

# 9. [Fraction +,-]

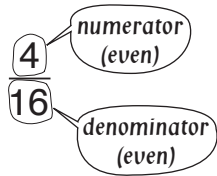
## Skill 9.1 Adding fractions with the same denominator (1).

MM4.2 1 1 2 2 3 3 4 4  
MM5.1 1 1 2 2 3 3 4 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.

### To simplify 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.

$$\frac{4 \div 2}{16 \div 2} = \frac{2 \div 2}{8 \div 2} = \frac{1}{4}$$

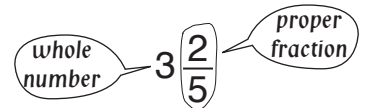
### To change an improper fraction to a mixed number



- Divide the numerator by the denominator.  
 $\frac{7}{3} = 7 \div 3 = 2 \text{ remainder } 1$
- Write the result as the whole number and the remainder over the denominator.  
 $\frac{7}{3} = 7 \div 3 = 2 \frac{1}{3}$

### To change a mixed number to an improper fraction

#### MIXED NUMBER



- Multiply the whole number by the denominator and then add the result to the numerator.  
 $3 \frac{2}{5} \rightarrow 3 \times 5 + 2 = 17$
- Rewrite the total over the denominator.

$$3 \frac{2}{5} = \frac{17}{5}$$

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

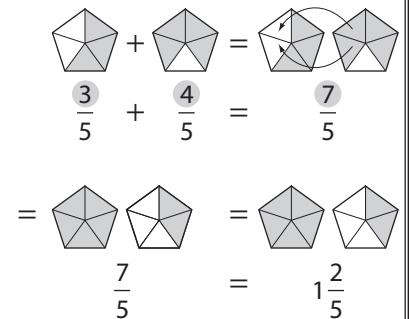
A.  $\frac{3}{5} + \frac{4}{5}$  (Add the numerators (top numbers) only)

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

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

(7 ÷ 5 = 1 remainder 2)

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



a)  $\frac{5}{12} + \frac{4}{12}$  (Add the numerators (top numbers) only)

$$= \frac{5+4}{12} = \frac{9}{12 \div 3} = \boxed{\frac{3}{4}}$$

b)  $\frac{2}{5} + \frac{2}{5} =$

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

c)  $\frac{3}{11} + \frac{5}{11} =$

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

d)  $\frac{2}{7} + \frac{4}{7} =$

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

e)  $\frac{2}{13} + \frac{8}{13} =$

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

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

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

# Skill 9.1 Adding fractions with the same denominator (2).

MM4.2 11 22 33 44  
MM5.1 11 22 33 44

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

Change to mixed number

$= 8 \div 5$

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

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

$=$

$=$

$=$

i)  $\frac{7}{9} + \frac{7}{9} =$

$=$

$=$

$=$

j)  $\frac{7}{11} + \frac{9}{11} =$

$=$

$=$

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

$=$

$=$

l)  $\frac{9}{13} + \frac{11}{13} =$

$=$

$=$

m)  $\frac{5}{8} + \frac{7}{8} =$

$= \frac{5+7}{8} = \frac{12}{8}$

Simplify

$= \frac{3}{2} = 3 \div 2$

$=$

n)  $\frac{3}{4} + \frac{3}{4} =$

$=$

$=$

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

$=$

$=$

Change to mixed number

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

$= \frac{1+5}{8} = \frac{6}{8}$

$=$

q)  $\frac{1}{15} + \frac{2}{15} =$

$=$

$=$

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

$=$

$=$

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

$=$

t)  $\frac{5}{12} + \frac{3}{12} =$

$=$

$=$

u)  $\frac{7}{10} + \frac{1}{10} =$

$=$

$=$

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

$=$

w)  $\frac{5}{12} + \frac{5}{12} =$

$=$

$=$

x)  $\frac{2}{15} + \frac{10}{15} =$

$=$

$=$

## Skill 9.2 Subtracting fractions with the same denominator.

MM4.2 11 22 33 44  
MM5.1 1 22 33 44

- 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 9.1, page 41)

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

A.  $\frac{5}{8} - \frac{1}{8}$  *Subtract the numerators (top numbers) only*

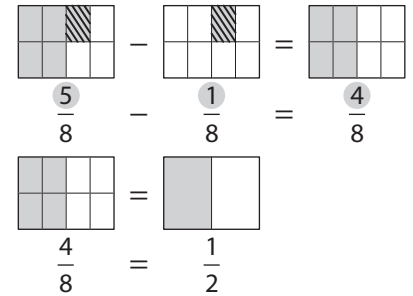
$$= \frac{5-1}{8}$$

$$= \frac{4}{8}$$

*Simplify*

$$= \frac{4 \div 4}{8 \div 4}$$

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



a)  $\frac{7}{11} - \frac{2}{11}$  *Subtract the numerators (top numbers) only*

$$= \frac{7-2}{11} = \frac{5}{11}$$

b)  $\frac{8}{9} - \frac{1}{9} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

c)  $\frac{11}{13} - \frac{9}{13} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

d)  $\frac{11}{5} - \frac{2}{5}$

$$= \frac{11-2}{5} = \frac{9}{5}$$

*Change to mixed number*

$$= 9 \div 5 = 1\frac{4}{5}$$

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

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

f)  $\frac{20}{7} - \frac{2}{7} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

g)  $\frac{7}{12} - \frac{5}{12}$  *Simplify*

$$= \frac{2 \div 2}{12 \div 2} = \frac{\quad}{\quad}$$

h)  $\frac{13}{15} - \frac{8}{15} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

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

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

j)  $\frac{9}{14} - \frac{5}{14} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

k)  $\frac{11}{16} - \frac{5}{16} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

l)  $\frac{9}{10} - \frac{1}{10} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

m)  $\frac{11}{18} - \frac{7}{18} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

n)  $\frac{9}{20} - \frac{3}{20} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

o)  $\frac{19}{24} - \frac{7}{24} =$

$$= \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

### Skill 9.3 Adding mixed numbers with the same denominator (1).

MM4.2 1 1 2 2 3 3 4 4  
MM5.1 1 1 2 2 3 3 4 4

- Add the whole numbers first.
- Add the fractions. (see skill 9.1, page 41)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 41)
- Write the result as a mixed number.

**Q.**  $1\frac{5}{10} + 1\frac{3}{10} =$

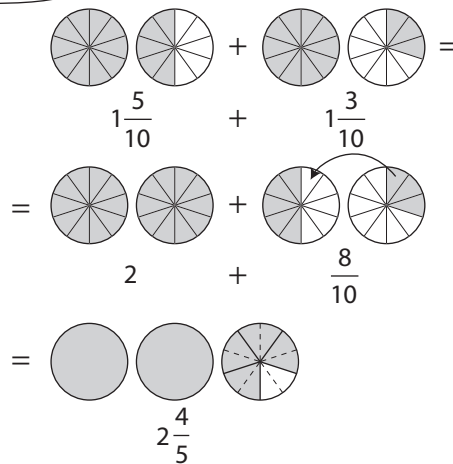
**A.**  $1 + 1 + \frac{5}{10} + \frac{3}{10}$

Add the numerators (top numbers) only

$= 2 + \frac{8}{10}$  *Simplify*

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

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



**a)**  $2\frac{2}{5} + 1\frac{2}{5} =$

$= 3 + \frac{4}{5} = \boxed{\phantom{00}}$

**b)**  $1\frac{1}{7} + 3\frac{5}{7} =$

$= \phantom{00} = \boxed{\phantom{00}}$

**c)**  $3\frac{1}{9} + \frac{4}{9} =$

$= \phantom{00} = \boxed{\phantom{00}}$

**d)**  $3\frac{5}{11} + \frac{4}{11} =$

$= \phantom{00} = \boxed{\phantom{00}}$

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

$= \phantom{00} = \boxed{\phantom{00}}$

**f)**  $2\frac{3}{7} + \frac{3}{7} =$

$= \phantom{00} = \boxed{\phantom{00}}$

**g)**  $4\frac{1}{8} + \frac{3}{8} =$

$= 4 + \frac{4}{8}$  *Simplify*

$= 4 + \frac{1}{2} = \boxed{4\frac{1}{2}}$

**h)**  $2\frac{3}{10} + \frac{3}{10} =$

$= \phantom{00} = \boxed{\phantom{00}}$

**i)**  $1\frac{2}{9} + 2\frac{1}{9} =$

$= \phantom{00} = \boxed{\phantom{00}}$

**j)**  $1\frac{1}{12} + 2\frac{7}{12} =$

$= \phantom{00}$   
 $= \phantom{00} = \boxed{\phantom{00}}$

**k)**  $2\frac{1}{10} + \frac{4}{10} =$

$= \phantom{00}$   
 $= \phantom{00} = \boxed{\phantom{00}}$

**l)**  $2\frac{1}{15} + 3\frac{4}{15} =$

$= \phantom{00}$   
 $= \phantom{00} = \boxed{\phantom{00}}$

**Skill 9.3** Adding mixed numbers with the same denominator (2).

m)  $1\frac{4}{5} + 2\frac{2}{5} =$   
 $= 3 + \frac{6}{5}$  *Change to mixed number*  
 $= 3 + 1\frac{1}{5} = \boxed{4\frac{1}{5}}$

n)  $1\frac{2}{3} + 4\frac{2}{3} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

o)  $3\frac{5}{7} + 2\frac{6}{7} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

p)  $2\frac{5}{9} + \frac{5}{9} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

q)  $3\frac{4}{11} + \frac{10}{11} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

r)  $3\frac{8}{9} + \frac{8}{9} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

s)  $3\frac{11}{15} + 2\frac{7}{15} =$   
 $= 5 + \frac{18}{15}$  *Simplify*  
 $= 5 + \frac{6}{5}$  *Change to mixed number*  
 $= 5 + 1\frac{1}{5} = \boxed{6\frac{1}{5}}$

t)  $4\frac{3}{8} + \frac{7}{8} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

u)  $2\frac{3}{4} + 3\frac{3}{4} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

v)  $1\frac{1}{2} + 4\frac{1}{2} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

w)  $2\frac{5}{12} + \frac{11}{12} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

x)  $4\frac{3}{10} + \frac{9}{10} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

y)  $3\frac{2}{3} + 4\frac{1}{3} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

z)  $5\frac{2}{6} + 3\frac{5}{6} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

A)  $2\frac{7}{13} + \frac{9}{13} =$   
 $=$   
 $=$   $\boxed{\phantom{00}}$

## Skill 9.4 Subtracting mixed numbers with the same denominator (1).

MM4.2 1 1 2 2 3 3 4 4  
MM5.1 1 1 2 2 3 3 4 4

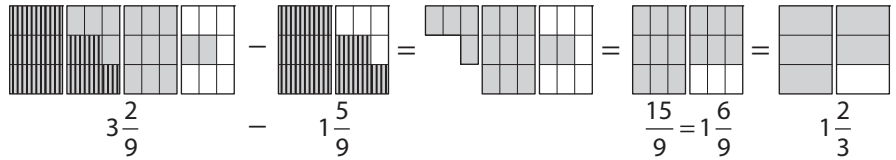
- Change mixed numbers to improper fractions before subtracting. (see skill 9.1, page 41)
- Subtract the fractions. (see skill 9.2, page 43)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 41)

Q.  $3\frac{2}{9} - 1\frac{5}{9} =$

A.  $3\frac{2}{9} - 1\frac{5}{9}$  *Change to improper fractions*  
 $= \frac{29}{9} - \frac{14}{9}$  *Subtract the numerators (top numbers) only*  
 $= \frac{15}{9}$  *Change to mixed number*  
 $= 1\frac{6 \div 3}{9 \div 3}$  *Simplify*  
 $= 1\frac{2}{3}$

$$3\frac{2}{9} = \frac{3 \times 9 + 2}{9} = \frac{29}{9}$$

$$1\frac{5}{9} = \frac{1 \times 9 + 5}{9} = \frac{14}{9}$$



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

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

*Subtract the numerators (top numbers) only*

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

b)  $3\frac{2}{7} - 1\frac{4}{7} =$

$$=$$

$$= \boxed{\phantom{00}}$$

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

$$=$$

$$= \boxed{\phantom{00}}$$

d)  $3\frac{4}{7} - 1\frac{6}{7} =$

$$=$$

$$= \boxed{\phantom{00}}$$

e)  $4\frac{1}{9} - 1\frac{5}{9} =$

$$=$$

$$= \boxed{\phantom{00}}$$

f)  $2\frac{3}{11} - 1\frac{8}{11} =$

$$=$$

$$= \boxed{\phantom{00}}$$

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

$$= \frac{23}{10} - \frac{7}{10}$$

$$= \frac{16}{10}$$

*Change to mixed number*

$$= 1\frac{6 \div 2}{10 \div 2} = \boxed{\phantom{00}}$$

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

$$=$$

$$= \boxed{\phantom{00}}$$

i)  $4\frac{5}{12} - 1\frac{7}{12} =$

$$=$$

$$= \boxed{\phantom{00}}$$

## Skill 9.4 Subtracting mixed numbers with the same denominator (2).

MM4.2 1 1 2 2 3 3 4 4  
MM5.1 1 1 2 2 3 3 4 4

- Subtract the whole numbers first.
- Subtract the fractions. (see skill 9.2, page 43)
- Simplify the resulting fraction if necessary. (see skill 9.1, page 41)

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

Example:

$$\textcircled{\text{1 whole circle}} \quad 1 = \frac{3}{3} = \frac{5}{5} \quad \text{numerator} = \text{denominator}$$

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

A.  $4\frac{1}{8} - 2\frac{5}{8}$

$$= 2 + \frac{1}{8} - \frac{5}{8}$$

$$= 1 + 1 + \frac{1}{8} - \frac{5}{8}$$

$$= 1 + \frac{8}{8} + \frac{1}{8} - \frac{5}{8}$$

$$= 1 + \frac{9}{8} - \frac{5}{8}$$

$$= 1 + \frac{4}{8} = 1 + \frac{1}{2} = 1\frac{1}{2}$$

$$4 - 2 = 2 \text{ and } \frac{1}{8} - \frac{5}{8} = ?$$

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

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

$$\frac{8}{8} + \frac{1}{8} = \frac{8+1}{8} = \frac{9}{8}$$

$$\frac{9}{8} - \frac{5}{8} = \frac{9-5}{8} = \frac{4}{8}$$

Simplify.

j)  $4\frac{7}{9} - 1\frac{2}{9} =$

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

*Subtract the numerators (top numbers) only*

$$= 3 + \frac{5}{9} = \boxed{\phantom{00}}$$

k)  $2\frac{7}{8} - 1\frac{5}{8} =$

$$= \boxed{\phantom{00}}$$

l)  $3\frac{8}{9} - 2\frac{1}{9} =$

$$= \boxed{\phantom{00}}$$

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

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

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

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

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

$$= 2 + \frac{1}{2} = \boxed{\phantom{00}}$$

n)  $3\frac{1}{12} - 1\frac{5}{12} =$

$$= \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

o)  $4\frac{2}{15} - 2\frac{7}{15} =$

$$= \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

$$= \boxed{\phantom{00}}$$

**Skill 9.5** Subtracting a fraction or a mixed number from a whole number (1) MM4.2 11 2 2 33 44  
AM5.1 11 2 2 33 44

- Write the whole number as an improper fraction with the same denominator as the mixed number.
- Change the mixed number to an improper fraction before subtracting. (see skill 9.1, page 41)
- Subtract the fractions. (see skill 9.2, page 43)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 41)

**Q.**  $3 - 1\frac{1}{4} =$

**A.**  $3 - 1\frac{1}{4}$  Change to improper fractions

3 can be written as:  $\frac{3}{1} = \frac{12}{4}$

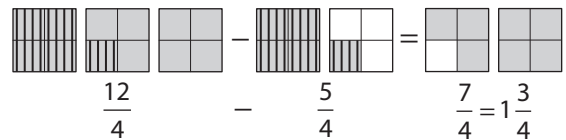
and  $1\frac{1}{4} = \frac{1 \times 4 + 1}{4} = \frac{5}{4}$

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

$= \frac{12}{4} - \frac{5}{4}$  Subtract the numerators (top numbers) only

$= \frac{7}{4}$  Change to mixed number

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



**a)**  $2 - \frac{2}{9} =$

$= \frac{2}{1} - \frac{2}{9}$  2 can be written as  $\frac{2}{1}$  or  $\frac{18}{9}$

$= \frac{18}{9} - \frac{2}{9}$  Subtract the numerators (top numbers) only

$= \frac{16}{9} = \boxed{1\frac{7}{9}}$

**b)**  $4 - \frac{7}{10} =$

$=$   
.....  
 $=$   
.....  
 $=$   $\quad$

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

$=$   
.....  
 $=$   
.....  
 $=$   $\quad$

**d)**  $5 - 2\frac{4}{7} =$

$= \frac{5}{1} - \frac{18}{7}$   
.....  
 $= \frac{35}{7} - \frac{18}{7}$   
.....  
 $= \frac{17}{7} = \boxed{\quad}$

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

$=$   
.....  
 $=$   
.....  
 $=$   $\quad$

**f)**  $3 - 1\frac{6}{11} =$

$=$   
.....  
 $=$   
.....  
 $=$   $\quad$

**g)**  $4 - 1\frac{7}{8} =$

$=$   
.....  
 $=$   
.....  
 $=$   $\quad$

**h)**  $3 - 2\frac{1}{8} =$

$=$   
.....  
 $=$   
.....  
 $=$   $\quad$

**i)**  $5 - 3\frac{5}{12} =$

$=$   
.....  
 $=$   
.....  
 $=$   $\quad$



**Skill 9.5** Subtracting a fraction or a mixed number from a whole number (2) MM4.2 11 22 33 44  
MM5.1 11 22 33 44

- Subtract the whole numbers first.
- Borrow 1 from the whole number and write it as a fraction with the same denominator.
- Subtract the fractions. (see skill 9.2, page 43)

**Q.**  $4 - 1\frac{5}{7} =$

**A.**  $4 - 1\frac{5}{7} =$   
 $= 3 - \frac{5}{7}$   
 $= 2 + 1 - \frac{5}{7}$   
 $= 2 + \frac{7}{7} - \frac{5}{7}$   
 $= 2 + \frac{2}{7} = 2\frac{2}{7}$

$4 - 1 = 3$  and  $3 = 2 + 1$

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

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

**j)**  $4 - \frac{2}{5} =$   
 $= 3 + 1 - \frac{2}{5}$   
 $= 3 + \frac{5}{5} - \frac{2}{5}$   
 $= 3 + \frac{3}{5} = \boxed{\phantom{00}}$

**k)**  $3 - \frac{5}{9} =$   
 $=$   
 $=$   
 $=$   
 $= \boxed{\phantom{00}}$

**l)**  $2 - \frac{3}{11} =$   
 $=$   
 $=$   
 $=$   
 $= \boxed{\phantom{00}}$

**m)**  $4 - 2\frac{2}{3} =$   
 $= 2 - \frac{2}{3}$   
 $= 1 + 1 - \frac{2}{3}$   
 $= 1 + \frac{3}{3} - \frac{2}{3}$   
 $= 1 + \frac{1}{3} = \boxed{\phantom{00}}$

**n)**  $2 - 1\frac{5}{8} =$   
 $=$   
 $=$   
 $=$   
 $= \boxed{\phantom{00}}$

**o)**  $5 - 2\frac{3}{10} =$   
 $=$   
 $=$   
 $=$   
 $= \boxed{\phantom{00}}$

**p)**  $4 - 1\frac{3}{7} =$   
 $=$   
 $=$   
 $=$   
 $= \boxed{\phantom{00}}$

**q)**  $3 - 2\frac{9}{10} =$   
 $=$   
 $=$   
 $=$   
 $= \boxed{\phantom{00}}$

**r)**  $5 - 1\frac{11}{12} =$   
 $=$   
 $=$   
 $=$   
 $= \boxed{\phantom{00}}$

**Skill 9.6** Adding fractions with different denominators - one denominator divides evenly into the other denominator (1).

MM4.2 11 22 33 44  
MM5.1 11 22 33 44

- Find the lowest common denominator of the fractions, which is the Lowest Common Multiple (LCM) of the denominators. In this case the LCM is the largest denominator.
- Change the fractions to equivalent fractions with the lowest common denominator.
- Add the fractions with the same denominators. (see skill 9.1, page 41)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 41)

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

Examples:

$$\frac{5}{6} + \frac{1 \times 3}{2 \times 3} = \frac{5}{6} + \frac{3}{6} = \frac{8}{6} = \frac{4}{3} = 1\frac{1}{3} \quad (\text{LCM of 6 and 2 is 6, because 2 divides evenly into 6})$$

OR

$$\frac{5}{6} + \frac{1}{2} = \frac{10}{12} + \frac{6}{12} = \frac{16}{12} = \frac{4}{3} = 1\frac{1}{3} \quad (\text{common denominator of 6 and 2 is } 6 \times 2 = 12)$$

**To find the Lowest 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  $\Rightarrow$  Lowest Common Multiple (LCM).

**Hint:** The lowest common multiple is the smallest number that the two numbers divide into.

**LCM when one number divides evenly into the other number**

5	15	LCM of 5 and 15	
5	15		stop
10	30		
15	45		
20	60		

**Hint:** LCM is the largest number.

**LCM when the numbers have NO common factors other than 1**

2	3	LCM of 2 and 3	
2	3		stop
4	6		
6	9		
8	12		

**Hint:** LCM is the product of the numbers.

**To find equivalent fractions**

same area shaded

$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8}$

different numerators and denominators

same value (equivalent fractions)

$$\frac{1 \times 2}{2 \times 2} = \frac{2}{4} \quad \frac{1 \times 3}{2 \times 3} = \frac{3}{6} \quad \frac{1 \times 4}{2 \times 4} = \frac{4}{8}$$

Equivalent fractions have the same value.

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

**Skill 9.6**

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

**Q.**  $\frac{3}{10} + \frac{3}{2} =$

**A.**  $\frac{3}{10} + \frac{3}{2}$   
 $= \frac{3}{10} + \frac{3 \times 5}{2 \times 5}$   
 $= \frac{3}{10} + \frac{15}{10}$   
 $= \frac{18}{10}$   
 $= \frac{9}{5}$   
 $= 1\frac{4}{5}$

LCM of 10 and 2 is 10

To give the second fraction a denominator of 10, multiply both the numerator and denominator by 5.

Add the fractions.

Simplify.

Change to a mixed number.

**a)**  $\frac{2}{9} + \frac{1}{3} =$  LCM of 9 and 3 is 9  
 $= \frac{2}{9} + \frac{1 \times 3}{3 \times 3}$   
 $= \frac{2}{9} + \frac{3}{9} = \boxed{\frac{5}{9}}$

**b)**  $\frac{3}{8} + \frac{5}{16} =$  LCM of 8 and 16 is 16  
 $= \frac{3 \times 2}{8 \times 2} + \frac{5}{16}$   
 $= \frac{6}{16} + \frac{5}{16} = \boxed{\frac{11}{16}}$

**c)**  $\frac{1}{6} + \frac{2}{3} =$   
 $= \frac{1}{6} + \frac{2 \times 2}{3 \times 2}$   
 $= \frac{1}{6} + \frac{4}{6} = \boxed{\frac{5}{6}}$

**d)**  $\frac{1}{2} + \frac{3}{8} =$   
 $= \frac{1 \times 4}{2 \times 4} + \frac{3}{8}$   
 $= \frac{4}{8} + \frac{3}{8} = \boxed{\frac{7}{8}}$

**e)**  $\frac{1}{4} + \frac{1}{8} =$   
 $= \frac{1 \times 2}{4 \times 2} + \frac{1}{8}$   
 $= \frac{2}{8} + \frac{1}{8} = \boxed{\frac{3}{8}}$

**f)**  $\frac{7}{10} + \frac{3}{20} =$   
 $= \frac{7 \times 2}{10 \times 2} + \frac{3}{20}$   
 $= \frac{14}{20} + \frac{3}{20} = \boxed{\frac{17}{20}}$

**g)**  $\frac{3}{4} + \frac{1}{12} =$   
 $= \frac{3 \times 3}{4 \times 3} + \frac{1}{12}$   
 $= \frac{9}{12} + \frac{1}{12}$   
 $= \frac{10}{12} = \boxed{\frac{5}{6}}$

**h)**  $\frac{1}{5} + \frac{3}{10} =$   
 $= \frac{1 \times 2}{5 \times 2} + \frac{3}{10}$   
 $= \frac{2}{10} + \frac{3}{10} = \boxed{\frac{5}{10}} = \boxed{\frac{1}{2}}$

**i)**  $\frac{1}{6} + \frac{5}{18} =$   
 $= \frac{1 \times 3}{6 \times 3} + \frac{5}{18}$   
 $= \frac{3}{18} + \frac{5}{18} = \boxed{\frac{8}{18}} = \boxed{\frac{4}{9}}$

**j)**  $\frac{7}{15} + \frac{3}{5} =$   
 $= \frac{7}{15} + \frac{3 \times 3}{5 \times 3}$   
 $= \frac{7}{15} + \frac{9}{15} = \boxed{\frac{16}{15}} = \boxed{1\frac{1}{15}}$

**k)**  $\frac{5}{6} + \frac{1}{2} =$   
 $= \frac{5}{6} + \frac{1 \times 3}{2 \times 3}$   
 $= \frac{5}{6} + \frac{3}{6} = \boxed{\frac{8}{6}} = \boxed{1\frac{2}{6}} = \boxed{1\frac{1}{3}}$

**l)**  $\frac{1}{2} + \frac{7}{12} =$   
 $= \frac{1 \times 6}{2 \times 6} + \frac{7}{12}$   
 $= \frac{6}{12} + \frac{7}{12} = \boxed{\frac{13}{12}} = \boxed{1\frac{1}{12}}$

**Skill 9.7** Adding fractions with different denominators - the denominators have no common factors other than 1 (e.g. 5 and 6).

MM4.2 11 22 33 44  
MM5.1 11 22 33 44

- Find the lowest common denominator of the fractions, which is the Lowest Common Multiple (LCM) of the denominators. In this case the LCM is the product of the denominators. (see skill 9.6, page 50)
- Change the fractions to equivalent fractions with the lowest common denominator.
- Add the fractions with the same denominators. (see skill 9.1, page 41)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 41)

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

**A.**  $\frac{1}{3} + \frac{5}{8}$   
 $= \frac{1 \times 8}{3 \times 8} + \frac{5 \times 3}{8 \times 3}$   
 $= \frac{8}{24} + \frac{15}{24}$   
 $= \frac{23}{24}$

LCM of 3 and 8 is 24

Multiply the numerator and denominator of the first fraction by 8.

Multiply the numerator and denominator of the second fraction by 3.

Add the fractions.

**a)**  $\frac{1}{7} + \frac{2}{3} =$   
 $= \frac{1 \times 3}{7 \times 3} + \frac{2 \times 7}{3 \times 7}$   
 $= \frac{3}{21} + \frac{14}{21} = \frac{17}{21}$

LCM of 7 and 3 is 21

**b)**  $\frac{2}{5} + \frac{1}{6} =$   
 $=$   
 $=$     $=$   

**c)**  $\frac{2}{7} + \frac{3}{5} =$   
 $=$   
 $=$     $=$   

**d)**  $\frac{3}{5} + \frac{2}{9} =$   
 $=$   
 $=$   

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

**f)**  $\frac{2}{3} + \frac{1}{5} =$   
 $=$   
 $=$   

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

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

**i)**  $\frac{2}{3} + \frac{4}{5} =$   
 $=$   
 $=$   
 $=$

**Skill 9.8** Subtracting fractions with different denominators - one denominator divides evenly into the other denominator.

- Find the lowest common denominator of the fractions, which is the Lowest Common Multiple (LCM) of the denominators. In this case the LCM is the largest denominator. (see skill 9.6, page 50)
- Change the fractions to equivalent fractions with the lowest common denominator.
- Subtract the fractions with the same denominators. (see skill 9.2, page 43)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 41)

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

**Q.**  $\frac{3}{4} - \frac{3}{20} =$

**A.**  $\frac{3}{4} - \frac{3}{20}$  LCM of 4 and 20 is 20

$$= \frac{3 \times 5}{4 \times 5} - \frac{3}{20}$$

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

$$= \frac{12}{20}$$

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

To give the first fraction a denominator of 20, multiply both the numerator and denominator by 5.

Subtract the fractions.

Simplify.

**a)**  $\frac{5}{6} - \frac{2}{3} =$  LCM of 6 and 3 is 6

$$= \frac{5}{6} - \frac{2 \times 2}{3 \times 2}$$

$$= \frac{5}{6} - \frac{4}{6} = \boxed{\frac{1}{6}}$$

**b)**  $\frac{4}{5} - \frac{3}{20} =$

$$= \frac{4 \times 4}{5 \times 4} - \frac{3}{20}$$

$$= \frac{16}{20} - \frac{3}{20} = \boxed{\frac{13}{20}}$$

**c)**  $\frac{7}{8} - \frac{1}{2} =$

$$= \frac{7}{8} - \frac{1 \times 4}{2 \times 4}$$

$$= \frac{7}{8} - \frac{4}{8} = \boxed{\frac{3}{8}}$$

**d)**  $\frac{3}{4} - \frac{5}{8} =$

$$= \frac{3 \times 2}{4 \times 2} - \frac{5}{8}$$

$$= \frac{6}{8} - \frac{5}{8} = \boxed{\frac{1}{8}}$$

**e)**  $\frac{2}{7} - \frac{2}{21} =$

$$= \frac{2 \times 3}{7 \times 3} - \frac{2}{21}$$

$$= \frac{6}{21} - \frac{2}{21} = \boxed{\frac{4}{21}}$$

**f)**  $\frac{3}{10} - \frac{3}{20} =$

$$= \frac{3 \times 2}{10 \times 2} - \frac{3}{20}$$

$$= \frac{6}{20} - \frac{3}{20} = \boxed{\frac{3}{20}}$$

**g)**  $\frac{3}{4} - \frac{5}{12} =$

$$= \frac{3 \times 3}{4 \times 3} - \frac{5}{12}$$

$$= \frac{9}{12} - \frac{5}{12}$$

$$= \frac{4}{12} = \boxed{\frac{1}{3}}$$

**h)**  $\frac{5}{6} - \frac{7}{12} =$

$$= \frac{5 \times 2}{6 \times 2} - \frac{7}{12}$$

$$= \frac{10}{12} - \frac{7}{12}$$

$$= \frac{3}{12} = \boxed{\frac{1}{4}}$$

**i)**  $\frac{3}{10} - \frac{3}{50} =$

$$= \frac{3 \times 10}{10 \times 10} - \frac{3}{50}$$

$$= \frac{30}{100} - \frac{6}{100}$$

$$= \frac{24}{100} = \boxed{\frac{6}{25}}$$

**Skill 9.9** Subtracting fractions with different denominators -  
the denominators have no common factors other than 1 (e.g. 5 and 6).

MM4.2 11 22 33 44  
MM5.1 11 22 33 44

- Find the lowest common denominator of the fractions, which is the Lowest Common Multiple (LCM) of the denominators. In this case the LCM is the product of the denominators. (see skill 9.6, page 50)
- Change the fractions to equivalent fractions with the lowest common denominator.
- Subtract the fractions with the same denominators. (see skill 9.2, page 43)
- Simplify the resulting fraction and/or change it to a mixed number if necessary. (see skill 9.1, page 41)

**Q.**  $\frac{4}{5} - \frac{2}{3} =$

**A.**  $\frac{4}{5} - \frac{2}{3}$   
 $= \frac{4 \times 3}{5 \times 3} - \frac{2 \times 5}{3 \times 5}$   
 $= \frac{12}{15} - \frac{10}{15}$   
 $= \frac{2}{15}$

LCM of 5 and 3 is 15

Multiply the numerator and denominator of the first fraction by 3.

Multiply the numerator and denominator of the second fraction by 5.

Subtract the fractions.

**a)**  $\frac{3}{2} - \frac{5}{9} =$   
 $= \frac{3 \times 9}{2 \times 9} - \frac{5 \times 2}{9 \times 2}$   
 $= \frac{27}{18} - \frac{10}{18} = \frac{17}{18}$

LCM of 2 and 9 is 18

**b)**  $\frac{5}{7} - \frac{1}{4} =$   
 $=$   
 $=$    $=$

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

**d)**  $\frac{5}{7} - \frac{2}{3} =$   
 $=$   
 $=$    $=$

**e)**  $\frac{2}{5} - \frac{1}{12} =$   
 $=$   
 $=$    $=$

**f)**  $\frac{3}{5} - \frac{3}{11} =$   
 $=$   
 $=$    $=$

**g)**  $\frac{7}{9} - \frac{3}{4} =$   
 $=$   
 $=$    $=$

**h)**  $\frac{1}{2} - \frac{3}{7} =$   
 $=$   
 $=$    $=$

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

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

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

**l)**  $\frac{7}{9} - \frac{2}{5} =$   
 $=$   
 $=$    $=$