

5. [Fraction \times, \div]

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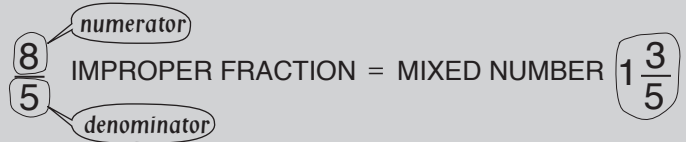
Skill 5.1 Multiplying a fraction by a whole number (1).

MMMaue 1 1 2 2 3 3 4 4
MMLime 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.

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

Greatest Common Factor (GCF) 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 Greatest Common Factor is the largest number that divides evenly in both numbers.

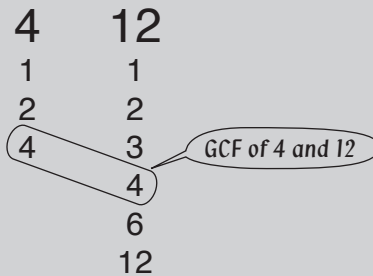
Examples:

GCF of 5 and 5



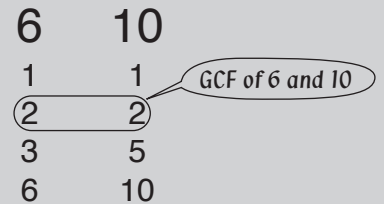
Hint: 5 is the GCF of 5 and 5 because 5 is the largest number that divides into 5 and 5.

GCF of 4 and 12



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

GCF of 6 and 10



Hint: 2 is the GCF 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 Greatest 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.

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

Divide 5 and 10 by 5
5 ÷ 5 = 1
10 ÷ 5 = 2

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

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

- Multiply the numerator of the fraction by the whole number.
- Do not 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*

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

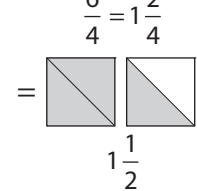
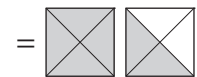
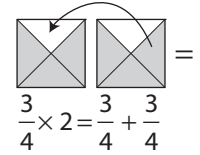
OR

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

$= \frac{6}{4}$

$= 1\frac{2+2}{4+2}$ *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) $5 \times \frac{3}{10} =$
 $=$
 $= \boxed{}$

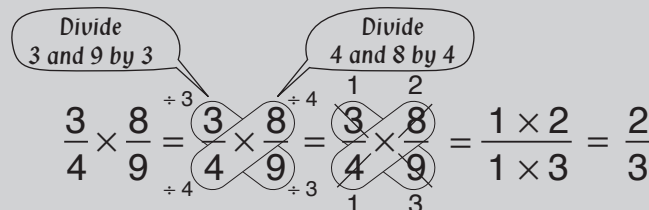
k) $10 \times \frac{2}{15} =$
 $=$
 $= \boxed{}$

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

Skill 5.2 Multiplying two fractions (1).

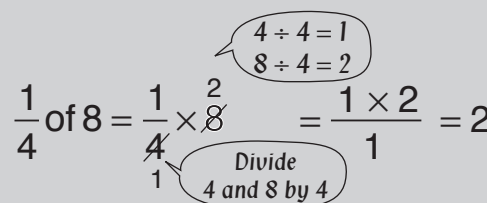
Cross simplifying two fractions

- 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 Greatest 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.



“Of” means “times”

A quarter of a box of 8 pencils equals 2.



- 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.

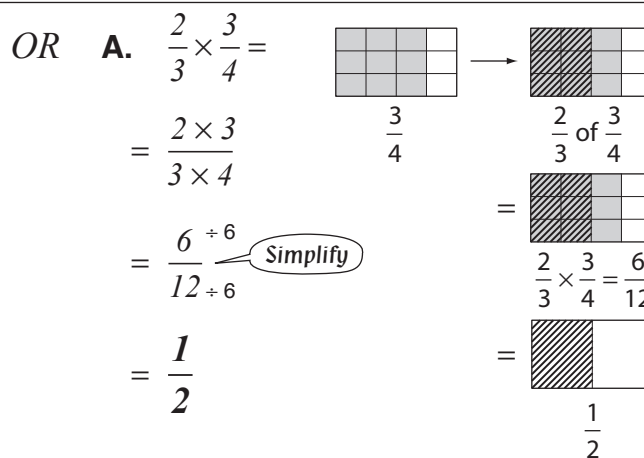
Q. $\frac{2}{3} \times \frac{3}{4} =$

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

Divide 3 and 3 by 3

Divide 2 and 4 by 2

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



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

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

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

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

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

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

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

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

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

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

f) $\frac{4}{9} \times \frac{1}{5} =$

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

Skill 5.2 Multiplying two fractions (2).

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

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

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

Divide
5 and 10 by 5

$$= \frac{1 \times 3}{8 \times 2} = \boxed{\frac{3}{16}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

j) $\frac{3}{5} \times \frac{1}{12} =$

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

k) $\frac{9}{16} \times \frac{4}{7} =$

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

l) $\frac{5}{11} \times \frac{2}{15} =$

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

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

Divide
3 and 3 by 3

$$= \frac{1 \times 1}{1 \times 4} = \boxed{\phantom{\frac{3}{16}}}$$

Divide
2 and 8 by 2

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$=$$

$$=$$

$$= \boxed{\phantom{\frac{3}{16}}}$$

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

$$= \frac{65}{20}$$

Change to mixed number

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

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

Divide 3 and 6 by 2

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

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

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

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$= \boxed{}$$

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

$$=$$

$$=$$

$$= \boxed{}$$

Skill 5.4 Multiplying three fractions.

MMMaive 11 22 33 44
MMLime 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

$$= \frac{1}{4} \times \frac{2}{1} \times \frac{1}{3}$$

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

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

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

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

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

Simplify

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

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

$$=$$

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

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

$$=$$

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

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

$$=$$

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

Skill 5.5 Dividing two fractions.

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

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

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

$$= \frac{1}{\cancel{6}^4} \times \frac{\cancel{8}_2}{3}$$

Divide 6 and 8 by 2

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

$$= \frac{4}{9}$$

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

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

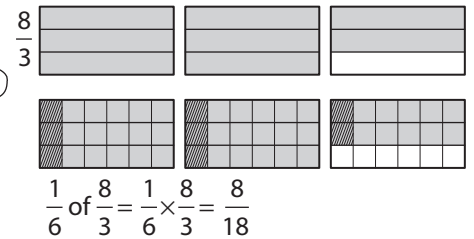
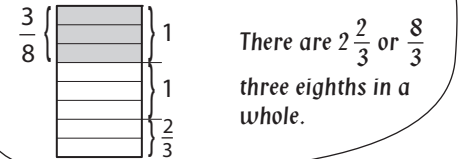
$$= \frac{1 \times 8}{6 \times 3}$$

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

Simplify

$$= \frac{4}{9}$$

How many three eighths are there in a whole?



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

$$=$$

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

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

$$=$$

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

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

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

Divide 3 and 3 by 3

$$= \frac{\cancel{3}^1}{5 \cancel{10}_2} \times \frac{\cancel{3}_1}{4}$$

Divide 10 and 4 by 2

$$= \frac{1 \times 2}{5 \times 1} = \boxed{\phantom{\frac{5}{24}}}$$

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

$$=$$

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

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

$$=$$

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

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

$$=$$

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

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

$$=$$

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

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

$$=$$

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

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. Do not 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. $2 \div \frac{1}{4} =$

↓ ↓
 $= 2 \times \frac{4}{1}$ Invert fraction

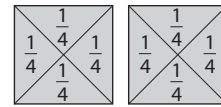
$= \frac{2 \times 4}{1}$

$= \frac{8}{1}$

$= 8$

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) $5 \div \frac{5}{6} =$

↓ ↓
 $= 5 \times \frac{6}{5}$ Invert fraction

$= \frac{1}{5} \times \frac{6}{5_1}$ Divide 5 and 5 by 5

$= \frac{1 \times 6}{1} =$ 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.

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

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

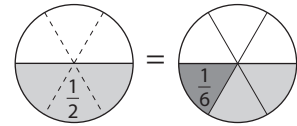
↓ ↓
Invert second fraction

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

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

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

What is one half divided into 3 equal parts?



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

This can also be thought of as one third of a half.

$$\frac{1}{3} \text{ of } \frac{1}{2} = \frac{1}{3} \times \frac{1}{2} = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

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

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

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

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

↓ ↓
Divide 4 and 8 by 4

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

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

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

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

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

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

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

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

$$=$$

$$=$$

$$=$$

$$=$$

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

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

$$=$$

$$=$$

$$=$$

$$=$$

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

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

$$=$$

$$=$$

$$=$$

$$=$$

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

Skill 5.8 Dividing a mixed number by a fraction or by another mixed number.

MMMaue 11 22 33 44
MMLime 11 22 33 44

- Change the mixed numbers to improper fractions before multiplying. (see skill 5.1, page 49)
- 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. $2\frac{2}{3} \div 1\frac{1}{3} =$

A. $\frac{8}{3} \div \frac{4}{3} =$ *Invert second fraction*

$$= \frac{8}{3} \times \frac{3}{4}$$

Divide 3 and 3 by 3

$$= \frac{\cancel{8}^2}{\cancel{3}_1} \times \frac{\cancel{3}_1}{4}$$

Divide 8 and 4 by 4

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

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

$$= 2$$

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*

$$= \frac{9}{4} \div \frac{3}{4}$$

$$= \frac{9}{4} \times \frac{4}{3}$$

Divide 9 and 3 by 3

$$= \frac{\cancel{9}^3}{4} \times \frac{4}{\cancel{3}_1}$$

Divide 4 and 4 by 4

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

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

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

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

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

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

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

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

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

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

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$

$$=$$