Day1

Evaluating Algebraic Expression

Objective: To use the Order of Operations to evaluate arithmetic and algebraic expressions.

Driving cars on the right side of the road

is such an agreement

Order of Operations (O^3) is an agreement that results in everyone doing the problem the same way that results in one answer

Order of Operations

Compute from LEFT to RIGHT

1. GROUPING
2. EXPONENTIALS
3. MULTIPLY / DIVIDE
4. ADD / SUBRACT

Ex $4 + 2 \times 5 =$

There are no grouping symbols
There are no exponentials

Start with multiplying

$= 4 + 10$
$= 14$

Day 1

Ex. Compute $5 + 36 \div 6 \times 2 + 3$

Using O^3, these are no signs of grouping - no exponentials.

Start with Mult / Divide, whichever comes 1st

$$\begin{aligned} & 5 + \underline{36 \div 6} \times 2 + 3 \\ = \; & 5 + \underline{6 \qquad \times 2} + 3 \\ = \; & 5 + \quad 12 \quad + 3 \\ = \; & 20 \end{aligned}$$

$a/b = a - 1/b$

N. B. Notice in the O^3, mult and division are on the same line: so we do whichever comes 1st.

The reason they are on the same line is because division is defined in terms of multiplication

$a \div b = a \times 1/b$

$8 \div 4 = 8 \times 1/4$

Day 2

Evaluating Algebraic Expression

Ex Compute $5 + 2(5 + 3) \div 2 \times 4$

Using O^3; Grouping is 1st

$5 + 2(5 + 3) \div 2 \times 4$

$= 5 + \underline{2 \cdot 8} \div 2 \times 4$

$= 5 + \underline{16} \div \underline{2} \times 4$

$= 5 + \underline{8 \times 4}$

$= 5 + 32$

$= 37$

Ex Complete $3^2 \cdot 4 \div 12 + 4$

Using O^3, Exponentials is 1st

$= 3^2 \cdot 4 \div 12 + 4$

$= \underline{9 \cdot 4} \div 12 + 4$

$= \underline{36} \div \underline{12} + 4$

$= 3 + 4$

$= 7$

To evaluate an algebraic expression, you simply substitute the numbers for the variables and use O^3

Ex. Evaluate $a + bc$; if $a = 2$, $b = 3$, and $c = 5$

$a + bc$

Substituting

$2 + 3 \cdot 5$

Now use O^3

$= 2 + 15$

$= 17$

Ex. Evaluate $2l + 2w$, if $l = 8$ and $w = 5$

$2l + 2w$

$= 2 \cdot 8 + 2 \cdot 5$

$= 16 + 10$

$= 26$

Ex. Evaluate $\frac{1}{2}(B + C) \cdot H$, if $B = 10$, $C = 8$, and $H = 5$

$\frac{1}{2}(10 + 8) \cdot 5$

$\frac{1}{2}(10+8)\cdot 5$

Grouping 1st

$= \underline{\frac{1}{2}(18)}\cdot 5$

$= 9 \cdot 5$

$= 45$

N.B. Knowing O^3, is important - being able to manipulate rules is just as important .

Ex. Compute $4 \times 13 \times 25$

Using O^3, we should multiply from left to right.

$\underline{4 \times 13} \times 25$

$= 52 \times 25$

$= 1300$

Manipulating the same problem

$4 \times 13 \times 25$

will make the computation easier - a lot easier

$4 \times 13 \times 25$

Using the Commutative and Associative Properties, I can rewrite that arithmetic expression as

$$
\begin{aligned}
& 4 \times 13 \times 25 \\
= \quad & (4 \times 25) \times 13 \\
= \quad & 100 \times 13 \\
= \quad & 1300
\end{aligned}
$$

Evaluate $3x + 2y - 5$, if $x = 5$ and $y = 3\frac{1}{2}$

$$
\begin{aligned}
& 3x + 2y - 5 \\
= \quad & 3 \cdot 5 + 2(3\tfrac{1}{2}) - 5 \\
= \quad & 15 + 7 - 5 \\
= \quad & 17
\end{aligned}
$$

Evaluate $\frac{6a}{2} - \frac{6 + 3xy}{a}$, if $a = 4$, $b = 10$, $x = 2$, and $y = 6$

$$\frac{6 \cdot 4}{2} - \frac{10 + 3 \cdot 2 \cdot 6}{4}$$

$$
\begin{aligned}
= \quad & 12 - \frac{10 + 36}{4} \\
= \quad & 12 - \frac{46}{4}
\end{aligned}
$$

$12 - 11\frac{1}{2}$

$= \frac{1}{2}$

If $a = 2$, $b = 3$, $c = 5$, $d = 1$, $e = 0$, and $f = 6$, evaluate the following algebraic expressions

1) $f - 4$

2) $\frac{3a + 4f}{c}$

3) $6b + 5a$

4) $6^2 + 2f$

5) $\frac{f^2}{2} + \frac{bc}{a}$

6) $\frac{3ab}{2} - 5ac \div 6$