Ex 1. Sharon can embroider a logo on a t-shirt in 6 mins, Tracy takes 9 mins to do the same task. How long will it take both of them to embroider 100 t-shirts?

<table>
<thead>
<tr>
<th></th>
<th>Rate</th>
<th>Time</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharon</td>
<td>(\frac{1}{6})</td>
<td>t min</td>
<td>(\frac{t}{6})</td>
</tr>
<tr>
<td>Tracy</td>
<td>(\frac{1}{9})</td>
<td>t min</td>
<td>(\frac{t}{9})</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

\[
\frac{t}{6} + \frac{t}{9} = 100 \quad \text{LCD = 18}
\]

\[
18 \left( \frac{t}{6} \right) + 18 \left( \frac{t}{9} \right) = 18 \left( 100 \right)
\]

\[
3t + 2t = 1800
\]

\[
\frac{5t}{5} = 1800 \quad t = 360 \text{ mins or 6 hrs}
\]

\[
\frac{360}{6} = (60 \text{ Sharon}) \quad \frac{360}{9} = (40 \text{ Tracy})
\]

Ex 2. One pump can empty a pool in 30 mins and another pump can empty the pool in 48 mins. How long will it take both pumps to empty the pool? Rate \times \text{time} = \text{task}. 
Rate \times \text{ time} = \text{ task}

One pump \quad \frac{1}{30} \text{ pool} \text{ min} \quad t = \frac{t}{130}

two pumps \quad \frac{1}{48} \text{ pool} \text{ min} \quad t = \frac{t}{148}

\frac{t}{30} + \frac{t}{48} = 1

8 \quad 5

240(\frac{t}{30}) + 240(\frac{t}{48}) = 240(1)

\frac{8t + 5t}{13} = 240

13t = 240

\frac{t}{13} = \frac{240}{13} \quad t = 18 \frac{6}{13} \text{ min.}

### 37. Motion and distance problems

Rate \times \text{ time} = \text{ distance}

The speed of the freight train is 14 mph less than a passenger train. The passenger train travels 400 mi in the same amount of time the freight train travels 330 mi. Find the speed of each train.

Passenger train: \quad \text{Rate} \times \text{ time} = \text{ distance}

\begin{align*}
\frac{400}{x} &= 330 \\
x &= \frac{400}{330}
\end{align*}

\text{LCM} = x(x-14)

\begin{align*}
\frac{400(x-14)}{x} &= 330(x) \\
40x - 560 &= 33x \\
40x - 40x &= 560 \\
-7x &= -560 \\
-7 &= x \\
80 &= x
\end{align*}

Passenger train speed is 80 mph

Freight train: \quad 80 - 14 = 66

Passenger train = 80 mph

Freight train = 66 mph.
Jet travels 460 mph in still air and flies 525 miles into the wind and 525 miles with the wind in a total of 2.3 hr. Find the speed of the wind.

Start → 7777777777 Stop

\[ \text{Wind} \leftarrow \text{return stop.} \]

\[ RX = D \]

\[ \frac{R}{t} = \frac{D}{t} \]

Against

With

\[ R \times \text{time} = \text{Distance} \]

\[ \frac{460-x}{525} = \frac{525}{460-x} \]

\[ \frac{460+x}{525} = \frac{525}{460+x} \]

Ratio of plane = 460 mph

Ratio of wind = x

Time against + t with = total time, 2.3 hrs.

\[ \frac{525}{460-x} + \frac{525}{460+x} = 2.3 \]

\[ \text{LCD} = 460-x \]

\[ 525 \times (460+x) + 525(460-x) = 2.3(460-x)(460+x) \]

\[ 241,500 + 525x + 241,500 - 525x = 2.3(211,600 - x^2) \]

\[ 483,000 = 2.3(211,600 - x^2) \]

\[ \frac{483,000}{2.3} = 211,600 - x^2 \]

\[ 211,600 = 211,600 - x^2 \]

\[ -1600 = -x^2 \]

\[ +x^2 + x^2 \]

\[ \sqrt{x^2} = \pm \sqrt{1600} \]

\[ x^2 - 1600 = 0 \]

\[ x = \pm 40 \]

\[ x = 40 \text{ mph} \]