Adding and Subtracting Fractions with Unlike Denominators



Adding fractions is important when dealing with measurement. For example, a carpenter makes several measurements such as:

 $\frac{1}{8}$ inch, $\frac{1}{2}$ inch and $\frac{3}{4}$ inch

Now how does he or she add the measurements to figure out the total length needed? Finds the LCD, of course!

When adding or subtracting fractions, the fractions must have a common denominator. You can get a common denominator by finding the equivalent fractions with the lowest common denominator (LCD).

Examples A)
$$\frac{5}{10} + \frac{13}{15} = ?$$

Step 1: Find the lowest common multiple of the denominators (this will be the lowest common denominator).

10: 10, 20, 30, 40, ... 15: 15, 30, 45, ...

The LCD of 10 and 15 is 30.

Step 2: Find the equivalent fractions with the lowest common denominator.

$$\frac{5 \times 3}{10 \times 3} = \frac{15}{30} \qquad \qquad \frac{13 \times 2}{15 \times 2} = \frac{26}{30}$$

Step 3: Add the two fractions.

$$\frac{15}{30} + \frac{26}{30} = \frac{41}{30}$$

Step 4: Reduce the improper fraction by dividing the denominator into the numerator.

$$30\overline{\smash{\big)}41} = 1\frac{11}{30}$$
$$\frac{30}{11}$$

Knowledge and Employability Studio Mathematics ©Alberta Education, Alberta, Canada (www.LearnAlberta.ca) **B)** $2\frac{5}{6} + 3\frac{1}{7} = ?$

The set of multiples of 6: 6, 12, 18, 24, 30, 36, 42, ... The set of multiples of 7: 7, 14, 21, 28, 35, 42, ...

The LCD is 42.

$$2\frac{5 \times 7}{6 \times 7} = \frac{35}{42} + \frac{3\frac{1 \times 6}{7 \times 6} = \frac{6}{42}}{\frac{41}{42}} = 5\frac{41}{42}$$

C) If a punch recipe calls for $1\frac{1}{4}c$ of pop, $\frac{2}{3}c$ of raspberry juice and $\frac{3}{4}c$ of cranberry juice, how much punch will there be in total?

$$1\frac{1}{4} + \frac{2}{3} + \frac{3}{4}$$

Find the LCM of 4 and 3.

The set of multiples of 4: 4, 8, 12, 16, ... The set of multiples of 3: 3, 6, 9, 12, ...

The LCD is 12.

Calculate equivalent fractions with denominators of 12.

$$1\frac{1}{4} \times \frac{3}{3} = 1\frac{3}{12}$$
$$\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$$
$$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$$

Add and reduce to lowest form.

$$1\frac{3}{12} + \frac{8}{12} + \frac{9}{12} = 1\frac{20}{12}, \ 12)\frac{1}{20} = 1\frac{8}{12} + 1 = 2\frac{2}{3}$$
$$-\frac{12}{8}$$

Knowledge and Employability Studio Mathematics ©Alberta Education, Alberta, Canada (www.LearnAlberta.ca)



- 1. Find a partner. Each partner writes down two fractions with different denominators. Exchange papers and add the fractions together.
- 2. Bob is responsible for stocking shelves at a busy grocery store. His boss has asked him to calculate how many boxes he is able to unpack between customers. Complete the chart below. The first one has been done for you.

Day of the	Boxes unpacked	Boxes unpacked	Lowest	Conversions		Operation	Total
week	in the morning	in the afternoon	Denominator	Morning	Afternoon		Afternoon)
Monday	$\frac{3}{4}$	$\frac{2}{3}$	12	$\frac{3}{4} = \frac{9}{12}$	$\frac{2}{3} = \frac{8}{12}$	$\frac{9}{12} + \frac{8}{12}$	$\frac{17}{12} = 1\frac{5}{12}$
Tuesday	$\frac{1}{2}$	<u>5</u> 6					
Wednesday	$\frac{4}{5}$	$\frac{1}{2}$					
Thursday	$\frac{4}{7}$	$\frac{2}{3}$					
Friday	2 <u>1</u> 3	1 <u>1</u> 2					

Answer the following questions in complete sentences:

- a) How many more boxes were unpacked on Friday than Tuesday?
- b) On which day were the most boxes unpacked? The least?

3. Julie is a plumber and makes many house calls. She bills her clients by the hour and records each job in fraction form. Complete the chart below to indicate Julie's hours for the week. The first one has been done for you.

Day of the	Billable hours in	Billable hours in	Lowest	owest Conversions		Total hours	
week	the morning	the afternoon	Denominator	Morning	Afternoon	Afternoon)	
Monday	$1\frac{1}{4}$	2 <u>2</u> 3	12	$\frac{1}{4} = \frac{3}{12} (+1)$	$\frac{2}{3} = \frac{8}{12}(+2)$	$3 + \frac{8+3}{12} = 3\frac{11}{12}$	
Tuesday	$4\frac{3}{4}$	$1\frac{1}{2}$					
Wednesday	3 <u>4</u> 5	$1\frac{1}{3}$					
Thursday	$1\frac{1}{8}$	2 <u>5</u> 6					
Friday	$\frac{1}{2}$	3 <u>4</u> 6					

4. Sonya stacked shelves in a warehouse using a mechanical stacker. Each day, a goal was set in the morning for her to achieve by the end of the day. These goals were set according to what she was stacking. She recorded the amount of shelves she stacked at noon to evaluate her progress. Use Sonya's chart to determine how many more shelves she needs to stack to reach the daily goals. The first one has been done for you.

Day of the	Goal	Noon	Lowest	Conversions		Operation	Amount she needs
week	Obai	Noon	Denominator	Goal	Noon	Operation	reach her goal
Monday	12 <u>3</u>	5 <u>1</u> 5	8: 8, 16, 24, 32, 40 5: 5, 10, 15, 20, 40 40	$\frac{3\times5}{8\times5} = \frac{15}{40}$	$\frac{1\times8}{5\times8} = \frac{8}{40}$	$ \begin{array}{r} 12 \frac{15}{40} \\ \underline{} - 5 \frac{8}{40} \\ 7 \frac{7}{40} \end{array} $	$7\frac{7}{40}$
Tuesday	20 <u>1</u>	10 <u>2</u>					
Wednesday	16 <u>4</u>	9 <u>1</u> 3					
Thursday	22	10 <u>1</u>					
Friday	18 <u>3</u>	11					

5. Terry biked to the west coast and returned using a different route. His trip to the coast took him $12\frac{3}{4}h$ and his return trip was $9\frac{3}{12}h$. How much time did he save on his return trip?

6. Selina loaded boxes of corn onto a truck after school. The boxes were not always full. Selina estimated and recorded the amount in each box, then totaled the amount at the end of her shift. The following chart represents one shift.

	1
TA	

Box	Estimate of Amount
1	$\frac{3}{4}$ full
2	$\frac{2}{3}$ full
3	$\frac{7}{8}$ full
4	$\frac{3}{4}$ full
5	$\frac{5}{6}$ full

Use a variety of strategies, such as LCM and LCD, to total Selina's estimates for her shift.

7. Brad poured $3\frac{7}{8}$ L of oil into his car following an oil and filter change. In two months, he added another $2\frac{4}{5}$ L of oil. How much oil had Brad's car used in the two months?