

Student Name

Mathematics Stage 5 Paths

EQUATIONS C

Book 1 Solve linear equations involving algebraic fractions and equations of more than 3 steps

Version: 260207

Report mistakes & suggest improvements:
<https://MrDingMaths.com>

CONTENTS

Review of Linear Equations	2
Algebraic Fractions: Monomial Numerators	7
Algebraic Fractions: Binomial Numerators	10
Algebraic Fractions: Cross Multiplying	16
Algebraic Fractions: Algebraic Denominators	19

OVERVIEW

SYLLABUS CONTENT

MA5-EQU-P-02 solves linear equations of more than 3 steps, monic and non-monic quadratic equations, and linear simultaneous equations

Solve linear equations involving algebraic fractions and equations of more than 3 steps

- Solve linear equations involving more than 3 steps
- Solve equations that involve 2 or more fractions

REVIEW OF LINEAR EQUATIONS

FOUNDATION

1 Solve these equations.

a $x + 8 = 13$	b $x - 5 = 3$	c $-x + 4 = 7$	d $-x - 5 = -9$
e $2x + 9 = 14$	f $4x + 3 = 14$	g $3x - 3 = -4$	h $6x + 5 = -6$
i $-3x + 5 = 17$	j $-2x + 7 = 4$	k $-4x - 9 = 9$	l $-3x - 7 = -3$
m $8 - x = 10$	n $5 - x = -2$	o $6 - 5x = 16$	p $4 - 9x = -7$

2 Solve these equations.

a $3n - 1 = 2n + 3$	b $4b + 3 = 2b + 1$	c $5x - 2 = 2x + 10$
d $5 - x = 27 + x$	e $16 + 9a = 10 - 3a$	f $13y - 21 = 20y - 35$
g $13 - 12x = 6 - 3x$	h $3x + 21 = 18 - 2x$	

3 Solve these equations.

a $4(x + 3) = 16$	b $2(x - 3) = 12$	c $2(x - 4) = 15$
d $3(1 - 2x) = 8$	e $3(2x + 3) = -5x$	f $2(4x - 5) = -7x$

4 Solve these equations.

a $3(2x + 3) + 2(x + 4) = 25$

b $2(3x - 2) - 3(x + 1) = 5$

c $5(x - 3) = 4(x - 6)$

d $5(x + 2) = 3(2x - 3)$

1

4

-9

19

5 Solve these equations.

a $\frac{a}{2} - 1 = 3$

b $1 - \frac{x}{3} = 9$

c $\frac{a}{12} = \frac{2}{3}$

d $\frac{y}{20} = \frac{4}{5}$

e $\frac{x-4}{2} = 3$

f $\frac{x+2}{3} = 5$

g $\frac{2x+7}{3} = 5$

h $\frac{3x-2}{4} = 4$

i $\frac{3x}{2} + 2 = 8$

j $\frac{2x}{3} - 2 = -8$

k $5 - \frac{x}{2} = 1$

l $4 - \frac{2x}{3} = 0$

m $\frac{x+1}{3} + 2 = 9$

n $\frac{x-3}{2} - 4 = 1$

o $4 + \frac{x-5}{2} = -3$

p $\frac{7-4x}{6} = \frac{3}{2}$

q $y + \frac{y}{2} = 1$

r $\frac{2x-1}{3} - 2 = 3$

$-\frac{1}{2}$

$\frac{2}{3}$

8

6 Substitute the given values and then solve for the unknown in each of the following formulas.

a $v = u + at$

$v = 6, u = 2, t = 4$

b $s = ut + \frac{1}{2}at^2$

$s = 20, t = 2, a = 4$

1

6

c $A = \frac{h}{2}(a + b)$

$A = 10, h = 4, a = 3$

d $A = P\left(1 + \frac{r}{100}\right)$

$A = 1000, P = 800$

2

25

e $v^2 = u^2 + 2as$

$u = 6, v = 10, a = 2$

f $E = \frac{1}{2}mv^2$

$E = 40\,960, m = 80$

16

 ± 32

7 Solve these equations.

a $\frac{1}{x} = 3$

b $\frac{2}{a} = 5$

c $7 = \frac{3}{2y}$

 $\frac{1}{3}$ $\frac{2}{5}$ $\frac{3}{14}$

d $\frac{20+a}{a} = -3$

e $\frac{9-2t}{t} = 13$

f $\frac{1}{x} - 3 = \frac{1}{2}$

-5

 $\frac{9}{15}$ $\frac{2}{7}$

8 A rectangle has one side 13.5 cm longer than the other. Its perimeter is 56 cm.

a Draw a diagram to represent this information.

b Write an equation to represent the scenario.

$4x + 27 = 56$

c What are the dimensions of the rectangle?

7.25 by 20.75 cm

9 The sum of three consecutive numbers is 207.

a Write an equation to represent this.

$(x - 1) + x + (x + 1) = 207$

b Solve the equation to find the numbers.

68, 69, 70

10 The sum of two consecutive odd numbers is 248.

a Write an equation to represent this.

$$x + (x + 2) = 248$$

b Solve the equation to find the numbers.

$$123, 125$$

11 Tamsin is a technician and charges \$30 up front and \$46 for each hour that she works.

a Write an equation to represent this information.

Let C be total cost and n be number of hours.

$$C = 46n + 30$$

b What will a 4-hour job cost?

$$\$214$$

c Find how many hours she worked if the cost is:

i \$76

$$1$$

ii \$513

$$10.5$$

iii \$1000 (nearest minute)

$$21 \text{ h } 5 \text{ min}$$

12 Chloe paid \$1.45 for an apple and an orange, and the apple cost 15 cents more than the orange, how much did the orange cost?

$$x + (x + 0.15) = 1.45$$

$$65c$$

13 Evita has scored 312 points in 15 games.

How many points must she average per game in her next 3 games to take her overall average to 20 points per game?

$$20 = \frac{312 + 3x}{18}$$

$$16$$

14 Amy bought a total of 12 fiction and non-fiction books.

a If she bought x fiction books, how many non-fiction books did she buy?

$$12 - x$$

b The fiction books cost \$12 each and the non-fiction books cost \$25 each.
If she paid \$248 altogether, how many of each kind of book did she purchase?

$$12x + 25(12 - x) = 248$$

$$4 \text{ fiction, } 8 \text{ non-fiction}$$

ALGEBRAIC FRACTIONS: MONOMIAL NUMERATORS

- To solve equations involving two algebraic fractions:
 - Rewrite each algebraic fraction with their common denominator.
 - Simplify by adding or subtracting the fractions.
 - Solve.

Example Solve linear equations involving two fractions and monomial numerators.

	$\frac{x}{2} + \frac{x}{5} = 3$	How did we know to make the denominator 10?
1. Denominators	$\frac{5x}{10} + \frac{2x}{10} = 3$	10 is the of the
2. Simplify	$\frac{7x}{10} = 3$	How do we change the denominator of a fraction?
3. Solve	$\times 10 \quad \times 10$ $7x = 30$ $\div 7 \quad \div 7$ $x = \frac{30}{7}$	Multiply or divide the or by the same number.

Solve these equations.

a $\frac{x}{5} + \frac{2x}{5} = 18$

b $\frac{4y}{9} - \frac{y}{9} = 21$

c $\frac{8t}{11} + \frac{9t}{11} = 17$

$x = 30$

$y = 63$

$t = 11$

d $\frac{x}{5} + \frac{x}{6} = 22$

$\frac{\quad}{30} + \frac{\quad}{30} = 22$

e $\frac{2x}{3} + \frac{5x}{4} = 46$

f $10 = \frac{x}{3} - \frac{x}{2}$

$x = 60$

$x = 24$

$x = -60$

1 Solve these equations by making the denominators the same.

a $\frac{x}{5} + \frac{x}{2} = 21$
 $\frac{2x}{10} + \frac{5x}{10} = 21$

b $\frac{x}{2} - \frac{x}{5} = -12$

c $-\frac{x}{4} + \frac{x}{3} = -5$

30

-40

-60

d $-\frac{x}{2} - \frac{x}{3} = -5$

e $\frac{3x}{2} + \frac{7x}{5} = 5$

f $\frac{5x}{6} - \frac{3x}{7} = -2$

6

$\frac{50}{29}$

$-\frac{84}{17}$

g $\frac{x}{2} + \frac{2x}{3} = 7$

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

i $\frac{3x}{5} - \frac{2x}{3} = 1$

6

4

-15

j $\frac{2x}{3} + \frac{5x}{4} = 46$

k $\frac{x}{5} + \frac{x}{6} = 22$

l $10 = \frac{x}{2} + \frac{x}{3}$

24

60

12

m $4 = \frac{x}{2} - \frac{x}{3}$

n $\frac{6x}{5} + \frac{2x}{3} = 28$

o $4 = \frac{3x}{7} - \frac{x}{3}$

24

15

42

- 2** Half of a number (x) plus one-third of twice the same number is equal to 4.
- Write an equation describing the situation.
 - Solve the equation to find the number.

$$\frac{x}{2} + \frac{2x}{3} = 4$$

$$x = \frac{24}{7}$$

- 3** Mila and Sophie each have the same number of computer games (x computer games each). Rachel, who doesn't have any games, takes one-third of Mila's computer games and a quarter of Sophie's computer games to give her a total of 77 computer games.
- Write an equation describing the total number of computer games for Rachel.
 - Solve the equation to find how many computer games Mila and Sophie each had.

$$\frac{x}{3} + \frac{x}{4} = 77$$

$$x = 132$$

- 4** Sookai drove to her holiday destination 1000 km away over a period of five days. on the first day she travels a certain distance, on the second day she travels half that distance, on the third day a third of that distance, on the fourth day one-quarter of the distance and on the fifth day one-fifth of the distance and reached her destination. Write an equation and solve it to find how far she travelled on the first day, to the nearest kilometre.

$$x + \frac{x}{2} + \frac{x}{3} + \frac{x}{4} + \frac{x}{5} = 1000$$

$$x = 438 \text{ km}$$

ALGEBRAIC FRACTIONS: BINOMIAL NUMERATORS

- To solve equations involving two algebraic fractions with binomial numerators:
 - Rewrite each algebraic fraction with their common denominator.
If the fraction has a binomial numerator, you must multiply each term.
 - Simplify by adding or subtracting the fractions.
 - Solve.

Example Solve linear equations involving two fractions and binomial numerators.

	$\frac{x-1}{2} + \frac{x+2}{5} = 2$	How did we determine the common denominator?
1. Denominators	$\frac{5(x-1)}{10} + \frac{2(x+2)}{10} = 2$	We should change the denominator to the of the denominators.
2. Simplify	$\frac{5x-5+2x+4}{10} = 2$	What steps were involved in simplifying the fraction?
	$\frac{7x-1}{10} = 2$	 the brackets,
3. Solve	$\begin{aligned} \times 10 \quad \times 10 \\ 7x - 1 = 20 \\ 7x = 21 \\ x = 3 \end{aligned}$	then combine the terms

Solve these equations.

a
$$\frac{x+3}{3} + \frac{x-4}{2} = 4$$

$$\frac{2(x+3)}{6} + \frac{3(x-4)}{6} = 4$$

b
$$\frac{x-1}{3} = \frac{x}{4}$$

c
$$\frac{x}{2} - \frac{2x+1}{3} = 2$$

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

$x = 6$

$x = 4$

$x = -14$

$x = -\frac{17}{4}$

1 Solve these equations.

a $\frac{3x}{2} - \frac{x}{8} = 12$

b $\frac{x}{3} + \frac{2x-1}{4} = 0$

c $\frac{x}{4} + \frac{2x+1}{6} = 0$

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

e $\frac{x+2}{3} + \frac{x-1}{2} = 1$

f $\frac{x-4}{5} + \frac{x+2}{3} = 2$

2 Read the example carefully and answer the questions.

Worked Solution	Explanation
Solve: $\frac{2x}{3} - \frac{x-5}{5} = 3$ $\frac{5(2x)}{15} - \frac{3(x-5)}{15} = 3$ $\frac{5(2x) - 3(x-5)}{15} = 3$ $\frac{7x + 15}{15} = 3$ $\times 15 \quad \times 15$ $7x - 15 = 45$ $7x = 60$ $x = \frac{60}{7}$	In the step marked by the arrow, why is it important we have brackets? <i>We are subtracting of the fraction, so we need to group the terms together.</i> By expanding and simplifying, show why the numerator is $7x + 15$.

3 Solve these equations.

a $\frac{x+2}{3} - \frac{x-1}{2} = 1$

b $\frac{x-4}{5} - \frac{x+2}{3} = 2$

c $\frac{x+1}{5} - \frac{x+1}{6} = 2$

1

-26

59

d $\frac{x+5}{2} - \frac{x-1}{4} = 3$

e $\frac{2y-1}{4} - \frac{y-2}{6} = -1$

f $\frac{2x+3}{4} - \frac{7x-1}{6} = 2$

1

 $-\frac{13}{4}$ $-\frac{13}{8}$

4 Solve these equations.

a $3(x+3) = 6x$

b $\frac{x+3}{3} = 6x$

3

 $\frac{3}{17}$

c $\frac{x+3}{3} + \frac{x+3}{6} = 6x$

d $\frac{x+3}{3} - \frac{x+3}{6} = 6x$

 $\frac{3}{11}$ $\frac{3}{35}$

5 Solve these equations.

a $\frac{x+2}{2} + \frac{x+4}{3} = 4$

e $\frac{x+2}{6} - \frac{x+4}{8} = 9$

i $\frac{4x-2}{6} - \frac{4x-4}{8} = 9$

b $\frac{x+2}{2} + \frac{x+4}{8} = 4$

2

f $\frac{x+2}{6} - \frac{x-4}{8} = 9$

220

j $\frac{4x-4}{8} - \frac{4x-2}{6} = 9$

53

c $\frac{x+2}{2} + \frac{x+4}{8} = 9$

4

g $\frac{x-2}{6} - \frac{x-4}{8} = 9$

196

k $\frac{4x-4}{8} - \frac{4x-2}{6} = 1$

-55

d $\frac{x+2}{6} + \frac{x+4}{8} = 9$

12

h $\frac{2x-2}{6} - \frac{2x-4}{8} = 9$

212

l $\frac{4x-4}{8} - \frac{4x-2}{6} = \frac{1}{2}$

-7

28

106

-4

6 2013 HSC Standard 2 Band 5

Mr Ding tried to solve this equation and made a mistake in Line 2.

$$\frac{W+4}{3} - \frac{2W-1}{5} = 1 \quad \dots \text{Line 1}$$

$$5W + 20 - 6W - 3 = 15 \quad \dots \text{Line 2}$$

$$17 - W = 15 \quad \dots \text{Line 2}$$

$$W = 2 \quad \dots \text{Line 4}$$

Solve this equation correctly for W .

$$\frac{W+4}{3} - \frac{2W-1}{5} = 1$$

$w = 8$

7 Solve these equations

a $\frac{n+2}{2} + \frac{n}{6} = 5$

b $\frac{x+2}{10} + \frac{20-x}{4} = 4$

c $\frac{2x-5}{3} - \frac{x+7}{5} = 2$

6

8

$\frac{76}{7}$

d $\frac{4-k}{5} - \frac{3k-1}{2} = 20$

e $\frac{4x+3}{2} - \frac{30x+11}{8} = -\frac{3}{4}$

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

-11

$\frac{1}{2}$

$-\frac{21}{5}$

8 Solve these equations.

a

$$\frac{x+1}{2} - \frac{x}{3} + \frac{4x}{5} = -1$$

b

$$\frac{4-2x}{3} - \frac{5x}{4} + \frac{3x+1}{2} = 2$$

$-\frac{45}{29}$

$-\frac{2}{5}$

9 Solve these equations.

a

$$\frac{6x-5}{4} - \frac{7-8x}{3} = \frac{1}{2}$$

b

$$\frac{a-10}{5} - \frac{5-2a}{4} = \frac{1}{2}$$

c

$$\frac{2x-7}{3} - \frac{5-4x}{2} = \frac{2}{5}$$

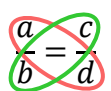
$\frac{49}{50}$

$\frac{75}{14}$

$\frac{157}{80}$

ALGEBRAIC FRACTIONS: CROSS MULTIPLYING

- **Cross multiplying** is a shortcut.
- Only use this shortcut when Fraction = Fraction

Cross Multiplying
$\frac{a}{b} = \frac{c}{d}$  $ad = bc$

Example Solve linear equations involving fractions with pronumerals on both sides.

Common denominator method	Cross multiplying method
$\frac{x-1}{3} = \frac{x}{4}$ $\frac{4(x-1)}{12} = \frac{3x}{12}$ $\times 12 \quad \times 12$ $4(x-1) = 3x$ $4x - 4 = 3x$ $-3x \quad -3x$ $x - 4 = 0$ $+4 \quad +4$ $x = 4$	$\frac{x-1}{3} = \frac{x}{4}$ <i>cross multiply</i> $4(x-1) = 3x$ $4x - 4 = 3x$ $-3x \quad -3x$ $x - 4 = 0$ $+4 \quad +4$ $x = 4$
What step do you skip when cross multiplying? Why can't you cross multiply to solve $\frac{x+3}{3} = \frac{x-4}{2} + 1$?	

a $\frac{x+2}{5} = \frac{x}{3}$

$x = 3$

b $\frac{x+1}{2} = \frac{x}{3}$

$x = -3$

c $\frac{3x-1}{5} = \frac{2x}{7}$

$x = \frac{7}{11}$

d $\frac{x-1}{2} = \frac{x+1}{4}$

$x = 3$

e $\frac{2y-1}{5} = \frac{y+1}{4}$

$y = 3$

f $\frac{3+y}{2} = \frac{2-y}{3}$

$y = -1$

1 Solve these equations.

a $\frac{x+1}{4} = \frac{x}{3}$

b $\frac{2x-1}{6} = \frac{3x}{5}$

c $\frac{x-2}{3} = \frac{x}{2}$

3

$-\frac{5}{8}$

-4

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

e $\frac{x+2}{3} = \frac{x+1}{2}$

f $\frac{3+x}{2} = \frac{2-x}{3}$

5

1

-1

g $\frac{2x+4}{4} = \frac{x+6}{3}$

h $\frac{2x+12}{7} = \frac{3x+5}{4}$

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

6

1

-17

j $\frac{10-x}{2} = \frac{x+1}{3}$

k $\frac{1-x}{5} = \frac{2-x}{3}$

l $\frac{6-2x}{3} = \frac{5x-1}{4}$

$\frac{28}{5}$

$\frac{7}{2}$

$\frac{27}{23}$

m $\frac{2(x+1)}{3} = \frac{3(2x-1)}{2}$

n $\frac{3(6-x)}{2} = \frac{2(x+1)}{5}$

o $\frac{-2(x-1)}{3} = \frac{2-x}{4}$

$\frac{13}{14}$

$\frac{86}{19}$

$\frac{2}{5}$

For these questions, you cannot cross multiply straight away.

You can use the common denominator method, or make one side into a single fraction.

10 2018 HSC Standard 2 Band 5

$$\frac{2x}{5} + 1 = \frac{3x + 1}{2}$$

$\frac{5}{11}$

11 Solve these equations.

a

$$\frac{x + 4}{7} + \frac{2x - 9}{6} = 5x + 1$$

b

$$\frac{7n + 1}{2} + 7 = \frac{3n - 25}{4}$$

$-\frac{81}{190}$

-5

c

$$\frac{3}{4} - \frac{x + 1}{12} = \frac{2}{3} - \frac{x - 1}{6}$$

d

$$\frac{4x + 1}{6} - \frac{2x - 1}{15} = \frac{3x - 5}{5} - \frac{6x + 1}{10}$$

2

-2.5

e

$$-\frac{x}{4} + \frac{3}{8} = \frac{1}{5}(3x - 1)$$

f

$$\frac{4 - x}{2} + \frac{5}{3} = \frac{2}{5}(1 - 2x)$$

$\frac{23}{34}$

$-\frac{98}{9}$

ALGEBRAIC FRACTIONS: ALGEBRAIC DENOMINATORS

- To remove algebraic terms from the denominator, multiply both sides of the equation by the denominator.
 - Isolate the algebraic fractions, if possible.
 - If there are many fractions, rewrite them with the same denominator.
 - Multiply both sides by the denominator of the fraction.
 - Solve.

Example Solve linear equations involving with algebraic denominators.

Worked Example	Your Turn	
$\frac{5}{x} = 3$ $\times x \quad \times x$ $5 = 3x$ $\div 3 \quad \div 3$ $\frac{5}{3} = x$	$\frac{2}{x} = 7$	$\frac{16}{x} - 1 = 23$
	$x = \frac{2}{7}$	$x = \frac{2}{3}$
$\frac{6}{2+x} = 5$ $\times (2+x) \quad \times (2+x)$ $6 = 5(2+x)$ $6 = 10 + 5x$ $-4 = 5x$ $-\frac{4}{5} = x$	$\frac{8}{3+x} = 4$	$\frac{12}{4-x} = -8$
	$x = -1$	$x = \frac{11}{2}$
$\frac{4-7x}{4x-7} = 2$ $\times (4x-7) \quad \times (4x-7)$ $4-7x = 2(4x-7)$ $4-7x = 8x-14$ $+7x \quad +7x$ $4 = 15x-14$ $+14 \quad +14$ $18 = 15x$ $\div 15 \quad \div 15$ $\frac{6}{5} = x$	$\frac{x+1}{x-5} = 15$	$3 = \frac{x+1}{2x-6}$
	$x = \frac{38}{7}$	$x = \frac{19}{5}$

1 Solve these equations.

a $\frac{1}{x} + 3 = 4$

b $4 + \frac{20}{x} = 14$

c $5 = \frac{-10}{x} + 3$

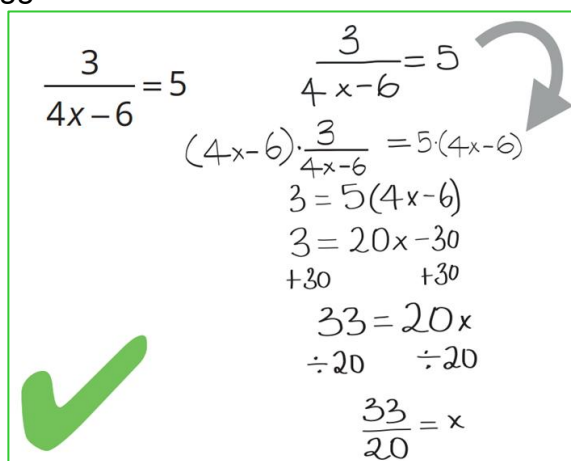
d $\frac{16}{x} + 1 = 3$

e $\frac{15}{2x} - 2 = 3$

f $5 = \frac{10}{x+5} - 3$

2 Read the example carefully and answer the questions.

Maggie's work:



$$\begin{aligned} \frac{3}{4x-6} &= 5 \\ (4x-6) \cdot \frac{3}{4x-6} &= 5 \cdot (4x-6) \\ 3 &= 5(4x-6) \\ 3 &= 20x - 30 \\ +30 & \quad +30 \\ 33 &= 20x \\ \div 20 & \quad \div 20 \\ \frac{33}{20} &= x \end{aligned}$$

In the step marked with an arrow, why did Maggie multiply both sides by $(4x - 6)$?

$4x - 6$ is the of the fraction.

Solve:

$$\frac{6}{6x-4} = 3$$

$x = 1$

3 Solve these equations.

a $\frac{4}{x} + \frac{5}{x} = 1$

b $\frac{7}{y} + \frac{11}{y} = 2$

c $\frac{21}{x} + \frac{19}{x} = 5$

d $\frac{3}{2z} + \frac{19}{2z} = 5$

e $\frac{4}{x} + \frac{5}{2x} = 1$

f $\frac{7}{3y} + \frac{11}{y} = 2$

g $\frac{21}{2x} + \frac{19}{x} = 5$

h $\frac{3}{4z} + \frac{19}{2z} = 5$

4 Solve these equations.

a $\frac{20+a}{a} = -3$

b $\frac{9-2t}{t} = 13$

c $\frac{3}{x-1} = -1$

-5

 $\frac{3}{5}$

-2

d $\frac{3x}{2x-1} = -1$

e $5 = \frac{x+1}{x+2}$

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

 $\frac{1}{5}$ $-\frac{9}{4}$ $\frac{1}{6}$

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

h $\frac{3}{x^2} - \frac{2}{x} = \frac{5}{x}$

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

 $\frac{9}{13}$ $\frac{3}{7}$ $\frac{3}{19}$

j $\frac{4x+1}{3} - \frac{x-3}{6} = \frac{x+5}{6}$

k $\frac{1}{x+2} - \frac{2}{x-3} = \frac{5}{(x+2)(x-3)}$

l $\frac{2}{x+4} - \frac{1}{x-1} = \frac{3}{(x+4)(x-1)}$

0

-12

9

5 Find the value of a by simplifying the LHS of these equations.

a $\frac{a}{x-1} - \frac{2}{x+1} = \frac{4}{(x-1)(x+1)}$

b $\frac{3}{2x-1} + \frac{a}{x+1} = \frac{5x+2}{(2x-1)(x+1)}$

- 6 Reciprocals are used in the study of electronics to calculate resistances in parallel circuits. This formula finds the total resistance R_T in a circuit, given two resistors R_1 , R_2 in parallel.

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$$

Find R_T :

a

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

4

b

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

3

c

$$\frac{1}{R_T} = \frac{1}{6} + \frac{1}{4}$$

$\frac{12}{5}$

d

$$\frac{1}{R_T} = \frac{1}{120} + \frac{1}{260}$$

$\frac{1560}{19}$

Show that this is **always** true: When two resistors with equal resistance are connected in parallel, the total resistance is equal to half the resistance of one of the resistors.

$$\begin{aligned}\frac{1}{R_T} &= \frac{1}{x} + \frac{1}{x} \\ \frac{1}{R_T} &= \frac{2}{x} \\ \therefore R_T &= \frac{x}{2}\end{aligned}$$

- 7 One number is twice another number. The sum of their reciprocals is $\frac{3}{10}$.

- a Write an equation describing the situation.
b Solve the equation to find the two numbers.

$$\begin{aligned}\frac{1}{2x} + \frac{1}{x} &= \frac{3}{10} \\ x &= 5\end{aligned}$$

The two numbers are 5 and 10

- 8 Solve this equation.

$$\frac{7}{4} = 1 + \frac{1}{1 + \frac{1}{x}}$$