CHAPTER 3: COMMON FRACTIONS

3.1 BASIC CONCEPTS

3.1.1 WHAT IS A FRACTION?

Teachers: Please emphasise that fractions involve looking at EQUAL parts of a whole.

		equal parts (denominator)	shaded parts (numerator)	shaded fraction	unshaded fraction		equal parts (denominator)	shaded parts (numerator)	shaded fraction	unshaded fraction
1.1	a)	4	3	$\frac{3}{4}$	$\frac{1}{4}$	b)	4	1	$\frac{1}{4}$	$\frac{3}{4}$
	c)	3	2	$\frac{2}{3}$	$\frac{1}{3}$	d)	5	3	$\frac{3}{5}$	$\frac{2}{5}$
	e)	8	5	$\frac{5}{8}$	$\frac{3}{8}$	f)	6	5	$\frac{5}{6}$	$\frac{1}{6}$
	g)	3	1	$\frac{1}{3}$	$\frac{2}{3}$	h)	5	2	$\frac{2}{5}$	$\frac{3}{5}$
1.2	a)	8	shade 3	$\frac{3}{8}$	$\frac{5}{8}$	b)	5	shade 4	$\frac{4}{5}$	$\frac{1}{5}$
	c)	3	shade 2	$\frac{2}{3}$	$\frac{1}{3}$	d)	6	shade 5	$\frac{5}{6}$	$\frac{1}{6}$
	e)	6	shade 1	$\frac{1}{6}$	$\frac{5}{6}$	f)	8	shade 6	$\frac{6}{8}$	$\frac{2}{8}$

		total items (denom)	selected items (num)	fraction selected	fraction left over		total items (denom)	selected items (num)	fraction selected	fraction left over
2.1	a)	2	1	$\frac{1}{2}$	$\frac{1}{2}$	b)	3	1	$\frac{1}{3}$	$\frac{2}{3}$
	c)	7	5	$\frac{5}{7}$	$\frac{2}{7}$	d)	8	2	$\frac{2}{8}$	$\frac{6}{8}$
	e)	4	3	$\frac{3}{4}$	$\frac{1}{4}$	f)	8	6	$\frac{6}{8}$	$\frac{2}{8}$
2.2	a)	6	select 3	$\frac{3}{6}$	$\frac{3}{6}$	b)	3	select 1	$\frac{1}{3}$	$\frac{2}{3}$
	c)	4	select 2	$\frac{2}{4}$	$\frac{2}{4}$	d)	5	select 3	$\frac{3}{5}$	$\frac{2}{5}$
	e)	8	select 7	$\frac{7}{8}$	$\frac{1}{8}$	f)	7	select 2	$\frac{2}{7}$	$\frac{5}{7}$
	g)	5	select 2	$\frac{2}{5}$	$\frac{3}{5}$	h)	9	select 5	$\frac{5}{9}$	$\frac{4}{9}$

3.1.2 NUMERATOR AND DENOMINATOR

1. a) denominator b) numerator c) count d) name e) divide

2. a) True b) False, it can be any number, except zero.

3. a) If the denominator = 1 — the number = the numerator
   b) If the numerator = the denominator — the fraction = 1
   c) If the denominator is a factor of the numerator — the fraction = a whole number

3.1.3 PROPER & IMPROPER FRACTIONS & MIXED NUMBERS

1. An infinite number, as the denominator increases, the possibilities increase.

2. a) $\frac{1}{2}$; 1; $1\frac{1}{2}$; 2; $2\frac{1}{2}$; 3; $3\frac{1}{2}$; 4; $4\frac{1}{2}$; 5; $5\frac{1}{2}$; 6

   b) $\frac{1}{3}$; $\frac{2}{3}$; 1; $1\frac{1}{3}$; $1\frac{2}{3}$; 2; $2\frac{1}{3}$; $2\frac{2}{3}$; 3; $3\frac{1}{3}$; $3\frac{2}{3}$; 4; $4\frac{1}{3}$; $4\frac{2}{3}$; 5

   c) $\frac{1}{4}$; $\frac{2}{4}$; $\frac{3}{4}$; 1; $1\frac{1}{4}$; $1\frac{2}{4}$; $1\frac{3}{4}$; 2; $2\frac{1}{4}$; $2\frac{2}{4}$; $2\frac{3}{4}$; 3; $3\frac{1}{4}$; $3\frac{2}{4}$; $3\frac{3}{4}$; 4

   d) $\frac{1}{5}$; $\frac{2}{5}$; $\frac{3}{5}$; $\frac{4}{5}$; 1; $1\frac{1}{5}$; $1\frac{2}{5}$; $1\frac{3}{5}$; $1\frac{4}{5}$; 2; $2\frac{1}{5}$; $2\frac{2}{5}$; $2\frac{3}{5}$; $2\frac{4}{5}$; 3

e)	$\frac{1}{10}$; $\frac{2}{10}$; $\frac{3}{10}$; $\frac{4}{10}$; $\frac{5}{10}$; $\frac{6}{10}$; $\frac{7}{10}$; $\frac{8}{10}$; $\frac{9}{10}$; 1; $1\frac{1}{10}$; $1\frac{2}{10}$; $1\frac{3}{10}$; $1\frac{4}{10}$; $1\frac{5}{10}$; $1\frac{6}{10}$; $1\frac{7}{10}$; $1\frac{8}{10}$; $1\frac{9}{10}$; 2
f)	$8\frac{1}{4}$; $8\frac{2}{4}$; $8\frac{3}{4}$; 9; $9\frac{1}{4}$; $9\frac{2}{4}$; $9\frac{3}{4}$

3.

a) $\frac{1}{2}$	b) $\frac{1}{4}$; $\frac{3}{4}$	c) $\frac{1}{5}$; $\frac{3}{5}$	d) $\frac{1}{3}$; $\frac{2}{3}$	e) $\frac{1}{6}$; $\frac{3}{6}$; $\frac{5}{6}$	

4.

a) proper fraction	b) improper fraction	c) mixed number
d) improper fraction	e) mixed number	f) proper fraction

5.

a) $3\frac{1}{3} = \frac{10}{3}$	b) $2\frac{1}{6} = \frac{13}{6}$	c) $2\frac{5}{8} = \frac{21}{8}$	d) $3\frac{3}{7} = \frac{24}{7}$	e) $1\frac{3}{4} = \frac{7}{4}$	f) $1\frac{3}{5} = \frac{8}{5}$

6.

a)

$\frac{3}{3}$	$\frac{4}{3}$	$\frac{5}{3}$	$\frac{6}{3}$	$\frac{7}{3}$	$\frac{8}{3}$	$\frac{9}{3}$	$\frac{10}{3}$	$\frac{11}{3}$	$\frac{12}{3}$
1	$1\frac{1}{3}$	$1\frac{2}{3}$	2	$2\frac{1}{3}$	$2\frac{2}{3}$	3	$3\frac{1}{3}$	$3\frac{2}{3}$	4

b)

$\frac{5}{5}$	$\frac{6}{5}$	$\frac{7}{5}$	$\frac{8}{5}$	$\frac{9}{5}$	$\frac{10}{5}$	$\frac{11}{5}$	$\frac{12}{5}$	$\frac{13}{5}$	$\frac{14}{5}$
1	$1\frac{1}{5}$	$1\frac{2}{5}$	$1\frac{3}{5}$	$1\frac{4}{5}$	2	$2\frac{1}{5}$	$2\frac{2}{5}$	$2\frac{3}{5}$	$2\frac{4}{5}$

7.1	a) $\frac{13}{2}$ $6\frac{1}{2}$	b) $\frac{7}{6}$; $\frac{9}{6}$; $\frac{11}{6}$ $1\frac{1}{6}$; $1\frac{3}{6}$; $1\frac{5}{6}$	c) $\frac{17}{4}$; $\frac{19}{4}$ $4\frac{1}{4}$; $4\frac{3}{4}$	d) $\frac{10}{3}$; $\frac{11}{3}$ $3\frac{1}{3}$; $3\frac{2}{3}$	e) $\frac{12}{5}$; $\frac{14}{5}$ $2\frac{2}{5}$; $2\frac{4}{5}$
7.2	a) $\frac{5}{2}$; $\frac{9}{2}$; $\frac{13}{2}$ $2\frac{1}{2}$; $4\frac{1}{2}$; $6\frac{1}{2}$	b) $\frac{4}{3}$; $\frac{8}{3}$; $\frac{14}{3}$ $1\frac{1}{3}$; $2\frac{2}{3}$; $4\frac{2}{3}$	c) $\frac{13}{4}$; $\frac{18}{4}$; $\frac{23}{4}$ $3\frac{1}{4}$; $4\frac{2}{4}$; $5\frac{3}{4}$	d) $\frac{12}{5}$; $\frac{15}{5}$; $\frac{19}{5}$ $2\frac{2}{5}$; 3; $3\frac{4}{5}$	e) $\frac{7}{6}$; $\frac{10}{6}$; $\frac{17}{6}$ $1\frac{1}{6}$; $1\frac{4}{6}$; $2\frac{5}{6}$

8.

a) $3\frac{1}{3}$	b) $4\frac{1}{4}$	c) $5\frac{1}{5}$	d) $5\frac{1}{2}$	e) $1\frac{5}{6}$	f) $2\frac{2}{7}$
g) $1\frac{8}{9}$	h) $2\frac{2}{11}$	i) $2\frac{5}{8}$	j) $1\frac{5}{12}$	k) $5\frac{3}{4}$	l) $3\frac{3}{5}$
m) $12\frac{1}{2}$	n) $3\frac{1}{6}$	o) $2\frac{5}{7}$	p) $1\frac{5}{8}$	q) $2\frac{2}{9}$	r) $2\frac{3}{10}$

9.

a) $\frac{7}{2}$	b) $\frac{11}{5}$	c) $\frac{51}{10}$	d) $\frac{16}{3}$	e) $\frac{34}{5}$	f) $\frac{53}{5}$
g) $\frac{8}{3}$	h) $\frac{11}{6}$	i) $\frac{53}{12}$	j) $\frac{17}{4}$	k) $\frac{34}{7}$	l) $\frac{105}{20}$

10. a) 6 b) 7 c) 6 d) 10 e) 7 f) 9

11. a) 15 b) 1 c) 11 d) 6 e) 19 f) 56

12.

a) 5 rem 1	$\frac{11}{2}$	$5\frac{1}{2}$	b) 5 rem 2	$\frac{17}{3}$	$5\frac{2}{3}$	c) 8 rem 3	$\frac{35}{4}$	$8\frac{3}{4}$
d) 4 rem 3	$\frac{23}{5}$	$4\frac{3}{5}$	e) 10 rem 4	$\frac{64}{6}$	$10\frac{4}{6}$	f) 7 rem 2	$\frac{51}{7}$	$7\frac{2}{7}$

3.1.4 EQUIVALENT FRACTIONS

1.

a) $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$	b) $\frac{1}{2} = \frac{3}{6} = \frac{6}{12}$	c) $\frac{1}{3} = \frac{2}{6} = \frac{4}{12}$	d) $\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$	e) $\frac{1}{3} = \frac{3}{9}$
f) $\frac{1}{4} = \frac{2}{8}$	g) $\frac{3}{4} = \frac{6}{8}$	h) $\frac{1}{4} = \frac{3}{12}$	i) $\frac{1}{5} = \frac{2}{10}$	j) $\frac{2}{5} = \frac{4}{10}$

2.

a) $\frac{4}{8}$	b) $\frac{50}{100}$	c) $\frac{10}{15}$	d) $\frac{9}{12}$	e) $\frac{4}{10}$	f) $\frac{3}{18}$	g) $\frac{3}{9}$	h) $\frac{8}{32}$
i) $\frac{90}{100}$	j) $\frac{7}{21}$	k) $\frac{9}{15}$	l) $\frac{2}{8}$	m) $\frac{3}{15}$	n) $\frac{12}{20}$	o) $\frac{15}{60}$	

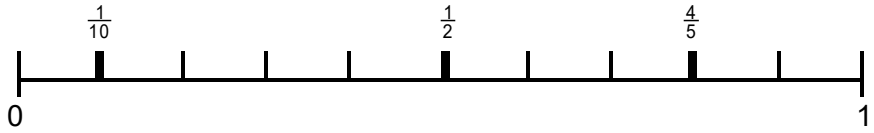
3.

a) $(\div 2)$ $\frac{2}{6} = \frac{1}{3}$	b) $(\div 2)$ $\frac{4}{10} = \frac{2}{5}$	c) $(\div 5)$ $\frac{35}{50} = \frac{7}{10}$	d) $(\div 4)$ $\frac{4}{20} = \frac{1}{5}$	e) $(\div 4)$ $\frac{8}{12} = \frac{2}{3}$
f) $(\div 5)$ $\frac{5}{20} = \frac{1}{4}$	g) $(\div 3)$ $\frac{9}{12} = \frac{3}{4}$	h) $(\div 3)$ $\frac{3}{15} = \frac{1}{5}$	i) $(\div 15)$ $\frac{15}{60} = \frac{1}{4}$	j) $(\div 15)$ $\frac{45}{60} = \frac{3}{4}$
k) $(\div 3)$ $\frac{75}{100} = \frac{3}{4}$	l) $(\div 3)$ $\frac{9}{15} = \frac{3}{5}$	m) $(\div 5)$ $\frac{25}{35} = \frac{5}{7}$	n) $(\div 2)$ $\frac{14}{24} = \frac{7}{12}$	o) $(\div 3)$ $\frac{24}{27} = \frac{8}{9}$

3.1.5 FRACTIONS ON NUMBER LINES

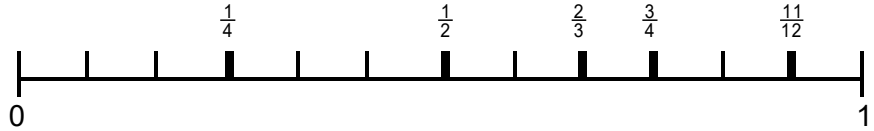
1.

a)



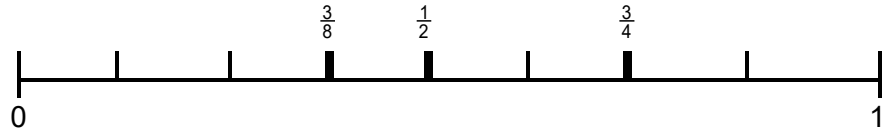
$\frac{1}{2} = \frac{5}{10}$; $\frac{4}{5} = \frac{8}{10}$

b)



$\frac{1}{2} = \frac{6}{12}$; $\frac{2}{3} = \frac{8}{12}$
$\frac{3}{4} = \frac{9}{12}$; $\frac{1}{4} = \frac{3}{12}$

c)



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

3.1.6 LOWEST COMMON DENOMINATOR (LCD) Ext

1. a) $\frac{2}{4}$; $\frac{3}{4}$ b) $\frac{6}{10}$; $\frac{3}{10}$ c) $\frac{10}{12}$; $\frac{7}{12}$ d) $\frac{2}{6}$; $\frac{1}{6}$ e) $\frac{6}{8}$; $\frac{7}{8}$ f) $\frac{15}{20}$; $\frac{14}{20}$ g) $\frac{15}{25}$; $\frac{19}{25}$ h) $\frac{13}{21}$; $\frac{9}{21}$

3.1.7 COMPARE AND ORDER FRACTIONS

If all unitary fractions, it is not necessary to write equivalent fractions with the same denominator.

1. a) $\frac{1}{2} > \frac{1}{3}$ b) $\frac{1}{4} < \frac{1}{3}$ c) $\frac{1}{3} > \frac{1}{4}$ d) $\frac{1}{3} > \frac{1}{5}$ e) $\frac{1}{5} > \frac{1}{8}$ f) $\frac{1}{5} < \frac{1}{4}$

2. a) $\frac{1}{2} > \frac{1}{10}$ b) $\frac{1}{8} < \frac{1}{2}$ c) $\frac{1}{5} > \frac{1}{10}$ d) $\frac{1}{8} < \frac{1}{4}$ e) $\frac{1}{2} > \frac{1}{4}$ f) $\frac{1}{6} < \frac{1}{2}$

3. a) $\frac{1}{5}$; $\frac{1}{7}$; $\frac{1}{8}$; $\frac{1}{12}$ b) $\frac{1}{2}$; $\frac{1}{3}$; $\frac{1}{6}$; $\frac{1}{10}$

4. a) $\frac{2}{5} < \frac{3}{5}$ b) $\frac{3}{4} > \frac{2}{4}$ c) $\frac{3}{8} < \frac{5}{8}$

5. a) $\frac{3}{4} > \frac{2}{4}$ b) $\frac{3}{5} < \frac{4}{5}$ c) $\frac{3}{3} > \frac{1}{3}$ d) $\frac{3}{8} < \frac{7}{8}$ e) $\frac{1}{6} < \frac{2}{6}$

6. a) $\frac{1}{7}$; $\frac{3}{7}$; $\frac{5}{7}$; $\frac{7}{7}$ b) $\frac{1}{12}$; $\frac{5}{12}$; $\frac{11}{12}$; $\frac{17}{12}$

Writing equivalent fractions with the same denominator for the following is not necessary.
Comparison can be done by inspection.

7. a) < b) < c) > d) > e) > f) = g) < h) > i) > j) = k) = l) <

8.

a) $\frac{1}{2}$ & $\frac{3}{4}$	b) $\frac{1}{4}$ & $\frac{2}{8}$	c) $\frac{2}{3}$ & $\frac{9}{12}$	d) $\frac{17}{20}$ & $\frac{3}{4}$	e) $\frac{5}{6}$ & $\frac{5}{12}$
$\frac{2}{4}$ & $\frac{3}{4}$	$\frac{2}{8}$ & $\frac{2}{8}$	$\frac{8}{12}$ & $\frac{9}{12}$	$\frac{17}{20}$ & $\frac{15}{20}$	$\frac{10}{12}$ & $\frac{5}{12}$
$\frac{1}{2} < \frac{3}{4}$	$\frac{1}{4} = \frac{2}{8}$	$\frac{2}{3} < \frac{9}{12}$	$\frac{17}{20} > \frac{3}{4}$	$\frac{5}{6} > \frac{5}{12}$

f) $\frac{3}{5}$ & $\frac{15}{20}$ $\frac{12}{20}$ & $\frac{15}{20}$ $\frac{3}{5} < \frac{15}{20}$	g) $\frac{1}{3}$ & $\frac{3}{12}$ $\frac{4}{12}$ & $\frac{3}{12}$ $\frac{1}{3} > \frac{3}{12}$	h) $\frac{3}{4}$ & $\frac{5}{8}$ $\frac{6}{8}$ & $\frac{5}{8}$ $\frac{3}{4} > \frac{5}{8}$	i) $\frac{1}{2}$ & $\frac{5}{6}$ $\frac{3}{6}$ & $\frac{5}{6}$ $\frac{1}{2} < \frac{5}{6}$	j) $\frac{2}{5}$ & $\frac{7}{15}$ $\frac{6}{15}$ & $\frac{7}{15}$ $\frac{2}{5} < \frac{7}{15}$

9.

a)	Given:	$\frac{5}{12}$; $\frac{3}{4}$; $\frac{5}{6}$; $\frac{1}{3}$	
	Same denominator:	$\frac{5}{12}$; $\frac{9}{12}$; $\frac{10}{12}$; $\frac{4}{12}$	
	Reordered:	$\frac{10}{12}$; $\frac{9}{12}$; $\frac{5}{12}$; $\frac{4}{12}$	
	So original fractions:	$\frac{5}{6}$; $\frac{3}{4}$; $\frac{5}{12}$; $\frac{1}{3}$	
b)	Given:	$\frac{1}{2}$; $\frac{3}{10}$; $\frac{3}{4}$; $\frac{13}{20}$	
	Same denominator:	$\frac{10}{20}$; $\frac{6}{20}$; $\frac{15}{20}$; $\frac{13}{20}$	
	Reordered:	$\frac{15}{20}$; $\frac{13}{20}$; $\frac{10}{20}$; $\frac{6}{20}$	
	So original fractions:	$\frac{3}{4}$; $\frac{13}{20}$; $\frac{1}{2}$; $\frac{3}{10}$	

3.2 ADDITION AND SUBTRACTION

3.2.1 SAME DENOMINATOR: ADDITION

1.

a) $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{4}{3} = 1\frac{1}{3}$	b) $\frac{1}{4} + \frac{1}{4} + \frac{2}{4} + \frac{2}{4} = \frac{6}{4} = 1\frac{2}{4}$ or $1\frac{1}{2}$
c) $\frac{3}{5} + \frac{2}{5} + \frac{4}{5} = \frac{9}{5} = 1\frac{4}{5}$	d) $\frac{1}{6} + \frac{3}{6} + \frac{2}{6} + \frac{4}{6} = \frac{10}{6} = 1\frac{4}{6}$ or $1\frac{2}{3}$

2.

a) $\frac{2}{3}$	b) $\frac{3}{4}$	c) $\frac{5}{6}$	d) $\frac{5}{10} = \frac{1}{2}$	e) $\frac{5}{6}$	f) $\frac{3}{4}$	g) $\frac{5}{8}$	h) $\frac{4}{5}$	i) $\frac{5}{7}$	j) $\frac{5}{10} = \frac{1}{2}$

3.1	a) $\frac{2}{2} = 1$	b) $\frac{3}{3} = 1$	c) $\frac{6}{6} = 1$	d) $\frac{4}{4} = 1$	e) $\frac{8}{8} = 1$	f) $\frac{5}{5} = 1$	g) $\frac{7}{7} = 1$	h) $\frac{10}{10} = 1$
3.2	a) $\frac{12}{3} = 4$	b) $\frac{12}{4} = 3$	c) $\frac{12}{6} = 2$	d) $\frac{20}{10} = 2$	e) $\frac{10}{2} = 5$	f) $\frac{14}{7} = 2$	g) $\frac{15}{5} = 3$	h) $\frac{12}{6} = 2$
3.3	Answers are all whole numbers as the numerator is a multiple of the denominator.							

4.

a) $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{7}{3} = 2\frac{1}{3}$
b) $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{9}{2} = 4\frac{1}{2}$
c) $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{5}{4} = 1\frac{1}{4}$
d) $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{6}{5} = 1\frac{1}{5}$
e) $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{13}{6} = 2\frac{1}{6}$

5.

a) $\frac{5}{3} = 1\frac{2}{3}$	b) $\frac{4}{4} = 1$	c) $\frac{7}{5} = 1\frac{2}{5}$	d) $\frac{12}{8} = 1\frac{4}{8} = 1\frac{1}{2}$	e) $\frac{6}{6} = 1$	f) $\frac{16}{10} = 1\frac{6}{10} = 1\frac{3}{5}$
g) $\frac{9}{2} = 4\frac{1}{2}$	h) $\frac{10}{3} = 3\frac{1}{3}$	i) $\frac{9}{4} = 2\frac{1}{4}$	j) $\frac{9}{5} = 1\frac{4}{5}$	k) $\frac{9}{6} = 1\frac{3}{6} = 1\frac{1}{2}$	l) $\frac{21}{8} = 2\frac{5}{8}$

6.

a) $3\frac{2}{3}$	b) $2\frac{1}{4}$	c) $3\frac{3}{5}$	d) $2\frac{5}{8}$	e) $4\frac{5}{6}$	f) $1\frac{7}{10}$

7.

a) $4\frac{3}{8} + 2\frac{2}{8}$ $= 6\frac{5}{8}$	b) $3\frac{1}{5} + 1\frac{2}{5}$ $= 4\frac{3}{5}$	c) $3\frac{1}{4} + 1\frac{2}{4}$ $= 4\frac{3}{4}$	d) $3\frac{1}{6} + 2\frac{2}{6}$ $= 5\frac{3}{6}$ $= 5\frac{1}{2}$	e) $1\frac{3}{6} + 2\frac{1}{6}$ $= 3\frac{4}{6}$ $= 3\frac{2}{3}$
f) $2\frac{3}{10} + 3\frac{7}{10}$ $= 5 + \frac{10}{10}$ $= 5 + 1$ $= 6$	g) $4\frac{1}{2} + 3\frac{1}{2} + 2\frac{1}{2}$ $= 9 + \frac{3}{2}$ $= 9 + 1\frac{1}{2}$ $= 10\frac{1}{2}$	h) $2\frac{1}{3} + 2\frac{2}{3} + 5\frac{1}{3}$ $= 9 + \frac{4}{3}$ $= 9 + 1\frac{1}{3}$ $= 10\frac{1}{3}$	i) $3\frac{1}{4} + 2\frac{3}{4} + 1\frac{2}{4}$ $= 6 + \frac{6}{4}$ $= 6 + 1\frac{2}{4}$ $= 7\frac{1}{2}$	

3.2.2 SAME DENOMINATOR: SUBTRACTION

1.

a) $\frac{1}{3}$

b) $\frac{1}{4}$

c) $\frac{3}{5}$

d) $\frac{2}{8} = \frac{1}{4}$

e) $\frac{2}{6} = \frac{1}{3}$

f) $\frac{1}{10}$

2.

a) $3\frac{2}{3} - 3\frac{1}{3}$ $= \frac{1}{3}$	b) $2\frac{3}{4} - 1\frac{1}{4}$ $= 1\frac{2}{4}$ $= 1\frac{1}{2}$	c) $2\frac{2}{5} - 1\frac{1}{5}$ $= 1\frac{1}{5}$	d) $3\frac{5}{6} - 1\frac{1}{6}$ $= 2\frac{4}{6}$ $= 2\frac{2}{3}$
e) $2\frac{5}{8} - 1\frac{3}{8}$ $= 1\frac{2}{8}$ $= 1\frac{1}{4}$	f) $3\frac{5}{9} - 3\frac{2}{9}$ $= \frac{3}{9}$ $= \frac{1}{3}$	g) $4\frac{7}{10} - 3\frac{3}{10}$ $= 1\frac{4}{10}$ $= 1\frac{2}{5}$	h) $1\frac{11}{12} - \frac{5}{12}$ $= 1\frac{6}{12}$ $= 1\frac{1}{2}$

3.

a) $3\frac{1}{3} - 1\frac{2}{3}$ $= 2\frac{4}{3} - 1\frac{2}{3}$ $= 1\frac{2}{3}$	b) $5\frac{1}{4} - 2\frac{3}{4}$ $= 4\frac{5}{4} - 2\frac{3}{4}$ $= 2\frac{2}{4}$ $= 2\frac{1}{2}$	c) $1\frac{2}{5} - \frac{4}{5}$ $= \frac{7}{5} - \frac{4}{5}$ $= \frac{3}{5}$	d) $2\frac{2}{6} - 1\frac{5}{6}$ $= 1\frac{8}{6} - 1\frac{5}{6}$ $= \frac{3}{6}$ $= \frac{1}{2}$
e) $3\frac{5}{8} - 2\frac{7}{8}$ $= 2\frac{13}{8} - 2\frac{7}{8}$ $= \frac{6}{8}$ $= \frac{3}{4}$	f) $3\frac{2}{9} - 1\frac{7}{9}$ $= 2\frac{11}{9} - 1\frac{7}{9}$ $= 1\frac{4}{9}$	g) $2\frac{3}{10} - 1\frac{7}{10}$ $= 1\frac{13}{10} - 1\frac{7}{10}$ $= \frac{6}{10}$ $= \frac{3}{5}$	h) $5\frac{1}{12} - 1\frac{5}{12}$ $= 4\frac{13}{12} - 1\frac{5}{12}$ $= 3\frac{8}{12}$ $= 3\frac{2}{3}$

3.2.3 DIFFERENT DENOMINATORS: ADDITION & SUBTRACTION

1.

a) $\frac{1}{2} + \frac{1}{4}$ $= \frac{2}{4} + \frac{1}{4}$ $= \frac{3}{4}$	b) $\frac{1}{2} + \frac{3}{8}$ $= \frac{4}{8} + \frac{3}{8}$ $= \frac{7}{8}$	c) $\frac{1}{5} + \frac{7}{10}$ $= \frac{2}{10} + \frac{7}{10}$ $= \frac{9}{10}$	d) $\frac{7}{12} + \frac{1}{6}$ $= \frac{7}{12} + \frac{2}{12}$ $= \frac{9}{12}$ $= \frac{3}{4}$	e) $\frac{1}{4} + \frac{5}{12}$ $= \frac{3}{12} + \frac{5}{12}$ $= \frac{8}{12}$ $= \frac{2}{3}$
f) $\frac{7}{20} + \frac{3}{4}$ $= \frac{7}{20} + \frac{15}{20}$ $= \frac{22}{20}$ $= 1\frac{2}{20} = 1\frac{1}{10}$	g) $\frac{1}{2} + \frac{2}{5} + \frac{7}{10}$ $= \frac{5}{10} + \frac{4}{10} + \frac{7}{10}$ $= \frac{16}{10}$ $= 1\frac{6}{10} = 1\frac{3}{5}$	h) $\frac{1}{3} + \frac{1}{2} + \frac{1}{6}$ $= \frac{2}{6} + \frac{3}{6} + \frac{1}{6}$ $= \frac{6}{6}$ $= 1$	i) $\frac{1}{2} + \frac{1}{4} + \frac{3}{8}$ $= \frac{4}{8} + \frac{2}{8} + \frac{3}{8}$ $= \frac{9}{8}$ $= 1\frac{1}{8}$	

2.

a) $\frac{3}{4} - \frac{1}{2}$ $= \frac{3}{4} - \frac{2}{4}$ $= \frac{1}{4}$	b) $\frac{3}{4} - \frac{3}{8}$ $= \frac{6}{8} - \frac{3}{8}$ $= \frac{3}{8}$	c) $\frac{3}{5} - \frac{1}{10}$ $= \frac{6}{10} - \frac{1}{10}$ $= \frac{5}{10}$ $= \frac{1}{2}$	d) $\frac{2}{3} - \frac{5}{12}$ $= \frac{8}{12} - \frac{5}{12}$ $= \frac{3}{12}$ $= \frac{1}{4}$
e) $\frac{4}{7} - \frac{3}{14}$ $= \frac{8}{14} - \frac{3}{14}$ $= \frac{5}{14}$	f) $\frac{11}{15} - \frac{2}{3}$ $= \frac{11}{15} - \frac{10}{15}$ $= \frac{1}{15}$	g) $\frac{7}{8} - \frac{3}{16}$ $= \frac{14}{16} - \frac{3}{16}$ $= \frac{11}{16}$	h) $\frac{7}{9} - \frac{1}{18}$ $= \frac{14}{18} - \frac{1}{18}$ $= \frac{13}{18}$

3.

a) $1\frac{1}{2} + 2\frac{2}{6}$ $= 1\frac{3}{6} + 2\frac{2}{6}$ $= 3\frac{5}{6}$	b) $2\frac{1}{3} + 2\frac{5}{9}$ $= 2\frac{3}{9} + 2\frac{5}{9}$ $= 4\frac{8}{9}$	c) $3\frac{1}{2} + 2\frac{5}{12}$ $= 3\frac{6}{12} + 2\frac{5}{12}$ $= 5\frac{11}{12}$	d) $3\frac{5}{8} + 1\frac{1}{4}$ $= 3\frac{5}{8} + 1\frac{2}{8}$ $= 4\frac{7}{8}$	e) $1\frac{7}{10} + 4\frac{1}{5}$ $= 1\frac{7}{10} + 4\frac{2}{10}$ $= 5\frac{9}{10}$

f) $2\frac{1}{2}+1\frac{7}{20}$ $=2\frac{10}{20}+1\frac{7}{20}$ $=3\frac{17}{20}$	g) $2\frac{1}{2}+1\frac{5}{8}+3\frac{3}{4}$ $=2\frac{4}{8}+1\frac{5}{8}+3\frac{6}{8}$ $=6+\frac{15}{8}$ $=6+1\frac{7}{8}$ $=7\frac{7}{8}$	h) $5\frac{1}{12}+3\frac{1}{6}+1\frac{1}{4}$ $=5\frac{1}{12}+3\frac{2}{12}+1\frac{3}{12}$ $=9\frac{6}{12}$ $=9\frac{1}{2}$	i) $2\frac{3}{5}+1\frac{2}{15}+2\frac{1}{3}$ $=2\frac{9}{15}+1\frac{2}{15}+2\frac{5}{15}$ $=5+\frac{16}{15}$ $=5+1\frac{1}{15}$ $=6\frac{1}{15}$

4.

a) $2\frac{1}{2}-1\frac{1}{4}$ $=2\frac{2}{4}-1\frac{1}{4}$ $=1\frac{1}{4}$	b) $3\frac{2}{3}-1\frac{1}{6}$ $=3\frac{4}{6}-1\frac{1}{6}$ $=2\frac{3}{6}$ $=2\frac{1}{2}$	c) $2\frac{1}{2}-1\frac{3}{8}$ $=2\frac{4}{8}-1\frac{3}{8}$ $=1\frac{1}{8}$	d) $3\frac{2}{3}-3\frac{2}{9}$ $=3\frac{6}{9}-3\frac{2}{9}$ $=\frac{4}{9}$
e) $1\frac{2}{3}-\frac{5}{12}$ $=1\frac{8}{12}-\frac{5}{12}$ $=1\frac{3}{12}$ $=1\frac{1}{4}$	f) $2\frac{9}{10}-2\frac{2}{5}$ $=2\frac{9}{10}-2\frac{4}{10}$ $=\frac{5}{10}$ $=\frac{1}{2}$	g) $4\frac{11}{16}-2\frac{1}{2}$ $=4\frac{11}{16}-2\frac{8}{16}$ $=2\frac{3}{16}$	h) $3\frac{17}{18}-3\frac{1}{2}$ $=3\frac{17}{18}-3\frac{9}{18}$ $=\frac{8}{18}$ $=\frac{4}{9}$

5.

a) $2\frac{1}{2}-\frac{3}{4}$ $=2\frac{2}{4}-\frac{3}{4}$ $=1\frac{6}{4}-\frac{3}{4}$ $=1\frac{3}{4}$	b) $1\frac{1}{2}-\frac{5}{6}$ $=1\frac{3}{6}-\frac{5}{6}$ $=\frac{9}{6}-\frac{5}{6}$ $=\frac{4}{6}$ $=\frac{2}{3}$	c) $2\frac{1}{2}-\frac{7}{8}$ $=2\frac{4}{8}-\frac{7}{8}$ $=1\frac{12}{8}-\frac{7}{8}$ $=1\frac{5}{8}$	d) $5\frac{1}{2}-4\frac{7}{10}$ $=5\frac{5}{10}-4\frac{7}{10}$ $=4\frac{15}{10}-4\frac{7}{10}$ $=\frac{8}{10}$ $=\frac{4}{5}$
e) $3\frac{1}{12}-2\frac{3}{4}$ $=3\frac{1}{12}-2\frac{9}{12}$ $=2\frac{13}{12}-2\frac{9}{12}$ $=\frac{4}{12}$ $=\frac{1}{3}$	f) $3\frac{3}{5}-1\frac{14}{15}$ $=3\frac{9}{15}-1\frac{14}{15}$ $=2\frac{24}{15}-1\frac{14}{15}$ $=1\frac{10}{15}$ $=1\frac{2}{3}$	g) $2\frac{3}{16}-1\frac{3}{4}$ $=2\frac{3}{16}-1\frac{12}{16}$ $=1\frac{19}{16}-1\frac{12}{16}$ $=\frac{7}{16}$	h) $4\frac{1}{6}-3\frac{5}{18}$ $=4\frac{3}{18}-3\frac{5}{18}$ $=3\frac{21}{18}-3\frac{5}{18}$ $=\frac{16}{18}$ $=\frac{8}{9}$

6.

a) Total mass of vegetables $=(3\frac{1}{2}+1\frac{1}{4}+\frac{1}{2}+2\frac{3}{8})$ kg $=(3\frac{4}{8}+1\frac{2}{8}+\frac{4}{8}+2\frac{3}{8})$ kg $=(3+1+2)$ kg $+(\frac{4}{8}+\frac{2}{8}+\frac{4}{8}+\frac{3}{8})$ kg $=6$kg $+\frac{13}{8}$ kg $=6$kg $+1\frac{5}{8}$ kg $=7\frac{5}{8}$ kg	b) Cups of flour needed $=2\frac{1}{4}-1\frac{3}{4}$ $=1\frac{5}{4}-1\frac{3}{4}$ $=\frac{2}{4}$ $=\frac{1}{2}$
c) Distance he rode $=(2\frac{1}{4}+3\frac{1}{8})$ km $=5$km $+(\frac{1}{4}+\frac{1}{8})$ km $=5$km $+(\frac{2}{8}+\frac{1}{8})$ km $=5$km $+\frac{3}{8}$ km $=5\frac{3}{8}$ km	d) Juice left $=70\ell-(50\frac{1}{2}+13\frac{3}{4})\ell$ $=70\ell-(50\frac{2}{4}+13\frac{3}{4})\ell$ $=70\ell-63\frac{5}{4}\ell$ $=70\ell-64\frac{1}{4}\ell$ $=5\frac{3}{4}\ell$

3.3 FRACTION OF A WHOLE NUMBER

1. a) 2; 6 b) 3; 12 c) 2; 16

2.1	a) 8	b) 6	c) 5	d) 20	e) 5	f) 10	g) 4	h) 6
2.2	a) 30	b) 24	c) 30	d) 32	e) 15	f) 18	g) 15	h) 20

3. a) i) $1 \div 6 = \frac{1}{6}$ ii) R72 ÷ 6 = R12

b) i) $\frac{1}{6}$ of 30 = 5 people ii) $\frac{5}{6}$ of 30 = 5 x 5 = 25 people or 30 – 5 = 25

c) Blue: $\frac{1}{3}$ of 12 = 4; Red: $\frac{1}{4}$ of 12 = 3; Green: $\frac{1}{6}$ of 12 = 2
Blue + Red + Green = 4 + 3 + 2 = 9; Yellow: 12 – 9 = 3

d) i) $\frac{2}{3}$ ii) $\frac{1}{3}$ of R36 = R12, so $\frac{2}{3}$ of R36 = R24

4. a) 4 faces need hats b) 3 out of 15 = $\frac{3}{15}$ or $\frac{1}{5}$ c) 15 out of 20 d) $\frac{4}{5}$ of 100 = 80

5. a) i) Beans: $\frac{1}{6}$ of R120 = R20 Potatoes: $\frac{1}{3}$ of R120 = R40 Ice cream: $\frac{1}{2}$ of R120 = R60
ii) R20 + R40 + R60 = R120 which is the original amount

b) No of learners = $\frac{2}{5}$ of 250 = 250 ÷ 5 x 2 = 100

c) $\frac{3}{4}$ of 200 = 150km
Still to travel $\frac{1}{4}$ of 200 = 50km or 200km – 150km = 50km

d) Meera: $\frac{1}{3}$ of 45 = 15 Nonhlanhla: $\frac{1}{9}$ of 45 = 5 Jay: $\frac{2}{9}$ of 45 = 10
Thandi: $\frac{1}{5}$ of 45 = 9 Siphiwo: $\frac{2}{15}$ of 45 = 6

6. a) i) $\frac{1}{4}$ ii) $9 \div 4 = \frac{9}{4} = 2\frac{1}{4}$ apples
b) i) $\frac{1}{7}$ ii) $5 \div 7 = \frac{5}{7}$ of a pizza

7. a) i) No of children
= R240 ÷ R20
= 12
ii) $\frac{1}{12}$

b) i) No of children
= 30 ÷ 5
= 6
ii) $\frac{1}{6}$

c) i) Total no of shells
= 7 x 4
= 28
ii) $\frac{1}{7}$

8. a) 9 marbles: $\frac{9}{36} = \frac{1}{4}$
b) 3 marbles: $\frac{3}{36} = \frac{1}{12}$
c) 30 marbles: $\frac{30}{36} = \frac{5}{6}$

CHAPTER 3: MIXED BAG

1.

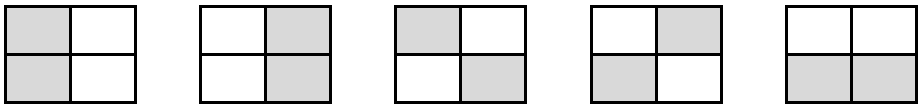
proper fractions	improper fractions	mixed numbers	whole numbers	
$\frac{3}{5}$; $\frac{11}{15}$; $\frac{2}{7}$	$\frac{20}{4}$; $\frac{8}{5}$; $\frac{15}{4}$; $\frac{10}{5}$	$3\frac{1}{7}$; $5\frac{6}{11}$	$\frac{10}{10}$; $\frac{20}{4}$; $\frac{10}{5}$	Discuss: 2 fractions in last column are improper, but are equal to whole numbers.

2.

	total no of parts	fraction with green shading	fraction with blue shading	fraction with white shading		total no of parts	fraction with green shading	fraction with blue shading	fraction with white shading
a)	6	$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$	b)	8	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{3}{8}$
c)	5	$\frac{2}{5}$	$\frac{1}{5}$	$\frac{2}{5}$	d)	9	$\frac{3}{9}$	$\frac{2}{9}$	$\frac{4}{9}$
e)	7	$\frac{3}{7}$	$\frac{1}{7}$	$\frac{3}{7}$	f)	10	$\frac{4}{10}$	$\frac{2}{10}$	$\frac{4}{10}$

3. a) $\frac{10}{24} = \frac{5}{12}$ b) $\frac{7}{16}$ c) $\frac{9}{18} = \frac{1}{2}$ (9 triangles or half squares out of 18)

4.



5.1 3 pizzas cut into quarters = 12 quarters

5.2 a) 8 b) 15 c) 13 d) 6 e) 21 f) 11

Notice that this is same as converting from whole or mixed number to improper fraction.

6.

a) $\frac{1}{6}$ of Jozi's is more, as her whole cake is larger (comparing fractions of different amounts)

b) $\frac{2}{3} = \frac{10}{15}$ so $\frac{11}{15} > \frac{2}{3}$ so Michelle takes longer (comparing fractions of the same amount)

7.

a) 24 and 25 so $\frac{3}{5}$ of 40 < $\frac{5}{8}$ of 40	b) 27 and 32 so $\frac{3}{8}$ of 72 < $\frac{4}{9}$ of 72
c) 56 and 48 so $\frac{7}{8}$ of 64 > $\frac{6}{7}$ of 56	d) 40 and 45 so $\frac{4}{5}$ of 50 < $\frac{3}{4}$ of 60

8.

Left over chocolate = whole chocolate – (Paul's share + Mina's share)

$= 1-(\frac{1}{2}+\frac{3}{8}) = 1-(\frac{4}{8}+\frac{3}{8}) = 1-\frac{7}{8} = \frac{1}{8}$ so C is the correct answer

9.

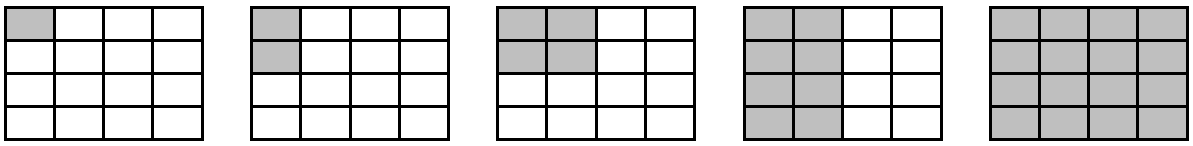
a) $5\frac{2}{5}+\frac{3}{5}+4\frac{1}{5}$ $=9+\frac{6}{5}$ $=9+1\frac{1}{5}$ $=10\frac{1}{5}$	b) $2\frac{11}{15}-2\frac{2}{15}$ $=\frac{9}{15}$ $=\frac{3}{5}$	c) $6\frac{5}{6}+\frac{3}{6}+5\frac{1}{6}$ $=11+\frac{9}{6}$ $=11+1\frac{3}{6}$ $=12\frac{1}{2}$	d) $2\frac{2}{5}-1\frac{2}{5}$ $=1$
e) $4\frac{2}{15}-2\frac{11}{15}$ $=3\frac{17}{15}-2\frac{11}{15}$ $=1\frac{6}{15}$ $=1\frac{2}{5}$	f) $\frac{3}{5}+\frac{7}{15}+\frac{1}{3}$ $=\frac{9}{15}+\frac{7}{15}+\frac{5}{15}$ $=\frac{21}{15}$ $=1\frac{6}{15}$ $=1\frac{2}{5}$	g) $\frac{2}{5}-\frac{7}{20}$ $=\frac{8}{20}-\frac{7}{20}$ $=\frac{1}{20}$	h) $\frac{2}{3}+\frac{7}{18}+\frac{1}{2}$ $=\frac{12}{18}+\frac{7}{18}+\frac{9}{18}$ $=\frac{28}{18}$ $=1\frac{10}{18}$ $=1\frac{5}{9}$
i) $\frac{7}{16}+2\frac{5}{8}+3\frac{2}{4}$ $=\frac{7}{16}+2\frac{10}{16}+3\frac{8}{16}$ $=5+\frac{25}{16}$ $=5+1\frac{9}{16}$ $=6\frac{9}{16}$	j) $2\frac{2}{5}-1\frac{3}{20}$ $=2\frac{8}{20}-1\frac{3}{20}$ $=1\frac{5}{20}$ $=1\frac{1}{4}$	k) $1\frac{2}{9}+\frac{13}{18}+5\frac{5}{6}$ $=1\frac{4}{18}+\frac{13}{18}+5\frac{15}{18}$ $=6+\frac{32}{18}$ $=6+1\frac{14}{18}$ $=7\frac{7}{9}$	l) $5\frac{7}{20}-2\frac{7}{10}$ $=5\frac{7}{20}-2\frac{14}{20}$ $=4\frac{27}{20}-2\frac{14}{20}$ $=2\frac{13}{20}$

10.

If after 16 days everyone had it, after 15 days half this number had it, and after **14 days** one quarter of the number had it.

e.g. If 32 in the class, after 16 days 32 had flu. After 15 days 16 had flu. After 14 days 8 had it.
(8 is a quarter of 32)

Seen visually:



$\frac{1}{16}$	$\frac{2}{16} = \frac{1}{8}$	$\frac{4}{16} = \frac{1}{4}$	$\frac{8}{16} = \frac{1}{2}$	$\frac{16}{16} = 1$
Day 12	Day 13	Day 14	Day 15	Day 16

11.

Think – it is 20m **and** half its length. So the 20m must also be half its length.

Check: 20m + ($\frac{1}{2}$ of 40m) = 40m