

1.2: Exponents, square roots, and order of operations (cont'd)

Note Title

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Key ideas:

- operations within grouping symbols are done first

Grouping symbols: Parentheses () most common

Brackets [] { } act like parentheses

Fraction Bars

Absolute Value bars

Square roots

- multiplication and division precede (come before) addition and subtraction

- when there are ^{more than 1} divisions, or divisions mixed with multiplications, do them from left to right

- exponents apply only to their base

Example: $3 + 7(5)$
(EX)
 $= 3 + 35$
 $= \boxed{38}$

same as $3 + 7 \cdot 5$

EX: $6 - 3^2 + 2(5)$
 $= 6 - 9 + 10$
 $= 6 + (-9) + 10$
 $= -3 + 10$
 $= \boxed{7}$

EX: $50 \div 10 \cdot 3 \div 2$

$$= 5 \cdot 3 \div 2$$

$$= 15 \div 2$$

$$= \boxed{\frac{15}{2}} \quad (\text{improper fraction})$$

$$= \boxed{7\frac{1}{2}} \quad (\text{mixed number})$$

both OK {

Ex: $2 \cdot 5 \cdot 3 \cdot 4$

$$= 10 \cdot 12$$

$$= \boxed{120}$$

multiplication is ^{an} associative operation
(can change grouping)

and a commutative operation
(can change order)

1.2.2

Ex: Simplify.

$$\frac{16 - 8 \div 4}{4 + 8 \div 4 - 3} = \frac{16 - 2}{4 + 2 - 3} = \frac{14}{6 - 3} = \boxed{\frac{14}{3}}$$

Ex:

$$\frac{5 - |2 - 6(3)| + 4^2}{2 - \sqrt{4(8) + 4}} = \frac{5 - |2 - 18| + 16}{2 - \sqrt{32 + 4}}$$

$$= \frac{5 - |-16| + 16}{2 - \sqrt{36}} = \frac{5 - 16 + 16}{2 - 6} = \frac{5 - 0}{2 - 6} = \frac{5}{-4}$$

$$= \boxed{-\frac{5}{4}}$$

Example:

$$(-3)^2 = (-3)(-3) = \boxed{9}$$

$$-3^2 = -(3)(3) = \boxed{-9}$$

Very
important!

1.3: Addition of Real Numbers

1.3.1

Ex: $7 + (-12)$
 $= 7 - 12$
 $= \boxed{-5}$

Ex: $(-8) + (-12)$
 $= -8 - 12$
 $= \boxed{-20}$

Ex: $15 - 12$
 $= -12 + 15$
 $= \boxed{3}$

Ex: Translate to an algebraic expression.

a) 5 more than a number
Let x represent the unknown number

Better: $\boxed{5 + x}$

b) 3 less than twice a number
 $2x = 2 \cdot x$

$\boxed{2x - 3}$

Note: $3 - 2x$ is INCORRECT!

End of 1.3

1.4: Subtraction of real numbers

1.4.1

We've mostly done this.

Ex:

$$\begin{aligned} & 5 - (-6) \\ &= 5 - 1(-6) \\ &= 5 + 6 \\ &= \boxed{11} \end{aligned}$$

1.5 multiplication & Division of Real Numbers

1.5.1

Ex: $\frac{3}{5} \cdot \frac{2}{7} = \frac{3 \cdot 2}{5 \cdot 7} = \boxed{\frac{6}{35}}$

Ex: $\frac{3}{5} \div \frac{2}{7}$ or $\frac{\frac{3}{5}}{\frac{2}{7}}$
 $= \frac{3}{5} \cdot \frac{7}{2} = \boxed{\frac{21}{10}}$

Dividing by a number
is equivalent to
multiplying by its
reciprocal.

Ex: $\frac{0}{12} = \boxed{0}$

$\frac{12}{0} \Rightarrow \boxed{\text{undefined}}$