Using equations – balance strategy using inverse operations

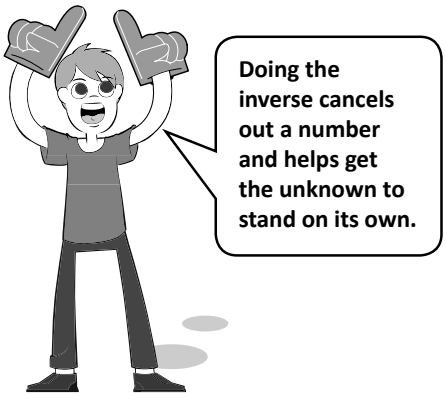
How can we find out the value of the symbol in this equation? We need to make it stand on its own while keeping the equation balanced. This is called the *balance strategy*.

We do this by performing the inverse operation to both sides. Can you see why?

☆ × 5 = 20

☆ × 5 ÷ 5 = 20 ÷ 5

☆ = 4



1 **Practise performing inverse operations by getting back to the first number. The first one has been done for you:**

a 20 [÷ 5] = 4 [× 5] = 20

b 35 [ ] = 5 [ ] = 35

c 64 [ ] = 8 [ ] = 64

d 72 [ ] = 8 [ ] = 72

e 54 [ ] = 9 [ ] = 54

f 18 [ ] = 6 [ ] = 18

2 **Find out the value of each symbol by performing inverse operations:**

a ◯ × 8 = 64

◯ × 8 ÷ _____ = 64 ÷ _____

◯ = _____

b ☆ × 7 = 56

☆ × 7 ÷ _____ = 56 ÷ _____

☆ = _____

3 **Find out the value of each symbol again. Perform the inverse operation in fewer steps.**

a ☺ ÷ 9 = 5

☺ = 5 × _____

☺ = _____

b ☺ ÷ 12 = 5

☺ = 5 × _____

☺ = _____

4 **Find out the value of each symbol by following the same steps as above. Set your work out neatly:**

a ◯ × 6 = 54

b ◯ × 5 = 125

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Using equations – balance strategy using inverse operations

Sometimes the symbol is not at the beginning so you have to rearrange the equation by performing an inverse operation. This is because it is easier to solve when the symbol is on the left hand side of the equals sign.

$12 = 78 - \blacktriangle$

Step 1 Move the symbol to the left with an inverse operation. The inverse of $+ \blacktriangle$ is $- \blacktriangle$:

$12 + \blacktriangle = 78 - \blacktriangle$

Step 2 Make the symbol stand alone with an inverse operation. To do this, subtract 12 from both sides:

$12 + \blacktriangle = 78 - 12$

Step 3 Now we can perform a simple subtraction to find out the value of the symbol:

$\blacktriangle = 78 - 12$

$\blacktriangle = 66$

5 **Follow the steps outlined above to find the value of the symbol.**

a $23 = 56 - \blacktriangle$

$\square + \blacktriangle = \square$

$\blacktriangle = \square - \square$

$\blacktriangle = \square$

b $32 = 78 - \blacktriangle$

$\square + \blacktriangle = \square$

$\blacktriangle = \square - \square$

$\blacktriangle = \square$

c $36 = 112 - \blacktriangle$

$\square + \blacktriangle = \square$

$\blacktriangle = \square - \square$

$\blacktriangle = \square$

d $52 = 105 - \blacktriangle$

$\square + \blacktriangle = \square$

$\blacktriangle = \square - \square$

$\blacktriangle = \square$

e $26 = 78 - \blacktriangle$

f $14 = 92 - \blacktriangle$

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Using equations – word problems

If you can solve equations with one unknown number using the balance strategy, you will be able to solve word problems with ease!

A large group of friends signed up to participate in a fun run. 56 of them got food poisoning the day before so had to pull out. How many people signed up if a total of 84 people ran the race?

☆ – 56 = 84

☆ – 56 = 84 + 56

☆ = 140

1 **Solve the following word problems using inverse operations. Start by choosing the matching equation from the box below.**

\$50 + △ = \$130	△ – 70 m = 38 m	\$83 + \$100 + △ = \$300

a Jack had a piece of rope and cut off 70 metres. He was left with 38 metres. How long was the rope?

b Tom found \$50 on the bus on Monday and was given birthday money by his Gran on Wednesday. How much did his Gran give him if he ended up with \$130?

c Matilda saved \$83 towards a trip to the snow and her parents gave her \$100. How much more money does she need if the trip costs \$300?

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Using equations – word problems

Kate saved each week for 5 weeks and then spent $25.

How much was she saving each week if she had $100 left at the end of 5 weeks and after spending $25?

Step 1 Set up the equation. The triangle stands for the amount Kate was saving each week.

▲ × 5 – 25 = $100

Step 2 Cancel out the – 25 with the inverse operation: + 25

▲ × 5 = 100 + 25

▲ × 5 = 125

Step 3 Cancel out × 5 with the inverse operation: ÷ 5

▲ = 125 ÷ 5

▲ = $25

Kate was saving $25 each week.

Make the unknown number stand on its own while keeping the equation balanced. We do this with inverse operations.

2 **Solve the following word problems using inverse operations. The equations are partially set up. You may like to use a calculator.**

a For my school fete I baked 3 batches of cookies, realized that wasn't enough and so I bought a dozen more. How many were in one batch if I had 84 cookies altogether?

3 × ▲ + 12 = 84

3 × ▲ = 84 – ☐

▲ = ☐ ÷ ☐

▲ = ☐

There were ☐ cookies in each batch.

b 8 same sized Year 5 classes assembled in the playground for photo day. There were 11 students absent. How many students are there in each class if there were 213 there on the day?

☐ × ▲ – 11 = 213

☐ × ▲ = 213 + 11

▲ = ☐ ÷ ☐

▲ = ☐

There were ☐ students in each class.

c Trin went on a holiday for 15 days. She collected 3 postcards a day for the first 10 days. By the end of her holiday she had 73 postcards. How many did she collect over the last 5 days?

3 × ☐ + ▲ = 73

Trin collected ☐ postcards over the last 5 days.

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Using equations – think of a number

Lim thinks of a number, adds 3 to it and then multiplies it by 4.

The answer is 20. What is Lim's number?

To answer this, first we need to write an equation with the unknown:

Step 1 Set up the equation. The heart shape stands for the unknown number.

♡ + 3 × 4 = 20

Step 2 Cancel out the × 4 with the inverse operation: ÷ 4

♡ + 3 = 20 ÷ 4

Step 3 Cancel out the + 3 with the inverse operation: – 3

♡ + 3 = 5

♡ = 5 – 3

♡ = 2

1 **Work out the numbers these children are thinking of:**

a Jamila says: *"I'm thinking of a number. I divide it by 7 and then add 6. My answer is 13."*

♡ ÷ 7 + 6 = 13

♡ ÷ 7 = 13 – 6

♡ ÷ 7 = ☐

♡ = ☐ × ☐

♡ = ☐

b Pablo says: *"I'm thinking of a number. I multiply it by 6 and then add 7. My answer is 55."*

♡ × 6 + 7 = 55

♡ × 6 = 55 – 7

♡ × 6 = ☐

♡ = ☐ ÷ ☐

♡ = ☐

c Mikaela says: *"I'm thinking of a number. I multiply it by 4 then subtract 12. My answer is 20."*

♡ ☐☐☐☐ = ☐

♡ ☐☐ = ☐☐☐

♡ ☐☐ = ☐

♡ = ☐☐☐

♡ = ☐

d Linh says: *"I'm thinking of a number. I divide it by 8 and then add 11. My answer is 19."*

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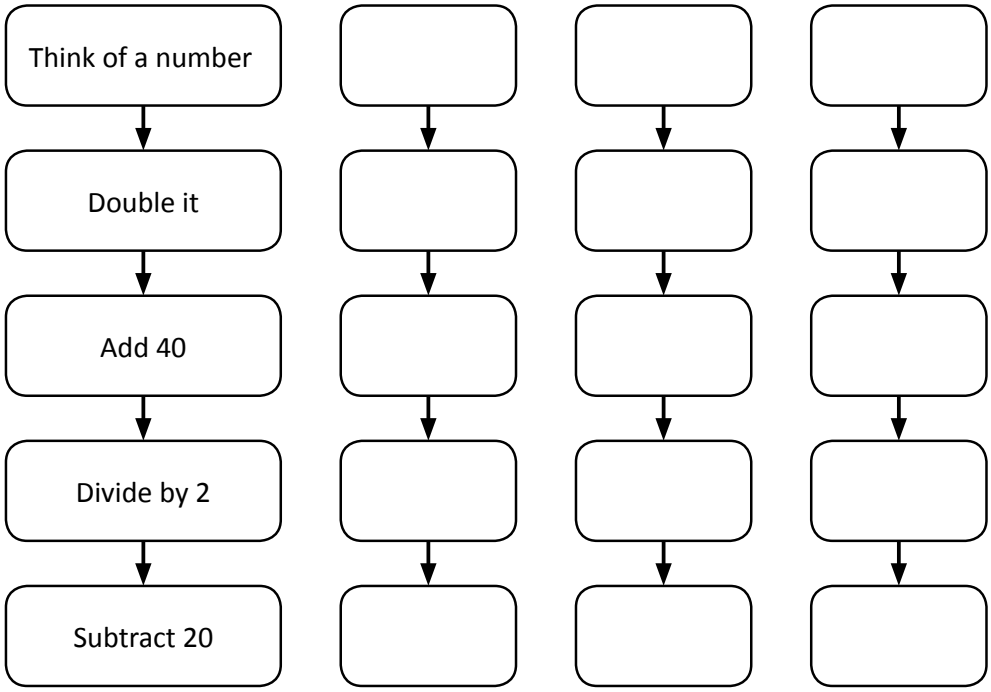
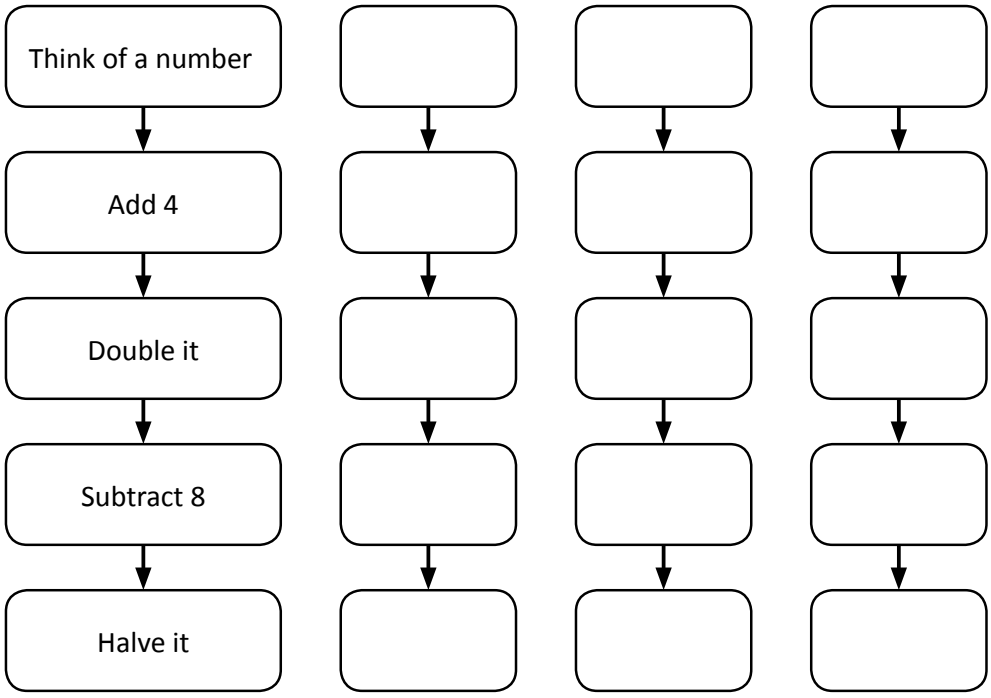
Using equations – think of a number

2 **Follow the steps for 3 different numbers.**



What happens each time? _____

3 **Follow the steps for 3 different numbers.**



What happens each time? _____

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Number tricks 1 — solve

What to do

Try this number puzzle by testing it out in the blank boxes.

Think of a number	✱	
Add 2	✱ + 2	
Add first number	✱ + ✱ + 2	
Divide by 2	✱ + 1	
Subtract 1	✱	

What do you notice? _____

What to do next

This number puzzle uses the same trick. This time complete the column of boxes with the number sentences using symbols. Then test it in the last column.

Think of a number	✱	
Double it		
Add 6		
Divide by 2		
Subtract 3		

Why does this work for any number?

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Number tricks 2

solve

Write the symbols for this puzzle in column 2 and test it out.

What number is left?

Think of a number	✱	
Add 4		
Double it		
Take away 2		
Add the first number		
Add 6		
Divide by 3		
Subtract the first number		
You would be left with _____		

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