

5. [Fraction \times, \div]

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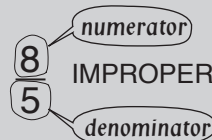
Skill 5.1 Multiplying a fraction by a whole number (1).

MM5.2 1 1 2 2 3 3 4 4
MM10 1 1 2 2 3 3 4 4

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.

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

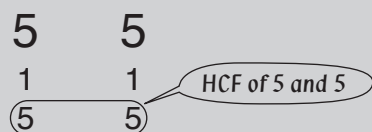
Highest Common Factor (HCF) of two numbers

- Write all the factors of each number (the factors must divide exactly into the number).
- Find the largest number that appears on both lists.

Hint: The highest common factor is the largest number that divides evenly in both numbers.

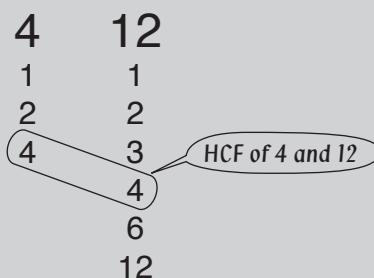
Examples:

HCF of 5 and 5



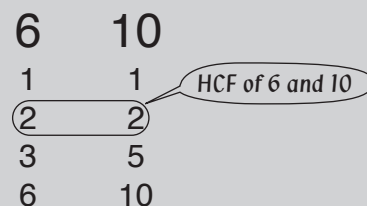
Hint: 5 is the HCF of 5 and 5 because 5 is the largest number that divides into 5 and 5.

HCF of 4 and 12



Hint: 4 is the HCF of 4 and 12 because 4 is the largest number that divides into 4 and 12.

HCF of 6 and 10



Hint: 2 is the HCF of 6 and 10 because 2 is the largest number that divides into 6 and 10.

Cross simplifying a fraction and a whole number

- Simplify the denominator of the fraction and the whole number. This means to divide them by the same number, usually by their highest common factor.
- Cross out the denominator of the fraction and the whole number.
- Write the result of the division next to each crossed number.
- Multiply the top numbers together.

$$\frac{3}{10} \times 5 = \frac{3}{\cancel{10}^2} \times \cancel{5}^1 = \frac{3}{2} = 1 \frac{1}{2}$$

Skill 5.1 Multiplying a fraction by a whole number (2).

MM5.2 1 1 2 2 3 3 4 4
MM10 1 1 2 2 3 3 4 4

- Multiply the numerator of the fraction by the whole number.
- Don't change the denominator.
- Simplify.

EITHER

- Cross simplify where possible before multiplying.

OR

- Simplify at the end.

Q. $\frac{3}{4} \times 2 =$

A. $\frac{\cancel{3}^1}{\cancel{4}_2} \times \cancel{2}^1 =$ *Divide 4 and 2 by 2*

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

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

Change to mixed number

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

OR A. $\frac{3}{4} \times 2 =$ *Multiply 3 by 2*

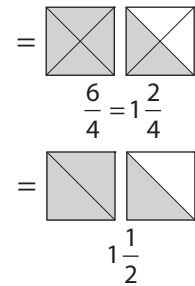
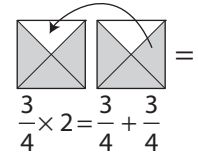
$$= \frac{3 \times 2}{4}$$

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

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

Simplify

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



a) $4 \times \frac{3}{7} =$

$$= \frac{4 \times 3}{7}$$

$$= \frac{12}{7} = \boxed{1\frac{5}{7}}$$

b) $\frac{2}{9} \times 5 =$

$$=$$

$$= \boxed{}$$

c) $6 \times \frac{2}{5} =$

$$=$$

$$= \boxed{}$$

d) $\frac{7}{10} \times 3 =$

$$=$$

$$= \boxed{}$$

e) $2 \times \frac{6}{7} =$

$$=$$

$$= \boxed{}$$

f) $\frac{1}{3} \times 4 =$

$$=$$

$$= \boxed{}$$

g) $6 \times \frac{1}{12} =$

$$= \frac{\cancel{6}^1 \times \cancel{1}}{\cancel{12}_2} =$$

Divide 6 and 12 by 6

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

h) $3 \times \frac{5}{9} =$

$$=$$

$$= \boxed{}$$

i) $2 \times \frac{1}{8} =$

$$=$$

$$= \boxed{}$$

j) $5 \times \frac{3}{10} =$

$$=$$

$$= \boxed{}$$

k) $10 \times \frac{2}{15} =$

$$=$$

$$= \boxed{}$$

l) $8 \times \frac{5}{6} =$

$$=$$

$$= \boxed{}$$

Skill 5.2 Multiplying two fractions (1).

Cross simplifying two fractions

- Simplify the numbers in the fractions diagonally (in a cross). This means to divide top and bottom numbers by the same number, usually by their Highest Common Factor. (see skill 5.1, page 49)
- Cross out the numbers in the fractions diagonally (in a cross).
- Write the result of the division next to each crossed number.
- Multiply the top results together.
- Multiply the bottom results together.

$$\frac{3}{4} \times \frac{8}{9} = \frac{\overset{\div 3}{\cancel{3}}}{\underset{\div 4}{\cancel{4}}} \times \frac{\overset{\div 4}{\cancel{8}}}{\underset{\div 3}{\cancel{9}}} = \frac{1}{1} \times \frac{2}{3} = \frac{2}{3}$$

Divide 3 and 9 by 3
Divide 4 and 8 by 4

“Of” means “times”

A quarter of a box of 8 pencils equals 2.



$$\frac{1}{4} \text{ of } 8 = \frac{1}{\cancel{4}} \times \frac{2}{\cancel{8}} = 2$$

$4 \div 4 = 1$
 $8 \div 4 = 2$
Divide 4 and 8 by 4

- Multiply the numerators of the fractions.
 - Multiply the denominators of the fractions.
- To simplify:

EITHER

- Cross simplify where possible before multiplying.

OR

- Simplify at the end.

Q. $\frac{2}{3} \times \frac{3}{4} =$

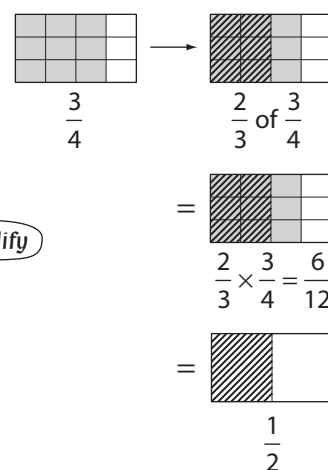
A. $\frac{2}{3} \times \frac{3}{4} =$

$$= \frac{\overset{\div 3}{\cancel{2}} \times \overset{\div 3}{\cancel{3}}}{\underset{\div 2}{\cancel{3}} \times \underset{\div 2}{\cancel{4}}} = \frac{1 \times 1}{1 \times 2} = \frac{1}{2}$$

Divide 3 and 3 by 3
Divide 2 and 4 by 2

OR A. $\frac{2}{3} \times \frac{3}{4} =$

$$= \frac{2 \times 3}{3 \times 4} = \frac{6}{12} \xrightarrow{\text{Simplify}} \frac{1}{2}$$



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

$$= \frac{3 \times 1}{4 \times 5} = \boxed{\frac{3}{20}}$$

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

$$= \boxed{\phantom{\frac{2}{21}}}$$

c) $\frac{1}{6} \times \frac{5}{8} =$

$$= \boxed{\phantom{\frac{5}{48}}}$$

Skill 5.2 Multiplying two fractions (2).

MM5.2 1 1 2 3 4
MM10 1 2 3 3 4 4

d) $\frac{5}{8} \times \frac{3}{10} =$

$$= \frac{\overset{1}{\cancel{5}}}{8} \times \frac{3}{\underset{2}{\cancel{10}}}$$

Divide
5 and 10 by 5

$$= \frac{1 \times 3}{8 \times 2} =$$

e) $\frac{3}{4} \times \frac{2}{5} =$

=

=

f) $\frac{2}{3} \times \frac{6}{11} =$

=

=

g) $\frac{2}{3} \times \frac{3}{8} =$

$$= \frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{3}}} \times \frac{\overset{1}{\cancel{3}}}{8 \times 4}$$

Divide
3 and 3 by 3Divide
2 and 8 by 2

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

h) $\frac{7}{10} \times \frac{2}{7} =$

=

=

i) $\frac{4}{9} \times \frac{9}{20} =$

=

=

j) $\frac{5}{16} \times \frac{4}{5} =$

=

=

k) $\frac{2}{11} \times \frac{11}{12} =$

=

=

l) $\frac{3}{20} \times \frac{5}{6} =$

=

=

m) $\frac{6}{10} \times \frac{5}{24} =$

=

=

n) $\frac{5}{7} \times \frac{14}{25} =$

=

=

o) $\frac{11}{12} \times \frac{6}{22} =$

=

=

p) $\frac{2}{15} \times \frac{5}{6} =$

=

=

q) $\frac{7}{27} \times \frac{18}{35} =$

=

=

r) $\frac{6}{40} \times \frac{8}{15} =$

=

=

s) $\frac{4}{9} \times \frac{3}{10} =$

=

=

t) $\frac{7}{8} \times \frac{6}{21} =$

=

=

u) $\frac{8}{15} \times \frac{3}{10} =$

=

=

Skill 5.3 Multiplying a mixed number by a fraction or by another mixed number.

- Change the mixed numbers to improper fractions before multiplying. (see skill 5.1, page 49)
 - Multiply the numerators of the fractions.
 - Multiply the denominators of the fractions.
- To simplify:

EITHER

- Cross simplify where possible before multiplying. (see skill 5.2, page 51)

OR

- Simplify at the end.

Q. $2\frac{3}{5} \times 1\frac{1}{4} =$

A. $2\frac{3}{5} \times 1\frac{1}{4} =$

Change to improper fractions

$$= \frac{13}{5} \times \frac{5}{4}$$

Divide 5 and 5 by 5

$$= \frac{13 \times 1}{1 \times 4}$$

$$= \frac{13}{4}$$

Change to mixed number

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

OR A. $2\frac{3}{5} \times 1\frac{1}{4} =$

$$= \frac{13}{5} \times \frac{5}{4}$$

$$= \frac{13 \times 5}{5 \times 4}$$

Simplify

$$= \frac{65}{20} = 3\frac{1}{4}$$

a) $1\frac{1}{2} \times \frac{5}{6} =$

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

Divide 3 and 6 by 3

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

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

b) $1\frac{1}{11} \times 3\frac{2}{3} =$

$$=$$

$$=$$

$$=$$

$$=$$

c) $3\frac{3}{4} \times 1\frac{1}{5} =$

$$=$$

$$=$$

$$=$$

$$=$$

d) $4\frac{1}{2} \times \frac{4}{15} =$

$$=$$

$$=$$

$$=$$

$$=$$

e) $1\frac{1}{5} \times 1\frac{7}{8} =$

$$=$$

$$=$$

$$=$$

$$=$$

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

$$=$$

$$=$$

$$=$$

$$=$$

g) $3\frac{1}{6} \times \frac{3}{4} =$

$$=$$

$$=$$

$$=$$

$$=$$

h) $2\frac{7}{10} \times 1\frac{2}{3} =$

$$=$$

$$=$$

$$=$$

$$=$$

i) $\frac{5}{6} \times 1\frac{5}{7} =$

$$=$$

$$=$$

$$=$$

$$=$$

Skill 5.4 Multiplying three fractions.

MM5.2 11 22 33 44
MM10 11 22 33 44

- Multiply the numerators of the fractions.
 - Multiply the denominators of the fractions.
- To simplify:

EITHER

- Cross simplify where possible before multiplying.
(see skill 5.2, page 51)

OR

- Simplify at the end.

Q. $\frac{1}{8} \times \frac{6}{7} \times \frac{7}{9} =$

A. $\frac{1}{8} \times \frac{6}{7} \times \frac{7}{9} =$

Divide 7 and 7 by 7

Divide 6 and 9 by 3

Divide 8 and 2 by 2

$$= \frac{1}{8} \times \frac{2}{1} \times \frac{1}{3}$$

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

$$= \frac{1}{12}$$

OR A. $\frac{1}{8} \times \frac{6}{7} \times \frac{7}{9} =$

$$= \frac{1 \times 6 \times 7}{8 \times 7 \times 9}$$

$$= \frac{42 \div 6}{504 \div 6}$$

Simplify

$$= \frac{7 \div 7}{84 \div 7}$$

Simplify

$$= \frac{1}{12}$$

a) $\frac{1}{2} \times \frac{1}{4} \times \frac{4}{5} =$

Divide 4 and 4 by 4

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

$$= \frac{1 \times 1 \times 1}{2 \times 1 \times 5} = \boxed{\frac{1}{10}}$$

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

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

c) $\frac{2}{3} \times \frac{1}{8} \times \frac{3}{4} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

d) $\frac{5}{6} \times \frac{3}{4} \times \frac{2}{5} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

e) $\frac{3}{4} \times \frac{3}{10} \times \frac{5}{6} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

f) $\frac{7}{10} \times \frac{2}{3} \times \frac{6}{7} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

g) $\frac{7}{9} \times \frac{2}{14} \times \frac{3}{4} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

h) $\frac{2}{3} \times \frac{9}{10} \times \frac{4}{9} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

i) $\frac{3}{10} \times \frac{5}{12} \times \frac{6}{15} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

j) $\frac{4}{5} \times \frac{10}{11} \times \frac{3}{8} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

k) $\frac{5}{6} \times \frac{4}{15} \times \frac{9}{16} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

l) $\frac{5}{11} \times \frac{11}{18} \times \frac{6}{25} =$

$$=$$

$$= \boxed{\phantom{\frac{1}{10}}}$$

Skill 5.5 Dividing two fractions.

MM5.2 1 1 2 2 3 3 4 4
MM10 1 1 2 2 3 3 4 4

- Copy the first fraction and change “divide by” (\div) into “times” (\times).
 - Invert the second fraction.
 - Multiply the numerators of the fractions.
 - Multiply the denominators of the fractions.
- To simplify:

EITHER

- Cross simplify where possible before multiplying.
(see skill 5.2, page 51)

OR

- Simplify at the end.

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

A. $\frac{1}{6} \div \frac{3}{8} =$ *Invert second fraction* **OR** **A.** $\frac{1}{6} \div \frac{3}{8} =$

$= \frac{1}{6} \times \frac{8}{3}$

$= \frac{1}{\cancel{6}^4} \times \frac{\cancel{8}_2}{3}$ *Divide 6 and 8 by 2*

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

$= \frac{4}{9}$

OR

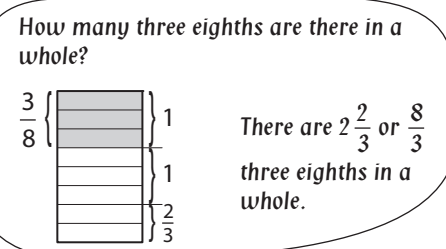
$= \frac{1}{6} \times \frac{8}{3}$

$= \frac{1 \times 8}{6 \times 3}$

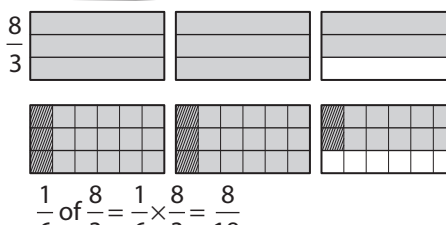
$= \frac{8 \div 2}{18 \div 2}$ *Simplify*

$= \frac{4}{9}$

How many three eighths are there in a whole?



There are $2\frac{2}{3}$ or $\frac{8}{3}$ three eighths in a whole.



$\frac{1}{6}$ of $\frac{8}{3} = \frac{1}{6} \times \frac{8}{3} = \frac{8}{18}$

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

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

$= \frac{1 \times 5}{8 \times 3} = \boxed{\frac{5}{24}}$

b) $\frac{1}{3} \div \frac{3}{4} =$

$=$

$=$

$= \boxed{\phantom{\frac{0}{0}}}$

c) $\frac{2}{7} \div \frac{5}{8} =$

$=$

$=$

$= \boxed{\phantom{\frac{0}{0}}}$

d) $\frac{3}{10} \div \frac{3}{4} =$

$= \frac{3}{10} \times \frac{4}{3}$

$= \frac{\cancel{3}^1}{\cancel{10}_5} \times \frac{\cancel{4}_2}{\cancel{3}_1}$ *Divide 3 and 3 by 3*

$= \frac{1 \times 2}{5 \times 1} = \boxed{\phantom{\frac{0}{0}}}$ *Divide 10 and 4 by 2*

e) $\frac{5}{8} \div \frac{1}{2} =$

$=$

$=$

$= \boxed{\phantom{\frac{0}{0}}}$

f) $\frac{2}{3} \div \frac{1}{6} =$

$=$

$=$

$= \boxed{\phantom{\frac{0}{0}}}$

g) $\frac{5}{8} \div \frac{5}{12} =$

$=$

$=$

$= \boxed{\phantom{\frac{0}{0}}}$

h) $\frac{9}{10} \div \frac{3}{8} =$

$=$

$=$

$= \boxed{\phantom{\frac{0}{0}}}$

i) $\frac{5}{9} \div \frac{15}{18} =$

$=$

$=$

$= \boxed{\phantom{\frac{0}{0}}}$

Skill 5.6 Dividing a whole number by a fraction.

- Copy the whole number and change “divide by” (\div) into “times” (\times).
- Invert the fraction.
- Multiply the whole number by the numerator of the fraction. Don't change the denominator. To simplify:

EITHER

- Cross simplify where possible before multiplying.
(see skill 5.2, page 51)

OR

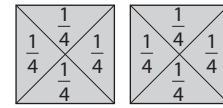
- Simplify at the end.

Q. $2 \div \frac{1}{4} =$

A. $2 \div \frac{1}{4} =$
 $= 2 \times \frac{4}{1}$
 $= \frac{2 \times 4}{1}$
 $= \frac{8}{1}$
 $= 8$

How many quarters are there in two wholes?

There are 8 quarters in two wholes.



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

a) $5 \div \frac{5}{6} =$
 $= 5 \times \frac{6}{5}$
 $= \frac{1 \times 6}{1} = \boxed{6}$

b) $2 \div \frac{2}{7} =$
 $=$
 $=$
 $=$
 $=$
 $=$
 $=$

c) $7 \div \frac{7}{9} =$
 $=$
 $=$
 $=$
 $=$
 $=$
 $=$

d) $4 \div \frac{2}{5} =$
 $=$
 $=$
 $=$
 $=$
 $=$
 $=$

e) $9 \div \frac{3}{8} =$
 $=$
 $=$
 $=$
 $=$
 $=$
 $=$

f) $8 \div \frac{1}{2} =$
 $=$
 $=$
 $=$
 $=$
 $=$
 $=$

g) $12 \div \frac{8}{11} =$
 $=$
 $=$
 $=$
 $=$
 $=$
 $=$

h) $8 \div \frac{6}{7} =$
 $=$
 $=$
 $=$
 $=$
 $=$
 $=$

i) $10 \div \frac{4}{9} =$
 $=$
 $=$
 $=$
 $=$
 $=$
 $=$

Skill 5.7 Dividing a fraction by a whole number.

MM5.2 11 22 33 44
MM10 11 22 33 44

- Copy the fraction and write the whole number as an improper fraction with denominator 1.
- Change “divide by” (\div) into “times” (\times).
- Invert the second fraction.
- Multiply the numerators of the fractions.
- Multiply the denominators of the fractions.

To simplify:

EITHER

- Cross simplify where possible before dividing.
(see skill 5.2, page 51)

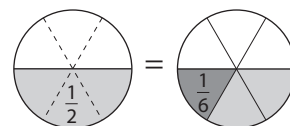
OR

- Simplify at the end.

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

A. $\frac{1}{2} \div 3 =$
 $= \frac{1}{2} \div \frac{3}{1} =$ *Invert second fraction*
 $= \frac{1}{2} \times \frac{1}{3} = \frac{1 \times 1}{2 \times 3} = \frac{1}{6}$

What is one half divided into 3 equal parts?



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

a) $\frac{4}{5} \div 8 =$

$$= \frac{4}{5} \div \frac{8}{1}$$

$$= \frac{4}{5} \times \frac{1}{8}$$

Divide 4 and 8 by 4

$$= \frac{1}{5} \times \frac{1}{2} = \frac{1}{10}$$

b) $\frac{3}{5} \div 9 =$

$$=$$

$$=$$

$$=$$

$$=$$

c) $\frac{6}{7} \div 3 =$

$$=$$

$$=$$

$$=$$

$$=$$

d) $\frac{6}{7} \div 12 =$

$$=$$

$$=$$

$$=$$

$$=$$

e) $\frac{3}{8} \div 15 =$

$$=$$

$$=$$

$$=$$

$$=$$

f) $\frac{8}{9} \div 16 =$

$$=$$

$$=$$

$$=$$

$$=$$

g) $\frac{4}{11} \div 20 =$

$$=$$

$$=$$

$$=$$

$$=$$

h) $\frac{5}{12} \div 25 =$

$$=$$

$$=$$

$$=$$

$$=$$

i) $\frac{6}{13} \div 15 =$

$$=$$

$$=$$

$$=$$

$$=$$

Skill 5.8 Dividing a mixed number by a fraction or by another mixed number. MM5.2 11 22 33 44
MM10 11 22 33 44

- Change the mixed numbers to improper fractions before dividing. (see skill 5.1, page 49)
- Copy the first fraction and change “divide by” (÷) into “times” (×).
- Invert the second fraction.
- Multiply the numerators of the fractions.
- Multiply the denominators of the fractions.

To simplify:

EITHER

- Cross simplify where possible before multiplying. (see skill 5.2, page 51)

OR

- Simplify at the end.

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

A. $\frac{8}{3} \div \frac{4}{3} =$ *Invert second fraction*
 $= \frac{8}{3} \times \frac{3}{4}$
Divide 8 and 4 by 4
 $= \frac{2}{3} \times \frac{3}{1}$
Divide 3 and 3 by 3
 $= \frac{2}{1} = 2$

OR A. $\frac{8}{3} \div \frac{4}{3} =$ *Invert second fraction*
 $= \frac{8}{3} \times \frac{3}{4}$
 $= \frac{8 \times 3}{3 \times 4}$
Simplify
 $= \frac{24 \div 12}{12 \div 12} = \frac{2}{1} = 2$

a) $2\frac{1}{4} \div \frac{3}{4} =$ *Change to improper fraction*
 $= \frac{9}{4} \div \frac{3}{4}$
 $= \frac{9}{4} \times \frac{4}{3}$
 $= \frac{3}{1} \times \frac{1}{1} = \boxed{3}$

b) $1\frac{3}{5} \div \frac{4}{5} =$
 $=$
 $=$
 $=$
 $= \boxed{}$

c) $5\frac{1}{3} \div 4 =$
 $=$
 $=$
 $=$
 $= \boxed{}$

d) $2\frac{3}{4} \div 6\frac{3}{5} =$
 $=$
 $=$
 $= \boxed{}$

e) $2\frac{2}{9} \div 1\frac{3}{7} =$
 $=$
 $=$
 $=$
 $= \boxed{}$

f) $3\frac{1}{3} \div 3\frac{3}{4} =$
 $=$
 $=$
 $=$
 $= \boxed{}$

g) $2\frac{2}{5} \div \frac{6}{25} =$
 $=$
 $=$
 $= \boxed{}$

h) $2\frac{1}{3} \div 1\frac{5}{9} =$
 $=$
 $=$
 $=$
 $= \boxed{}$

i) $1\frac{5}{6} \div 1\frac{5}{12} =$
 $=$
 $=$
 $=$
 $= \boxed{}$