MATHS with SCRATCH puts Magic into Maths

The four Maths operators in Scratch have the symbols: **+ − * /**

Here is the *division* operator

input windows

symbol is *slash*
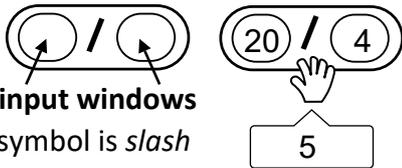
÷ Division ÷

Code the division operation in SCRATCH

Drag the *division* operator into the scripting area.
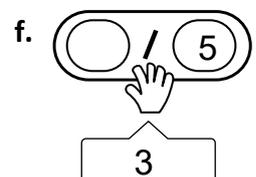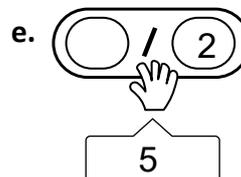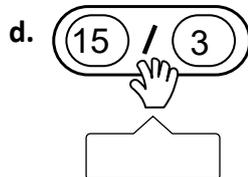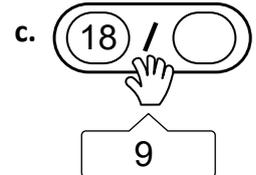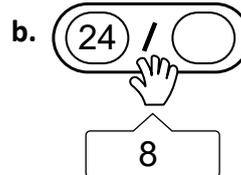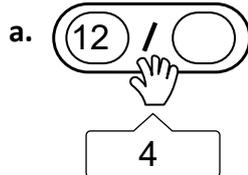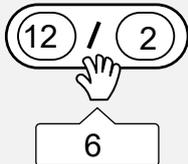Type 20 in the left input window and 4 in the right.

Click the block to make it report its value. It reports a value of 5.

A. **Write the missing value in each *division* Operator's blank input window *a* to *f*.**

On paper you are used to seeing these like this:

$$12 \div 2 = 6$$

Here is the same thing in Scratch:

12 / 2 → 6

a. 12 / ○ → 4

b. 24 / ○ → 8

c. 18 / ○ → 9

d. 15 / 3 → ☐

e. ○ / 2 → 5

f. ○ / 5 → 3

pronounced:

## B. The **Commutative** Property *come-you-tat-iv*

Which two operations are Commutative and which two are NOT Commutative ?

In **Commutative** operations, the numbers can be swapped across the symbol without making any difference to the result It's very easy with SCRATCH to show that **addition and multiplication ARE commutative** but **subtraction and division ARE NOT commutative**. We will use the same numbers, 5 and 3 in the four operators.
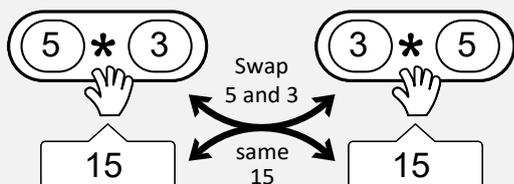
Commutative

in addition
the numbers can be swapped

5 + 3 → 8   Swap 5 and 3 / same 8   3 + 5 → 8
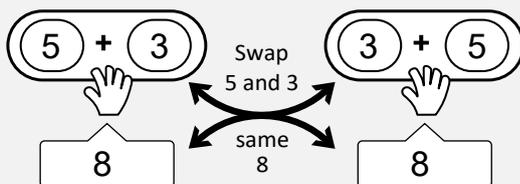
in multiplication
the numbers can be swapped

5 * 3 → 15   Swap 5 and 3 / same 15   3 * 5 → 15

In the ***addition*** and ***multiplication*** operators, the example numbers **5 and 3** can be switched or swapped. The order makes no difference to the value it reports. Addition and multiplication are said to be *COMMUTATIVE (they can be swapped around and it makes no difference).*

NOT Commutative

in subtraction
the numbers **cannot** be swapped

5 − 3 → 2   Swap 5 and 3 / **NOT** the same   3 − 5 → −2

in division
the numbers **cannot** be swapped

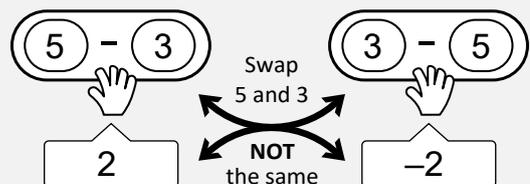5 / 3 → 1.66666667   Swap 5 and 3 / **NOT** the same   3 / 5 → 0.6
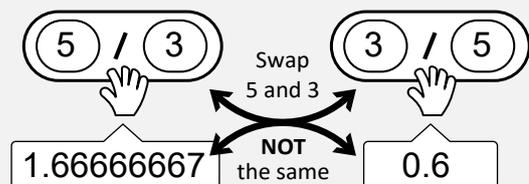
In the ***subtraction*** and ***division*** operators, the example numbers **5** and **3 cannot** be switched or swapped. The order makes a difference to the reported value. Subtraction and division are **NOT** *COMMUTATIVE (swapping the numbers around changes the values and makes a difference).*

Fractions
https://scratch.mit.edu/projects/376264311

C

What we know about FRACTIONS

On top, the **numerator** tells us the number of the named fractions below.

$\dfrac{1}{2}$ *one half* $\dfrac{2}{2}$ *two halves the WHOLE*

The **denominator** tells **what they are** and how **many make up the WHOLE** amount.

What we often do with FRACTIONS

We *add* fractions, often with *least common*

$$\dfrac{2}{3} + \dfrac{1}{4} = \dfrac{8}{12} + \dfrac{3}{12} = \dfrac{11}{12}$$

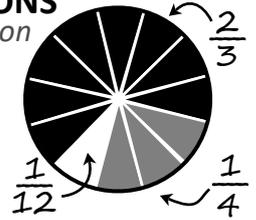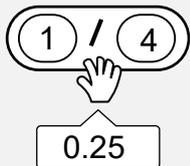$\dfrac{2}{3}$ $\dfrac{1}{12}$ $\dfrac{1}{4}$

denominator such as twelfths. We also *subtract, multiply* and *divide* fractions. Fractions can be *unit, non-unit fractions*, *equivalent*, *top-heavy* fractions, *mixed numbers*. We *order* them and show them as pie slices.

### Normally you see fractions like this:

$\dfrac{1}{4}$ *one quarter*

Here is the same thing in Scratch:

(1 / 4)

0.25

Fractions in Scratch

These actions with fractions are more suited to written Maths assignments in exercise books. They are not easily suited to calculators, tablets or computers. Also, the traditional symbols for multiplication (x) and division (÷) have been replaced with digital symbols. Fractions on digital devices are converted to decimals.

Fractions in SCRATCH use the **division** operator. The first input window is the *numerator*. The second input window is the *denominator*.

`3.142`

7	8	9	/
4	5	6	*
1	2	3	-
0	.	+	=
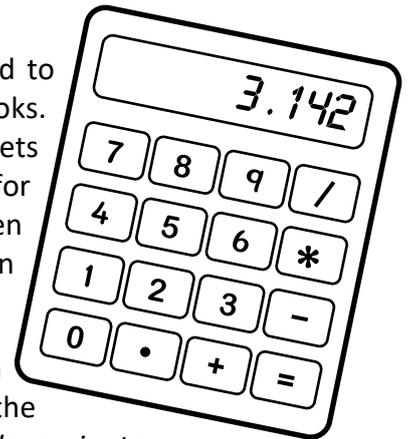
D **Write these division operators as unit fractions**. The first is done for you and the reported decimals are shortened to a max of 4 decimal places.

(1 / 3) $\dfrac{1}{3}$
0.3333

(1 / 5)   ☐
0.2

(1 / 6)   ☐
0.1666

(1 / 7)   ☐
0.1428

(1 / 8)   ☐
0.125

(1 / 10)   ☐
0.1

E **Complete the missing details in these unit and non-unit fractions as division operators.**

(◯ / ◯) $\dfrac{3}{4}$
0.75

(◯ / ◯) $\dfrac{2}{5}$
0.4

(3 / 5)   ☐
0.1666

(3 / 8)   ☐
0.375

(5 / 8)   ☐
0.625

(1 / 9)   ☐
0.1111

1 OPEN this resource. Press the green flag.
Answer each question and follow the instructions.
There are six learning situations, A to F.

½ of 24 is 12		What is one third of 24
a 🐱 `24 / 2`	*d* 🐱 Click me	
¼ of 24 is 6		What is two thirds of 24
b 🐱 `24 / 4`	*e* 🐱 Click me	
● Click for more		What is three fifths of 20
c 🐱 `24 / 4 * 3`	*f* 🐱 Click me	
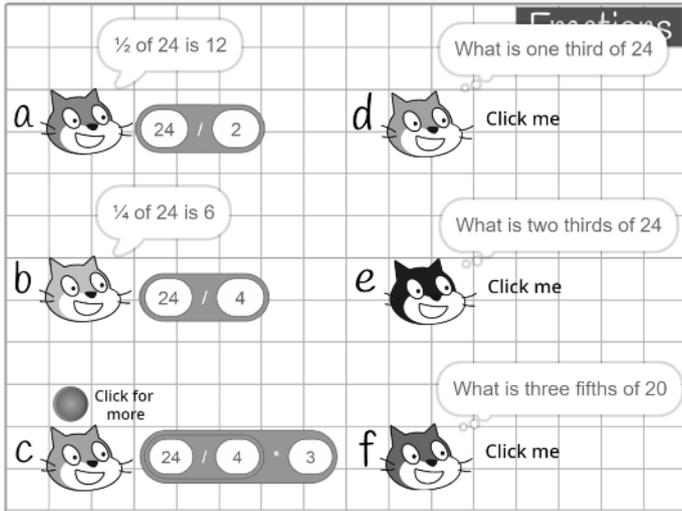
2 Coding the fraction of a quantity is similar to a Maths puzzle and the solution algorithm can be easily coded in Scratch.

3 While learning an approach to solving the Maths, you can learn useful coding skills also:
(1) How to code a button
(2) How to create a 'logical flow' using broadcasts
(3) How use the ÷ and x Operators to construct solution algorithms in Maths.

4 The logical flow of the Question A is:
(1) Click the **green flag**
This makes the sprite ask the Question in a speech balloon.
(2) *This could be coded for user input, but as it is a learning situation we assume you know the answer is **12**.*

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a

when 🏳 clicked
think (What is ½ of 24 ?)

What is ½ of 24

🐱 Click me

when this sprite clicked
broadcast (Button A ▼)
say (To get ½ of 24 just divide 24 by 2)

To get ½ of 24 just divide 24 by 2

🐱 **Answer A** The answer is 12
Press A

when I receive (Answer A ▼)
say join (½ of 24 is) (24 / 2)

Half of 24 is 12

🐱 (24 / 2 ✋) ▢

Continue from here

b think (What is ¼ of 24 ?)
(24 / 4 ✋) ▢

c think (What is ¾ of 24 ?)
(24 / 4) * 3 ✋ ▢

d think (What is one third of 24?)
(24 / 3 ✋) ▢

e think (What is two thirds of 24?)
(24 / 3) * 2 ✋ ▢

f think (What is three fifths of 20?)
(20 / 5) * 3 ✋ ▢

Your ideas are welcome
for this final page
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