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Step 2: Open your interactive resource using Adobe Acrobat Reader DC.

If you are a PC/Mac user and your downloaded PDF resource does not open using Acrobat Reader by default, simply right-click your PDF file, go to 'Open with' and select Adobe Acrobat Reader DC from the drop-down list.

Step 3: Complete the resource!

For PC/Mac users: To fill in the resource, click the text fields and type your answers as needed. Check boxes and radio buttons can simply be clicked on to make the selection of your choice and for anything else you will see the question mark icon which, upon being clicked, will reveal specific instructions to help you respond to the corresponding question or activity. When you are finished with the resource, go to File > Save As... and save your file in a memorable location.

For smart device users: To fill in the resource, follow the same process as described above. When you are finished, simply press the back button in the top left of the appscreen and your PDF will save automatically.

Remember: Saving your PDF will overwrite the original file, so be sure to create a copy before starting if you wish to keep a blank copy of the resource on your device.

We hope you have found this information useful. If you experience any problems in following the instructions above, please contact the Beyond team at and we will do our best to help with your query.

Your turn

Solve each of the following equations:

1. $12x + 2 = 2x - 28$

   $10x = -30$

   $x = -3$

2. $4x - 2 = 12 - 3x$

   $7x = 14$

   $x = 2$

3. $12x + 3 = 9x - 12$

   $3x = -15$

   $x = -5$

4. $15x - 45 = 9x - 9$

   $6x = 36$

   $x = 6$

5. $11x + 4 = 3x - 12$

   $8x = -16$

   $x = -2$

6. $10x + 19 = 4x + 34$

   $6x = 15$

   $x = 2.5$

7. $5x + 2 = 16 - 2x$

   $7x = 14$

   $x = 2$

8. $3x + 3 = x + 8$

   $2x = 5$

   $x = 2.5$

9. $8x + 40 = 3x + 5$

   $5x = -35$

   $x = -7$

10. $9x + 12 = 6x + 14$

    $3x = 2$

    $x = \dfrac{2}{3}$

11. $5(x + 3) = 3(x + 9)$

    $5x + 15 = 3x + 27$

    $2x = 12$

    $x = 6$

12. $8(x - 1) = 4(x + 3)$

    $8x - 8 = 4x + 12$

    $4x = 20$

    $x = 5$

13. $\dfrac{6x + 1}{2} = 2x + 3$

    $6x + 1 = 2(2x + 3)$

    $6x + 1 = 4x + 6$

    $2x = 5$

    $x = 2.5$

14. $\dfrac{5x + 2}{3} = x + 2$

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

    $5x + 2 = 3x + 6$

    $2x = 4$

    $x = 2$

16. $3 + 2x = \dfrac{1}{2}(7x - 18)$

    $3 + 2x = 3.5x - 9$

    $12 = 1.5x$

    $8 = x$

15. $3x - 2 = \dfrac{10x + 1}{4}$

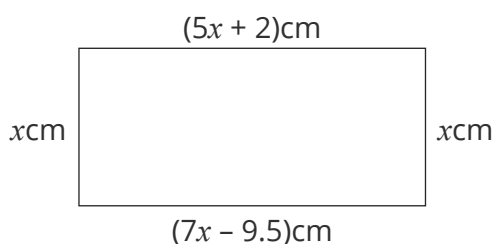   **$4(3x - 2) = 10x + 1$**

    $12x - 8 = 10x + 1$

    $2x = 9$

    $x = 4.5$

Challenge

The diagram shows a rectangle.

a. Explain why $5x + 2 = 7x - 9.5$

   The opposite sides of a rectangle have the same length.

b. Solve $5x + 2 = 7x - 9.5$

   $2x = 11.5$

   $x = 5.75$

c. Use your answer to part (b) to work out the perimeter of the rectangle.

   $5 \times 5.75 + 2 = 30.75$cm

   $7 \times 5.75 - 9.5 = 30.75$cm

   $30.75 + 30.75 + 5.75 + 5.75 = 73$cm

Solving Linear Equations with Variables on Both Sides

Prior Knowledge:

- Solving equations with the variable on one side
- Expanding brackets

Solving equations means to find the **value** of x (or whatever letter is used) that makes the equation true. To do this, you will have to **rearrange** the equation to get x (or whatever letter is used) on its **own**.

Rather than using trial and error or guessing the value of x, it is best to keep **rearranging** the equation until you get the '$x =$' on one side. There are a few **important** things to remember when rearranging.

1) You must always do the same thing to both sides of the equation.
2) To 'get rid' of something, do the opposite (use its inverse).
   - The inverse of + is – and the inverse of – is +.
   - The inverse of × is ÷ and the inverse of ÷ is ×.
3) Finally, you must keep going until you have a letter **on its own**.

Equations can have **unknowns** or a **variable** on both sides of the equation.

Example 1

Solve the following equation: $8x + 2 = 3x + 12$

Collect all the terms containing x on one side and all the terms which don't on the other. It doesn't matter which order you start in, so long as you systematically move one term at a time. It's a good idea to write down what you're doing at every stage – put it in brackets next to the equation to help you see the calculations you are doing.

Let's start by moving the $3x$. To do this, you must subtract $3x$ from both sides of the equation.

$$8x + 2 = 3x + 12$$
$$(-3x) \qquad\qquad (-3x)$$
$$5x + 2 = 12$$

Now, you are able to move the 2 to the other side by subtracting it from both sides of the equation.

$$5x + 2 = 12$$
$$(-2) \qquad\qquad (-2)$$
$$5x = 10$$

Finally, divide by 5 to get the '$x =$' on the one side:

$$5x = 10$$
$$(\div 5) \qquad\qquad (\div 5)$$
$$x = 2$$

Example 2

Solve the following equation: $\frac{4x - 3}{5} = x - 2$

Start by multiplying both sides by 5.

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

$(\times 5)$ $\qquad$ $(\times 5)$

$$4x - 3 = 5(x - 2)$$

Then, expand the bracket.

$4x - 3 = 5x - 10$

Now, you are able to solve your equation.

$\qquad 4x - 3 = 5x - 10$

$(- 4x) \qquad\qquad (- 4x)$

$\qquad -3 = x - 10$

$(+ 10) \qquad\qquad (+ 10)$

$\qquad 7 = x$ (which is the same as $x = 7$)

Your turn

Solve each of the following equations:

1. $12x + 2 = 2x - 28$

5. $11x + 4 = 3x - 12$

2. $4x - 2 = 12 - 3x$

6. $10x + 19 = 4x + 34$

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9. $8x + 40 = 3x + 5$

15. $3x - 2 = \dfrac{10x + 1}{4}$

10. $9x + 12 = 6x + 14$

16. $3 + 2x = \dfrac{1}{2}(7x - 18)$

11. $5(x + 3) = 3(x + 9)$

Challenge

The diagram shows a rectangle.

(5x + 2)cm

$x$cm ⬚ $x$cm

(7x – 9.5)cm

12. $8(x - 1) = 4(x + 3)$

a. Explain why $5x + 2 = 7x - 9.5$

13. $\dfrac{6x + 1}{2} = 2x + 3$

b. Solve $5x + 2 = 7x - 9.5$

14. $\dfrac{5x + 2}{3} = x + 2$

c. Use your answer to part (b) to work out the perimeter of the rectangle.

Solving Linear Equations with Variables on Both Sides

Prior Knowledge:

- Solving equations with the variable on one side
- Expanding brackets

Solving equations means to find the **value** of x (or whatever letter is used) that makes the equation true. To do this, you will have to **rearrange** the equation to get x (or whatever letter is used) on its **own**.

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$$8x + 2 = 3x + 12$$
$$(-3x) \qquad (-3x)$$
$$5x + 2 = 12$$

Now, you are able to move the 2 to the other side by subtracting it from both sides of the equation.

$$5x + 2 = 12$$
$$(-2) \qquad (-2)$$
$$5x = 10$$

Finally, divide by 5 to get the 'x =' on the one side:

$$5x = 10$$
$$(\div 5) \qquad (\div 5)$$
$$x = 2$$

Example 2

Solve the following equation: $\frac{4x - 3}{5} = x - 2$

Start by multiplying both sides by 5.

$$\frac{4x - 3}{5} = x - 2$$
$$(\times 5) \qquad\qquad (\times 5)$$
$$4x - 3 = 5(x - 2)$$

Then, expand the bracket.

$4x - 3 = 5x - 10$

Now, you are able to solve your equation.

$$4x - 3 = 5x - 10$$
$$(- 4x) \qquad\qquad (- 4x)$$
$$-3 = x - 10$$
$$(+ 10) \qquad\qquad (+ 10)$$
$$7 = x \text{ (which is the same as } x = 7)$$

Your turn

Solve each of the following equations:

1. $12x + 2 = 2x - 28$

5. $11x + 4 = 3x - 12$

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Challenge

The diagram shows a rectangle.

$(5x + 2)$cm

$x$cm $x$cm
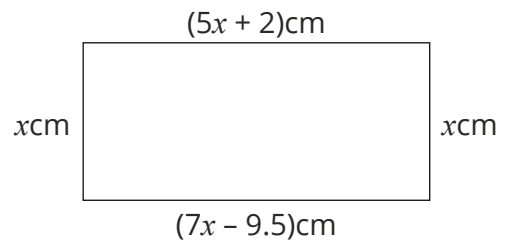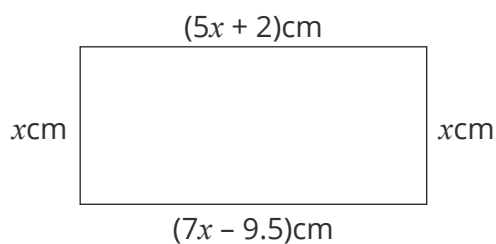
$(7x - 9.5)$cm

a. Explain why $5x + 2 = 7x - 9.5$

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b. Solve $5x + 2 = 7x - 9.5$

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c. Use your answer to part (b) to work out the perimeter of the rectangle.

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