Grade 6 Math

Category 1 – Numerical Representations & Relationships

UNDERSTANDING RATIONAL NUMBERS

whole numbers: zero and the counting numbers: {0, 1, 2, 3, 4, ...}

opposite: number that is the same distance from 0, but on the other side of 0, on a number line; (−1 • number)

Examples: $-\frac{3}{8}$ is opposite $\frac{3}{8}$; 1.7 is opposite −1.7; −(−9) = 9

integers: whole numbers and their opposites (includes negatives): {... −4, −3, −2, −1, 0, 1, 2, 3, 4, ...}

Rational Numbers / Integers / Whole Numbers

rational number: any number that can be expressed as a fraction; includes whole numbers, integers, terminating decimals (1.5, 0.125), repeating decimals (0.333... = 0.$\bar{3}$), percents (10%, $33\frac{1}{3}$%, 33.3%), fractions ($\frac{1}{2}$), improper fractions ($\frac{8}{3}$), and mixed numbers ($2\frac{2}{3}$)

Example: Classify each: −71; −5; $-\frac{4}{5}$; 0; $\frac{1}{6}$; 0.3; 71 — **Whole Numbers:** 0, 71 **Integers:** −71, −5, 0, 71 **Rational Numbers:** −71, −5, $-\frac{4}{5}$, 0, $\frac{1}{6}$, 0.3, 71

A fraction $\frac{a}{b}$, where b ≠ 0, is a way to represent $a \div b$: $\frac{a}{b} = a \div b$ or $b\overline{)a}$; useful for conversions. **Examples:** $\frac{3}{5}$ = 3 ÷ 5; $\frac{1}{11}$ is $11\overline{)1}$; 4 ÷ 6 = $\frac{4}{6}$; $5\overline{)8}$ is $\frac{8}{5}$

absolute value, |a|: distance from 0 on number line (always positive)

Examples: |−0.5| = 0.5; $|\frac{3}{8}| = \frac{3}{8}$ → *magnitude; not the same as "opposi*[illegible]

COMPARING, ORDERING RATIONAL NUMBERS

Convert rational numbers to the same form (e.g., decimal) to [illegible] on a number line or for comparison. For fractions, find equiv[illegible] fractions with a common denominator and then compare [illegible]

From	To	Conversion Method
integer	fraction	put integer over denominator 1 (5 = $\frac{5}{1}$, −3 = [illegible]
decimal	fraction	digits to right of decimal point [illegible] numerator; use smallest place value for den[illegible] (2.15 = $2\frac{15}{100}$)
fraction	decimal or integer	divide numerator by denom[illegible] $\frac{n}{d} = n \div d$ or $d\overline{)n}$ [illegible]
fraction	equivalent fraction	multiply/divide both numerato[illegible] same nonzero number [illegible]
mixed number	improper fraction	convert integer t[illegible] denominator a[illegible]
improper fraction	mixed number	divide to find [illegible] part is remaind[illegible]
percent	decimal	divide by 100; drop [illegible]
decimal	percent	multiply by 100; add % [illegible]

Example: Order from least to greatest flour needed. Locate each value on a [illegible] number line. strateg[illegible] Answer: 2.25 < 2.3 < [illegible] muffins, brownies, coo[illegible]

Flour Needed [illegible]

Carefully order negative [illegible], 10 > 5, but [illegible]

[illegible] compare −0.5°F [illegible]

RATIOS, RATES AND PERCENTS

[illegible]

percent: [illegible] (ratio) [illegible] to 100

benchmark percents/decimals/fractions: memorize these values; [illegible] for estimating

1%	10%	20%	25%	[illegible]	[illegible]	40%	50%	60%	$66\frac{2}{3}$%	70%	75%	[illegible]
0.01	0.1	0.2	0.25	[illegible]	0.3	0.4	0.5	0.6	0.6	0.7	0.75	[illegible]

models of 1%, 10%, 25%, $33\frac{1}{3}$%:

Example: If 8[illegible] of David's te[illegible] serves are g[illegible] 85 of 100 or [illegible] good to bad [illegible]

PROPORTIONS

proportional relationship: two rat[illegible] are equal; write the ratio in words to help you keep the num[illegible] and denominators consistent

Example: On Friday, 1 out of [illegible] wear glasses. If 15 teachers wear glasses [illegible] ... number of total teache[illegible] ... number of teachers [illegible] Or write [illegible]

Ratio	Giv[illegible]	Show	[illegible]portion
Six shirts cost $54. Two shirts cost $18.	... Sally [illegible] seven shi[illegible]	[illegible]	[illegible]
A car travels 180 miles in 3 ho[illegible]	... John has 100 more miles to go	[illegible]	[illegible]
A bu[illegible] every $[illegible]	... their wag[illegible] total $96[illegible]	[illegible]	[illegible]

Example: U[illegible] proportion: $\frac{1}{3} = \frac{15}{t}$ [illegible] numerator [illegible] 1 x [illegible] = 15, so 3 x 15 = t → t = 45

[illegible] for any [illegible] ≠ 0, then $n_1d_2 = n_2d_1$

Exa[illegible] are 2 boys [illegible] in a gym. There are 714 total kids. [illegible] any are boys? [illegible] so, [illegible] = 7b → divide by 7 → [illegible] (2)(714 ÷ 7) = (2)(102) = 204 boys

[illegible]RS, EXPRESSIONS AND EQUATIONS

[illegible] shows the numb[illegible] a base value is multiplied by itself [illegible] 2^3 → 2 is the base; 3 is the exponent: 2^3 = 2 x 2 x 2 ; 4^2 = 4 x 4

[illegible] **Example:** What is the prime [illegible] factorization of 360? [illegible] 360 = 5 x 2 x 3 x 2 x 3 x 2 [illegible] 360 = $2^3 \times 3^2 \times 5$

expression: a [illegible] mathematical phrase with no =, <, or > (e.g., "twice the [illegible] m" is [illegible]); use the order of operations (GEMDAS) to simplify; start from "inside" and work outward

1. G[illegible] (parentheses, brackets)
2. Exponents
3. Multiply and Divide (left to right)
4. Add and Subtract (left to right)

Example: Simplify the expression.

$2[3 + 18(1 - \frac{1}{3})]^2 - 5$ → G (), S
$2[3 + 18(\frac{2}{3})]^2 - 5$ → G [], E
$2[3 + 18(\frac{2}{3} \times \frac{2}{3})]^2 - 5$ → G (), M
$2[3 + 18(\frac{4}{9})]^2 - 5$ → G [], M
$2[3 + 8]^2 - 5$ → G [], A
$2(11)^2 - 5$ → E
2(121) − 5 → M → 242 − 5 = 237

equation: mathematical sentence with =; shows 2 expressions are equal ("9 is half the mass, m," is 9 = $\frac{1}{2}m$)

Examples: Which equations are true?

2.5 = [illegible] ✓; 215% = [illegible] = 1.15 ✗; 500 = $2^2 \times 3 \times 5^2$ = 600 → 500 = 600 ✗

Models can show whether two expressions are equivalent (left = right).

Example: Is this equation true? 2d − 3 = 6($\frac{1}{3}$d − 1) Answer: No. Model shows right side is 3 fewer than the left.

PROPERTIES OF OPERATIONS

[illegible]

(8)(2x) + (8)($\frac{1}{8}$) — *associative property of multiplication and inverse property of multiplication*; 16x + 1; so, 8(2x + $\frac{1}{8}$) = 16x + 1

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Symbol indicates section aligns to Texas College and Career Readiness Standards.