Mixing Juice

Every year, the seventh grade students at Langston Hughes School go on an outdoor-education camping trip. During the week-long trip, the students study nature and participate in recreational activities. Everyone pitches in to help with the cooking and cleanup.

Arvind and Mariah are in charge of making orange juice for all the campers. They make the juice by mixing water and orange juice concentrate. To find the mix that tastes best, Arvind and Mariah decided to test some recipes on a few of their friends.

### Problem 3.1

Arvind and Mariah tested four juice mixes.

<table>
<thead>
<tr>
<th>Mix A</th>
<th>Mix B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 cups concentrate</td>
<td>1 cup concentrate</td>
</tr>
<tr>
<td>3 cups cold water</td>
<td>4 cups cold water</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mix C</th>
<th>Mix D</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 cups concentrate</td>
<td>3 cups concentrate</td>
</tr>
<tr>
<td>8 cups cold water</td>
<td>5 cups cold water</td>
</tr>
</tbody>
</table>

A. Which recipe will make juice that is the most “orangey”? Explain your answer.

B. Which recipe will make juice that is the least “orangey”? Explain your answer.

C. Assume that each camper will get $\frac{1}{2}$ cup of juice. For each recipe, how much concentrate and how much water are needed to make juice for 240 campers? Explain your answer.

### Problem 3.1 Follow-Up

1. How did you use ratios in solving Problem 3.1?

2. For each recipe, how much concentrate and how much water is needed to make 1 cup of juice?
A. Mix A was the orangeyest because it had the most percent concentrate (40%).

B. Mix B was the least orangeyest because it had the least amount of concentrate.
**Mix A:** \[2 + 3 = 5 \text{ cups of juice} \times 3 = 15 \text{ cups} \text{ concentrate} + 9 \text{ water} \]
\[6/5 \text{ concentrate} \]

**Mix C:** \[4 + 8 = 12 \text{ cups of juice} \times 1.25 = 15 \text{ cups} \text{ concentrate} \]
\[8 \times 1.25 = 10 \text{ water} \]
\[5/15 \text{ concentrate} \]

**Mix B:** \[1 + 4 = 5 \text{ cups of juice} \times 3 = 15 \text{ cups} \text{ concentrate} + 12 \text{ water} \]
\[3/15 \text{ concentrate} \]

**Mix D:** \[3 + 5 = 8 \text{ cups of juice} \times \frac{1}{4} = 1.875 = 15 \text{ cups} \text{ concentrate} \]
\[3 \times \frac{1}{4} = 0.75 \times 1.875 = 5.641 \text{ water} \]
\[5.641 \times 1.88 = 9.4 \]
\[15 \text{ concentrate} \]

Most Orangey (most concentrate): per 15 cups of juice
Least Orangey (least concentrate): per 15 cups of juice

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**Mix A**
- Mix is the most because the 2:3 ratio is the most concentrate to water
- \[\frac{2}{5}\]

**Mix C**
- Concentrate mix C: \[\frac{3}{5}\]

**Mix D:** \[\frac{3}{8}\]

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**Mix B**
- Mix B is the least because 1:4 ratio is the least concentrated to water
- \[\frac{1}{5}\]
Team 5

Mix A
1 concentrate
1 1/2 water

Mix B

Mix C
A. mixture (A) would have the most taste
B. mixture (B) would have the least taste

Mix D

Team 6

WATER

A. Mix A = \frac{3}{5} = 60\% \text{ most orangey}
   Mix B = \frac{4}{5} = 80\%
   Mix C = \frac{8}{10} = 67\%
   Mix D = \frac{5}{8} = 63\%

Concentrate

B. Mix A = \frac{2}{8} = 40\%
   Mix B = \frac{1}{4} = 25\% \text{ least orangey}
   Mix C = \frac{8}{8} = 50\%
   Mix D = \frac{3}{5} = 60\%
A. Mix "A" is the most orangey because it has the least amount of water added which is 1 1/2 cups of water.

B. Mix "B" is the least fruity because it has 4 cups of water to 1 cup of concentrate.

Mix A
\[
\frac{2}{3} = \frac{1}{1\frac{1}{2}} \text{ con.}
\]

Mix B
\[
\frac{1}{4} \text{ con.}
\]

Mix C
\[
\frac{4}{8} = \frac{1}{2} \text{ con.}
\]

Mix D
\[
\frac{3}{5} = \frac{1}{1\frac{1}{3}} \text{ water}
\]

Team 7

Mix A - 3/5 water = 60% water
Mix B - 4/5 water = 80% water
Mix C - 3/2 water = 67% water
Mix D - 3/8 water = 63% water

Most orangey - Mix A
Least orangey - Mix B

Team 8
Mix A 1st (most)
\[
\frac{2}{5} = \frac{16}{40}
\]

Mix B 4th (least)
\[
\frac{1}{5} = \frac{8}{40}
\]

\[
\frac{4}{12} = \frac{13.3}{40}
\]

Mix D 2nd
\[
\frac{3}{8} = \frac{15}{40}
\]

Team 9

Mix A is most orangy, because...

100% ÷ 5 = 20%

1 cup = 20% of the mixture

20% x 2 cups = 40% concentrate

Mix B is the least orangy because...

100% ÷ 5 = 20%

1 cup = 20%

1 cup x 20% = 20% concentrate

Mix C is neither because...

100% ÷ 12 = 8% 1 cup = 8%

4 cups x 8% = 32% concentrate

Mix D is neither because...

100% ÷ 8 = 12.5%

1 cup = 12.5%

3 x 12.5% = 37.5% concentrate

Team 10
Mix A - \( \frac{3}{5} = 60\% \) Water / 40\% Concentrate
Mix B - \( \frac{4}{5} = 80\% \) \( \sim / 20\% \) 
Mix C - \( \frac{8}{12} = 67\% \) \( \sim / 33\% \) 
Mix D - \( \frac{5}{8} = 63\% \) \( \sim / 37\% \)

A) Mix A is the most orangey because it is only 60\% water, the least watered down.

B) Mix B is the least orangey because it is 80\% water, the most watered down.

A) The juice that will taste most orange is mix A because it does not have as much water as mixes B, C, and D.
B) The juice that will taste least orange is mix B because it has more water and less concentrate than mixes A, C, and D.