



Solving linear equations with one unknown

Year 11 General Maths
Units 1 and 2

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Unit 1 and 2 General Mathematics course.

- To be able to solve linear equations with one unknown.
- To be able to set up linear equations.



Recap

We are moving swiftly through this section of the textbook! Now we look at finding the values of unknown letters which are in equations.

Remember: Equations have an equals sign in it!

You have done a lot of this in previous years but I've not explained it to you in the way that I like to explain it using:

- Kissing
- Bunk Beds
- Prison Guards

And so much more!



Unpacking is the way to go

I like to use the idea of unpacking when I try and find the value of a letter in an equation.

I need to try and make it the **loner** of the equation. It needs to end up all alone and lonely on the left hand side of the equals sign.

This means that all other numbers need to end up on the other side of the equals sign.

This means you need to know about reverse operations.



Reverse operations

Here are the most commonly used reverse operations

<i>Operation</i>	+	-	×	÷	x^2 (power of 2, square)	\sqrt{x} (square root)
<i>Opposite operation</i>	-	+	÷	×	\sqrt{x} (square root)	x^2 (power of 2, square)



Let's look at some examples

Solve the equation

$$x + 6 = 10.$$

$$\begin{array}{r} -6 \quad x + \cancel{6} = 10 \quad -6 \\ \hline \hline x = 4 \end{array}$$



Let's look at some examples

Solve the equation

$$3y = 18.$$

$$\begin{array}{ccc} & 3y = 18 & \\ \div 3 & \cancel{3}y = 18 & \div 3 \\ & \underline{\underline{y = 6}} & \end{array}$$



Let's look at some examples

Solve the equation

$$4(x - 3) = 24.$$

$$\begin{aligned} & 4(x - 3) = 24 \\ +12 \quad & 4x \cancel{-12} = 24 + 12 \\ & 4x = 36 \\ \div 4 \quad & \cancel{4}x = 36 \div 4 \\ & x = \underline{\underline{9}} \end{aligned}$$

$$\begin{aligned} & 4(x - 3) = 24 \\ \cancel{4} \quad & (x - 3) = 24 \div 4 \\ \div 4 \quad & x \cancel{-3} = 6 \\ +3 \quad & x = 9 + 3 \\ & x = \underline{\underline{9}} \end{aligned}$$



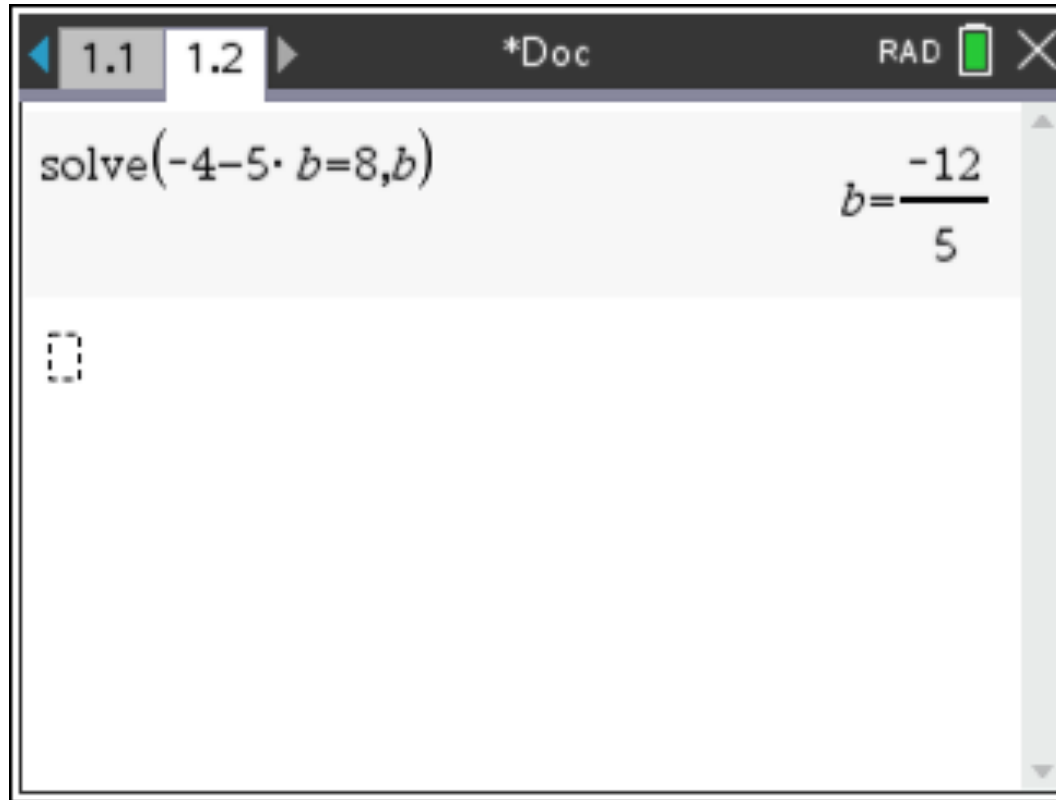
Now let's use the CAS

This is a CAS course after all.

We can use the **solve** function!

Solve the equation

$$-4 - 5b = 8$$



The screenshot shows a CAS window with a dark header bar containing navigation arrows, page numbers '1.1' and '1.2', the title '*Doc', and 'RAD' mode with a battery icon. The main area is split into two sections: the top section contains the command `solve(-4-5·b=8,b)` and the result $b = \frac{-12}{5}$; the bottom section contains a dashed rectangular box.



This still could have been done by hand ...

Solve the equation

$$-4 - 5b = 8$$

$x-1$

$$-4 - 5b = 8$$

$$~~+4~~ + 5b = -8$$

$$-4 \quad 5b = -12 \quad -4$$

$$5 \times b = -12$$

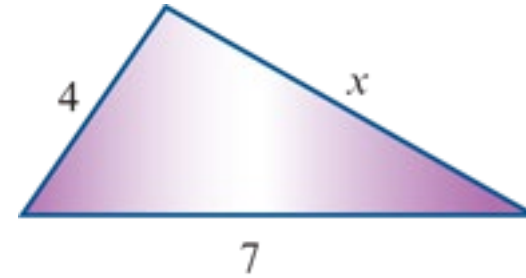
$$\div 5 \quad b = -\frac{12}{5} \quad \div 5$$



Example

Find an equation for the perimeter of the triangle shown.

Note: Perimeter is the distance around the outside of a shape.



$$P = 4 + x + 7$$

$$P = \underline{11 + x}$$

$$P = \underline{\underline{x + 11}}$$



Example

If 11 is added to a certain number, the result is 25. Find the number.

Important hint: In this case, we need to use a pronumeral to stand for the number we don't know (or are trying to find). There is no **definitive** rule which tells you what letter you need to use.

$$\cancel{11} + x = 25$$
$$-11 \quad \quad \quad x = \underline{\underline{14}} \quad \quad \quad -11$$



Example

At a recent show, Chris spent \$100 on 8 showbags, each costing the same price.

- Using x as the cost of one showbag, write an equation showing the cost of 8 showbags.
- Use the equation to find the cost of one showbag.

Now things get a little more interesting ...

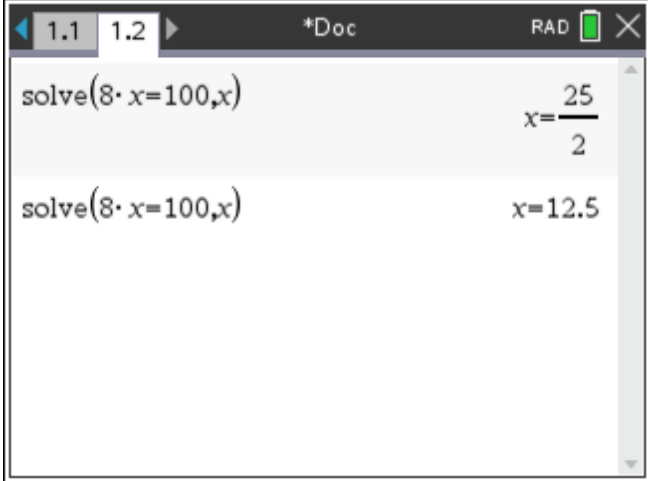
$$x \times 8 = 100$$

$$8x = 100$$

$$x = \frac{100}{8} = \frac{25}{2}$$

$$= 12.5$$

$$\therefore \text{cost} = \$12.50$$



The screenshot shows a calculator window with the following content:

```
1.1 1.2 *Doc RAD X
solve(8·x=100,x) x=25/2
solve(8·x=100,x) x=12.5
```



Example

A car rental company has a fixed charge of \$110 plus \$84 per day for the hire of a car. The Brown family have budgeted \$650 for the hire of a car during their family holiday. For how many days can they hire a car?

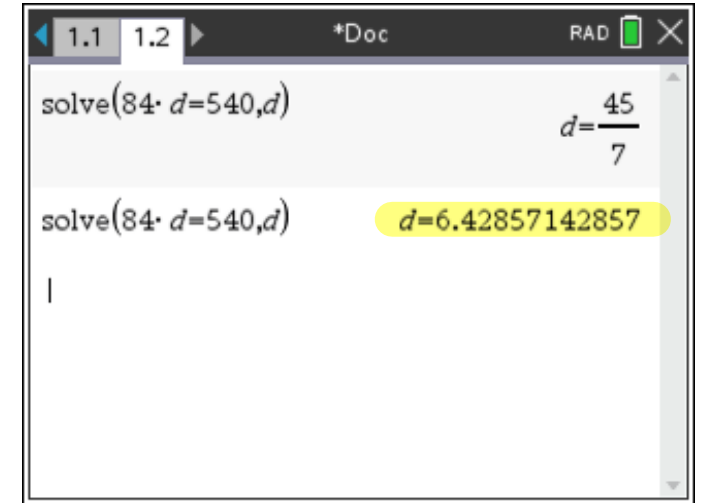
$$C = 110 + 84 \times d$$

$$650 = 110 + 84 \times d$$

$$540 = 84 \times d$$

$$\text{solve } (84d = 540, d)$$

$$d = 6.428 \dots$$



```
1.1 1.2 *Doc RAD X
solve(84 * d = 540, d)      d = 45/7
solve(84 * d = 540, d)      d = 6.42857142857
|
```

$$\underline{\underline{d = 6}}$$



Work to complete

The work I am asking to be completed for this topic is shown below.

This is the minimum work which should be completed. The more questions which are answered the better your chance of success in exams. Questions towards the end of the exercises and in the Chapter Review are the best practice you can do.

Questions to complete:

Exercise 5B: 1, 2, 4, 5acdf, 6adg, 7aceg, 8adgjm, 9, 11, 13, 16, 18, 19, 20

