

Section 3.6: Order of Operations

Two students were asked to evaluate: $(-8) - 2(24 \div (-8))^2$

Here are their calculations.

A

$$\begin{aligned} & (-8) - 2(24 \div (-8))^2 \\ & = (-10)(24 \div (-8))^2 \\ & = (-10)(-3)^2 \\ & = (-10)(9) \\ & = -90 \end{aligned}$$

B

$$\begin{aligned} & (-8) - 2(24 \div (-8))^2 \\ & = (-8) - 2(-3)^2 \\ & = (-8) - (-6)^2 \\ & = -8 - 36 \\ & = -44 \end{aligned}$$

Why did both these students get incorrect answers?

What is the correct answer?

Recall: Order of Operations are:

B - Brackets
 E - Exponents
 D - Division
 M - Multiplication
 A - Addition
 S - Subtraction

} In order from
 Left to Right
 } In order from
 Left to Right

* Apply the order of operations correctly to find the solution:

$$(-8) - 2(24 \div (-8))^2$$

$$(Ans) \quad (-8) - 2(-3)^2$$

$$= (-8) - 2(9)$$

$$= (-8) - 18$$

$$= -26$$

Example #1: Evaluate: $(-0.8) + 1.2 \div (-0.3) \times 1.5$

$$(-0.8) + (-4) \times 1.5$$

$$(Ans) (-0.8) + 1.2 \div (-0.3) \times 1.5$$

$$= (-0.8) - 4 \times 1.5$$

$$= (-0.8) - 6$$

$$= -6.8$$

Example #2: Evaluate the following skill testing question:

$$\left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right) - \left(-\frac{2}{3}\right) \div \left[\frac{1}{3} + -\frac{3}{12}\right]$$

$$\text{Ans) } \left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right) - \left(-\frac{2}{3}\right) \div \left[\frac{4}{12} + \frac{-3}{12}\right]$$

$$= \left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right) - \left(-\frac{2}{3}\right) \div \frac{1}{12}$$

$$= \frac{1}{4} - \left(-\frac{2}{3}\right) \div \frac{1}{12}$$

$$= \frac{1}{4} - \left(-\frac{2}{3}\right) \times \frac{12}{1}$$

$$= \frac{1}{4} - \left(\frac{-24}{3}\right)$$

$$= \frac{1}{4} + 8$$

$$= 8\frac{1}{4}$$

Example #3: Word Problems:

To convert a temperature in degrees Fahrenheit to degrees Celsius, use the following formula: $C = \frac{F - 32}{1.8}$

Question: Determine the temperature in Celsius if: (A) $F = 90^\circ$ (B) $F = 8^\circ$

$$\text{Ans) (A) } C = \frac{F - 32}{1.8} = \frac{90 - 32}{1.8} = \frac{58}{1.8} = 32.\bar{2}^\circ\text{C}$$

$$\text{(B) } C = \frac{F - 32}{1.8} = \frac{8 - 32}{1.8} = \frac{-24}{1.8} = -13.\bar{3}^\circ\text{C}$$

Homework:

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#3, 8, 10A, 12A, D

10. A can of soup is a cylinder with radius 3.5 cm and height 11.5 cm.



Use the formula:

Surface area = $2\pi r^2 + 2\pi r \times \text{height}$,
where r is the radius of the can

- Determine the area of tin needed to make the can, to the nearest square centimetre.
- Explain how you used the order of operations in part a.

$$\begin{aligned}
 SA &= 2\pi r^2 + 2\pi r h \\
 &= 2\pi (3.5)^2 + 2\pi (3.5)(11.5) \\
 &= 2\pi (12.25) + 2\pi (35)(11.5) \\
 &= 77 + 253 \\
 &= 330 \text{ cm}^2
 \end{aligned}$$