NUMERACY
from
SCRATCH

Here are 10 sample worksheets.

For more free downloadable worksheets, visit:

www.scratchfromscratch.com

Introduction to Numeracy from Scratch

Round Blocks in Square Holes

The Operators palette has blocks that can be used to extend Scratch to Numeracy and perform common calculations in mathematics. Start by making a combination block. Just drag a rounded green operator into the rectangular window of the **say** or **think** block. You can also drag one operator into the window of another. You can input number data into the operator's rounded windows. Combined with the **say** and **think** blocks, when the combo block is clicked, the sprite is instructed to report the outcome of the operation. The potential of Scratch to make Numeracy creative, exciting and absorbing for the children, is limitless. Over the following pages there is a selection of ten example worksheets based on this very easy technique. There are many more on the web site www.scratchfromscratch.com. It is envisaged that the teacher will demonstrate and discuss the lesson objective on the interactive screen and when the children are ready they will use the worksheets.

THESE ARE THE MAIN BLOCKS YOU NEED TO MAKE NUMERACY EXCITING AND ABSORBING.

LISTEN TO WHAT THE CAT SAYS OR THINKS.

THE CAT HAS ALL THE ANSWERS.

SAY BLOCK

say Hello! for 2 secs

THINK BLOCK

think Hmm... for 2 secs

PICK RANDOM OPERATOR

pick random 1 to 10

repeat 10   LOOP BLOCK

PLUS OPERATOR

◯ + ◯

MINUS OPERATOR

◯ - ◯

MULTIPLICATION

◯ * ◯

DIVISION

◯ / ◯

MODULUS

◯ mod ◯

ROUND

round ◯

EQUALITY

☐ = ☐

INEQUALITY

☐ > ☐

wait 1 secs
WAIT COMMAND

which number
VARIABLE

It's as easy as ①Create the combo ②Input numbers ③Click to run

There are several other examples of numeracy strands touched on in the book:
- area and perimeter of squares and rectangles (p.68)
- number of sides, size of angles in regular shapes (p.69)
- area and circumference of circles (p. 70)
- divisibility of numbers (p. 76, 77)
- number lists, number patterns (p.90)
- computational thinking inc. application of Pythoras' theorem (p.99)
- increasing speed over time (p.100)
- data recording, block graphs (p. 100)

ADDITION WITHIN 20

FOR 7 YEAR OLDS

the *plus operator* in the say block
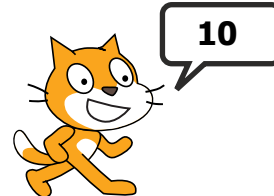
say [Hello!] for 2 secs

MAKE THE COMBO

(1) ◯ + ◯
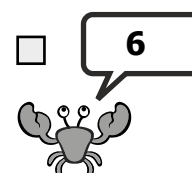
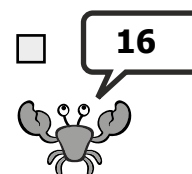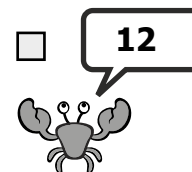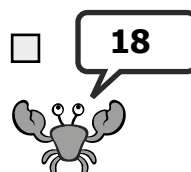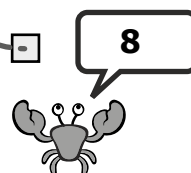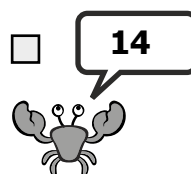say (3 + 7) for 2 secs

INPUT NUMBERS

(2)

CLICK

(3)

10

Below, children join the code block with the answer the sprite will give when it's clicked. Check it out, with a click!

PAIRS

A say (4 + 4) for 2 secs ☐

B say (6 + 6) for 2 secs ☐

C say (8 + 8) for 2 secs ☐

D say (7 + 7) for 2 secs ☐

E say (3 + 3) for 2 secs ☐

F say (9 + 9) for 2 secs ☐

crabs

☐ 12

☐ 14

☐ 16

☐ 8

☐ 6

☐ 18

MAKE MORE THAN TEN

A say (9 + 2) for 2 secs ☐

B say (8 + 5) for 2 secs ☐

C say (7 + 5) for 2 secs ☐

D say (6 + 8) for 2 secs ☐
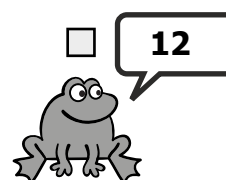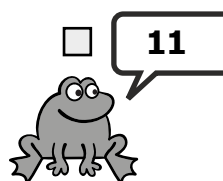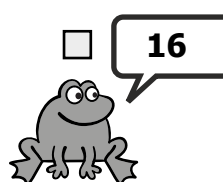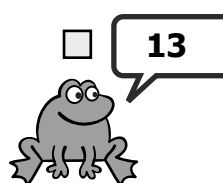
E say (7 + 9) for 2 secs ☐

F say (9 + 6) for 2 secs ☐

frogs

☐ 12

☐ 13

☐ 15

☐ 16

☐ 14

☐ 11

Sample Worksheet 2
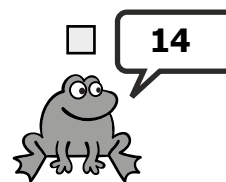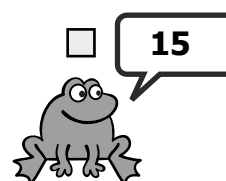
ADDITION WITHIN 20

FOR 7 YEAR OLDS

the *plus operator* used twice in the *say* block

THE COMBO BLOCK

say Hello! for **2** secs

say (**4** + **6**) + **3** for **2** secs

13

MAKE THE COMBO

INPUT 3 NUMBERS

CLICK

(+) (+)

① ② ③
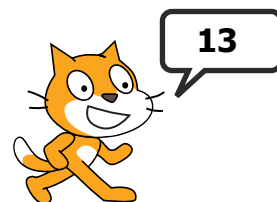
Children write the answer *they think* the sprite will give when its clicked.
Check interactively.

MAKE TEN AND MORE

USE DIFFERENT SPRITES INSTEAD OF A, B, C etc.

hippo say (3 + 7) + 4 for 2 secs

horse say (2 + 8) + 6 for 2 secs

cat say (5 + 5) + 9 for 2 secs

crab say (9 + 1) + 7 for 2 secs

monkey say (4 + 6) + 7 for 2 secs

mouse say (7 + 3) + 6 for 2 secs

duck say (5 + 8) + 5 for 2 secs

dog say (6 + 2) + 4 for 2 secs

penguin say (9 + 5) + 1 for 2 secs

parrot say (4 + 6) + 6 for 2 secs
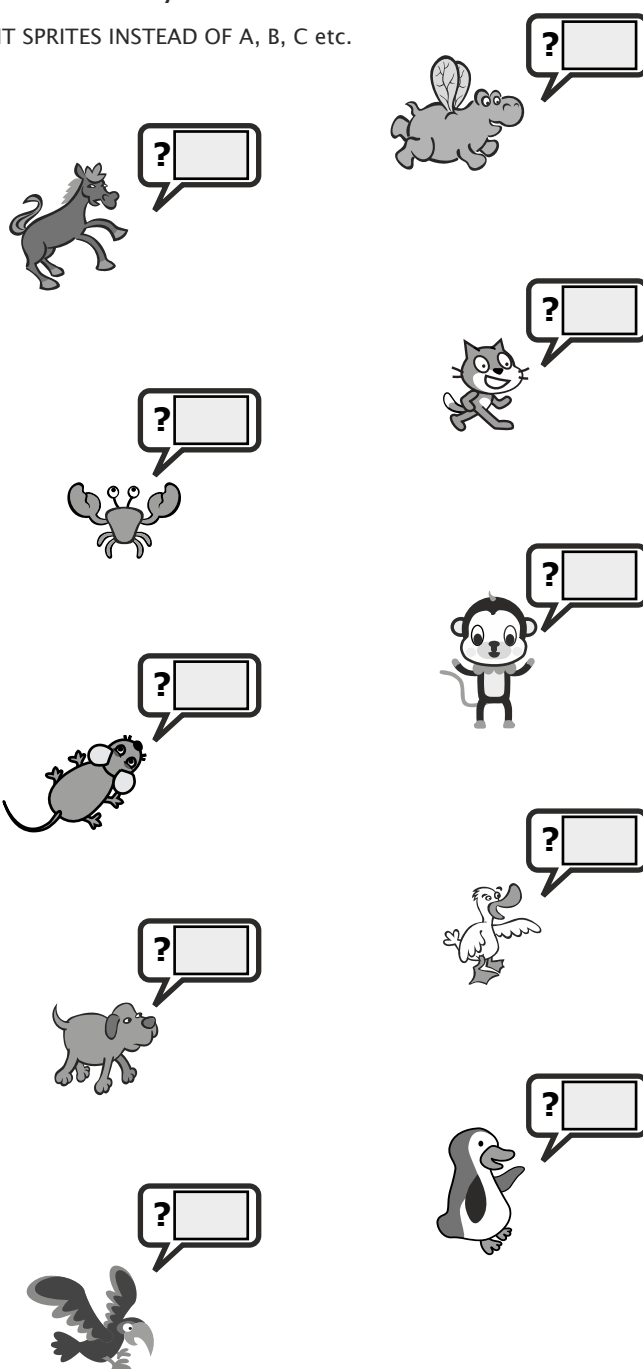
COMPUTATIONAL THINKING

FOR **8** YEAR OLDS

Random Numbers with the *pick random operator* in the think block

| 8 |

think Hmm... for **2** secs

pick random **1** to **10**

MAKE THE COMBO
①

CLICK 10 times

② think pick random **1** to **10** for **2** secs

USE THE CAT OR ANY
SPRITE FROM THE LIBRARY
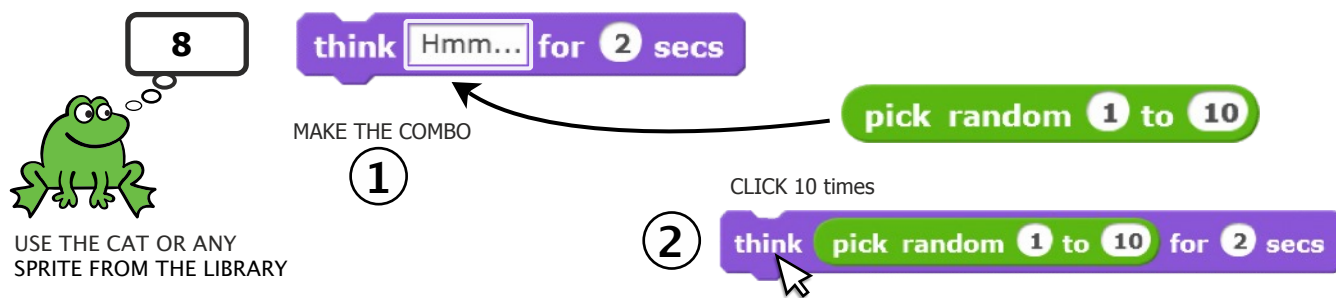
Children write the random number after each click.
Then they answer the questions and discuss the outcome.

**RANDOM
NUMBERS
(Round 1)**

What's the highest number?

What's the lowest number?

What's the most common number?

Which number between 1 and 10 didn't appear?

Record another 10 clicks. Compare. Discuss

**RANDOM
NUMBERS
(Round 2)**

What's the highest number?

What's the lowest number?

What's the most common number?

Which number between 1 and 10 didn't appear?

Record another 10 clicks. Compare. Discuss

Was there a different highest number?

Was there a different lowest number?

Was there a different most common number?

Which number between 1 and 10 didn't appear in both rounds?

COMPUTATIONAL THINKING

*FOR **8** YEAR OLDS*

Random Numbers and the *plus operator*

think `Hmm...` for **2** secs

MAKE THE COMBO

①

② INPUT in the second window

+ ◯

pick random **①** to **⑩**

③ think (pick random **①** to **⑩** + **③**) for **②** secs

CLICK

8

WHAT'S THE
RANDOM NUMBER ?

Children figure out the random numbers and answer the questions.

A think (pick random **①** to **⑩**) + **②**

8

random number ☐

highest possible ☐
lowest possible ☐

E think (pick random **⑩** to **⑳**) + **⑨**

22

random number ☐

highest possible ☐
lowest possible ☐

B think (pick random **①** to **⑩**) + **⑦**

10

random number ☐

highest possible ☐
lowest possible ☐

F think (pick random **⑩** to **⑳**) + **⑧**

25

random number ☐

highest possible ☐
lowest possible ☐

C think (pick random **①** to **⑩**) + **⑧**

17

random number ☐

highest possible ☐
lowest possible ☐

G think (pick random **⑩** to **⑳**) + **⑩**

26

random number ☐

highest possible ☐
lowest possible ☐

D think (pick random **①** to **⑩**) + **⑥**

13

random number ☐

highest possible ☐
lowest possible ☐

H think (pick random **⑩** to **⑳**) + **⑥**

21

random number ☐

highest possible ☐
lowest possible ☐

ORDER OF OPERATIONS

FOR 9 YEAR OLDS

addition and *multiplication operators*

DRAG RIGHT

DRAG LEFT

MAKE TWO COMBOS

① INPUT ②

say ((2 + 3) * 7) for 2 secs = [ ]

say (2 + (3 * 7)) for 2 secs = [ ]

THEY ARE THE SAME NUMBERS, BUT I GIVE TWO DIFFERENT ANSWERS.

③ CLICK TO FIND OUT WHAT ARE THE TWO DIFFERENT ANSWERS.

Calculators and computers often use this symbol ∗ to mean multiplication.

Children write the answer *they think* the sprite will give when its clicked.
Check interactively.

A
say ((5 + 4) * 4) for 2 secs = [ ]
say (5 + (4 * 4)) for 2 secs = [ ]

D
say ((2 + 6) * 3) for 2 secs = [ ]
say (2 + (6 * 3)) for 2 secs = [ ]

B
say ((6 + 2) * 5) for 2 secs = [ ]
say (6 + (2 * 5)) for 2 secs = [ ]

E
say ((8 + 3) * 5) for 2 secs = [ ]
say (8 + (3 * 5)) for 2 secs = [ ]

C
say ((1 + 8) * 4) for 2 secs = [ ]
say (1 + (8 * 4)) for 2 secs = [ ]

F
say ((7 + 9) * 2) for 2 secs = [ ]
say (7 + (9 * 2)) for 2 secs = [ ]

G Code a sprite to give an answer to each of the following maths algorithms.

$(3+9) \times 6$ $\qquad\qquad$ $9 + (6 \times 8)$ $\qquad\qquad$ $(5+4) \times 8$

H Can you think up **six different ways** to input numbers (not zero) into these operator block **to get the sprite to give the answer 10?**

(? + ?) $\qquad$ (? ∗ ?) $\qquad$ say [ ] for 2 secs

I KNOW 12 WAYS

Sample Worksheet 6

FRACTIONS AND DECIMALS
FOR 10 YEAR OLDS

ORDINARY FRACTIONS   MAKE TWO COMBOS

$$\frac{1}{2} \qquad \frac{1}{4} \qquad \frac{3}{4}$$

(1 / 2)   (1 / 4)   (3 / 4)

①

INPUT   **②**

say (1 + (1 / 2)) for ② secs = [ ]

say (2 + (3 / 8)) for ② secs = [ ]

MIXED NUMBERS   MIXED NUMBERS

(1 + (1 / 2))   (2 + (3 / 8))

$$1\frac{1}{2} \qquad\qquad 2\frac{3}{8}$$

> I USE THE DIVISION OPERATOR TO CONSTRUCT FRACTIONS.

③ CLICK TO FIND OUT WHAT THE CAT CALLS THESE MIXED NUMBERS.

Calculators and computers often use this symbol / to mean division.

Calculators, computers and the Scratch cat prefer to turn FRACTIONS into DECIMALS.

Children join the code block with the fraction and write the answer the sprite will give when it's clicked. Check each out, with a click!

(1 / 8) [ ]   **A** $\frac{1}{5}$ = [ ]

(1 / 5) [ ]   **B** $\frac{1}{8}$ = [ ]

(5 / 8) [ ]   **C** $\frac{7}{10}$ = [ ]

(7 / 8) [ ]   **D** $\frac{3}{10}$ = [ ]

(7 / 10) [ ]   **E** $\frac{5}{8}$ = [ ]

(3 / 10) [ ]   **F** $\frac{7}{8}$ = [ ]

(2 + (1 / 8)) [ ]   **G** $1\frac{3}{8}$ = [ ]

(3 + (1 / 5)) [ ]   **H** $3\frac{1}{2}$ = [ ]

(1 + (3 / 10)) [ ]   **I** $2\frac{1}{8}$ = [ ]

(3 + (1 / 2)) [ ]   **J** $1\frac{3}{10}$ = [ ]

(1 + (3 / 8)) [ ]   **K** $2\frac{3}{4}$ = [ ]

(2 + (3 / 4)) [ ]   **L** $3\frac{1}{5}$ = [ ]

FACTORS

FOR **10** *YEAR OLDS*

DID YOU KNOW THAT
2520
IS THE SMALLEST NUMBER THAT CAN BE DIVIDED BY
1, 2, 3, 4, 5, 6, 7, 8, 9 AND 10 WITHOUT A REMAINDER ?
I'LL SHOW YOU.
I WILL TAKE ONLY **20** SECONDS

say 2520 / 1 for 2 secs	=	2520
say 2520 / 2 for 2 secs	=	1260
say 2520 / 3 for 2 secs	=	
say 2520 / 4 for 2 secs	=	
say 2520 / 5 for 2 secs	=	504
say 2520 / 6 for 2 secs	=	
say 2520 / 7 for 2 secs	=	
say 2520 / 8 for 2 secs	=	
say 2520 / 9 for 2 secs	=	
say 2520 / 10 for 2 secs	=	252

① MAKE COMBO   **②** INPUT   **③** CLICK

use the duplicate tool

THINK OF IT THIS WAY.

○ mod ○

modulo is the remainder when the first number is divided by the second number

think 2520 mod 7 → 0

think 2520 mod 8 → 0

Children fill in the missing numbers.
Click again and again if necessary.

Children tick the box where the sprite reports a modulo of **zero**, that is where the first number divides by the second number with **no remainder**

A
27 mod 2 □
28 mod 2 ☑
29 mod 2 □

E
22 mod 6 □
24 mod 6 □
26 mod 6 □

B
18 mod 3 □
19 mod 3 □
20 mod 3 □

F
21 mod 7 □
25 mod 7 □
27 mod 7 □

C
38 mod 4 □
40 mod 4 □
42 mod 4 □

G
30 mod 8 □
32 mod 8 □
36 mod 8 □

D
52 mod 5 □
54 mod 5 □
55 mod 5 □

H
38 mod 9 □
42 mod 9 □
45 mod 9 □

AVERAGES　　　*FOR 11 YEAR OLDS*

MAKE TWO COMBOS

① say (10 + 18) / 2 for 2 secs　= ☐

INPUT

② say (25 + 29 + 30) / 3 for 2 secs　= ☐

THE AVERAGE OF A SET OF NUMBERS IS THEIR SUM
DIVIDED BY HOW MANY ARE IN THE SET.

③ CLICK TO FIND OUT THE AVERAGE.

Children write the answer the sprite gives when its clicked.
Check interactively.

Calculate the averages

A　say (18 + (23 + 25) / 3) for 2 secs　　18, 23, 25 = ☐

B　say (102 + (126 + 165) / 3) for 2 secs　　102, 126, 165 = ☐

C　say (56 + (65 + 71) / 3) for 2 secs　　56, 65, 71 = ☐

D　say ((28 + 29) + (41 + 45) / 4) for 2 secs　　28, 29, 41, 50 = ☐

E　say ((57 + 63) + (65 + 69) + 81 / 5) for 2 secs　　57, 63, 65, 69, 81 = ☐

F　say ((90 + 74) + (68 + 88) + 95 / 5) for 2 secs　　90, 74, 68, 88, 95 = ☐

Use the **round** operator when the average is a decimal.

round ◯

It rounds
up or down
to the nearest
whole number.

G　say round ((19 + (26 + 28) / 3) for 2 secs　19, 26, 28 = ☐

H　say round (16 + (24 + 25) / 3) for 2 secs　16, 24, 25 = ☐

I　　**Solve a puzzle:** The average of three numbers is 14.
Two of the numbers are 15 and 16. What is the third number? *Ask the cat.*

say ((14 ∗ 3) − (15 + 16)) for 2 secs　EXPLAIN THIS ALGORITHM.

115

ANGLES AND ROTATIONS

FOR 11 YEAR OLDS

MAKE THE SCRIPT

1

INPUT THE VALUES

2

CLICK

3

```
repeat 10
  turn ↻ 36 degrees
  wait 0.5 secs
```
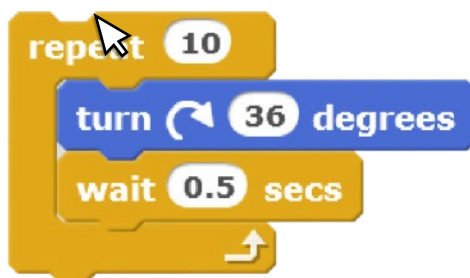
36 x 10 = 360° and 0.5 x 10 = 5 secs
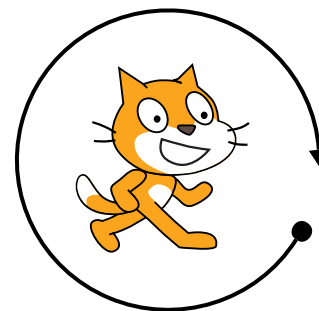
1. How many iterations to make the sprite complete 360°? How many seconds will it take?

(b)
```
repeat ?
  turn ↻ 10 degrees
  wait 0.5 secs
```
_____

(c)
```
repeat ?
  turn ↻ 20 degrees
  wait 0.5 secs
```
_____

(d)
```
repeat ?
  turn ↻ 30 degrees
  wait 0.5 secs
```
_____

(e)
```
repeat ?
  turn ↻ 40 degrees
  wait 0.2 secs
```
_____

(f)
```
repeat ?
  turn ↻ 45 degrees
  wait 0.2 secs
```
_____

(g)
```
repeat ?
  turn ↻ 15 degrees
  wait 0.2 secs
```
_____
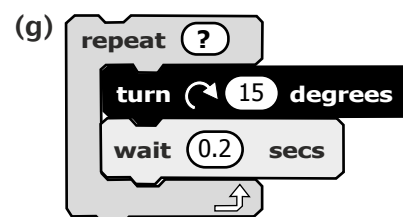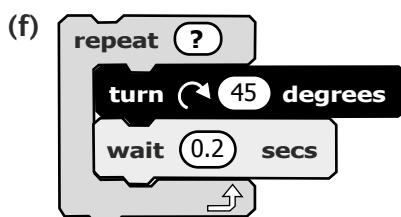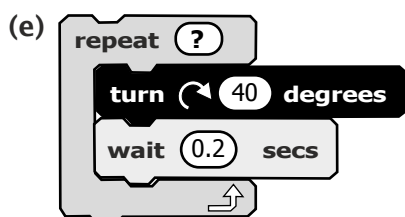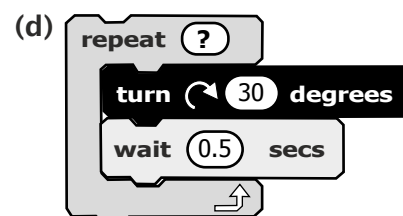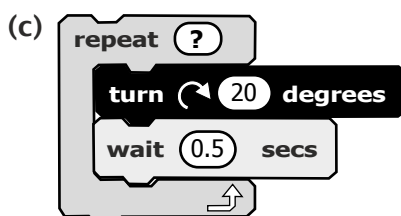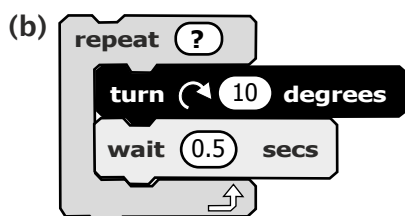
2. How many degrees in the number of iterations, to turn 360°? How many seconds in all?

(h)
```
repeat 20
  turn ↻ ? degrees
  wait 0.25 secs
```
_____

(i)
```
repeat 6
  turn ↻ ? degrees
  wait 0.25 secs
```
_____

(j)
```
repeat 60
  turn ↻ ? degrees
  wait 0.25 secs
```
_____

```
repeat 10
  turn ↻ 36 degrees
  set full turn to 10 * 36
  wait 0.2 secs
```
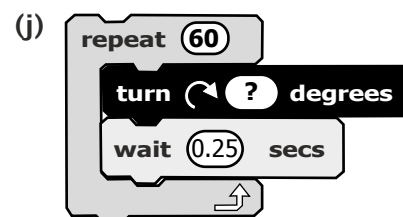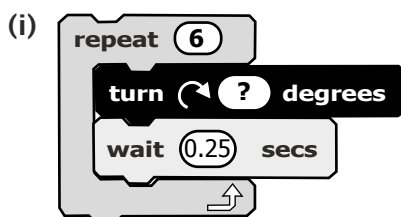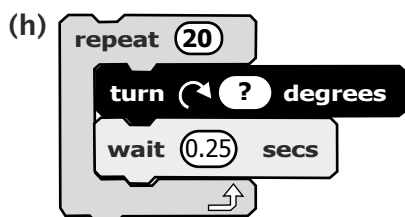
Create a variable and make the computer do the multiplication.

360

**Make the duck
tell you if you're correct.**
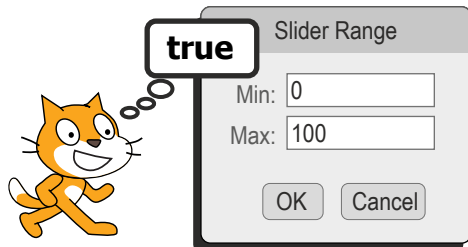
```
say full turn for 2 secs
```
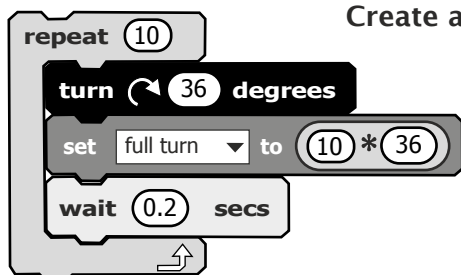
COMPLEMENTARY OPERATIONS

FOR 9 YEAR UPWARDS

MAKE A VARIABLE (Data palette)

the slider monitor

Cat:which number? `63`

drag the slider until cat says *true*

true

Slider Range

Min: `0`

Max: `100`

[OK] [Cancel]

set slider min and max

☑ **which number?**

Drag the variable reporter into the plus operator window

Set the slider monitor range to as low as possible. This will make it quicker and easier to find the number you are looking for. Drag the slider until the monitor window shows the number that makes cat report *true*. In this example, it's 63.

What's the solution? $137 + ? = 200$

think `137` + `which number?` = `200` for `2` secs

THERE'S ONLY ONE TRUE VALUE. I'LL TELL YOU WHEN IT'S *TRUE* OTHERWISE I WILL SAY 'FALSE'.

Making the combo block:

MAKE THE VARIABLE	MAKE THE COMBO	INPUT THE VALUES	CLICK
①	②	③	④

think `☐` = `☐` for `2` secs

When the sprite says *true*, the children write down the value of **which number?**

After discussion, the children need to arrive at the point where they see that the solution can be worked out using subtraction. At that stage of the discussion, construct the following solution algorithms.

say `200` - `which number?` for `2` secs — **137**

MAKE THE COMBO WITH THE VARIABLE	CLICK
①	②

say `200` - `137` for `2` secs — **63**

SERIF
ADVERT.