Solving for a variable in terms of other variables in a rational equation: Problem type 2

Solve for $y_2$.

\[
\frac{(y_1 - y_2)x}{5} = B
\]

\[
\Rightarrow \quad \frac{(y_1 - y_2)x}{5} = B
\]

\[
xy_1 - xy_2 = 5B
\]

\[
-xy_1 - xy_1
\]

\[
-xy_2 = 5B - xy_1
\]

\[
\overbrace{-x}^{y_2 = 5B - xy_1}
\]

\[
-x
\]

7. Solve for $c$.

\[
\frac{3}{c} = \frac{7}{a} + \frac{5}{b}
\]

\[
\frac{3}{c} = \frac{7}{a} + \frac{5}{b}
\]

\[
abc\quad abc
\]

\[
3ab = 7bc + 5ac
\]

\[
3ab = c(7b + 5a)
\]

\[
\overbrace{3ab}^{c} = \frac{c}{7b+5a}
\]
10. Writing a multi-step equation for a real-world situation

Scott takes classes at both Westside Community College and Pinwood Community College. At Westside, class fees are $98 per credit hour, and at Pinwood, class fees are $115 per credit hour. Scott is taking a combined total of 16 credit hours at the two schools.

Suppose that he is taking \( w \) credit hours at Westside. Write an expression for the combined total dollar amount he paid for his class fees.

\[
w = \text{westside credits} \\
p = 16 - w = \text{pinewood credits} \\
total = 98w + 115(16 - w) \\
98w + 1840 - 115w \\
1840 - 17w
\]

11. Solving a value mixture problem using a linear equation

A Web music store offers two versions of a popular song. The size of the standard version is 2.3 megabytes (MB). The size of the high-quality version is 4.9 MB. Yesterday, the high-quality version was downloaded twice as often as the standard version. The total size downloaded for the two versions was 3025 MB. How many downloads of the standard version were there?

<table>
<thead>
<tr>
<th></th>
<th>DOWN</th>
<th>SPEED</th>
<th>TOT</th>
</tr>
</thead>
<tbody>
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<td>STD</td>
<td>X</td>
<td>2.3MB/</td>
<td>2.3X</td>
</tr>
<tr>
<td></td>
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<td>D</td>
<td></td>
</tr>
<tr>
<td>HQ</td>
<td>2X</td>
<td>4.9MB/</td>
<td>9.8X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3025</td>
</tr>
</tbody>
</table>

\[
2.3X + 9.8X = 3025 \\
12.1x = 3025 \\
X = 3025 / 12.1 = 250
\]
13.

Solving a distance, rate, time problem using a linear equation

Two trains leave stations 234 miles apart at the same time and travel toward each other. One train travels at 75 miles per hour while the other travels at 55 miles per hour. How long will it take for the two trains to meet?

Do not do any rounding.

[Blank] hours

One train travels at 75 miles per hour.
The other travels at 55 miles per hour.

We'll let \(x\) be the amount of time, in hours, it takes for the trains to meet.

Using the formula \(\text{distance} = \text{rate} \times \text{time}\), we have the following information.

<table>
<thead>
<tr>
<th>Rate (miles per hour)</th>
<th>Time (hours)</th>
<th>Distance (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train #1 75</td>
<td>(x)</td>
<td>75x</td>
</tr>
<tr>
<td>Train #2 55</td>
<td>(x)</td>
<td>55x</td>
</tr>
</tbody>
</table>

The trains have 234 miles apart and eventually meet.

\[130x = 234\]

\[x = 1.8\]

---

Computing a percent mixture

A chemist mixes 125 milliliters of a solution that is 18% acid with 500 milliliters of pure acid. Answer the questions below. Do not do any rounding.

(a) How many milliliters of acid are in the resulting mixture?

[ ] milliliters

(b) What percentage of the resulting mixture is acid?

[ ]% 

<table>
<thead>
<tr>
<th>Volume (mL)</th>
<th>Acid (%)</th>
<th>Resulting Acid (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>125ML</td>
<td>.18</td>
<td>22.5</td>
</tr>
<tr>
<td>500ML</td>
<td>1.00</td>
<td>500</td>
</tr>
<tr>
<td>625ML</td>
<td>0.00</td>
<td>522.5</td>
</tr>
</tbody>
</table>

\[
\frac{522.5}{625} = .826 \text{ OR } 82.6\% 
\]
17

Solving a percent mixture problem using a linear equation

In the lab, Rafael has two solutions that contain alcohol and is mixing them with each other. He uses 200 milliliters less of Solution A than Solution B. Solution A is 18% alcohol and Solution B is 10% alcohol. How many milliliters of Solution B does he use, if the resulting mixture has 272 milliliters of pure alcohol?

<table>
<thead>
<tr>
<th>ML</th>
<th>% ALC</th>
<th>AL ML</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-</td>
<td>X-200</td>
<td>.18</td>
</tr>
<tr>
<td>B-</td>
<td>X</td>
<td>.10</td>
</tr>
</tbody>
</table>

\[.18(X-200) + .10X = 272\]

\[.18X - 36 + .10X = 272\]

\[.28X = 308\]

\[X = \frac{308}{.28} = 1100\]

20

Union and intersection of intervals

The sets $E$ and $F$ are defined as follows.

$E = \{x | x > 2\}$

$F = \{x | x \leq 5\}$

Write $E \cup F$ and $E \cap F$ using interval notation. If the set is empty, write $\emptyset$.

The set $E$ is the interval $(2, \infty)$. It is graphed below.

The set $F$ is the interval $(-\infty, 5]$. It is graphed below.
25

Solving inequalities with no solution or all real numbers as solutions

For each inequality, choose the statement that describes its solution. If applicable, give the solution.

\[ 20u + 35 < 17u + 26 \]
\[ 3u < -9 \]
\[ u < -3 \]

\[ -4w - 24 + 33 > 12 - 4w \]
\[ 9 > 12 \]

NO SOLUTIONS

43.

Writing equations of lines parallel and perpendicular to a given line through a point

Consider the line \( y = 2x - 6 \).

(a) Find the equation of the line that is parallel to this line and passes through the point \((-7, -2)\).

\[ m = 2 \]
\[ m = 2 \]
\[ \text{Pt slope: } y - (-2) = 2( x - (-7)) \]
\[ y + 2 = 2x + 14 \]
\[ y = 2x + 12 \]

(b) Find the equation of the line that is perpendicular to this line and passes through the point \((-7, -2)\).

\[ m = -1/2 \]
\[ \text{Pt slope: } y - (-2) = (-1/2)(x + 7) \]
\[ y + 2 = 2x + 14 \]
\[ y = (1/2)x - 11/2 \]

Note that the ALEKS graphing calculator may be helpful in checking your answer.