Calculating with Signed Numbers Using More Than One Operation

The order of operations we discussed for whole numbers applies to signed numbers as well. The rules that we will use in this chapter are listed in the following box.

**ORDER OF OPERATIONS FOR SIGNED NUMBERS**
With grouping symbols:

Do first

1. Perform operations inside the parentheses.
2. Simplify any expressions with exponents, and find any square roots.
3. Multiply or divide from left to right.

Do last
4. Add or subtract from left to right.

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**EXAMPLE 1** Perform the indicated operations in the proper order.

\[-6 \div (-2)(5)\]

\[-6 \div (-2)(5) \rightarrow (-3)(5) \rightarrow \boxed{15}\]
Practice Problem 1

Perform the indicated operations in the proper order.

\[
\frac{1 \div 2^0}{20 \div (-5)(-3)}
\]

\[
20 \div -5 \times -3
\]

\[
-4 \times (-3)
\]

\[
+ 12
\]
**Practice Problem 2** Perform the indicated operations in the proper order.

(a) $25 \div (-5) + 16 \div (-8)$  
(b) $9 + 20 \div (-4)$

\[
\begin{align*}
&\text{Last Row} \\
&\text{Last Row} \\
&\text{Last Row} \\
&\text{Last Row}
\end{align*}
\]
Practice Problem 3

Perform the indicated operations in the proper order.

\[
\frac{9(-3) - 5}{2(-4) \div (-2)} = \frac{-32}{4} = -8
\]
Practice Problem 4: Perform the indicated operations in the proper order.

\[-2(-12 + 15) + (-3)^4 + 2(-6)\]

PEMDAS:

1. Evaluate parentheses: 
   \[-2(-3) + (-3)^4 + 2(-6)\]

2. Exponentiation: 
   \[-2(-3) + 81 + 2(-6)\]

3. Multiplication: 
   \[-6 + 81 + (-12)\]

4. Addition: 
   \[75 + (-12)\]

5. Result: 
   \[63\]
Practice Problem 5

Perform the indicated operations in the proper order.

\[
\left( \frac{1}{5} \right)^2 + 4 \left( \frac{1}{5} - \frac{3}{10} \right) \div \frac{2}{3}
\]

\[
\frac{1}{5} - \frac{3}{10} \quad \frac{2}{5} \cdot \frac{1}{5} + \frac{3}{10} \quad \frac{2}{5} + \frac{3}{10} = \frac{1}{2}
\]

\[
\frac{1}{5} + \frac{4 \cdot \frac{1}{10}}{\frac{2}{3}} = \frac{2}{3}
\]

\[
\frac{1}{25} + \frac{4}{10} - \frac{3}{10} = \frac{2}{3}
\]

\[
\frac{1}{25} + \frac{-3}{5} \cdot \frac{3}{5} = \frac{2}{5}
\]

\[
\frac{1}{25} + \frac{-15}{25} = \frac{-14}{25}
\]
Perform the indicated operations in the proper order.

1. \(-8 \div (-4)(3)\)
2. \(-20 \div (-5)(6)\)

4. \(60 \div (-20)(5)\)
5. \(16 + 32 \div (-4)\)

7. \(24 \div (-3) + 16 \div (-4)\)
8. \((-56) \div (-7) + 30\)

10. \(6(-3) + 8(-1) - (-2)\)
11. \(-4(1.5 - 2.3)\)

13. \(5 - 30 \div 3\)
14. \(8 - 70 \div 5\)

16. \(9(-6) + 6\)
17. \(3(-4) + 6(-2) - 3\)

19. \(11(-6) - 3(12)\)
20. \(10(-5) - 4(12)\)
26. \[ \frac{12 - 4 + 10}{5(-3) + 9} \]

28. \[ \frac{-25 \div 5 + (-3)(-4) - 7}{8 - (18 \div 3)} \]

30. \[ \frac{6(-3) \div (-2) + 5}{32 \div (-8)} \]
Perform the operations in the proper order.

33. \(3(2 - 6) + 4^2\)  
34. \(-5(8 - 3) + 6^2\)  
35. \(12 \div (-6) + (7 - 2)^3\)

36. \(-20 \div 2 + (6 - 3)^4\)  
37. \((-1\frac{1}{2})(-4) - 3\frac{1}{4} \div \frac{1}{4}\)  
38. \((6)(-2\frac{1}{2}) + 2\frac{1}{3} \div \frac{1}{3}\)

39. \(\left(\frac{3}{5} - \frac{2}{5}\right)^2 + \left(\frac{3}{2}\right)\left(-\frac{1}{5}\right)\)

40. \(\left(\frac{5}{8} - \frac{1}{8}\right)^2 - \left(\frac{5}{6}\right)\left(\frac{8}{5}\right)\)
Temperature Averages. The following chart gives the average monthly high and low temperatures in degrees Fahrenheit for the city of Noril'sk, one of Russia's northernmost cities.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
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<td>-13</td>
<td>-11</td>
<td>0</td>
<td>13</td>
<td>29</td>
<td>50</td>
<td>64</td>
<td>59</td>
<td>44</td>
<td>21</td>
<td>-1</td>
<td>-9</td>
</tr>
<tr>
<td>Low</td>
<td>-27</td>
<td>-21</td>
<td>-14</td>
<td>-3</td>
<td>17</td>
<td>38</td>
<td>49</td>
<td>46</td>
<td>35</td>
<td>12</td>
<td>-10</td>
<td>-18</td>
</tr>
</tbody>
</table>

Use the chart to solve Exercises 43–48. Round to the nearest tenth of a degree when necessary.

43. What is the average low temperature in Noril’sk during December, January, and February?

44. What is the average high temperature in Noril’sk during December, January, and February?

45. What is the average low temperature in Noril’sk from January through June?

46. What is the average high temperature in Noril’sk from October through March?