

Adding and Subtracting: Like Denominators

How to find sums or differences of fractions with like denominators:

Find $\frac{2}{14} + \frac{6}{14}$. The fractions have like denominators, so you can just add the numerators.

$\frac{2}{14} + \frac{6}{14} = \frac{8}{14}$ Write the sum over the common denominator.

$\frac{8}{14} = \frac{4}{7}$ Simplify if possible.

Find $\frac{5}{7} - \frac{2}{7}$. The denominators are the same, so you can subtract the numerators.

$\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$ $\frac{3}{7}$ cannot be simplified, so

$\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$

Find each sum or difference. Simplify your answer.

1. $\frac{1}{6} + \frac{3}{6} = \frac{2}{3}$ _____

2. $\frac{9}{11} - \frac{4}{11} = \frac{5}{11}$ _____

3. $\frac{6}{7} - \frac{2}{7} = \frac{4}{7}$ _____

4. $\frac{3}{12} + \frac{8}{12} = \frac{11}{12}$ _____

5. $\frac{8}{9} - \frac{5}{9} = \frac{1}{3}$ _____

6. $\frac{1}{10} + \frac{8}{10} = \frac{9}{10}$ _____

7. $\frac{4}{15} + \frac{11}{15} = \frac{15}{15}$ or 1 _____

8. $\frac{16}{20} - \frac{9}{20} = \frac{7}{20}$ _____

9. **Number Sense** Give an example of two fractions whose sum can be simplified to $\frac{1}{2}$.

Anything that can be reduced to $\frac{1}{2}$, for example, $\frac{1}{8} + \frac{3}{8}$

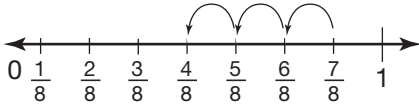
10. A quarter has a diameter of $\frac{15}{16}$ in. A dime has a diameter of $\frac{11}{16}$ in., and a nickel has a diameter of $\frac{13}{16}$ in. If you put each coin side by side, what is the combined width of the three coins?

$\frac{39}{16}$ in., or $2\frac{7}{16}$ in.

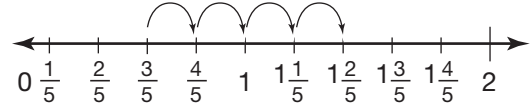
Adding and Subtracting: Like Denominators

Find each sum or difference. Use a number line. Simplify your answers.

1. $\frac{7}{8} - \frac{3}{8}$ $\frac{1}{2}$



2. $\frac{3}{5} + \frac{4}{5}$ $1\frac{2}{5}$



Find each sum or difference. Simplify your answers.

3. $\frac{6}{7} + \frac{1}{7}$ 1

4. $\frac{9}{10} - \frac{4}{10}$ $\frac{1}{2}$

5. $\frac{8}{15} - \frac{5}{15}$ $\frac{1}{5}$

6. $\frac{1}{11} + \frac{3}{11} + \frac{4}{11}$ $\frac{8}{11}$

7. $\frac{1}{6} + \frac{2}{6} + \frac{5}{6}$ $1\frac{1}{3}$

8. $\frac{2}{20} + \frac{5}{20} + \frac{7}{20}$ $\frac{7}{10}$

Evaluate **9** through **11** for $x = \frac{2}{9}$.

9. $\frac{8}{9} + x$ $1\frac{1}{9}$

10. $\frac{5}{9} - x$ $\frac{1}{3}$

11. $(\frac{7}{9} - x) + \frac{1}{9}$ $\frac{2}{3}$

12. Use the table to answer the questions.

a. What is the total amount of seafood in the soup?

$1\frac{3}{4}$ lb

b. How much more shrimp than cod is in the soup?

$\frac{1}{4}$ lb

Seafood for Soup

Cod	$\frac{5}{8}$ lb
Scallops	$\frac{2}{8}$ lb
Shrimp	$\frac{7}{8}$ lb

13. **Critical Thinking** Max has 12 pairs of socks. Of them, 6 pairs are blue, 3 pairs are brown, and 2 pairs are white. Max wants to know what fraction of the socks are blue or brown. How can he find the numerator?

A Add $6 + 3 + 2$.

B Add $6 + 3$.

C Subtract 11 from 12.

D Subtract 9 from 12.

14. **Writing to Explain** Explain how you can add two fractions with denominators of 10 and end up with a sum whose denominator is 5.

Sample answer: By simplifying a sum, such as

$\frac{1}{10} + \frac{5}{10} = \frac{6}{10}$, which simplifies to $\frac{3}{5}$.

Least Common Multiple

There are different ways to find the least common multiple (LCM) of two numbers. Here are two ways of finding the LCM of 4 and 5:

List Multiples

Step 1: List multiples of each number.

4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48...

5: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50...

Step 2: Check the multiples the numbers have in common.

4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48...

5: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50...

Step 3: Determine which of the common multiples is the least.

20 and 40 are both common multiples, but 20 is the least.

The LCM of 4 and 5 is 20.

Use Prime Factors

Step 1: List the prime factors of each number.

4: 2×2

5: 5

Step 2: Circle the greatest number of times each different factor appears.

4: 2×2

5: 5

Step 3: Find the product of the factors you circled.

$2 \times 2 \times 5 = 20$

The LCM of 4 and 5 is 20.

Find the LCM of each set of numbers.

1. 6, 7 **42** _____

2. 4, 5 **20** _____

3. 10, 15 **30** _____

4. 2, 5, 10 **10** _____

5. 6, 21 **42** _____

6. 8, 10 **40** _____

7. 12, 20 **60** _____

8. 5, 10, 25 **50** _____

9. 7, 8 **56** _____

10. **Number Sense** If you know the LCM of 4 and 5, how could you find the LCM of 40 and 50?

Multiply the LCM of 4 and 5 by 10.

11. **Writing to Explain** Peter says the least common multiple of 4, 6, and 12 is 24. Do you agree or disagree? Explain.

Disagree. 24 is a common multiple of 4, 6, and 12, but it is not the least common multiple. The number 12 is.

Least Common Multiple

Find the LCM of each set of numbers.

1. 15, 20 **60** 2. 4, 50 **100** 3. 8, 12 **24**
4. 14, 42 **42** 5. 21, 30 **210** 6. 3, 7, 10 **210**
7. 6, 7, 8 **168** 8. 16, 20 **80** 9. 12, 16 **48**

10. At what times of the day between 10:00 A.M. and 5:00 P.M. do the chemistry presentation and the recycling presentation start at the same time?

10:00 A.M., 12:00 P.M.,

2:00 P.M., 4:00 P.M.

Science Museum	
— Show Schedule —	
Chemistry	— Every 30 minutes
Electricity	— Every 20 minutes
Recycling	— Every 40 minutes
Fossils	— Every 45 minutes
The first showing for all shows is at 10:00 A.M.	

11. The museum does shows in schools every Monday and shows in public libraries every fifth day (on both weekdays and weekends). If the museum did both a school show and a library show on Monday, how many days will it be until it does both shows on the same day again?

35 days

12. Which of the following pairs of numbers is correctly listed with its LCM?

A 5, 15; LCM: 30

B 20, 30; LCM: 60

C 24, 36; LCM: 12

D 7, 9; LCM: 21

13. **Writing to Explain** What method would you use to find the LCM of a group of four numbers? Explain and give an example.

Sample answer: prime factorization;

To find the LCM of 3, 6, 8, and 10,

multiply the greatest number of

times each factor appears in each

prime factorization: $2^3 \times 3 \times 5 = 120$.

Adding and Subtracting: Unlike Denominators

If you are adding or subtracting fractions and the denominators are not the same, the first thing to do is find a common denominator. The best common denominator to use is the least common multiple of the two denominators.

Step 1:

Use the LCM to find a common denominator.

$$\text{Find } \frac{2}{6} + \frac{1}{2}.$$

The LCM of 2 and 6 is 6.
The least common denominator (LCD) is 6.

$$\text{Find } \frac{3}{4} - \frac{1}{3}.$$

The LCD of 3 and 4 is 12.

Step 2:

Write equivalent fractions.

$$\begin{array}{r} \frac{2}{6} = \frac{2}{6} \\ + \frac{1}{2} = + \frac{3}{6} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{3}{4} = \frac{9}{12} \\ - \frac{1}{3} = - \frac{4}{12} \\ \hline \end{array}$$

Step 3:

Add or subtract.
Simplify if possible.

$$\begin{array}{r} \frac{2}{6} = \frac{2}{6} \\ + \frac{1}{2} = + \frac{3}{6} \\ \hline \frac{5}{6} \end{array}$$

$$\begin{array}{r} \frac{3}{4} = \frac{9}{12} \\ - \frac{1}{3} = - \frac{4}{12} \\ \hline \frac{5}{12} \end{array}$$

Find each sum or difference. Simplify your answer.

$$1. \frac{3}{4} + \frac{5}{2} = \underline{\mathbf{3\frac{1}{4}}}$$

$$2. \frac{11}{12} - \frac{1}{3} = \underline{\mathbf{\frac{7}{12}}}$$

$$3. \frac{4}{15} + \frac{4}{5} = \underline{\mathbf{\frac{16}{15}, \text{ or } 1\frac{1}{15}}}$$

$$4. \frac{5}{6} - \frac{4}{9} = \underline{\mathbf{\frac{7}{18}}}$$

$$5. \frac{2}{3} + \frac{7}{10} = \underline{\mathbf{\frac{41}{30}, \text{ or } 1\frac{11}{30}}}$$

$$6. \frac{2}{5} + \frac{2}{3} - \frac{6}{30} = \underline{\mathbf{\frac{13}{15}}}$$

7. **Number Sense** The least common denominator for the sum $\frac{3}{8} + \frac{5}{12}$ is 24. Name another common denominator that you could use.

Sample answers: 48, 72

8. A recipe calls for $\frac{1}{2}$ cup of milk and $\frac{1}{3}$ cup of water. What is the total amount of liquid in the recipe?

$\frac{5}{6}$ C

Adding and Subtracting: Unlike Denominators

Find each sum or difference. Simplify your answer.

1. $\frac{5}{6} + \frac{4}{12} = \underline{1\frac{1}{6}}$

2. $\frac{4}{5} - \frac{1}{10} = \underline{\frac{7}{10}}$

3. $\frac{5}{12} + \frac{2}{3} = \underline{1\frac{1}{12}}$

4. $\frac{9}{20} + \frac{3}{5} = \underline{1\frac{1}{20}}$

5. $\frac{6}{16} - \frac{1}{4} = \underline{\frac{1}{8}}$

6. $\frac{19}{21} - \frac{2}{7} = \underline{\frac{13}{21}}$

7. $\frac{2}{5} + \frac{5}{20} = \underline{\frac{13}{20}}$

8. $\frac{8}{9} - \frac{5}{12} = \underline{\frac{17}{36}}$

9. $\frac{7}{8} + \frac{11}{24} - \frac{5}{6} = \underline{\frac{1}{2}}$

10. **Number Sense** Is $\frac{7}{8}$ or $\frac{11}{10}$ closer to 1? How did you decide?

$\frac{11}{10}$ is closer to 1 because $\frac{1}{10} < \frac{1}{8}$, so $\frac{11}{10}$ is a shorter distance from 1.

Emma has a small garden. Emma's garden is $\frac{1}{5}$ beans, $\frac{1}{8}$ peas, and $\frac{1}{2}$ corn. The rest is planted with flowers.

11. What fraction of Emma's garden is planted with vegetables?

$\frac{33}{40}$ of Emma's garden is planted with vegetables.

12. Are there more flowers or peas in Emma's garden?

There are more flowers, because $\frac{7}{40}$ of the garden is flowers, and only $\frac{5}{40}$ is peas.

13. To solve the subtraction sentence $\frac{17}{10} - \frac{2}{5} = ?$, which common denominator is the best choice?

- A 10
 B 15
 C 20
 D 50

14. **Writing to Explain** To find the sum of $\frac{4}{9}$ and $\frac{7}{12}$, Mario rewrites the fractions as $\frac{8}{36}$ and $\frac{21}{36}$. His answer is $\frac{29}{36}$. Is Mario right? If not, show his error and correct it.

Mario is wrong. $\frac{4}{9}$ should be rewritten as $\frac{16}{36}$.

The correct answer is $\frac{37}{36}$.

Estimating Sums and Differences of Mixed Numbers

You can use rounding to estimate sums and differences of fractions and mixed numbers.

How to round fractions:

If the fractional part is greater than or equal to $\frac{1}{2}$, round up to the next whole number.

Example: Round $3\frac{5}{7}$ to the nearest whole number.

$\frac{5}{7}$ is greater than $\frac{1}{2}$, so $3\frac{5}{7}$ rounds up to 4.

If the fractional part is less than $\frac{1}{2}$, drop the fraction and use the whole number you already have.

Example: Round $6\frac{1}{3}$ to the nearest whole number.

$\frac{1}{3}$ is less than $\frac{1}{2}$, so drop $\frac{1}{3}$ and round down to 6.

How to estimate sums and differences of fractions and mixed numbers:

Round both numbers to the nearest whole number. Then add or subtract.

Example: Estimate $4\frac{1}{8} + 7\frac{2}{3}$.

$4\frac{1}{8}$ rounds down to 4.

$7\frac{2}{3}$ rounds up to 8.

$$4 + 8 = 12$$

So, $4\frac{1}{8} + 7\frac{2}{3}$ is about 12.

Round to the nearest whole number.

1. $8\frac{6}{7}$ **9** _____

2. $14\frac{2}{9}$ **14** _____

3. $42\frac{4}{7}$ **43** _____

4. $6\frac{51}{100}$ **7** _____

5. $29\frac{4}{5}$ **30** _____

6. $88\frac{2}{4}$ **89** _____

7. $19\frac{3}{34}$ **19** _____

8. $63\frac{41}{49}$ **64** _____

Estimate each sum or difference.

9. $7\frac{2}{5} + 8\frac{1}{9}$ **15** _____

10. $13\frac{5}{8} - 2\frac{7}{10}$ **11** _____

11. $2\frac{1}{4} + 5\frac{1}{2} + 10\frac{3}{4}$ **19** _____

12. $11\frac{3}{5} - 4\frac{1}{12}$ **8** _____

13. $8 + 4\frac{11}{14} + 5\frac{1}{9}$ **18** _____

14. $15\frac{6}{7} - 12\frac{2}{10}$ **4** _____

Estimating Sums and Differences of Mixed Numbers

Round to the nearest whole number.

1. $3\frac{4}{9}$ **3** 2. $5\frac{6}{7}$ **6** 3. $2\frac{2}{5}$ **2** 4. $11\frac{12}{15}$ **12**

Estimate each sum or difference.

5. $2\frac{1}{4} + 3\frac{5}{6}$ **6** 6. $5\frac{6}{9} - 1\frac{3}{4}$ **4**
 7. $8\frac{5}{13} + 5\frac{3}{5}$ **14** 8. $11 - 6\frac{3}{7} + 2\frac{2}{5}$ **7**

Rodrigo and Mel are competing in a track meet. The table at the right shows the results of their events.

Participant	Event	Results/Distance
Rodrigo	Long jump	1. $6\frac{3}{8}$ ft 2. $5\frac{5}{6}$ ft
	Softball throw	$62\frac{1}{5}$ ft
Mel	Long jump	1. $4\frac{7}{10}$ ft 2. $4\frac{3}{4}$ ft
	Softball throw	$71\frac{7}{8}$ ft

9. Rodrigo claims his best jump was about 1 ft longer than Mel's best jump. Is he correct?

Yes, the difference is about 1 ft.

10. Use the table above. If the school record for the softball throw is 78 ft, about how much farther must Rodrigo throw the ball to match the record?

A 15 ft **B** 16 ft C 18 ft D 20 ft

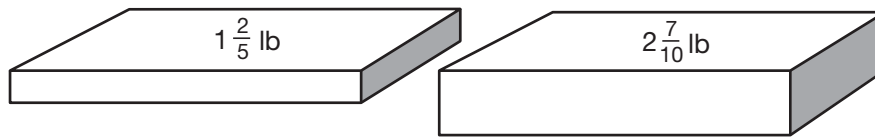
11. **Writing to Explain** Consider the sum of $\frac{3}{5} + \frac{3}{4}$. Round each fraction and estimate the sum. Add the two fractions using a common denominator and then round the result. Which estimate is closest to the actual answer?

$$1 + 1 = 2; \frac{12}{20} + \frac{15}{20} = \frac{27}{20} = 1\frac{7}{20};$$

This rounds to 1; The second estimate is closer to the actual answer.

Adding Mixed Numbers

You can add to find the total weight of these two packages of cheese.



Write the fractions so they both have the same denominator. Add the whole numbers. Add the fractions.

$$\begin{array}{r}
 1\frac{2}{5} = 1\frac{4}{10} \\
 + 2\frac{7}{10} = + 2\frac{7}{10} \\
 \hline
 3\frac{11}{10}
 \end{array}
 = 3 + 1\frac{1}{10} = 4\frac{1}{10}$$

Write the improper fraction as a mixed number. Add the whole numbers. Write the fraction in simplest form.

The total weight of the cheese is $4\frac{1}{10}$ pounds.

Find each sum. Simplify your answer.

$$\begin{array}{r}
 1. \quad 5\frac{2}{3} = 5\frac{4}{6} \\
 + 3\frac{1}{6} = + 3\frac{1}{6} \\
 \hline
 8\frac{5}{6}
 \end{array}$$

$$\begin{array}{r}
 2. \quad 7\frac{4}{5} = 7\frac{16}{20} \\
 + 6\frac{1}{4} = + 6\frac{5}{20} \\
 \hline
 14\frac{1}{20}
 \end{array}$$

$$3. \quad 8\frac{7}{11} + 14\frac{6}{11} = 23\frac{2}{11}$$

$$4. \quad 6\frac{1}{4} + 9\frac{7}{8} = 16\frac{1}{8}$$

$$5. \quad 3\frac{5}{8} + 12\frac{1}{6} = 15\frac{19}{24}$$

$$6. \quad 14 + 13\frac{5}{7} = 27\frac{5}{7}$$

7. On Monday, $3\frac{7}{10}$ inches of snow fell during the day. Another $5\frac{1}{2}$ inches of snow fell that night. What was the total snowfall?

$9\frac{1}{5}$ inches

8. **Writing to Explain** Explain how to rewrite $5\frac{7}{8} + 14\frac{1}{6}$ so the fractions have the same denominator. Find the sum.

Find a common multiple for 8 and 6. One way is to write multiples until you find one that is the same for both numbers: Use 24 as the common denominator; $20\frac{1}{24}$.

Adding Mixed Numbers

Find each sum. Simplify your answer.

1. $5 + 3\frac{1}{6} = \underline{8\frac{1}{6}}$

2. $4\frac{4}{5} + 8\frac{1}{10} = \underline{12\frac{9}{10}}$

3. $1\frac{5}{8} + \frac{15}{16} = \underline{2\frac{9}{16}}$

4. $6\frac{2}{3} + \frac{5}{4} = \underline{7\frac{11}{12}}$

5. $2\frac{7}{8} + 4 = \underline{6\frac{7}{8}}$

6. $7\frac{6}{10} + 1\frac{9}{20} = \underline{9\frac{1}{20}}$

7. $\frac{7}{8} + 3\frac{3}{5} + 2 = \underline{6\frac{19}{40}}$

8. $9 + 3\frac{2}{3} + \frac{5}{6} = \underline{13\frac{1}{2}}$

9. **Number Sense** Give an example of two mixed numbers whose sum is a whole number.

Sample answer: Any two mixed numbers that include halves as fractional parts, such as $6\frac{1}{2} + 2\frac{5}{10}$

10. An ostrich egg is $6\frac{4}{5}$ in. long. A California condor's egg is $4\frac{3}{10}$ in. long, and an albatross egg is $5\frac{7}{10}$ in. long. If the three eggs are placed end to end, what is the total length in inches?

$16\frac{4}{5}$ in.

11. Shanda can travel 10 mi on her electric scooter before she has to recharge the batteries. If it is $4\frac{5}{8}$ mi to the library and $5\frac{2}{5}$ mi to her friend's house, can she make both trips before she needs to recharge the batteries?

No; $4\frac{5}{8} + 5\frac{2}{5} = 10\frac{1}{40}$, which is greater than 10.

12. Which is the fractional portion of the solution to $5\frac{3}{8} + 2\frac{3}{12}$?

A $\frac{6}{12}$

B $\frac{5}{8}$

C $\frac{6}{8}$

D $\frac{15}{8}$

13. **Writing to Explain** Explain the steps to adding mixed numbers. What must you do first?

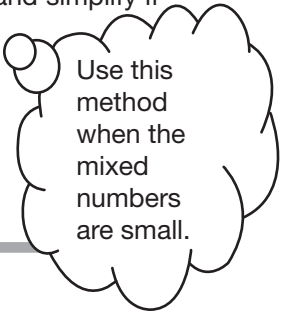
Sample answer:

Find a common denominator, add the whole numbers, add the fractions, and simplify if possible.

Subtracting Mixed Numbers

To subtract mixed numbers, the fractional parts must have the same denominator. Use one of these methods:

Step 1	Step 2	Step 3	Step 4
Find $8\frac{1}{3} - 5\frac{4}{5}$ Estimate: $8 - 6 = 2$	Use the LCD to write equivalent fractions. $8\frac{1}{3} = 8\frac{5}{15}$ $5\frac{4}{5} = 5\frac{12}{15}$	Rename $8\frac{5}{15}$ to show more fifteenths so you can subtract. $8\frac{5}{15}$ $7\frac{5}{15} + \frac{15}{15}$ $7\frac{20}{15}$	Subtract and simplify if possible. $7\frac{20}{15} - 5\frac{12}{15} = 2\frac{8}{15}$
Find $3\frac{1}{2} - 1\frac{5}{8}$ Estimate: $4 - 2 = 2$	Write each mixed number as an improper fraction. $3\frac{1}{2} = \frac{7}{2}$ $1\frac{5}{8} = \frac{13}{8}$	Use the LCD to rewrite the improper fractions with the same denominator. $\frac{7}{2} = \frac{28}{8}$ $\frac{13}{8}$	Subtract and simplify if possible. $\frac{28}{8} - \frac{13}{8} = \frac{15}{8}$ $1\frac{7}{8}$



Use this method when the mixed numbers are small.

Find each difference. Simplify if possible.

- | | | |
|---|--|---|
| 1. $5\frac{9}{10} - 2\frac{3}{5} = \underline{3\frac{3}{10}}$ | 2. $11\frac{7}{16} - 8\frac{3}{8} = \underline{3\frac{1}{16}}$ | 3. $9\frac{2}{3} - 9\frac{1}{6} = \underline{\frac{1}{2}}$ |
| 4. $4\frac{2}{3} - 2 = \underline{2\frac{2}{3}}$ | 5. $4\frac{1}{4} - \frac{7}{12} = \underline{3\frac{2}{3}}$ | 6. $5\frac{6}{7} - 2\frac{13}{14} = \underline{2\frac{13}{14}}$ |
| 7. $6\frac{5}{16} - 3\frac{3}{4} = \underline{2\frac{9}{16}}$ | 8. $8 - 4\frac{7}{10} = \underline{3\frac{3}{10}}$ | 9. $2\frac{1}{5} - \frac{13}{15} = \underline{1\frac{1}{3}}$ |
| 10. $7\frac{7}{8} - 2\frac{3}{4} = \underline{5\frac{1}{8}}$ | 11. $3\frac{1}{3} - 1\frac{7}{9} = \underline{1\frac{5}{9}}$ | 12. $12\frac{3}{8} - 5\frac{1}{8} = \underline{7\frac{1}{4}}$ |
| 13. $7\frac{3}{4} - 2\frac{7}{8} = \underline{4\frac{7}{8}}$ | 14. $3\frac{7}{9} - 1\frac{1}{3} = \underline{2\frac{4}{9}}$ | 15. $12\frac{1}{8} - 5\frac{3}{8} = \underline{6\frac{3}{4}}$ |

16. **Number Sense** How do you know if you need to rename the first number in a subtraction problem involving mixed numbers?

If the fractional part of the first number is less than the fractional part of the second number, you will have to rename the first number to subtract.

Subtracting Mixed Numbers

Find each difference. Simplify if possible.

1. $2\frac{3}{5} - 1\frac{1}{5} = \underline{1\frac{2}{5}}$

2. $1\frac{4}{9} - \frac{8}{9} = \underline{\frac{5}{9}}$

3. $5\frac{5}{8} - 1\frac{9}{16} = \underline{4\frac{1}{16}}$

4. $12 - 4\frac{5}{6} = \underline{7\frac{1}{6}}$

5. $6\frac{15}{16} - 4 = \underline{2\frac{15}{16}}$

6. $3\frac{7}{12} - 2\frac{3}{4} = \underline{\frac{5}{6}}$

7. $9 - 7\frac{5}{8} = \underline{1\frac{3}{8}}$

8. $15\frac{1}{6} - 8\frac{2}{3} = \underline{6\frac{1}{2}}$

9. $6\frac{8}{9} - 1\frac{2}{3} = \underline{5\frac{2}{9}}$

10. $2\frac{3}{7} - 1\frac{5}{14} = \underline{1\frac{1}{14}}$

11. In which of the exercises above do you have to rename the first mixed number to show more fractional parts before subtracting?

Exercises 2, 4, 6, 7, and 8

The table at the right shows the lengths of various carpentry nails.

Carpentry Nails

Size	Length (inches)
5d	$1\frac{3}{4}$
9d	$2\frac{3}{4}$
12d	$3\frac{1}{4}$
30d	$4\frac{1}{2}$

12. How much longer is a 30d nail than a 5d nail?

$2\frac{3}{4}$ in. longer

13. How much longer is a 12d nail than a 9d nail?

$\frac{1}{2}$ in. longer

14. To subtract $4\frac{5}{6}$ from $10\frac{1}{3}$, which of the following must the mixed number $10\frac{1}{3}$ first be renamed as?

A $9\frac{2}{3}$

B $9\frac{4}{6}$

C $9\frac{8}{6}$

D $10\frac{2}{6}$

15. **Writing to Explain** Jack says that once you have a common denominator you are ready to subtract two mixed numbers. What other step might be necessary before you can subtract? Give an example.

Sample answer:

The larger number may need to be renamed.

For example, $3\frac{1}{4} - 1\frac{1}{2} = 3\frac{1}{4} - 1\frac{2}{4} = 2\frac{5}{4} - 1\frac{2}{4}$.

Problem Solving: Make a Table

Mario plans to walk $\frac{3}{4}$ mile today. Tomorrow he will walk $\frac{1}{2}$ mile more, then $\frac{1}{2}$ mile more every day after that. How long will it take before Mario walks 3 miles in one day?

Make a table showing each day and the distance he walks every day.

Day	1	2	3	4	5	6
Distance (mi)	$\frac{3}{4}$	$1\frac{1}{4}$	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}$

Start with the first day's distance.

Add $\frac{1}{2}$ mile for every day

$$3\frac{1}{4} > 3$$

Mario will walk at least 3 miles on Day 6.

Make tables to solve. Write each answer in a complete sentence.

1. The phone company charges 10¢ to connect a call for one minute and 8¢ per minute after that. How long could you talk on the phone for \$1?

With this phone company, you could talk for 12 minutes for \$1.

2. A plumber charges \$30 for a house call and \$20 per $\frac{1}{2}$ hour of work. How much will the plumber charge for $4\frac{1}{2}$ hours of work at Mrs. DiMarco's house?

The plumber would charge \$210.

3. **Geometry** The angles of a triangle have a sum of 180° . The angles of a rectangle have a sum of 360° . The angles of a pentagon have a sum of 540° . Continue this pattern to find the sum of the angles of an octagon.

The sum of the angles of an octagon is 1080° .

4. **Writing to Explain** Write a problem based on the information in the table. Extend the table if necessary.

Day	1	2	3	4	5
Pages Read	23	58	93	128	□

Sample answer: Amy read 23 pages on Day 1 and 35 pages each of the following days. How many pages did she read on Day 5?

Problem Solving:

Make a Table

Make tables to solve. Write each answer in a complete sentence.

1. A train has 3 engines, 52 boxcars, and 1 caboose. At every stop, it picks up 8 more boxcars. How many total cars (engines, cars, and cabooses) will the train have after 5 stops?

The train will have a total of 96 cars after the fifth stop.

2. Eileen likes to keep scrapbooks. She already has 4 scrapbooks filled with 40 pages each. If she fills 5 pages every month, how many months will it take her to fill up 2 more 40-page scrapbooks?

It will take 16 months for Eileen to fill two more scrapbooks.

3. Phil's Garage charges \$50 for towing and \$40 per hour to fix a car. Cliff's Cars charges \$60 for towing and \$38 per hour to fix a car. After how many hours of working on a car will the cost of towing and fixing a car be the same at the two repair shops?

The charges will be the same after 5 hours of working on a car.

4. Dominic got a new video game. The first time he played the game he scored 80 points. After that, each time he played he increased his score by 60 points. How many times will he have to play before he scores 500 points?

He will score 500 points the 8th time he plays the game.

5. A scientist is studying certain germs. She places 3 germs in a special solution that will help the germs grow. The number of germs doubles every hour. How many germs will there be after 8 hours?

A 24

B 384

C 768

D 786

6. **Writing to Explain** Ed saved \$50 one week. For the next 6 weeks, he saved \$25 more than he saved the week before. How much did he save in all? One student solved this problem using the expression $\$50 + 6(\$25) = \$200$. What error was made? What is the correct answer?

The student did not take into account that the amount Ed saved increased every week. The correct answer is that Ed saved a total of \$875.