

Number Sense

Ontario MTH1W • Number: number sets, integers, fractions, ratios, percents, powers and scientific notation

vertexmath.ca
Worksheet, answers &
this cheat sheet



MOST TESTED An \$80 hoodie is 25% off, and 13% HST is added to the sale price. What do you pay? (card 7)

Which percent question?

Percent
of an
amount

decimal × amount

Part as a
percent

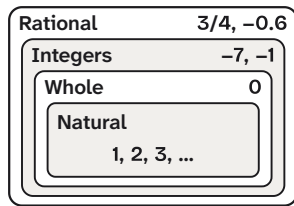
part ÷ whole × 100

Price goes
up or
down

change ÷ original

1 Number sets

USE Simplify before you classify: $18/6 = 3$ is natural, so it is also whole, an integer and rational.



TRAP 0 is whole, an integer and rational, but **not** natural: natural numbers start at 1.

2 Order and $|x|$

$$|-7| = |7| = 7$$

USE $|x|$ is the distance from 0, never negative. To order, write each number as a decimal: further left is smaller.

TRAP $-0.7 < -0.6$: -0.7 is further left, even though $0.7 > 0.6$.

3 Integer signs

$$a - (-b) = a + b \quad a + (-b) = a - b$$

Multiply or divide non-zero integers:

even number of negatives **positive**
odd number of negatives **negative**

EXAMPLE $(-2)(-3)(-4) = -24$: three negatives.

TRAP $-12 - (-5) = -12 + 5 = -7$, not -17 .

4 BEDMAS

USE Brackets (and $| |$ bars), Exponents, then $\times$ and $\div$ left to right, then $+$ and $-$ left to right.

EXAMPLE $-2[-8 - 4|-3|^2] = -2[-8 - 36] = 88$

TRAP $-4^2 = -16$: the exponent acts on the 4 only. $(-4)^2 = 16$.

5 Fractions

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$$

USE Add or subtract: rewrite over the **lowest common denominator (LCD)**. Multiply or divide: change mixed numbers to improper fractions first (2 and $1/3$ is $7/3$).

TRAP $1/2 + 1/3 = 3/6 + 2/6 = 5/6$, not $2/5$: never add the denominators.

TRAP $3/4 - 1/2 \times 1/3 = 3/4 - 1/6 = 7/12$, not $1/12$: multiply first.

6 Ratios and rates

$$\frac{a}{b} = \frac{c}{d} \Rightarrow ad = bc$$

unit price = price $\div$ quantity

USE Scale a ratio by **multiplying** both terms by the same number. Compare **unit prices**, not package sizes.

EXAMPLE \$4.49 for 500 g is \$8.98/kg, so \$7.99 for 1 kg is cheaper.

TRAP 2 : 3 scaled to 10 : ? is 10 : 15 (multiply by 5), not 10 : 11 (add 8).

7 Percents

$$\text{percent change} = \frac{\text{new} - \text{original}}{\text{original}} \times 100$$

$$\text{up } r: \times (1 + r) \quad \text{down } r: \times (1 - r)$$

USE r is the percent as a decimal: 13% is 0.13, 0.4% is 0.004.

EXAMPLE \$80, 25% off, plus 13% HST: $80 \times 0.75 \times 1.13 = 67.80$, so \$67.80.

TRAP 25% off, then 10% off: $\times 0.75 \times 0.9 = \times 0.675$, so 32.5% off, not 35%.

8 Exponent laws

$$a^m \times a^n = a^{m+n} \quad (a^m)^n = a^{mn}$$

$$\frac{a^m}{a^n} = a^{m-n} \quad (ab)^n = a^n b^n$$

$$a^0 = 1 \quad a^{-n} = \frac{1}{a^n}$$

USE Add or subtract exponents only with the **same base**. No law works on sums: $3^2 + 3^2 = 18$.

TRAP $x^{10} \div x^2 = x^8$, not x^5 : subtract the exponents.

TRAP $5^{-2} = 1/25$, a positive number, not -25 or $-1/25$.

9 Scientific notation

$$a \times 10^n, \quad 1 \leq a < 10$$

USE $n > 0$ for numbers ≥ 10 ; $n < 0$ for numbers between 0 and 1. Multiply the a 's and add the exponents, then fix a .

EXAMPLE $(4 \times 10^5)(3 \times 10^{-2}) = 12 \times 10^3 = 1.2 \times 10^4$

TRAP Compare the powers first: $1.1 \times 10^{-2} > 9.9 \times 10^{-8}$.

TRAP $10^5 \div 10^{-3} = 10^{5-(-3)} = 10^8$, not 10^2 .