

4. [Fraction +, -]

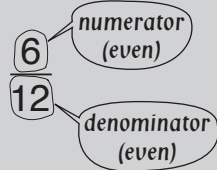
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Skill 4.1 Adding fractions with the same denominator (1).

MMMaive 112 2 3 3 4 4
MMLime 11 2 2 3 3 4 4

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.

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

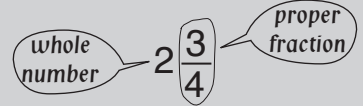
Changing an improper fraction to a mixed number



- 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).
- Do not change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary.

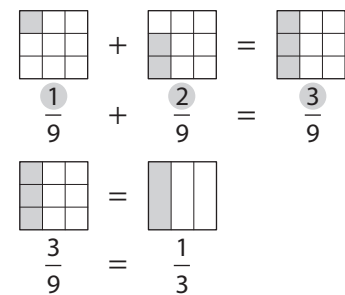
Q. $\frac{1}{9} + \frac{2}{9} =$

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

$$= \boxed{\phantom{\frac{\quad}{\quad}}}$$

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

$$= \boxed{\phantom{\frac{\quad}{\quad}}}$$

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

$$= \boxed{\phantom{\frac{\quad}{\quad}}}$$

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

$$= \boxed{\phantom{\frac{\quad}{\quad}}}$$

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

$$= \boxed{\phantom{\frac{\quad}{\quad}}}$$

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

g) $\frac{5}{7} + \frac{6}{7} =$
 $= \frac{11}{7}$

Change to mixed number

$= 11 \div 7 =$ $1\frac{4}{7}$

h) $\frac{4}{5} + \frac{4}{5} =$
 $= \frac{8}{5}$

$= 8 \div 5 =$

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

$=$ $=$

j) $\frac{6}{11} + \frac{7}{11} =$
 $=$

$=$

k) $\frac{11}{17} + \frac{10}{17} =$
 $=$

$=$

l) $\frac{13}{15} + \frac{6}{15} =$
 $=$

$=$

m) $\frac{1}{6} + \frac{1}{6} =$
 $= \frac{2}{6}$

Simplify

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

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

$=$

o) $\frac{1}{8} + \frac{5}{8} =$
 $=$

$=$

p) $\frac{5}{12} + \frac{4}{12} =$
 $=$

$=$

q) $\frac{4}{15} + \frac{6}{15} =$
 $=$

$=$

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

$=$

s) $\frac{3}{4} + \frac{3}{4} =$
 $= \frac{6}{4} = 1\frac{2}{4}$

Simplify

$= \frac{6}{4} = 1\frac{2 \div 2}{4 \div 2} =$ $1\frac{1}{2}$

t) $\frac{7}{8} + \frac{1}{8} =$
 $= \frac{8}{8} = \frac{1}{1} =$

$=$

u) $\frac{5}{6} + \frac{5}{6} =$
 $=$

$=$

v) $\frac{11}{10} + \frac{9}{10} =$
 $=$

$=$

w) $\frac{7}{12} + \frac{7}{12} =$
 $=$

$=$

x) $\frac{11}{15} + \frac{7}{15} =$
 $=$

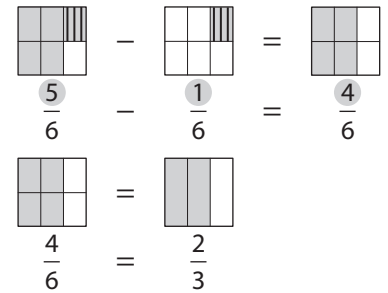
$=$

Skill 4.2 Subtracting fractions with the same denominator.

- Subtract the numerators (top numbers of the fractions).
- Do not change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary.
(see skill 4.1, page 31)

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

A. $\frac{5}{6} - \frac{1}{6} =$ *Subtract the top numbers only*
 $= \frac{5-1}{6} =$
 $= \frac{4 \div 2}{6 \div 2}$ *Simplify*
 $= \frac{2}{3}$



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

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

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

d) $\frac{17}{9} - \frac{4}{9} =$
 $= \frac{13}{9}$ *Change to mixed number*
 $= 13 \div 9 =$ $1 \frac{4}{9}$

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

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

g) $\frac{8}{9} - \frac{2}{9} =$ *Simplify*
 $= \frac{6 \div 3}{9 \div 3} =$ $\frac{\quad}{\quad}$

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

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

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

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

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

m) $\frac{17}{5} - \frac{2}{5} =$
 $= \frac{15 \div 5}{5 \div 5} = \frac{3}{1} =$ $\frac{\quad}{\quad}$

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

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

Skill 4.3 Adding mixed numbers with the same denominator.

- Add the whole numbers first.
- Add the numerators (top numbers of the fractions).
- Do not change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary.
(see skill 4.1, page 31)

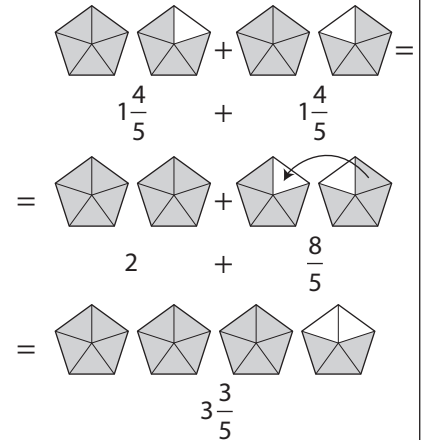
Q. $1\frac{4}{5} + 1\frac{4}{5} =$

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

$= \boxed{}$

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

$= \boxed{}$

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

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

$= 2 + 1 = \boxed{}$

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

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

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

$= \boxed{}$

g) $2\frac{5}{7} + 1\frac{3}{7} =$ *Change to mixed number*

$= 3 + \frac{8}{7}$

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

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

$= \boxed{}$

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

$= \boxed{}$

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

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

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

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

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

$= \boxed{}$

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

$= \boxed{}$

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

- Change mixed numbers to improper fractions before subtracting. (see skill 4.1, page 31)
- Subtract the numerators.
- Do not change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 31)

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*

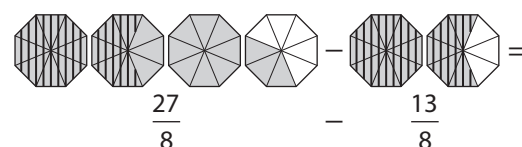
$= \frac{14}{8}$ *Change to mixed number*

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

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

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

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



$= \frac{14}{8} = 1\frac{6}{8}$

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

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

$= \frac{16}{5} - \frac{9}{5}$ *Subtract the top numbers only*

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

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

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

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

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

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

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

$= \frac{26}{8}$ *Change to mixed number*

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

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).

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MMLime 1 1 2 3 3 4 4

- Subtract the whole numbers first.
- Subtract the numerators.
- Do not change the denominators.
- Simplify the resulting fraction if necessary. (see skill 4.1, page 31)

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

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

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

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

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

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

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

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

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

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

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 31)
- Write the whole number as an improper fraction with the same denominator as the mixed number.
- Subtract the numerators.
- Do not change the denominators.
- Simplify the resulting fraction and/or change it to a mixed number if necessary.
(see skill 4.1, page 31)

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.
- Do not 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: $\frac{3}{1}$

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

OR **A.** $2 - \frac{2}{9} =$ $3 - 1 = 2$

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

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

$$= 1 + \frac{7}{9}$$

$$= 1\frac{7}{9}$$

$$2 = 1 + 1$$

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

$$\frac{9}{9} - \frac{2}{9} = \frac{7}{9}$$

a) $2 - \frac{2}{7} =$

$$= \frac{2}{1} - \frac{2}{7}$$

$$= \frac{14}{7} - \frac{2}{7}$$

Subtract the top numbers only

$$= \frac{12}{7}$$

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

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

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

Skill 4.5 Subtracting a fraction or a mixed number from a whole number (2).

 MMMauve 1 1 2 2 3 3 4 4
 MMLime 1 1 2 2 3 3 4 4

g) $4 - 2\frac{1}{6} =$

$$= \frac{4}{1} - \frac{13}{6}$$

$$= \frac{24}{6} - \frac{13}{6}$$

$$= \frac{11}{6}$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

i) $7 - 3\frac{5}{8} =$

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

j) $5 - \frac{2}{3} =$

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

$$= 4 + \frac{3}{3} - \frac{2}{3}$$

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

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

k) $2 - \frac{3}{4} =$

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

l) $6 - \frac{4}{7} =$

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

n) $3 - \frac{7}{8} =$

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

o) $5 - \frac{7}{10} =$

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

p) $3 - 1\frac{3}{5} =$

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

$$= 1 + 1 - \frac{3}{5}$$

$$= 1 + \frac{5}{5} - \frac{3}{5}$$

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

$$= \boxed{}$$

q) $5 - 3\frac{3}{8} =$

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

r) $4 - 1\frac{5}{6} =$

$$=$$

$$=$$

$$=$$

$$= \boxed{}$$

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

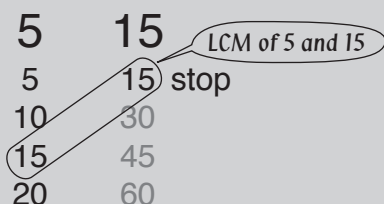
Least Common Multiple (LCM) of two numbers

- 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.

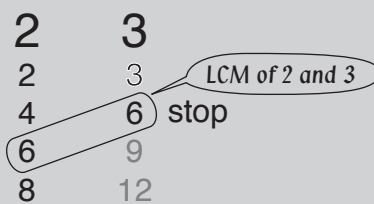
Examples:

One number divides evenly into the other number



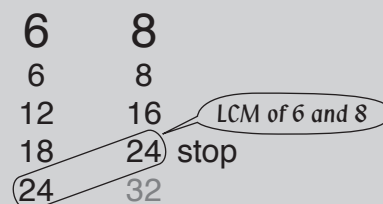
Hint: LCM is the largest number.

GCF of the numbers is 1



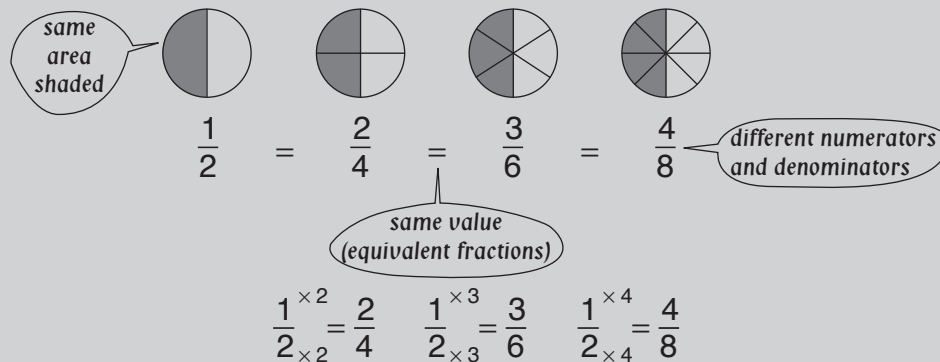
Hint: LCM is the product of the numbers.

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 least 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 31)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 31)

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).

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

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 $8 \div 4 = 2$*
 $= \frac{2+3}{8}$ *1 × 2 = 2*
 $= \frac{5}{8}$ *Add the top numbers only*

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 $32 \div 4 = 8$*
 $= \frac{8+12}{32}$ *1 × 8 = 8*
 $= \frac{20}{32 \div 4}$ *3 × 4 = 12*
 $= \frac{5}{8}$ *Simplify*

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

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

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

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*
 $= \frac{5}{10 \div 5} = \boxed{\frac{1}{2}}$

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

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

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

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

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

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

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

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

Skill 4.7 Adding fractions with different denominators -
the GCF of the denominators is 1 (e.g. 2 and 3, 5 and 6).

- 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 39)
- Change the fractions to equivalent fractions with the least common denominator.
- Add the fractions with the same denominators. (see skill 4.1, page 31)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 31)

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

A. $\frac{1}{2} + \frac{1}{3} =$ *LCM of 2 and 3 is 6*
 because $\frac{1}{2} \times 3 = 3$ because $\frac{1}{3} \times 2 = 2$
 $= \frac{1 \times 3}{2 \times 3} + \frac{1 \times 2}{3 \times 2}$ *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*
 $= \frac{13}{12} = 1 \frac{1}{12}$

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

$=$
 $=$

Skill 4.8 Adding fractions with different denominators - the denominators have common factors $\neq 1$ (e.g. 8 and 12).

- Find the least common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. (see skill 4.6, page 39)
- Change the fractions to equivalent fractions with the least common denominator.
- Add the fractions with the same denominators. (see skill 4.1, page 31)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 31)

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

<p>Q. $\frac{1}{4} + \frac{1}{6} =$</p>	<p>A. $\frac{1}{4} + \frac{1}{6} =$ LCM of 4 and 6 is 12</p> $= \frac{1 \times 3}{4 \times 3} + \frac{1 \times 2}{6 \times 2}$ <p style="text-align: center; margin-left: 100px;">because $12 \div 4 = 3$</p> $= \frac{3+2}{12}$ <p style="text-align: center; margin-left: 100px;">because $12 \div 6 = 2$</p> $= \frac{5}{12}$	<p>OR</p> <p>A. $\frac{1}{4} + \frac{1}{6} =$ Use $4 \times 6 = 24$ as the common denominator</p> $= \frac{1 \times 6}{4 \times 6} + \frac{1 \times 4}{6 \times 4}$ <p style="text-align: center; margin-left: 100px;">because $24 \div 4 = 6$</p> $= \frac{6+4}{24}$ <p style="text-align: center; margin-left: 100px;">because $24 \div 6 = 4$</p> $= \frac{10}{24}$ <p style="text-align: center; margin-left: 100px;">because $10 \div 2 = 5$</p> $= \frac{5}{12}$ <p style="text-align: center; margin-left: 100px;">Simplify</p>
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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) $\frac{3}{8} + \frac{7}{10} =$

$$=$$

$$=$$

$$= \boxed{}$$

Skill 4.11 Subtracting fractions with different denominators - the denominators have common factors $\neq 1$ (e.g. 8 and 12).

- Find the least common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. (see skill 4.6, page 39)
- Change the fractions to equivalent fractions with the least common denominator.
- Subtract the fractions with the same denominators. (see skill 4.2, page 33)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 31)

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

Q. $\frac{3}{8} - \frac{1}{6} =$

A. $\frac{3}{8} - \frac{1}{6} =$ LCM of 8 and 6 is 24

$$= \frac{3 \times 3}{8 \times 3} - \frac{1 \times 4}{6 \times 4} \quad \begin{array}{l} 3 \times 3 = 9 \\ \text{because } 24 \div 8 = 3 \end{array}$$

$$= \frac{9-4}{24} \quad \begin{array}{l} 1 \times 4 = 4 \\ \text{and } 24 \div 6 = 4 \end{array}$$

$$= \frac{5}{24}$$

OR A. $\frac{3}{8} - \frac{1}{6} =$ Use $8 \times 6 = 48$ as the common denominator

$$= \frac{3 \times 6}{8 \times 6} - \frac{1 \times 8}{6 \times 8} \quad \begin{array}{l} 3 \times 6 = 18 \\ \text{because } 48 \div 8 = 6 \end{array}$$

$$= \frac{18-8}{48} \quad \begin{array}{l} 1 \times 8 = 8 \\ \text{and } 48 \div 6 = 8 \end{array}$$

$$= \frac{10^{+2}}{48^{+2}} \quad \text{Simplify}$$

$$= \frac{5}{24}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{20}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{20}}}$$

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

$$=$$

$$= \boxed{\phantom{\frac{3}{20}}}$$

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

$$=$$

$$= \boxed{\phantom{\frac{3}{20}}}$$

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

$$=$$

$$= \boxed{\phantom{\frac{3}{20}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{20}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{20}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{20}}}$$

Skill 4.12 Adding and subtracting fractions with different denominators.

MMMauve 11 22 33 44
MMLime 11 22 33 44

- Find the least common denominator of the fractions, which is the Least Common Multiple (LCM) of the denominators. (see 4.6 to 4.11, pages 39 to 45)
- 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 31 and 4.2, page 33)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 4.1, page 31)

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

$$=$$

$$= \boxed{\phantom{\frac{}{}}}$$

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

$$=$$

$$= \boxed{\phantom{\frac{}{}}}$$

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

$$=$$

$$= \boxed{\phantom{\frac{}{}}}$$

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

$$=$$

$$= \boxed{\phantom{\frac{}{}}}$$

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

$$=$$

$$= \boxed{\phantom{\frac{}{}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{}{}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{}{}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{}{}}}$$

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 45)

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

A. $1 + 1 = 2$

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

$$= \frac{1 \times 3}{5 \times 3} + \frac{2 \times 5}{3 \times 5}$$

$$= \frac{3 + 10}{15}$$

$$= \frac{13}{15}$$

$$\Rightarrow 2 + \frac{13}{15} = 2\frac{13}{15}$$

Add whole numbers.

15 is the least 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.

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

$$=$$

$$=$$

$$\Rightarrow = \boxed{}$$

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

$$=$$

$$=$$

$$\Rightarrow = \boxed{}$$

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

$$=$$

$$=$$

$$\Rightarrow = \boxed{}$$

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

$$=$$

$$=$$

$$\Rightarrow = \boxed{}$$

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

$$=$$

$$=$$

$$\Rightarrow = \boxed{}$$

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

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$= \boxed{}$$