feet less than twice its width. If the perimeter of the garden is 80 feet, what will be its dimensions?

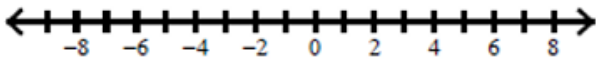
**2.** Amie published her first book. She was given $20,000 and an additional $0.15 for each copy of the book that sold. Her earnings, d, in dollars, from the publication of the book are given by **d = 20,000 + 0.15n** where n is the number of copies sold. During the first year, Amie earned $22,100 from the publication and sale of her book. How many copies of her book were sold?

## Unit 5: Inequalities

**1.** $11x + 13 \geq -20$

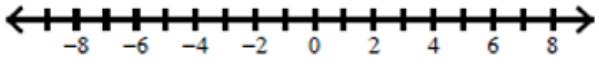
**2.** $-2x + 6 > 3x - 34$

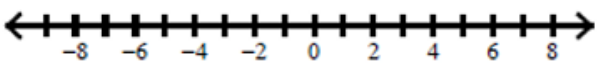


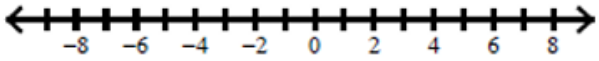
**3.** $3x - 7(x + 3) \geq -13$

**4.** $4 - 8x < 2(5 - 3x)$

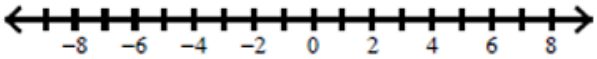


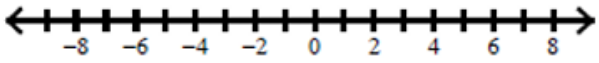
**5.** $x + 7 \leq 2$ **or** $x + 5 \geq 3$



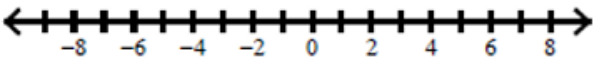

**6.** $3x + 5 < -16$ **or** $-5x - 8 \leq -13$



**7.** $-2 \leq 3x - 2 < 10$




**8.** $3 < 2x + 1 < 13$



## Unit 6: Polynomials

Directions: Simplify

**1.** $(5 + 2x^3 + x - 3x^2) + (4x^3 + 11 - 6x + 7x^2)$

**2.** $(2x^2 + 3x + 2) - (x^2 - 4x - 1)$

**3.** $3a^2b^3(2a^2 - 7ab + b^2)$

**4.** $(x + 4)(x + 9)$

**5.** $(2a + 5b)(a - 3b)$

**6.** $(x + 8)(x - 8)$

**7.** $(2y-1)^2$

**8.** $\frac{18a^3b+12a^2b^2-6ab}{6ab}$

**9.** $\frac{-24x^4+48x^3-8x^2}{8x^3}$

## Unit 7: Factoring

| GCF | DIFFERNCE OF TWO PERFECT SQUARES | BASIC TRINOMIAL | BOX METHOD |
|---|---|---|---|
| Polynomials that cannot be factored are called _____! | | | |

**1.** $21c - 12$

**2.** $x^2y + 8x$

**3.** $75a^2b^3c - 30ab^2$

**4.** $4m^2 - 81n^2$

**5.** $12x^2 - 12$

**6.** $27b - 75b^3$

**7.** $p^2 - 13p + 30$

**8.** $n^3 - 4n^2 - 60n$

**9.** $5w^2 - 15w - 20$

**10.** $3x^2 + 10x + 3$

**11.** $12c^2 + 5c - 2$

**12.** $2x^2 - 5x + 4$

## Unit 8: Solving Quadratic Equations

To solve a quadratic equation, use one of the following methods:

- Factoring
- Quadratic Formula

**1.** $x^2 + 8x = 0$

**2.** $4x^2 = 10x$

**3.** $x^2 + 5x = 6$

**4.** $x^2 = 18x - 81$

5.
The length of a rectangle is 4 inches less than twice its width. If the area of the rectangle is 70 square inches, what are its dimensions?

## *Completing the Square*

**Rewrite each expression by completing the square**

1. $a^2 - 4a + 15$

2. $c^2 + 20c - 40$

3. $x^2 + x + 1$

Solve for x by completing the square.

1. $a^2 - 4a + 15 = 0$

2. $n^2 - 2n - 15 = 0$

3. $r^2 + 4r + 3 = 0$

4. $c^2 + 20c - 40 = 0$

## Unit 9: Rational Expressions and Equations

Simplify each expression or solve each equation for x.

**1.** $\dfrac{x^2 - 12x + 20}{x - 10}$

2. $\dfrac{2n^2 - 10n}{n^2 - 9n + 20} \cdot \dfrac{n^2 - 8n + 16}{4n^2}$

3.

$$\frac{3y+9}{y+2} \div (y+3)$$

4.

$$\frac{x-7}{6} = \frac{4}{x+3}$$