KING EDWARD VI
HANDSWORTH GRAMMAR
SCHOOL FOR BOYS

KING EDWARD VI
ACADEMY TRUST
BIRMINGHAM

Year 7

2024 Mathematics 2025

Unit 3 Booklet

HGS Maths

Tasks

Dr Frost Course

Name: _____

Class: _____

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1 Fractions

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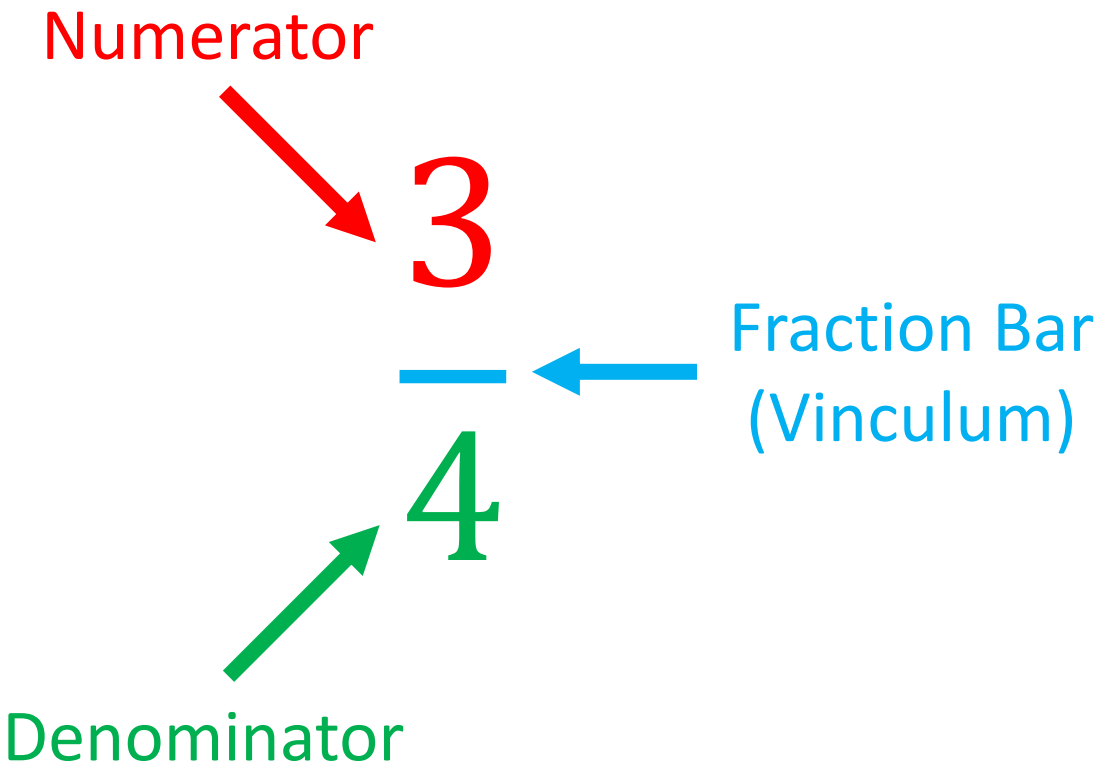

1.1 Equivalent Fractions

Worked Example	Your Turn
Multiply these fractions so they have a denominator of 8: a) $\frac{1}{2}$ b) $\frac{3}{4}$	Multiply these fractions so they have a denominator of 12: a) $\frac{1}{2}$ b) $\frac{3}{4}$

1.2 Simplifying Fractions

Worked Example	Your Turn
Simplify: a) $\frac{6}{20}$ b) $\frac{12}{20}$	Simplify: a) $\frac{6}{18}$ b) $\frac{12}{18}$

Worked Example	Your Turn
Simplify these fractions: a) $\frac{0.4}{0.7}$ b) $\frac{0.4}{1.2}$ c) $\frac{0.44}{1}$	Simplify these fractions: a) $\frac{0.5}{0.6}$ b) $\frac{0.6}{2.4}$ c) $\frac{0.36}{2}$

Worked Example	Your Turn
Express 50p as a fraction of £4. Give your answer in its simplest form.	Express 20p as a fraction of £10. Give your answer in its simplest form.

Worked Example	Your Turn
a) There are 12 red counters, in a box with 30 counters in total. Write this proportion as a fraction in its simplest form. b) There are 53 people at a party. 46 of them are adults. What fraction of the people are **not** adults?	a) There are 21 yellow counters, in a box with 36 counters in total. Write this proportion as a fraction in its simplest form. b) There are 49 people at a party. 42 of them are children. What fraction of the people are **not** children?

Dr Frost 98f and 98g

1.3 Improper Fractions and Mixed Numbers

Frayer Model – Improper Fraction

Definition	**Characteristics**
Examples	**Non-Examples**

Frayer Model – Mixed Number

Definition	**Characteristics**
Examples	**Non-Examples**

Worked Example	Your Turn
a) Convert $\frac{6}{5}$ into a mixed number. b) Convert $2\frac{1}{3}$ into an improper fraction.	a) Convert $\frac{13}{5}$ into a mixed number. b) Convert $4\frac{1}{3}$ into an improper fraction.

1.4 Adding and Subtracting Fractions

Worked Example

Calculate:

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

b) $\frac{2}{5} - \frac{1}{3}$

c) $1 - \frac{1}{3}$

Your Turn

Calculate:

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

b) $\frac{2}{3} - \frac{1}{5}$

c) $1 - \frac{1}{5}$

Dr Frost 117a and 56f

Fill in the Gaps

Question	With a Common Denominator	Unsimplified Answer	Simplified Answer (where possible)
$\frac{1}{3}+\frac{1}{6}$	$\frac{2}{6}+\frac{1}{6}$	$\frac{3}{6}$	$\frac{\square}{\square}$
$\frac{1}{4}+\frac{2}{3}$	$\frac{3}{12}+\frac{\square}{12}$	$\frac{\square}{12}$	$\frac{\square}{12}$
$\frac{2}{5}+\frac{1}{4}$	$\frac{\square}{20}+\frac{\square}{20}$	$\frac{\square}{20}$	$\frac{\square}{20}$
$\frac{5}{6}-\frac{1}{2}$	$\frac{\square}{6}-\frac{\square}{6}$	$\frac{\square}{6}$	$\frac{\square}{\square}$
$\frac{7}{8}-\frac{2}{3}$	$\frac{21}{\square}-\frac{16}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{7}{9}-\frac{3}{4}$	$\frac{\square}{\square}-\frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{\square}{\square}+\frac{\square}{\square}$	$\frac{\square}{35}+\frac{14}{35}$	$\frac{24}{35}$	$\frac{24}{35}$
$\frac{\square}{\square}-\frac{\square}{\square}$	$\frac{\square}{\square}-\frac{5}{\square}$	$\frac{6}{20}$	$\frac{\square}{\square}$
$\frac{\square}{\square}+\frac{\square}{\square}$	$\frac{\square}{\square}+\frac{7}{24}$	$\frac{\square}{\square}$	$\frac{2}{3}$
$\frac{13}{15}-\frac{\square}{\square}$	$\frac{26}{\square}-\frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{7}{10}$
$\frac{3}{10}+\frac{\square}{\square}+\frac{\square}{\square}$	$\frac{\square}{\square}+\frac{5}{20}+\frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{9}{10}$
$\frac{\square}{\square}+\frac{\square}{\square}-\frac{\square}{\square}$	$\frac{5}{\square}+\frac{\square}{\square}-\frac{8}{\square}$	$\frac{\square}{36}$	$\frac{2}{3}$

Worked Example	Your Turn
Calculate: a) $2\frac{1}{2}+3\frac{2}{5}$ b) $2\frac{1}{2}-1\frac{2}{5}$	Calculate: a) $2\frac{1}{3}+3\frac{2}{5}$ b) $2\frac{1}{3}-1\frac{2}{5}$

Fill in the Gaps

Question	Write as Improper Fractions	Convert to Common Denominator	Answer as Improper Fraction	Answer as Mixed Number
$1\frac{1}{3}+2\frac{1}{2}$	$\frac{4}{3}+\frac{5}{2}$	$\frac{8}{6}+\frac{15}{6}$	$\frac{23}{6}$	
$3\frac{2}{3}+1\frac{1}{4}$	$\frac{11}{3}+\frac{5}{4}$	$\frac{44}{12}+\frac{15}{12}$		
$4\frac{1}{2}-3\frac{2}{5}$	$\frac{9}{2}-\frac{17}{5}$	$\frac{\square}{10}-\frac{\square}{10}$		
$2\frac{3}{4}+1\frac{5}{6}$	$\frac{11}{4}+\frac{11}{6}$			
$5\frac{1}{3}-3\frac{2}{5}$				
$4\frac{3}{4}-2\frac{5}{7}$				
$2\frac{8}{9}+3\frac{3}{5}$				
$2\frac{13}{20}-\frac{7}{8}$				
	$\frac{7}{4}+\frac{12}{5}$			
	$\frac{\square}{9}-\frac{\square}{4}$	$\frac{100}{36}-\frac{45}{36}$		
	$\frac{3}{2}+\frac{\square}{\square}$		$\frac{29}{10}$	
$\square\frac{\square}{\square}-2\frac{1}{6}$				$3\frac{7}{30}$

1.5 Multiplying Fractions

Worked Example	Your Turn
Calculate: a) $\frac{2}{3} \times \frac{1}{6}$ b) $2 \times \frac{1}{6}$	Calculate: a) $\frac{2}{3} \times \frac{5}{6}$ b) $\frac{5}{6} \times 2$

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Worked Example	Your Turn
Calculate: a) $1\frac{1}{3} \times 4\frac{2}{5}$ b) $1\frac{1}{3} \times 2$	Calculate: a) $4\frac{1}{3} \times 1\frac{2}{5}$ b) $3 \times 1\frac{2}{5}$

Dr Frost 167a and 119b

Fill in the Gaps

Question	Write as Improper Fractions	Multiply Numerators/ Denominators	Simplify (where possible)	Answer as Mixed Number
$1\frac{2}{3} \times 1\frac{1}{2}$	$\frac{5}{3} \times \frac{3}{2}$	$\frac{15}{6}$	$\frac{5}{2}$	
$2\frac{2}{5} \times 1\frac{1}{3}$	$\frac{12}{5} \times \frac{4}{3}$	$\frac{48}{15}$		
$3\frac{1}{2} \times 3\frac{1}{3}$	$\frac{7}{2} \times \frac{10}{3}$			
$1\frac{3}{4} \times 2\frac{5}{7}$				
$2\frac{4}{5} \times \frac{6}{7}$				
$2\frac{3}{10} \times 2\frac{2}{9}$				
$5\frac{2}{3} \times 1\frac{3}{4}$				
$3\frac{7}{10} \times 1\frac{3}{7}$				
$5\frac{1}{2} \times 2\frac{3}{4}$				
	$\frac{9}{5} \times \frac{10}{3}$			
	$\frac{\square}{\square} \times \frac{5}{3}$	$\frac{75}{12}$		
$\square\frac{\square}{\square} \times 2\frac{2}{5}$		$\frac{132}{20}$		

Worked Example	Your Turn
Calculate: a) $\frac{2}{5} \times \frac{25}{18}$ b) $4\frac{1}{5} \times 5\frac{5}{7}$	Calculate: a) $\frac{2}{5} \times \frac{25}{16}$ b) $4\frac{1}{5} \times 6\frac{3}{7}$

Worked Example	Your Turn
$\frac{9}{10}$ of the students in a class are female. $\frac{2}{5}$ of the female students play chess. Calculate the fraction of the class who are female chess players. Give your answer in its simplest form.	$\frac{3}{7}$ of a tennis club are men. $\frac{6}{11}$ of the men in the club are right-handed. Calculate the fraction of the club who are right-handed men. Give your answer in its simplest form.

Worked Example	Your Turn
Viraj has 4 cats. Each cat eats $\frac{6}{11}$ of a tin of cat food a day. He buys 13 tins of cat food. Determine whether he has bought enough to feed his 4 cats for 5 days.	Mia has 3 cats. Each cat eats $\frac{9}{10}$ of a tin of cat food a day. They buy 15 tins of cat food. Determine whether they have bought enough to feed their 3 cats for 5 days.

1.6 Squaring and Square Rooting Fractions

Worked Example	Your Turn
Calculate: a) $\left(\frac{5}{8}\right)^2$ b) $\sqrt{\frac{16}{81}}$ c) $\left(-\frac{4}{5}\right)^2$	Calculate: a) $\left(\frac{3}{7}\right)^2$ b) $\sqrt{\frac{49}{81}}$ c) $\left(-\frac{2}{3}\right)^3$

1.7 Reciprocals

Worked Example	Your Turn
Write the reciprocals of: a) 6 b) $\frac{1}{6}$ c) $\frac{5}{6}$ d) $1\frac{5}{6}$ e) 1.2	Write the reciprocals of: a) 7 b) $\frac{1}{7}$ c) $\frac{2}{7}$ d) $1\frac{2}{7}$ e) 3.5

Dr Frost 159b, 159c, 159d, 159e and 159f

1.8 Dividing Fractions

Worked Example	Your Turn
Calculate: a) $\frac{1}{5} \div \frac{1}{3}$ b) $\frac{6}{5} \div \frac{2}{3}$ c) $\frac{1}{5} \div 2$ d) $2 \div \frac{1}{5}$	Calculate: a) $\frac{1}{5} \div \frac{2}{3}$ b) $\frac{1}{5} \div \frac{10}{3}$ c) $\frac{2}{5} \div 2$ d) $2 \div \frac{2}{5}$

Dr Frost 166a, 166b, 121a and 166c

Fill in the Gaps

Division	Equivalent Multiplication	Unsimplified Answer	Simplified Answer (where possible)
$\frac{2}{3} \div 6$	$\frac{2}{3} \times \frac{1}{6}$	$\frac{2}{18}$	$\frac{\square}{\square}$
$\frac{2}{5} \div 4$	$\frac{2}{5} \times \frac{1}{4}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{5}{8} \div 10$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{7}{10} \div \frac{3}{4}$	$\frac{7}{10} \times \frac{4}{3}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{6}{11} \div \frac{2}{3}$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{1}{10} \div \frac{4}{5}$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{7}{10} \div \frac{3}{4}$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \frac{\square}{\square}$	$\frac{2}{9} \times \frac{6}{5}$	$\frac{\square}{\square}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \frac{\square}{\square}$	$\frac{3}{8} \times \frac{\square}{\square}$	$\frac{12}{24}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \frac{2}{5}$	$\frac{\square}{\square} \times \frac{\square}{\square}$	$\frac{15}{20}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \frac{\square}{\square}$	$\frac{5}{12} \times \frac{\square}{\square}$	$\frac{10}{12}$	$\frac{\square}{\square}$
$\frac{\square}{\square} \div \square$	$\frac{\square}{\square} \times \frac{1}{3}$	$\frac{\square}{\square}$	$\frac{3}{10}$

Worked Example	Your Turn
Calculate: a) $2\frac{2}{3} \div \frac{1}{5}$ b) $2\frac{2}{3} \div 5$	Calculate: a) $2\frac{2}{3} \div \frac{2}{5}$ b) $2 \div 2\frac{2}{3}$

Dr Frost 168c and 168d

Fill in the Gaps

Question	Write as Improper Fractions	Write as a Multiplication	Multiply and Simplify (where possible)	Answer as Mixed Number
$2\frac{2}{3} \div 1\frac{1}{2}$	$\frac{8}{3} \div \frac{3}{2}$	$\frac{8}{3} \times \frac{2}{3}$	$\frac{16}{9}$	
$5\frac{1}{2} \div 1\frac{3}{4}$	$\frac{11}{2} \div \frac{7}{4}$	$\frac{11}{2} \times \frac{4}{7}$	$\frac{44}{14} = \frac{\square}{\square}$	
$4\frac{3}{5} \div 2\frac{2}{3}$	$\frac{23}{5} \div \frac{8}{3}$	$\frac{23}{5} \times \frac{3}{8}$		
$7\frac{2}{3} \div 1\frac{1}{6}$	$\frac{23}{3} \div \frac{7}{6}$			
$3\frac{7}{8} \div \frac{3}{4}$				
$1\frac{4}{5} \div 2\frac{2}{3}$				
$4\frac{1}{6} \div 1\frac{5}{12}$				
$3\frac{3}{10} \div 1\frac{4}{5}$				
$5\frac{1}{2} \div 3\frac{2}{3}$				
	$\frac{19}{6} \div \frac{7}{5}$			
		$\frac{23}{9} \times \frac{3}{7}$		
$4\frac{1}{2} \div \frac{\square}{\square}$				$1\frac{7}{20}$

Worked Example	Your Turn
Meriem has $3\frac{3}{5}$ tins of cat food. Each day their cat eats $\frac{9}{10}$ of a tin of food. Find how many days until the food runs out.	Lucas has $2\frac{2}{3}$ boxes of fish food. Each week his fish eats $\frac{1}{6}$ of a box of food. Find how many weeks until the food runs out.

1.9 Mixed Operations

Worked Example	Your Turn
Calculate $\frac{5}{7} + \frac{5}{3} \times \frac{3}{2}$ Give your answer as an improper fraction in its simplest form.	Calculate $\frac{3}{4} - \frac{3}{2} \times \frac{2}{5}$ Give your answer in its simplest form.

1.10 Fractions of Amounts

Worked Example	Your Turn
Calculate: a) $\frac{1}{4}$ of 24 b) $\frac{7}{4}$ of 24	Calculate: a) $\frac{1}{3}$ of 24 b) $\frac{5}{3}$ of 24

Dr Frost 57d and 57e

1.11 Increasing or Decreasing by a Fraction

Worked Example	Your Turn
a) Increase 60 by $\frac{1}{5}$	a) Increase 60 by $\frac{4}{5}$
b) Decrease 100 by $\frac{1}{5}$	b) Decrease 200 by $\frac{3}{5}$

1.12 Reverse Fractions of Amounts

Worked Example	Your Turn
Find the value of x: a) $\frac{1}{5}$ of x is 12 b) $\frac{6}{5}$ of x is 12	Find the value of x: a) $\frac{1}{4}$ of x is 15 b) $\frac{5}{4}$ of x is 15

Worked Example	Your Turn
a) $\frac{2}{3}$ of an amount is 28 What is the total amount? b) $\frac{4}{3}$ of an amount is 28 What is the total amount?	a) $\frac{4}{5}$ of an amount is 28 What is the total amount? b) $\frac{7}{3}$ of an amount is 28 What is the total amount?

Fill in the Gaps

$\frac{4}{5}$ of the amount	$\frac{1}{5}$ of the amount	Total amount	$\frac{6}{5}$ of the amount
12	3	15	18
36	9		54
48			
84			
4			
20			
2			
		100	
		10.5	
			12
			18
			24
0.8			
			21

Fill in the Gaps

$\frac{3}{5}$ of the amount	$\frac{1}{5}$ of the amount	Total amount	$\frac{12}{5}$ of the amount
48	16	80	192
12	4		
1.2			
	$\frac{1}{10}$	$\frac{1}{2}$	
$\frac{3}{8}$			
			6
			7.2
			8.4
$\frac{1}{2}$			
$\frac{5}{3}$			

Worked Example	Your Turn
One ninth of a number is 40. What is one quarter of the original?	One eighth of a number is 30. What is one fifth of the original?

Fill in the Gaps

Q	Original Amount	Fraction Of	New Amount	Change
1	£60	$\frac{1}{4}$		
2	£60		£20	
3	£60			− £20
4		$\frac{2}{3}$	£20	
5	£30		£12	
6		$\frac{2}{5}$	£18	
7			£18	− £45
8		$\frac{6}{7}$		− £45
9	£315			− £0
10	£315	$\frac{8}{7}$		
11	£315		£585	
12	£315			+ £780.75

Worked Example	Your Turn
a) The price of a jacket is decreased by $\frac{1}{7}$. The new price is £48.00. Work out the original price.	a) The price of a pair of shoes is decreased by $\frac{2}{7}$. The new price is £45.00. Work out the original price.
b) The price of a laptop is increased by $\frac{3}{7}$. The new price is £980.00. Work out the original price.	b) The price of a television is increased by $\frac{1}{4}$. The new price is £390.00. Work out the original price.

2 Decimals

2.1 Adding Decimals

Worked Example	Your Turn
Work out: $481.4 + 35.23$	Work out: $369.5 + 47.68$

2.2 Subtracting Decimals

Worked Example	Your Turn
Work out: $184.3 - 40.66$	Work out: $145.2 - 43.46$

2.3 Related Calculations

Worked Example	Your Turn
$93 \times 76 = 7068$ a) Calculate 9.3×7.6 b) Calculate 0.93×7.6	$26 \times 89 = 2314$ a) Calculate 2.6×89 b) Calculate 2.6×0.89

2.4 Multiplying Decimals

Worked Example	Your Turn
Work out 50.6×0.001	Work out 33.9×0.0001

Worked Example	Your Turn
Work out: a) 2.724×4 b) 386.6×2.09	Work out: a) 1.745×7 b) 379.6×4.23

Dr Frost 122a and 123d

2.5 Dividing Decimals

Worked Example	Your Turn
Work out: a) $50.6 \div 0.001$ b) $0.9 \div 0.003$	Work out: a) $33.9 \div 0.0001$ b) $0.06 \div 0.002$

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Worked Example	Your Turn
Work out: $1246.24 \div 8$	Work out: $1197.21 \div 7$

3 Solving Linear Equations

3.1 Terminology

- An **expression** is a collection of letters and numbers with no equals sign, for example $3x + 1$

- An **equation** contains an equals sign and an unknown letter to be solved, for example $3x + 1 = 10$

- A **formula** is a relationship between two or more letters, and it contains an equals sign, for example $A = bh$

- An **identity** is an equation that is always true, no matter what values are substituted, for example $2x + 3x = 5x$ (use $\equiv$)

Frayer Model – Equation

Definition	**Characteristics**
Examples	**Non-Examples**

3.2 One Step

To solve an equation means that we find the value of the variable(s).

Strategy: To get x on its own on one side of the equation, we gradually need to 'claw away' the things surrounding it.

Note: In algebra, we tend to give our answers as fractions rather than decimals (unless asked). And never recurring decimals. Don't round also (unless asked).

Worked Example	Your Turn
Solve the following equations: a) $x + 3.2 = 8.1$ b) $3.2 + x = 8.1$ c) $8.1 = x + 3.2$	Solve the following equations: a) $x + 6.5 = 11.1$ b) $6.5 + x = 12.1$ c) $11.1 = 7.5 + x$

Worked Example	Your Turn
Solve the following equations: a) $x - 3.9 = 8.7$ b) $3.9 - x = 8.7$	Solve the following equations: a) $x - 6.6 = 11.2$ b) $6.6 - x = 11.2$

Worked Example	Your Turn
Solve the following equations: a) $2.3x = 12.88$ b) $\frac{x}{2.1} = 8.5$	Solve the following equations: a) $3.1x = 19.22$ b) $\frac{x}{6.4} = 4.2$

3.3 Forming Expressions

Forming Expressions

Form the following expressions starting from x:

$4x - 5$	
$5 - 4x$	
$\frac{x}{4} - 5$	
$\frac{x - 5}{4}$	
$4(x - 5)$	

3.4 Two Steps

To solve an equation means that we find the value of the variable(s).

Strategy: To get x on its own on one side of the equation, we gradually need to 'claw away' the things surrounding it.

Note: In algebra, we tend to give our answers as fractions rather than decimals (unless asked). And never recurring decimals. Don't round also (unless asked).

Worked Example	Your Turn
Solve the following equations: a) $4x - 17 = 43$ b) $17 + 4x = 43$	Solve the following equations: a) $6x - 27 = 53$ b) $27 + 6x = 43$

Worked Example	Your Turn
Solve the following equations: a) $17 - 4x = 43$ b) $-17 - 4x = 43$	Solve the following equations: a) $27 - 6x = 53$ b) $-27 - 6x = 53$

3.5 Fractions

To solve an equation means that we find the value of the variable(s).

Strategy: To get x on its own on one side of the equation, we gradually need to 'claw away' the things surrounding it.

Note: In algebra, we tend to give our answers as fractions rather than decimals (unless asked). And never recurring decimals. Don't round also (unless asked).

Worked Example	Your Turn
Solve the following equations: a) $\frac{x}{3} + 12 = 49$ b) $\frac{x+12}{3} = 49$	Solve the following equations: a) $\frac{x-12}{6} = 49$ b) $\frac{x}{6} - 12 = 49$

Worked Example	Your Turn
Solve the following equations: a) $\frac{2x}{3} + 12 = 49$ b) $\frac{2x+12}{3} = 49$	Solve the following equations: a) $\frac{5x-12}{6} = 49$ b) $\frac{5x}{6} - 12 = 49$