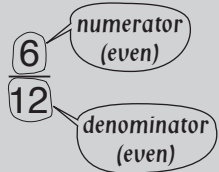


4. [Fraction +,-]

Skill 4.1 Adding fractions with the same denominator (1).

Simplifying a fraction

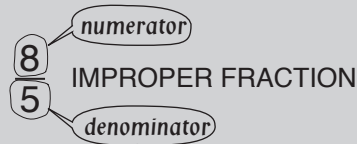
Hint: If the numbers are both even then you can start with dividing by 2.



- Divide both the numerator and the denominator by the same number.

$$\frac{6 \div 2}{12 \div 2} = \frac{3 \div 3}{6 \div 3} = \frac{1}{2}$$

Changing an improper fraction to a mixed number

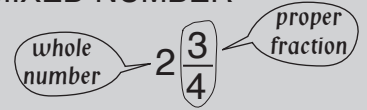


- Divide the numerator by the denominator.
 $\frac{8}{5} = 8 \div 5 = 1 \text{ remainder } 3$
- Write the result as the whole number and the remainder over the denominator.

$$\frac{8}{5} = 8 \div 5 = 1\frac{3}{5}$$

Changing a mixed number to an improper fraction

MIXED NUMBER



- Multiply the whole number by the denominator and then add the result to the numerator.

$$2\frac{3}{4} \quad 2 \times 4 + 3 = 11$$

- Rewrite the total over the denominator.

$$2\frac{3}{4} = \frac{11}{4}$$

- Add the numerators (top numbers of the fractions).
- Don't change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary.

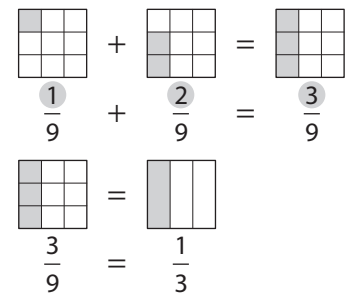
Q. $\frac{1}{9} + \frac{2}{9} =$

A. $\frac{1}{9} + \frac{2}{9} =$ *Add the top numbers only*

$$= \frac{1+2}{9} =$$

$$= \frac{3 \div 3}{9 \div 3}$$
 Simplify

$$= \frac{1}{3}$$



a) $\frac{3}{8} + \frac{2}{8} =$ *Add the top numbers only*

$$= \frac{3+2}{8} = \boxed{\frac{5}{8}}$$

b) $\frac{1}{6} + \frac{4}{6} =$

$$= \dots = \boxed{\dots}$$

c) $\frac{4}{9} + \frac{4}{9} =$

$$= \dots = \boxed{\dots}$$

d) $\frac{3}{11} + \frac{4}{11} =$

$$= \dots = \boxed{\dots}$$

e) $\frac{2}{9} + \frac{5}{9} =$

$$= \dots = \boxed{\dots}$$

f) $\frac{7}{13} + \frac{5}{13} =$

$$= \dots = \boxed{\dots}$$

Skill 4.1 Adding fractions with the same denominator (2).

$$\begin{aligned} \text{g) } \frac{5}{7} + \frac{6}{7} &= \\ &= \frac{11}{7} \quad \text{Change to mixed number} \\ &= 11 \div 7 = \boxed{1\frac{4}{7}} \end{aligned}$$

$$\begin{aligned} \text{h) } \frac{4}{5} + \frac{4}{5} &= \\ &= \frac{8}{5} \\ &= 8 \div 5 = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{i) } \frac{5}{9} + \frac{8}{9} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{j) } \frac{6}{11} + \frac{7}{11} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{k) } \frac{11}{17} + \frac{10}{17} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{l) } \frac{13}{15} + \frac{6}{15} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{m) } \frac{1}{6} + \frac{1}{6} &= \\ &= \frac{2}{6} \quad \text{Simplify} \\ &= \frac{2 \div 2}{6 \div 2} = \boxed{\frac{1}{3}} \end{aligned}$$

$$\begin{aligned} \text{n) } \frac{2}{10} + \frac{3}{10} &= \\ &= \frac{5}{10} = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{o) } \frac{1}{8} + \frac{5}{8} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{p) } \frac{5}{12} + \frac{4}{12} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{q) } \frac{4}{15} + \frac{6}{15} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{r) } \frac{3}{10} + \frac{1}{10} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{s) } \frac{3}{4} + \frac{3}{4} &= \\ &= \frac{6}{4} = 1\frac{2}{4} \quad \text{Simplify} \\ &= \frac{6 \div 2}{4 \div 2} = \boxed{1\frac{1}{2}} \end{aligned}$$

$$\begin{aligned} \text{t) } \frac{7}{8} + \frac{1}{8} &= \\ &= \frac{8}{8} = \frac{1}{1} = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{u) } \frac{5}{6} + \frac{5}{6} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{v) } \frac{11}{10} + \frac{9}{10} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{w) } \frac{7}{12} + \frac{7}{12} &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{x) } \frac{11}{15} + \frac{7}{15} &= \\ &= = \boxed{} \end{aligned}$$

- Subtract the numerators (top numbers of the fractions).
- Don't change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary.
(see skill 4.1, page 29)

Q. $\frac{5}{6} - \frac{1}{6} =$

A. $\frac{5}{6} - \frac{1}{6} =$ *Subtract the top numbers only*

$= \frac{5-1}{6} =$

$= \frac{4}{6}$ *Simplify*

$= \frac{2}{3}$

a) $\frac{4}{5} - \frac{2}{5} =$ *Subtract the top numbers only*

$= \frac{4-2}{5} =$

b) $\frac{7}{8} - \frac{4}{8} =$

$=$

c) $\frac{8}{9} - \frac{4}{9} =$

$=$

d) $\frac{17}{9} - \frac{4}{9} =$

$= \frac{13}{9}$ *Change to mixed number*

$= 13 \div 9 =$

e) $\frac{19}{10} - \frac{2}{10} =$

$=$

f) $\frac{18}{7} - \frac{2}{7} =$

$=$

g) $\frac{8}{9} - \frac{2}{9} =$ *Simplify*

$= \frac{6}{9} =$

h) $\frac{7}{12} - \frac{5}{12} =$

$=$

i) $\frac{5}{8} - \frac{1}{8} =$

$=$

j) $\frac{11}{18} - \frac{5}{18} =$

$=$

k) $\frac{13}{15} - \frac{10}{15} =$

$=$

l) $\frac{11}{16} - \frac{7}{16} =$

$=$

m) $\frac{17}{5} - \frac{2}{5} =$

$= \frac{15}{5} = \frac{3}{1} =$

n) $\frac{15}{8} - \frac{5}{8} =$

$=$

o) $\frac{19}{12} - \frac{5}{12} =$

$=$

- Add the whole numbers first.
- Add the numerators (top numbers of the fractions).
- Don't change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary.
 (see skill 4.1, page 29)

Q. $1\frac{4}{5} + 1\frac{4}{5} =$

A. $1 + 1 + \frac{4}{5} + \frac{4}{5} =$ *Add the top numbers only*

$= 2 + \frac{8}{5}$ *Change to mixed number*

$= 2 + 1\frac{3}{5}$ *Add the whole numbers*

$= 3\frac{3}{5}$

a) $2\frac{4}{7} + 3\frac{2}{7} =$ *Add the whole numbers*

$= 5 + \frac{6}{7} = \boxed{5\frac{6}{7}}$

b) $2\frac{4}{9} + 1\frac{4}{9} =$

$= \dots = \boxed{}$

c) $1\frac{3}{11} + 4\frac{7}{11} =$

$= \dots = \boxed{}$

d) $1\frac{1}{6} + 1\frac{5}{6} =$

$= 2 + \frac{6}{6}$

$= 2 + 1 = \boxed{}$

e) $2\frac{7}{10} + 3\frac{1}{10} =$

$= 5 + \frac{8}{10}$

$= \dots = \boxed{}$

f) $2\frac{5}{12} + 1\frac{4}{12} =$

$= \dots = \boxed{}$

g) $2\frac{5}{7} + 1\frac{3}{7} =$

$= 3 + \frac{8}{7}$ *Change to mixed number*

$= 3 + 1\frac{1}{7} = \boxed{}$

h) $2\frac{4}{9} + 2\frac{7}{9} =$

$= \dots = \boxed{}$

i) $3\frac{9}{10} + 5\frac{8}{10} =$

$= \dots = \boxed{}$

j) $1\frac{3}{8} + 2\frac{7}{8} =$

$= 3 + \frac{10}{8}$

$= 3 + 1\frac{2}{8}$ *Simplify*

$= 3 + 1\frac{1}{4} = \boxed{4\frac{1}{4}}$

k) $2\frac{5}{6} + 3\frac{5}{6} =$

$= \dots = \boxed{}$

l) $3\frac{5}{12} + 2\frac{10}{12} =$

$= \dots = \boxed{}$

Skill 4.4 Subtracting mixed numbers with the same denominator (1).

- Change mixed numbers to improper fractions before subtracting. (see skill 4.1, page 29)
- Subtract the numerators.
- Don't change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 29)

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

A. $3\frac{3}{8} - 1\frac{5}{8} =$ *Change to improper fractions*

$$= \frac{27}{8} - \frac{13}{8}$$

Subtract the top numbers only

$$= \frac{14}{8}$$

Change to mixed number

$$= 1\frac{6}{8}$$

Simplify

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

$3\frac{3}{8} = \frac{3 \times 8 + 3}{8} = \frac{27}{8}$

$1\frac{5}{8} = \frac{1 \times 8 + 5}{8} = \frac{13}{8}$

a) $3\frac{1}{5} - 1\frac{4}{5} =$

Subtract the top numbers only

$$= \frac{16}{5} - \frac{9}{5}$$

$$= \frac{7}{5} = \boxed{1\frac{2}{5}}$$

b) $5\frac{5}{7} - 2\frac{6}{7} =$

$$=$$

$$=$$

$$= \boxed{}$$

c) $4\frac{3}{11} - 2\frac{9}{11} =$

$$=$$

$$=$$

$$= \boxed{}$$

d) $4\frac{7}{8} - 1\frac{5}{8} =$

$$= \frac{39}{8} - \frac{13}{8}$$

Change to mixed number

$$= \frac{26}{8}$$

$$= 3\frac{2}{8} = \boxed{3\frac{1}{4}}$$

e) $4\frac{9}{12} - 2\frac{5}{12} =$

$$=$$

$$=$$

$$= \boxed{}$$

f) $5\frac{7}{9} - 3\frac{1}{9} =$

$$=$$

$$=$$

$$= \boxed{}$$

g) $4\frac{2}{9} - 2\frac{5}{9} =$

$$= \frac{38}{9} - \frac{23}{9}$$

$$= \frac{15}{9}$$

$$= 1\frac{6}{9} = \boxed{}$$

h) $3\frac{3}{8} - 1\frac{7}{8} =$

$$=$$

$$=$$

$$= \boxed{}$$

i) $4\frac{3}{10} - 2\frac{7}{10} =$

$$=$$

$$=$$

$$= \boxed{}$$

Skill 4.4 Subtracting mixed numbers with the same denominator (2).

- Subtract the whole numbers first.
- Subtract the numerators.
- Don't change the denominators.
- Simplify the resulting fraction if necessary. (see skill 4.1, page 29)

Hint: For subtractions you may need to convert 1 to an equivalent fraction.

Example: 1 (whole circle) = $\frac{3}{3}$ = $\frac{5}{5}$ (numerator = denominator)

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

A. $3\frac{3}{8} - 1\frac{5}{8} =$
 $= 2 + \frac{3}{8} - \frac{5}{8}$
 $= 1 + 1 + \frac{3}{8} - \frac{5}{8}$
 $= 1 + \frac{8}{8} + \frac{3}{8} - \frac{5}{8}$
 $= 1 + \frac{11}{8} - \frac{5}{8}$
 $= 1 + \frac{6}{8+2}$
 $= 1 + \frac{3}{4} = 1\frac{3}{4}$

$3 - 1 = 2$ and $\frac{3}{8} - \frac{5}{8} = ?$

$\frac{5}{8}$ can not be subtracted from $\frac{3}{8}$ and give a positive answer, so borrow a 1 from the 2.

$1 = \frac{8}{8}$ (see hint)

$\frac{8}{8} + \frac{3}{8} = \frac{8+3}{8} = \frac{11}{8}$

$\frac{11}{8} - \frac{5}{8} = \frac{11-5}{8} = \frac{6}{8}$

Simplify.

j) $5\frac{7}{8} - 3\frac{1}{8} =$
 $= 2 + \frac{7}{8} - \frac{1}{8}$
 $= 2 + \frac{6}{8+2}$
 $= 2 + \frac{3}{4} = 2\frac{3}{4}$

k) $4\frac{11}{12} - 1\frac{1}{12} =$
 $=$
 $=$
 $=$ =

l) $3\frac{11}{15} - 1\frac{2}{15} =$
 $=$
 $=$
 $=$ =

m) $5\frac{1}{4} - 3\frac{3}{4} =$
 $= 2 + \frac{1}{4} - \frac{3}{4}$
 $= 1 + 1 + \frac{1}{4} - \frac{3}{4}$
 $= 1 + \frac{4}{4} + \frac{1}{4} - \frac{3}{4}$
 $= 1 + \frac{2}{4+2}$
 $= 1 + \frac{1}{2} =$

n) $3\frac{1}{3} - 1\frac{2}{3} =$
 $=$
 $=$
 $=$
 $=$
 $=$ =

o) $3\frac{1}{15} - 1\frac{6}{15} =$
 $=$
 $=$
 $=$
 $=$
 $=$ =

Skill 4.5 Subtracting a fraction or a mixed number from a whole number (1).

EITHER

- Change the mixed number to an improper fraction before subtracting.
(see skill 4.1, page 29)
- Write the whole number as an improper fraction with the same denominator as the mixed number.
- Subtract the numerators.
- Don't change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary.
(see skill 4.1, page 29)

OR

- Subtract the whole numbers first.
- Borrow 1 from the whole number and write it as a fraction with the same denominator.
- Subtract the numerators.
- Don't change the denominators.

Q. $3 - 1\frac{2}{9} =$

A. $3 - 1\frac{2}{9} =$
 $= \frac{3}{1} - \frac{11}{9} =$
 $= \frac{27}{9} - \frac{11}{9} =$
 $= \frac{16}{9} =$
 $= 1\frac{7}{9}$

3 can be written as: $\frac{3}{1}$

$\frac{3}{1} = \frac{27}{9}$ and $1\frac{2}{9} = \frac{1 \times 9 + 2}{9} = \frac{11}{9}$

$\frac{27}{9} - \frac{11}{9} =$
 $= \frac{16}{9} = 1\frac{7}{9}$

OR

A. $2 - \frac{2}{9} =$ $3 - 1 = 2$
 $= 1 + 1 - \frac{2}{9}$ $2 = 1 + 1$
 $= 1 + \frac{9}{9} - \frac{2}{9}$ $1 = \frac{9}{9}$
 $= 1 + \frac{7}{9}$ $\frac{9}{9} - \frac{2}{9} = \frac{7}{9}$
 $= 1\frac{7}{9}$

a) $2 - \frac{2}{7} =$
 $= \frac{2}{1} - \frac{2}{7}$
 $= \frac{14}{7} - \frac{2}{7}$ Subtract the top numbers only
 $= \frac{12}{7} =$ $1\frac{5}{7}$

b) $3 - \frac{4}{9} =$
 $=$
 $=$
 $=$
 $=$ $\frac{\quad}{\quad}$

c) $2 - \frac{3}{7} =$
 $=$
 $=$
 $=$
 $=$ $\frac{\quad}{\quad}$

d) $2 - \frac{6}{13} =$
 $=$
 $=$
 $=$ $\frac{\quad}{\quad}$

e) $6 - \frac{5}{8} =$
 $=$
 $=$
 $=$ $\frac{\quad}{\quad}$

f) $4 - \frac{5}{12} =$
 $=$
 $=$
 $=$ $\frac{\quad}{\quad}$

Skill 4.5

Subtracting a fraction or a mixed number from a whole number (2)

MMMaive 1 1 2 2 3 3 4 4
MMLime 1 1 2 2 3 3 4 4

$$\begin{aligned} \text{g) } 4 - 2\frac{1}{6} &= \\ &= \frac{4}{1} - \frac{13}{6} \\ &= \frac{24}{6} - \frac{13}{6} \\ &= \frac{11}{6} = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{h) } 5 - 1\frac{3}{7} &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{i) } 7 - 3\frac{5}{8} &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{j) } 5 - \frac{2}{3} &= \\ &= 4 + 1 - \frac{2}{3} \\ &= 4 + \frac{3}{3} - \frac{2}{3} \\ &= 4 + \frac{1}{3} = \boxed{4\frac{1}{3}} \end{aligned}$$

$$\begin{aligned} \text{k) } 2 - \frac{3}{4} &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{l) } 6 - \frac{4}{7} &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{m) } 4 - \frac{1}{2} &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{n) } 3 - \frac{7}{8} &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{o) } 5 - \frac{7}{10} &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{p) } 3 - 1\frac{3}{5} &= \\ &= 2 - \frac{3}{5} \\ &= 1 + 1 - \frac{3}{5} \\ &= 1 + \frac{5}{5} - \frac{3}{5} \\ &= 1 + \frac{2}{5} = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{q) } 5 - 3\frac{3}{8} &= \\ &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

$$\begin{aligned} \text{r) } 4 - 1\frac{5}{6} &= \\ &= \\ &= \\ &= \\ &= = \boxed{} \end{aligned}$$

Skill 4.6 Adding fractions with different denominators - one denominator divides evenly into the other denominator (1).

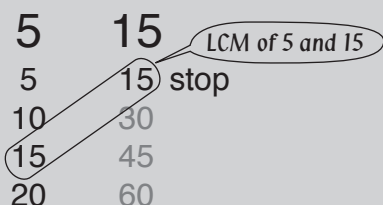
Least Common Multiple (LCM) of two numbers

- Write in ascending order some multiples of the smaller number first.
- Write in ascending order some multiples of the bigger number and stop when you find a multiple that appears in the first list \Rightarrow least common multiple (LCM).

Hint: The Least Common Multiple is the smallest number that the two numbers divide into.

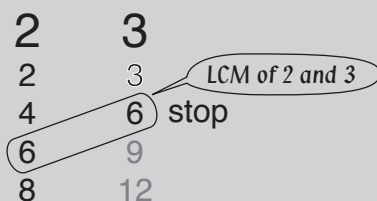
Examples:

One number divides evenly into the other number



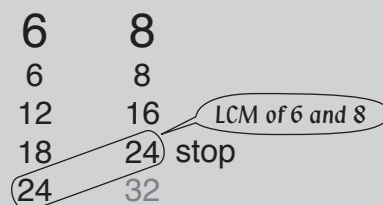
Hint: LCM is the largest number.

GCF of the numbers is 1



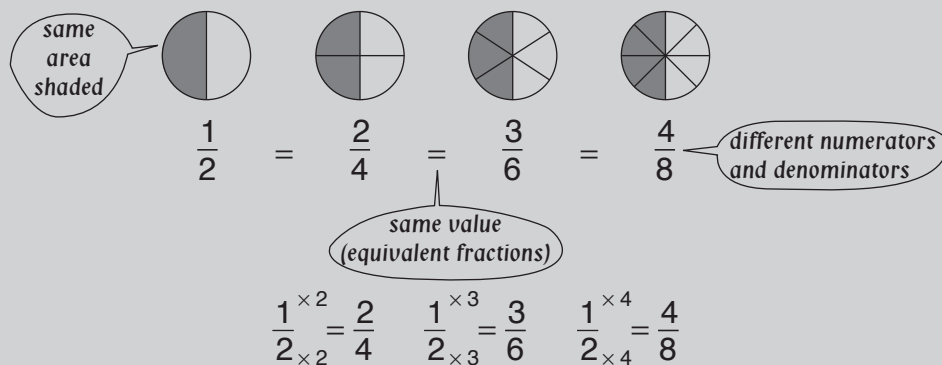
Hint: LCM is the product of the numbers.

Numbers have common factors $\neq 1$



Hint: LCM is the smallest number that they both divide into.

Equivalent Fractions



Equivalent fractions have the same value.

Equivalent fractions are formed by multiplying the numerator and denominator by the same number.

- Find the lowest common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. In this case the LCM is the largest denominator.
- Change the fractions to equivalent fractions with the least common denominator.
- Add the fractions with the same denominators. (see skill 4.1, page 29)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 29)

Example: $\frac{1}{4} + \frac{1}{12} = \frac{3}{12} + \frac{1}{12} = \frac{4}{12} = \frac{1}{3}$ (LCM of 4 and 12 is 12)

Hint: If unsure which is the LCM of the denominators, use their product as the common denominator.

Skill 4.6

Adding fractions with different denominators - one denominator divides evenly into the other denominator (2).

Q. $\frac{1}{4} + \frac{3}{8} =$

A. $\frac{1}{4} + \frac{3}{8} =$ *LCM of 4 and 8 is 8*
 $= \frac{1 \times 2}{4 \times 2} + \frac{3}{8}$ *because $8 \div 4 = 2$*
 $= \frac{2+3}{8}$ *Add the top numbers only*
 $= \frac{5}{8}$

OR

A. $\frac{1}{4} + \frac{3}{8} =$ *Use $4 \times 8 = 32$ as the common denominator*
 $= \frac{1 \times 8}{4 \times 8} + \frac{3 \times 4}{8 \times 4}$ *because $32 \div 4 = 8$*
 $= \frac{8+12}{32}$ *because $32 \div 8 = 4$*
 $= \frac{20}{32 \div 4}$ *Simplify*
 $= \frac{5}{8}$

a) $\frac{7}{10} + \frac{3}{20} =$ *LCM of 10 and 20 is 20*
 $= \frac{7 \times 2}{10 \times 2} + \frac{3}{20}$
 $= \frac{14+3}{20} =$

b) $\frac{2}{7} + \frac{2}{21} =$
 $=$
 $=$

c) $\frac{1}{6} + \frac{5}{12} =$
 $=$
 $=$

d) $\frac{1}{5} + \frac{3}{10} =$ *LCM of 5 and 10 is 10*
 $= \frac{1 \times 2}{5 \times 2} + \frac{3}{10}$
 $= \frac{2+3}{10}$ *Add the top numbers only*
 $= \frac{5}{10 \div 5} =$

e) $\frac{2}{3} + \frac{5}{6} =$
 $=$
 $=$

f) $\frac{5}{8} + \frac{1}{2} =$
 $=$
 $=$

g) $\frac{3}{4} + \frac{5}{8} =$
 $=$
 $=$
 $=$

h) $\frac{4}{5} + \frac{7}{10} =$
 $=$
 $=$

i) $\frac{1}{5} + \frac{1}{20} =$
 $=$
 $=$

j) $\frac{3}{4} + \frac{11}{12} =$
 $=$
 $=$
 $=$

k) $\frac{3}{10} + \frac{3}{50} =$
 $=$
 $=$

l) $\frac{2}{3} + \frac{1}{12} =$
 $=$
 $=$

- Find the least common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. In this case the LCM is the product of the denominators. (see skill 4.6, page 37)
- Change the fractions to equivalent fractions with the least common denominator.
- Add the fractions with the same denominators. (see skill 4.1, page 29)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 29)

Q. $\frac{1}{2} + \frac{1}{3} =$

A. $\frac{1}{2} + \frac{1}{3} =$ *LCM of 2 and 3 is 6*

because $6 \div 2 = 3$ because $6 \div 3 = 2$

Multiply the numerator and denominator by 3 $= \frac{1 \times 3}{2 \times 3} + \frac{1 \times 2}{3 \times 2}$ *Multiply the numerator and denominator by 2*

$= \frac{3+2}{6}$ *Add the top numbers only*

$= \frac{5}{6}$

a) $\frac{2}{5} + \frac{1}{8} =$ *LCM of 5 and 8 is 40*

$=$

$=$

$=$

b) $\frac{1}{3} + \frac{3}{10} =$

$=$

$=$

$=$

c) $\frac{2}{3} + \frac{1}{11} =$

$=$

$=$

$=$

d) $\frac{1}{3} + \frac{3}{4} =$ *LCM of 3 and 4 is 12*

$= \frac{1 \times 4}{3 \times 4} + \frac{3 \times 3}{4 \times 3}$

$= \frac{4+9}{12}$ *Add the top numbers only*

$= \frac{13}{12} =$

e) $\frac{2}{3} + \frac{2}{5} =$

$=$

$=$

$=$

f) $\frac{3}{4} + \frac{3}{5} =$

$=$

$=$

$=$

g) $\frac{4}{5} + \frac{1}{2} =$

$=$

$=$

$=$

h) $\frac{4}{7} + \frac{1}{2} =$

$=$

$=$

$=$

i) $\frac{1}{3} + \frac{7}{8} =$

$=$

$=$

$=$

- Find the least common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. (see skill 4.6, page 37)
- Change the fractions to equivalent fractions with the least common denominator.
- Add the fractions with the same denominators. (see skill 4.1, page 29)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 29)

Hint: If unsure which is the LCM of the denominators, use their product as the common denominator.

Q. $\frac{1}{4} + \frac{1}{6} =$

A. $\frac{1}{4} + \frac{1}{6} =$ *LCM of 4 and 6 is 12*

$$= \frac{1 \times 3}{4 \times 3} + \frac{1 \times 2}{6 \times 2} \quad \begin{matrix} \text{because } 12 \div 4 = 3 \\ \text{because } 12 \div 6 = 2 \end{matrix}$$

$$= \frac{3+2}{12} = \frac{5}{12}$$

OR

A. $\frac{1}{4} + \frac{1}{6} =$ *Use $4 \times 6 = 24$ as the common denominator*

$$= \frac{1 \times 6}{4 \times 6} + \frac{1 \times 4}{6 \times 4} \quad \begin{matrix} \text{because } 24 \div 4 = 6 \\ \text{because } 24 \div 6 = 4 \end{matrix}$$

$$= \frac{6+4}{24} = \frac{10}{24} \quad \text{Simplify}$$

$$= \frac{5}{12}$$

a) $\frac{5}{6} + \frac{1}{8} =$ *LCM of 6 and 8 is 24*

$$= \frac{5 \times 4}{6 \times 4} + \frac{1 \times 3}{8 \times 3}$$

Add the top numbers only

$$= \frac{20+3}{24} = \boxed{\frac{23}{24}}$$

b) $\frac{1}{4} + \frac{3}{10} =$

$$=$$

$$= \boxed{}$$

c) $\frac{1}{6} + \frac{1}{15} =$

$$=$$

$$= \boxed{}$$

d) $\frac{1}{12} + \frac{2}{9} =$

$$=$$

$$= \boxed{}$$

e) $\frac{1}{10} + \frac{2}{25} =$ *LCM of 10 and 25 is 50*

$$=$$

$$= \boxed{}$$

f) $\frac{3}{10} + \frac{4}{15} =$

$$=$$

$$= \boxed{}$$

g) $\frac{3}{10} + \frac{5}{6} =$

$$=$$

$$= \boxed{}$$

h) $\frac{3}{4} + \frac{5}{6} =$

$$=$$

$$= \boxed{}$$

i) $\frac{3}{8} + \frac{7}{10} =$

$$=$$

$$= \boxed{}$$

- Find the least common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. In this case the LCM is the product of the denominators. (see skill 4.6, page 37)
- Change the fractions to equivalent fractions with the least common denominator.
- Subtract the fractions with the same denominators. (see skill 4.2, page 31)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 29)

Q. $\frac{1}{3} - \frac{1}{5} =$

A. $\frac{1}{3} - \frac{1}{5} =$ LCM of 3 and 5 is 15

because $15 \div 3 = 5$ because $15 \div 5 = 3$

$\frac{1 \times 5 = 5}{3 \times 5} - \frac{1 \times 3 = 3}{5 \times 3}$ Multiply the numerator and denominator by 3

$= \frac{5-3}{15}$ Subtract the top numbers only

$= \frac{2}{15}$

a) $\frac{3}{8} - \frac{1}{5} =$ LCM of 8 and 5 is 40

$= \frac{3 \times 5}{8 \times 5} - \frac{1 \times 8}{5 \times 8}$

$= \frac{15-8}{40} = \boxed{\frac{7}{40}}$

b) $\frac{3}{5} - \frac{1}{2} =$

$=$

$=$ $=$

c) $\frac{3}{5} - \frac{1}{6} =$

$=$

$=$ $=$

d) $\frac{2}{3} - \frac{5}{8} =$

$=$

$=$ $=$

e) $\frac{2}{3} - \frac{1}{4} =$

$=$

$=$ $=$

f) $\frac{7}{9} - \frac{1}{2} =$

$=$

$=$ $=$

g) $\frac{2}{5} - \frac{2}{7} =$

$=$

$=$ $=$

h) $\frac{6}{7} - \frac{1}{2} =$ LCM of 7 and 2 is 14

$=$

$=$ $=$

i) $\frac{2}{5} - \frac{1}{4} =$

$=$

$=$ $=$

j) $\frac{4}{7} - \frac{3}{8} =$

$=$

$=$ $=$

k) $\frac{7}{10} - \frac{2}{3} =$

$=$

$=$ $=$

l) $\frac{9}{11} - \frac{2}{3} =$

$=$

$=$ $=$

- Find the least common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. (see skill 4.6, page 37)
- Change the fractions to equivalent fractions with the least common denominator.
- Subtract the fractions with the same denominators. (see skill 4.2, page 31)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 29)

Hint: If unsure which is the LCM of the denominators, use their product as the common denominator.

<p>Q. $\frac{3}{8} - \frac{1}{6} =$</p>	<p>A. $\frac{3}{8} - \frac{1}{6} =$ LCM of 8 and 6 is 24</p> $= \frac{3 \times 3}{8 \times 3} - \frac{1 \times 4}{6 \times 4}$ <p style="text-align: center;">because $24 \div 8 = 3$ and $24 \div 6 = 4$</p> $= \frac{9-4}{24}$ $= \frac{5}{24}$	<p>OR A. $\frac{3}{8} - \frac{1}{6} =$ Use $8 \times 6 = 48$ as the common denominator</p> $= \frac{3 \times 6}{8 \times 6} - \frac{1 \times 8}{6 \times 8}$ <p style="text-align: center;">because $48 \div 8 = 6$ and $48 \div 6 = 8$</p> $= \frac{18-8}{48}$ <p style="text-align: center;">Simplify</p> $= \frac{10 \div 2}{48 \div 2}$ $= \frac{5}{24}$
---	---	---

a) $\frac{9}{10} - \frac{3}{4} =$ LCM of 10 and 4 is 20

$$= \frac{9 \times 2}{10 \times 2} - \frac{3 \times 5}{4 \times 5}$$

Subtract the top numbers only

$$= \frac{18-15}{20} = \boxed{\frac{3}{20}}$$

b) $\frac{3}{8} - \frac{1}{10} =$

$=$

.....

$=$ $=$

.....

c) $\frac{3}{10} - \frac{4}{15} =$

$=$

.....

$=$ $=$

.....

d) $\frac{4}{9} - \frac{5}{12} =$

$=$

.....

$=$ $=$

.....

e) $\frac{3}{8} - \frac{1}{12} =$ LCM of 8 and 12 is 24

$=$

.....

$=$ $=$

.....

f) $\frac{5}{9} - \frac{4}{15} =$

$=$

.....

$=$ $=$

.....

g) $\frac{4}{15} - \frac{1}{6} =$

$=$

.....

$=$

.....

$=$ $=$

.....

h) $\frac{3}{10} - \frac{5}{25} =$

$=$

.....

$=$

.....

$=$ $=$

.....

i) $\frac{3}{10} - \frac{1}{6} =$

$=$

.....

$=$

.....

$=$ $=$

.....

- Find the least common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. (see skills 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, pages 37 to 43)
- Change the fractions to equivalent fractions with the least common denominator.
- Add and/or subtract the fractions with the same denominators. (see skills 4.1, page 29 and 4.2, page 31)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 29)

Q. $\frac{3}{5} - \frac{1}{4} + \frac{3}{20} =$

A. $\frac{3}{5} - \frac{1}{4} + \frac{3}{20} =$
 $= \frac{3 \times 4}{5 \times 4} - \frac{1 \times 5}{4 \times 5} + \frac{3}{20}$
 $= \frac{12 - 5 + 3}{20}$
 $= \frac{10 \div 10}{20 \div 10}$
 $= \frac{1}{2}$

20 is the least common denominator.
 5 divides into 20 four times. Multiply the numerator and denominator of $\frac{3}{5}$ by 4.
 4 divides into 20 five times. Multiply the numerator and denominator of $\frac{1}{4}$ by 5.
 20 divides into 20 once. Leave $\frac{3}{20}$ unchanged.

a) $\frac{1}{2} + \frac{3}{8} - \frac{1}{4} =$ LCM of 2, 8 and 4 is 8
 $= \frac{1 \times 4}{2 \times 4} + \frac{3}{8} - \frac{1 \times 2}{4 \times 2}$ Add and subtract numerators only
 $= \frac{4 + 3 - 2}{8} = \boxed{\frac{5}{8}}$

b) $\frac{1}{8} + \frac{7}{16} - \frac{1}{2} =$
 $=$
 $=$

c) $\frac{5}{6} - \frac{1}{2} + \frac{1}{12} =$
 $=$
 $=$

d) $\frac{1}{2} + \frac{1}{3} - \frac{3}{5} =$ LCM of 2, 3 and 5 is 30
 $=$
 $=$

e) $\frac{3}{5} - \frac{1}{2} + \frac{1}{9} =$
 $=$
 $=$

f) $\frac{2}{3} + \frac{1}{2} - \frac{6}{7} =$
 $=$
 $=$

g) $\frac{7}{11} + \frac{5}{22} - \frac{1}{2} =$
 $=$
 $=$
 $=$

h) $\frac{7}{10} - \frac{2}{5} + \frac{1}{2} =$
 $=$
 $=$
 $=$

i) $\frac{6}{7} - \frac{1}{2} - \frac{1}{14} =$
 $=$
 $=$
 $=$

Skill 4.13 Adding or subtracting mixed numbers with different denominators.

- Add or subtract the whole numbers first.
- Add or subtract the fractions by finding the common denominator. (see skills 4.6 to 4.11, pages 39 to 43)

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

A. $1 + 1 = 2$

Add whole numbers.

$$\begin{aligned} & \frac{1}{5} + \frac{2}{3} \\ &= \frac{1 \times 3}{5 \times 3} + \frac{2 \times 5}{3 \times 5} \\ &= \frac{3 + 10}{15} \end{aligned}$$

15 is the lowest common denominator.
5 divides into 15 three times.
Multiply the numerator and denominator of $\frac{1}{5}$ by 3.

3 divides into 15 five times.
Multiply the numerator and denominator of $\frac{2}{3}$ by 5.

$$\begin{aligned} &= \frac{13}{15} \\ &= 2 + \frac{13}{15} = 2\frac{13}{15} \end{aligned}$$

a) $1\frac{1}{6} + 2\frac{2}{9} = 3 + \dots$ *(Add whole numbers)*

$\frac{1}{6} + \frac{2}{9}$ *(LCM of 6 and 9 is 18)*

$$= \frac{1 \times 3}{6 \times 3} + \frac{2 \times 2}{9 \times 2} = \frac{3 + 4}{18} = \frac{7}{18}$$

$$\Rightarrow 3 + \frac{7}{18} = \boxed{3\frac{7}{18}}$$

b) $2\frac{3}{4} + 2\frac{3}{10} =$

$$\begin{aligned} &= \dots \\ &= \dots \\ &= \dots = \dots = \boxed{} \end{aligned}$$

c) $1\frac{3}{8} + 1\frac{1}{10} =$

$$\begin{aligned} &= \dots \\ &= \dots \\ &= \dots = \dots = \boxed{} \end{aligned}$$

d) $1\frac{1}{2} + 1\frac{1}{3} =$

$$\begin{aligned} &= \dots \\ &= \dots \\ &= \dots = \dots = \boxed{} \end{aligned}$$

e) $1\frac{2}{5} + 1\frac{1}{2} =$

$$\begin{aligned} &= \dots \\ &= \dots \\ &= \dots = \dots = \boxed{} \end{aligned}$$

f) $1\frac{4}{7} + 1\frac{1}{3} =$ *(LCM of 7 and 3 is 21)*

$$\begin{aligned} &= \dots \\ &= \dots \\ &= \dots = \dots = \boxed{} \end{aligned}$$

g) $2\frac{5}{7} - 1\frac{1}{2} =$

$$\begin{aligned} &= \dots \\ &= \dots \\ &= \dots = \dots = \boxed{} \end{aligned}$$

h) $4\frac{3}{4} - 1\frac{1}{3} =$

$$\begin{aligned} &= \dots \\ &= \dots \\ &= \dots = \dots = \boxed{} \end{aligned}$$

i) $3\frac{5}{6} - 1\frac{2}{3} =$

$$\begin{aligned} &= \dots \\ &= \dots \\ &= \dots = \dots = \boxed{} \end{aligned}$$