Equations: fact sheet

Planner week 9 · Learn these facts

One step

$p - 2 = 3$

+ 2 both sides

$p = 5$

Do the **opposite** operation

Same to both sides

Two steps

$6w + 2 = 20$

− 2: $6w = 18$

÷ 6: $w = 3$

Undo + or − first, then × or ÷

Check: $6 \times 3 + 2 = 20$

Collecting first

$x + x + x = 51$

$3x = 51$

$x = 17$

Collect like terms first

$3n + n = 4n$

Brackets

$4(x - 6) = 44$

$4x - 24 = 44$

$x = 17$

Expand, or divide both sides by 4 first

$x - 6 = 11$

Fractions

$y \div 4 = 10.5$

× 4 both sides

$y = 42$

Multiply both sides by the bottom

$\frac{x}{7} + 9 = 4$: $x = -35$

Letters on both sides

$5x - 14 = 52 - x$

$6x = 66$

$x = 11$

Get the letters on **one** side

Move the smaller one

Forming equations

perimeter = 18

$10x + 6 = 18$

$x = 1.2$

Add up the sides, set = to the total

Then solve

Opposites

+	−
×	÷
÷	×
Check	put the answer back in

Which sheet do I need?

Solving equations ▸
solve: the letter on one side

Letters on both sides ▸
the letter on both sides

Forming and solving equations ▸
write the equation from words or a shape

Key words

- **Equation** has an = and one answer
- **Solve** find the value of the letter
- **Inverse** the opposite operation
- **Balance** do the same to both sides

Exam tips

- Write each step on a new line.
- Do the same thing to **both** sides.
- Answers can be decimals, fractions or negative.
- Check by substituting your answer back in.
- Forming: write the equation first, then solve.
- Number machines: work backwards with the opposite operations.

Solving equations: fact sheet

Equations · Planner week 9 · Work out which type it is, follow the example

1 Two steps

Solve $6w + 2 = 20$

$$\begin{aligned} 6w + 2 &= 20 \\ -2 \quad & \quad -2 \\ 6w &= 18 \\ \div 6 \quad & \quad \div 6 \\ w &= \mathbf{3} \end{aligned}$$

1. **Undo + 2**: subtract 2 from both sides
2. **Undo × 6**: divide both sides by 6
3. **Check**: 6 × 3 + 2 = 20 ✓

Use this when: the letter has been multiplied and then had a number added or taken away

2 Brackets

Solve $4(2x - 3) = 20$

$$\begin{aligned} 4(2x - 3) &= 20 \\ 8x - 12 &= 20 \\ +12 \quad & \quad +12 \\ 8x &= 32 \\ \div 8 \quad & \quad \div 8 \\ x &= \mathbf{4} \end{aligned}$$

1. **Expand the bracket**: $8x - 12 = 20$
2. **Add 12** to both sides
3. **Divide** both sides by 8
4. **Check**: 4(8 − 3) = 20 ✓

Use this when: there is a bracket in the equation

3 Fractions

Solve $\frac{x}{7} + 9 = 4$

$$\begin{aligned} \frac{x}{7} + 9 &= 4 \\ -9 \quad & \quad -9 \\ \frac{x}{7} &= -5 \\ \times 7 \quad & \quad \times 7 \\ x &= \mathbf{-35} \end{aligned}$$

1. **Undo + 9**: subtract 9 from both sides
2. **Undo ÷ 7**: multiply both sides by 7
3. Answers can be **negative**

Use this when: the letter is divided by a number

4 Collecting first

Solve $x + x + x = 51$

$$\begin{aligned} x + x + x &= 51 \\ 3x &= 51 \\ \div 3 \quad & \quad \div 3 \\ x &= \mathbf{17} \end{aligned}$$

1. **Collect like terms**: $3x$
2. **Divide** both sides by 3
3. **Check**: 17 + 17 + 17 = 51 ✓

Use this when: the letter appears more than once on the same side

The big question

What has been done to the letter? **Undo it** with the opposite, in reverse order.

Write the opposite operation **under both sides** every time.

Letters on both sides? Use that sheet. Words or a shape? Use Forming and solving.

Watch out

- Only doing the operation to one side.
- 4(2x − 3) = 8x − 3 (it is 8x − 12).
- Dividing the wrong way: 3m = 36 gives m = 12, not 108.

Letters on both sides: fact sheet

Equations · Planner week 9 · Work out which type it is, follow the example

1 Letters on both sides

Solve $5x - 14 = 52 - x$

$$
\begin{aligned}
5x - 14 &= 52 - x \\
+x \qquad & \qquad +x \\
6x - 14 &= 52 \\
+14 \qquad & \qquad +14 \\
6x &= 66 \\
\div 6 \qquad & \qquad \div 6 \\
x &= \mathbf{11}
\end{aligned}
$$

1. **Get the letters on one side**: add x to both sides
2. **Get the numbers on the other side**: add 14
3. **Divide** both sides by 6
4. **Check**: $5 \times 11 - 14 = 41$ and $52 - 11 = 41$ ✓

Use this when: there is a letter on both sides of the =

2 Brackets and fractions

Solve $(5 - x) \div 2 = 2x - 7$

$$
\begin{aligned}
(5 - x) \div 2 &= 2x - 7 \\
\times 2 \qquad & \qquad \times 2 \\
5 - x &= 4x - 14 \\
+x \qquad & \qquad +x \\
5 &= 5x - 14 \\
+14 \qquad & \qquad +14 \\
19 &= 5x \\
\div 5 \qquad & \qquad \div 5 \\
3.8 &= \mathbf{x}
\end{aligned}
$$

1. **Clear the fraction**: multiply **every** term by 2
2. **Letters on one side**: add x
3. **Numbers on the other side**: add 14
4. **Divide** by 5: x = **3.8**

Use this when: there is a fraction or bracket as well as letters on both sides

The big question

What has been done to the letter? **Undo it** with the opposite, in reverse order.

Write the opposite operation **under both sides** every time.

Letters on both sides? Use that sheet. Words or a shape? Use Forming and solving.

Watch out

- Sign errors when moving terms.
- Forgetting to multiply every term when clearing a fraction.
- Stopping at 19 = 5x.

Forming and solving equations: fact sheet

Equations · Planner week 9 · Learn the method

Worked example

QUESTION

The angles in a triangle are $x°$, $2x°$ and $3x°$.
Work out the size of the largest angle.

ANSWER

1. The angles in a triangle add up to 180°: $x + 2x + 3x = 180$
2. $6x = 180$, so $x = 30$
3. Largest angle = $3x = 3 \times 30$

90°

Write an equation from the words, then solve it.

How to do it

1. Write each length or amount using the letter.
2. Add them up (or use the rule in the question).
3. Make it equal to the total you are given.
4. Solve.
5. Answer the question asked.

Model answer:

$6x = 180$, $x = 30$, so 90°

Watch out

- Forgetting the "= 180".
- Giving x when the question asks for an angle.
- Only adding some of the angles.