

1.2 ORDER OF OPERATIONS

1. Do operations that occur grouping symbols.
2. Evaluate exponents.
3. Do multiplication and division from left to right.
4. Do addition and subtraction from left to right.

EXAMPLES Use the order of operations

$$1. \quad 15 + 6 \cdot 2$$

$$15 + 12$$

$$\boxed{27}$$

$$2. \quad 2 \cdot 3^2 + 5$$

$$2 \cdot 9 + 5$$

$$18 + 5$$

$$\boxed{23}$$

$$3. \quad 2^4 - 5 \cdot 3$$

$$16 - 5 \cdot 3$$

$$16 - 15$$

$$\boxed{1}$$

$$4. \quad 16 \div 4 \cdot 2 + 5^2$$

$$16 \div 4 \cdot 2 + 25$$

$$4 \cdot 2 + 25$$

$$8 + 25$$

$$\boxed{33}$$

Evaluate the variable expression when r

5. $m^2 - 2 \cdot 3$

$$3^2 - 2 \cdot 3$$

$$9 - 2 \cdot 3$$

$$9 - 6$$

$$\boxed{3}$$

6. $\frac{15}{m} + 2^3 - 10$

$$\frac{15}{3} + 2^3 - 10$$

$$\frac{15}{3} + 8 - 10$$

$$5 + 8 - 10$$

$$13 - 10 = \boxed{3}$$

7. $m + 3^4 m$

$$3 + 3(3)^4 \text{ or } 3 + 3 \cdot 3^4$$

$$3 + 3 \cdot 81$$

$$3 + 243$$

$$\boxed{246}$$

8. $\frac{24}{m} \cdot 5$

$$\frac{24}{3} \cdot 5$$

$$8 \cdot 5$$

$$\boxed{40}$$

GROUPING SYMBOLS

Parenthesis () and brackets [] tell you order in which to do operations.

9. $7(13 - 8)$

$$7 \cdot 5$$

$$\boxed{35}$$

10. $24 - (3 + 1)$

$$24 - (3 + 1)$$

$$24 - 4$$

$$\boxed{20}$$

11. $2 [30 - (8 + 13)]$

$$2 [30 - 21]$$

$$2 \cdot 9$$

$$\boxed{18}$$

EXAMPLES Use the order of operations.

$$\begin{aligned}
 12. \quad & 4(1+5)^2 \div 8 \\
 & 4(6)^2 \div 8 \\
 & 4 \cdot 36 \div 8 \\
 & 144 \div 8 \\
 & \boxed{18}
 \end{aligned}$$

$$\begin{aligned}
 13. \quad & 27 \div 3(5^2 - 3) \\
 & 27 \div 3(2)^2 \\
 & 27 \div 3 \cdot 4 \\
 & 9 \cdot 4 \\
 & \boxed{36}
 \end{aligned}$$

EXAMPLES Evaluate if $a = 5$ and $b = 2$.

$$\begin{aligned}
 14. \quad & \frac{2}{3} [8(a^2 - b) + 3b] \\
 & \frac{2}{3} [8(5-2)^2 + 3 \cdot 2] \\
 & \frac{2}{3} [8(3)^2 + 3 \cdot 2] \\
 & \frac{2}{3} [8 \cdot 9 + 3 \cdot 2] \\
 & \frac{2}{3} [72 + 6] \\
 & \frac{2}{3} \cdot \frac{78}{1} = 26 \\
 & \boxed{52}
 \end{aligned}$$

The fraction bar is another grouping symbol. It indicates that the numerator and denominator should each be treated as a single value.

$$\frac{(16 + 8)}{(8 - 2)} \longrightarrow (16 + 8) \div (8 - 2)$$

TRY $\frac{9 \cdot 4 + 2}{5 - 1} = \frac{36 + 2}{25 - 1} = \frac{38}{24} = \frac{19}{12}$

$(9 \cdot 4 + 2) \div (5^2 - 1)$

\downarrow
 $\boxed{2}$

15. $\frac{13}{18} \cdot \frac{4}{2} \cdot \frac{1}{4} = \frac{9}{18-16+1} = \frac{9}{2+1} = \frac{9}{3} = \boxed{3}$

16. Evaluate the variable expression $\frac{x-2}{x-2} \cdot 5$ when $x=4$

$$\frac{x-2}{x-2} \cdot 5$$

$$\frac{4-2}{4^2-2 \cdot 5} = \frac{2}{16-2 \cdot 5} = \frac{2}{16-10} = \frac{2 \div 2}{6 \div 2} = \boxed{\frac{1}{3}}$$

17. Find the perimeter of the figure below

$x = 9$ and $y =$ distance around a figure

