

Section 3.6 Order of Operations with Rational Numbers

Review

- Brackets
- Exponents
- Division
- Multiplication
- Addition
- Subtraction

Complete any operations inside the brackets first. Then evaluate the exponents. Divide or multiply in the order you read them. Add or subtract in the order you read them!

Example 1: Calculate.

a)  $(-2.4) \div 1.2 - 7 \times 0.2$

b)  $(-3.4 + 0.6) + 4^2 \times 0.2$

c)  $\left(-\frac{2}{3}\right) \times \frac{1}{6} + \frac{1}{2}$

d)  $\left(\frac{3}{4} - \frac{7}{8}\right) \div \left(-\frac{5}{16}\right)$

e)  $\frac{7}{10} - \frac{1}{2} \times \frac{2}{5}$

f)  $\frac{1}{3} - \frac{1}{2} \left( -\frac{1}{3} \right)^2$

g)  $\left( 2\frac{1}{3} \right) + \left( 1\frac{1}{4} \right) \times \left( -\frac{2}{3} \right)$

h)  $\frac{1}{4} - 3 \left( \frac{2}{3} + 4 \right)$

i)  $\frac{10-7}{-4+2}$

$$\text{j) } \left(-\frac{2}{3} + \frac{1}{2}\right) \times \left(\frac{-3}{2}\right)^2$$

$$\text{k) } \left[ \frac{\frac{1}{4} - \left(-\frac{2}{5}\right)}{\frac{3}{5} - 1\frac{1}{2}} \right] \times (-2)^2 \div 3$$

Example 2: Error questions.

- a) A student's solution to a problem, to the nearest hundredth, is shown below. The solution is incorrect. Identify the errors and provide a correct solution.

**Correct Solution:**

$$\begin{aligned} & (-8.2)^2 \div (-0.2) - 2.9 \times (-5.7) \\ & = 67.24 \div (-0.2) - 2.9 \times (-5.7) \\ & = 67.24 \div (-0.2) - 16.53 \\ & = 67.24 \div (16.73) \\ & \doteq 4.02 \end{aligned}$$

- b) Two students were asked to evaluate:

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

Here are their calculations.

Student 1

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

Student 2

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

Why did both these students get incorrect answers?

What is the correct answer?

- c) The following test question was marked out of 3. What mark would you give this student? Justify your answer.

Calculate:  $\frac{-7}{8} - \frac{3}{4} \div \frac{1}{5} - \frac{1}{4}$

Student's answer:

Correct Solution

$$\begin{aligned} & \frac{-7}{8} - \frac{3}{4} \div \frac{1}{5} - \frac{1}{4} \\ = & \frac{-7}{8} - \frac{3}{20} - \frac{1}{4} \end{aligned}$$

$$\begin{aligned} = & \frac{-7}{40} - \frac{3}{40} - \frac{1}{40} \\ = & \frac{-11}{40} \end{aligned}$$