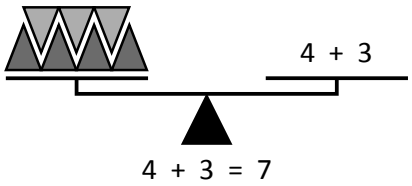
Equations and equivalence – understanding equivalence

An equation is like a set of balanced scales. Both sides are equal.
Look at the scale on the right.

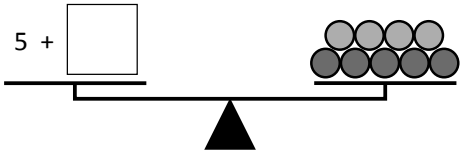
On one side are 4 black triangles and 3 grey triangles.
On the other side is the problem 4 + 3.
Is this a balanced equation?
Yes, because they both represent 7.



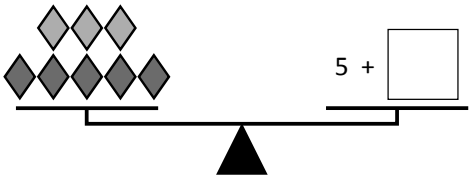
Sometimes, we haven't been given all the information and we have to work it out. This is what algebra is – solving missing number puzzles.

1 **Make these scales balance by adding the missing value:**

a

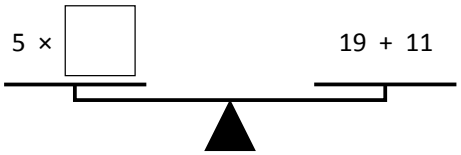


b

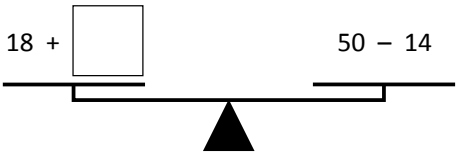


2 **These scales have number problems on each side. One side has a complete problem. On the other side, you need to work out the missing value. Write the value in the box so that the scales balance:**

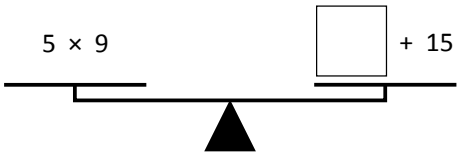
a



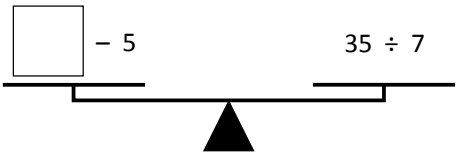
b



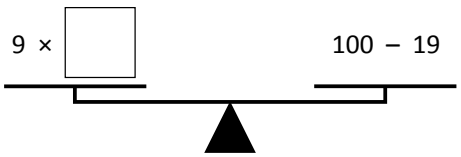
c



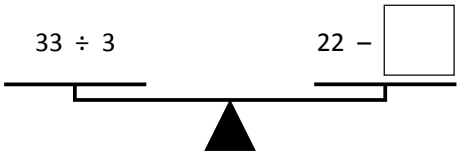
d

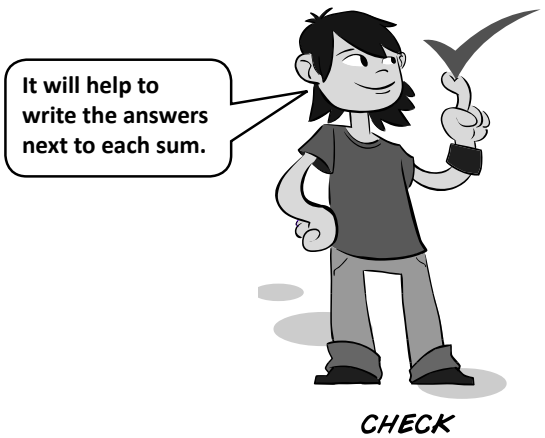


e



f





Equations and equivalence – understanding equivalence

If the sides are not balanced, we say the equation is unequal.

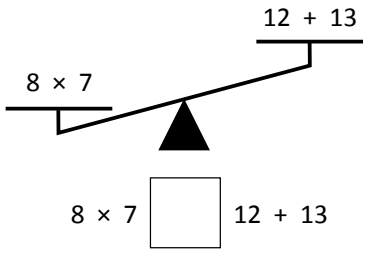
Look at these scales:
5 × 4 is greater than 5 + 4

So instead of an equals sign, we use the greater than sign:

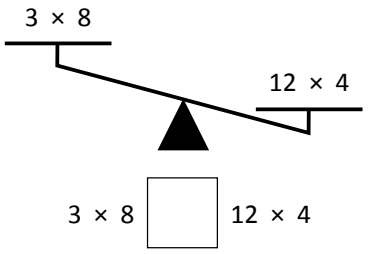
5 × 4 > 5 + 4

3 **Complete the following scales and inequalities by adding greater than (>) or less than (<):**

a

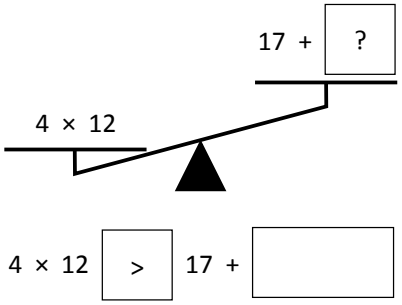


b

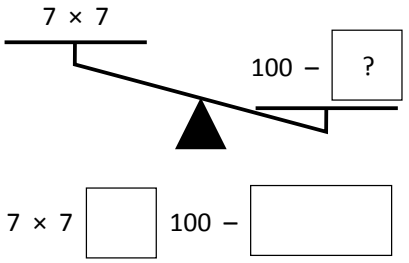


4 **In these problems, you have to add both the symbol *and* a value that would make the equation true. Remember, just like with ordinary scales, the bigger value will be lower down.**

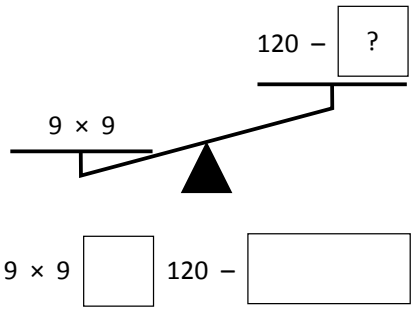
a



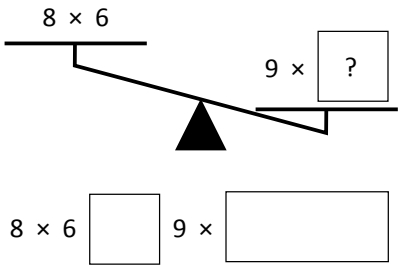
b



c



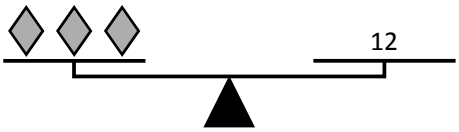
d



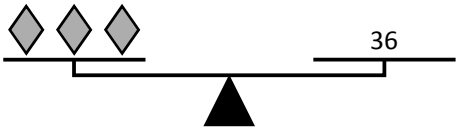
Equations and equivalence – using symbols

Symbols help us when we have more than one number to find.
A symbol can be any shape and stands for any unknown numbers.

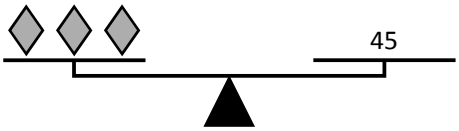
1 **Work out the value of the diamond in each question. Notice the same symbol is added 3 times. Your 3 times tables will help here.**

a  12

□ + □ + □ = 12

b  36

□ + □ + □ = 36

c  45

□ + □ + □ = 45

2 **Find the value of the symbols. Remember that if a symbol is used more than once, it means it is the same value again.**

a ☆ + ☆ + ☆ = 9 ☆ = □

b ♡ × ♡ = 36 ♡ = □

c ☺ × ☺ = 49 ☺ = □

3 **Find the value of the symbols and then check if you are right by using the same value in the question alongside it.**

a ◈ × ◈ = 81 ◈ × △ = 36

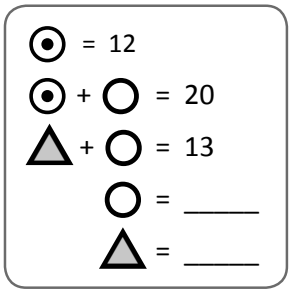
◈ = □ △ = □

b ○ + ✶ + ✶ = 29 ○ × ✶ = 60

○ = □ ✶ = □

Equations and equivalence – using symbols

Known values can help us work out the values of the secret symbols.
Your knowledge of inverse operations will also come in handy.



By knowing the value of ⊙ we can work out ○

12 + ○ = 20, so ○ = 8

By knowing the value of ○, we can work out △

△ + 8 = 13, so △ = 5

4 **Look carefully at the example above and follow the steps to find out the values of these secret symbols:**

a ✱ = 15

✱ + ○ = 40

△ + ○ = 65

○ = _____

△ = _____

b ◈ = 54

◈ ÷ ○ = 9

△ ÷ ○ = 3

○ = _____

△ = _____

5 **This time you must find the value of 3 different symbols △ ☆ ○ using the clues in each step:**

a ☆ × ☆ = 16

○ + ☆ = 100

○ – ☆ = △

☆ = ☐

○ = ☐

△ = ☐

b △ + △ = 50

△ ÷ ○ = 5

○ + △ = ☆

☆ = ☐

○ = ☐

△ = ☐

c ☆ + ○ = 20

☆ × △ = 72

13 – △ = 5

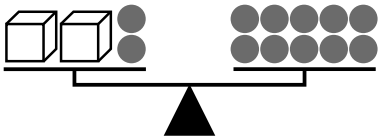
☆ = ☐

○ = ☐

△ = ☐

Equations and equivalence – keeping balance

We can work out how many counters are in each box by keeping balance.



Here is our equation. How do we work out how many counters are in each box? We use a symbol to represent the unknown.

$2 \times \square + 2 = 10$

If we take away 2 from each side, we maintain the balance and make the problem easier. We now have to work out the value of $\square$

$2 \times \square = 8$

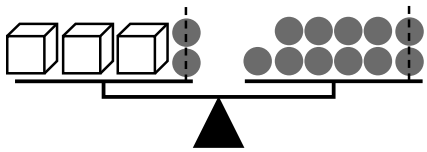
$2 \times 4 = 8$

This works because $2 \times 4 + 2 = 10$

1 **Find out how many counters are in each of the boxes. Remember to take away the same amount on both sides so the balance is kept.**

a

I will take away $\square$ from each side. This leaves me with:



$3 \times \square = \square$

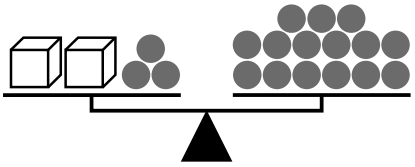
$\square = \square$

This works because $3 \times \square + 2 = 11$

.....

b

I will take away $\square$ from each side. This leaves me with:



$2 \times \square = \square$

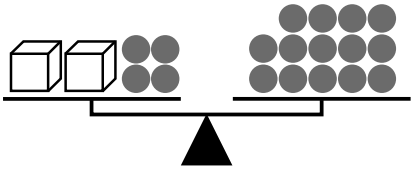
$\square = \square$

This works because $2 \times \square + \square = \square$

.....

c

I will take away $\square$ from each side. This leaves me with:



$\square \times \square = \square$

$\square = \square$

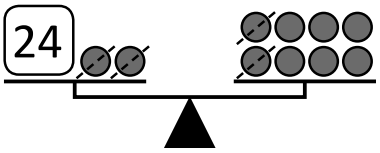
This works because $2 \times \square + \square = \square$

Equations and equivalence – keeping balance

In this activity you need to find out what each counter is worth.

Step 1 Make the number stand alone by keeping balance.

Step 2 Write an equation to solve.

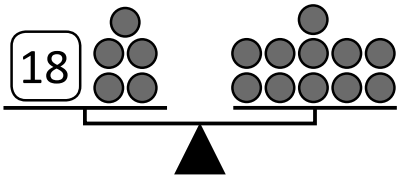


24 = ● × 6

● = 4

2 **Look carefully at each balanced scale and work out what the symbols equal:**

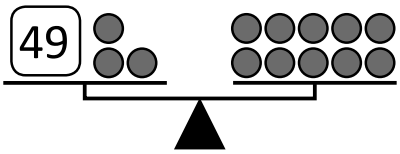
a



18 = ● × ☐

● = ☐

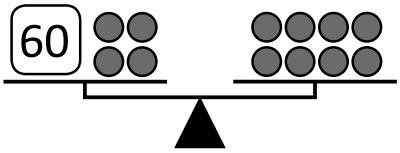
b



49 = ● × ☐

● = ☐

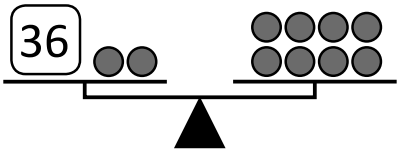
c



60 = ● × ☐

● = ☐

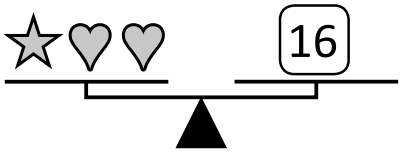
d

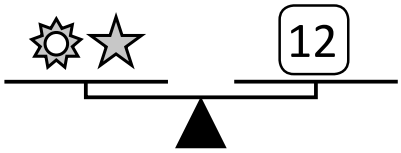


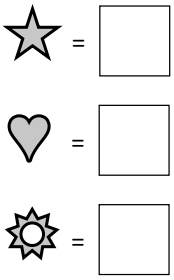
36 = ● × ☐

● = ☐

3 **This time use guess, check and improve to work out what the value of the symbols could be. The symbols have the same value on both scales.**







= ☐

= ☐

= ☐

Magician's hat trick

solve

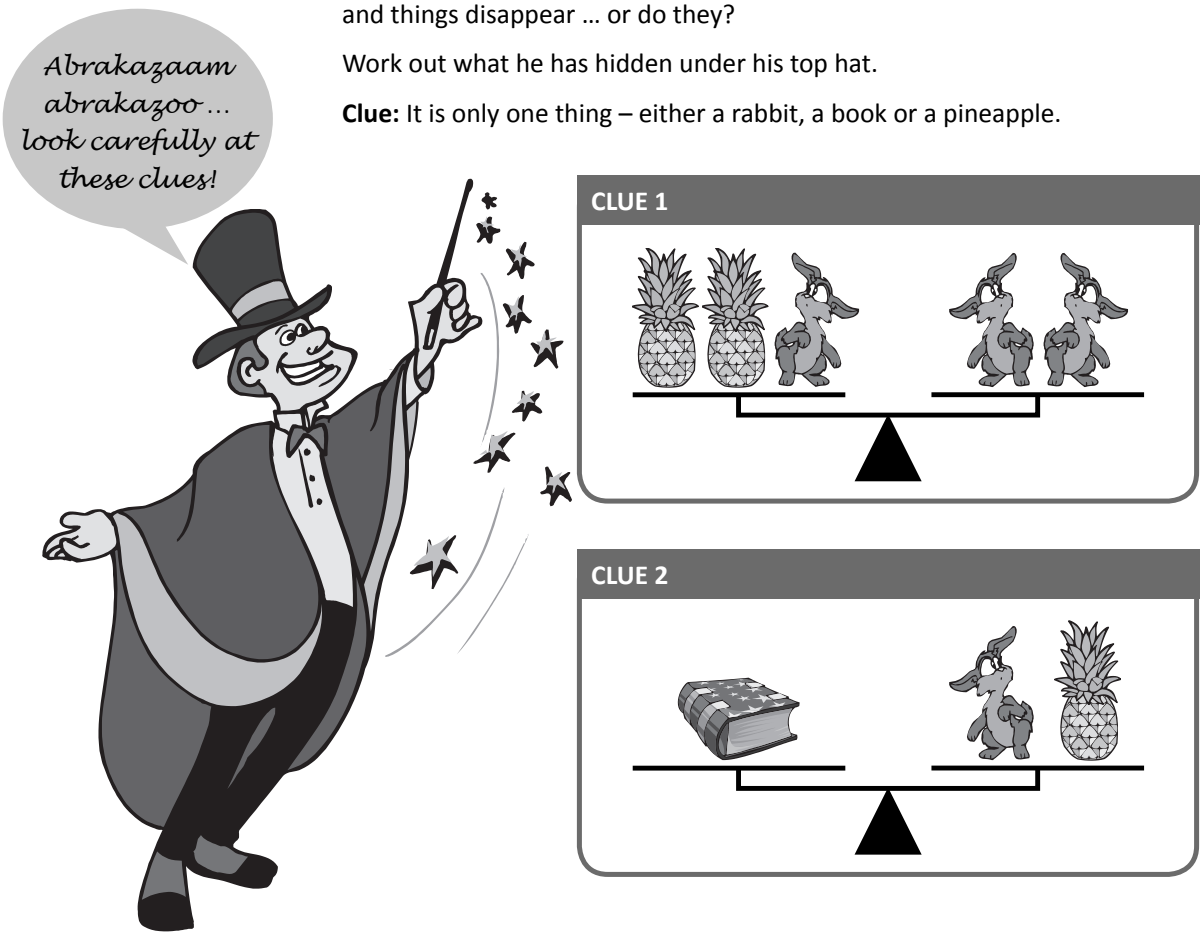
Getting ready

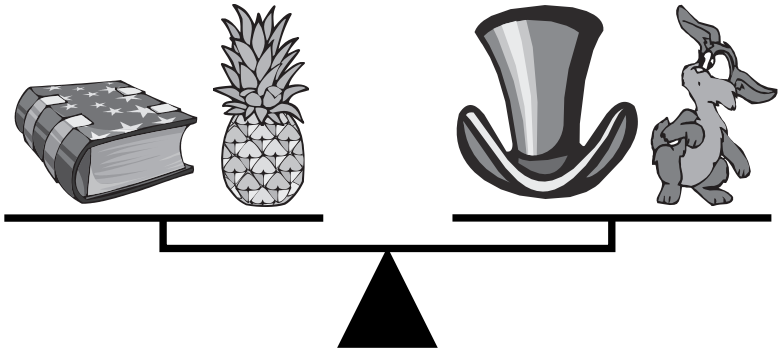
Mandana the magician is the master of optical illusions, magic tricks and disappearing acts.

One of his favourite tricks, is the disappearing act where he waves his wand and things disappear … or do they?

Work out what he has hidden under his top hat.

Clue: It is only one thing – either a rabbit, a book or a pineapple.





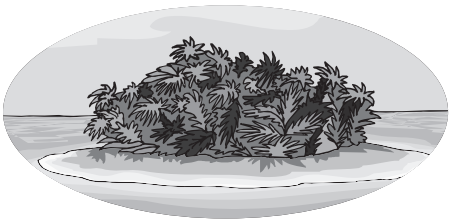
What to do

Underneath Mandana the magician's hat is:

Dhiffushi island currency — solve

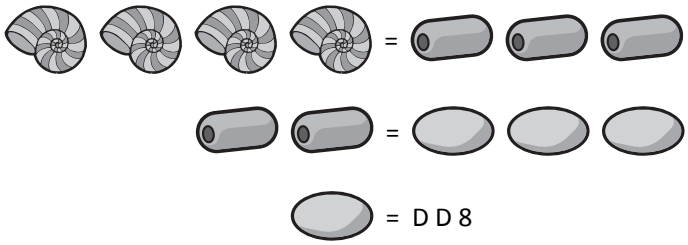
Getting ready

On the holiday island of Dhiffushi, instead of money, they use shells, beads and pebbles. Instead of a dollar sign they have this: D D, which stands for Dhiffushi Dollars.



What to do

Work out what this currency is equal to by looking at these clues:



= D D 8

Key
Shell =
Bead =
Pebble =

Using the symbol D D, convert the price of each of the following :

1 pebble = _____ so 3 pebbles = _____

1 bead = _____ so 2 beads = _____

1 shell = _____ so 4 shells = _____

Using Dhiffushi currency, draw what I could use to pay for the following:

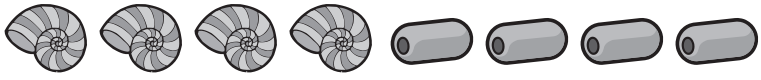
Snorkeling = D D 36

Rainforest trip = D D 40

Turtle watching = D D 54

Diving = D D 72

In Dhiffushi currency, how much was my accommodation if I paid:



My accommodation would be _____