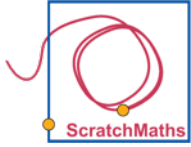


BUILDING WITH NUMBERS

MODULE 4: INVESTIGATION 2

Timers and Stopwatches





MODULE 4: INVESTIGATION 2

Activity 4.2.1 – Build a Stopwatch



ACTIVITY 4.2.1

Build a Stopwatch

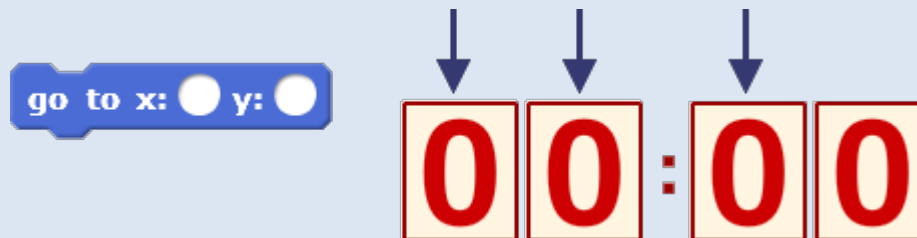
Open project **4-Stopwatch**

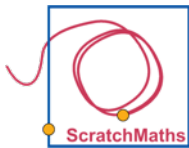
- if online Save as a copy and add your name
- if offline Save as and add your name

- Explore the project. Look at the *setup script* as well as the costumes of the **1 secs** sprite.



- **Duplicate** the **1 secs** sprite and rename to **10 secs**. **Duplicate** two more times and rename to **1 mins** and **10 mins**. Update all *setup scripts*.





MODULE 4: INVESTIGATION 2

Activity 4.2.1 – Build a Stopwatch



- ◆ Time is represented using the same digit costumes as the previous investigation, however the place values are different. What is the same and what is different between the two models?
- ◆ What happens when 1 secs gets to 0 again? Does it nudge 10 secs?



MODULE 4: INVESTIGATION 2

Activity 4.2.1 – Build a Stopwatch



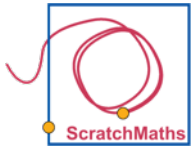
- For the **1 secs** sprite build a behaviour: **wait 1 secs** then display **next costume**. Do this **forever**. Add the hat block:



Note: **1 secs** will be the only sprite with when this sprite clicked, others will react only to broadcasting.

- Like earlier, make the **1 secs** sprite ‘nudge’ **10 secs** sprite when appropriate, i.e. when it reaches its last costume.





MODULE 4: INVESTIGATION 2

Activity 4.2.1 – Build a Stopwatch



- ☐ **10 secs** should react by **next costume**.

This simple script, however, must be extended as well: when appropriate **10 secs** will broadcast its message – *add 1 min*.

- ☐ **1 mins** sprite will react. Complete and debug the scripts of all four digits.

19:50

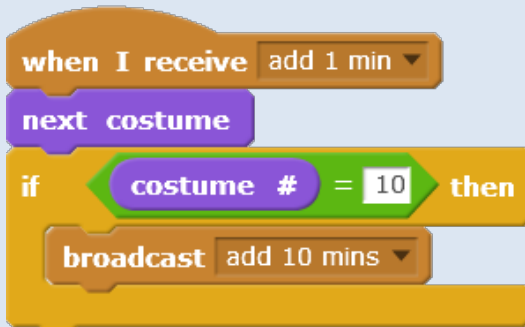
- ◆ What happens 1 second after **00:59**?
- ◆ Which costumes does **10 secs** actually need?
- ◆ Have you deleted or skipped the other costumes?

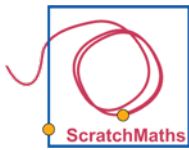
?

☐ Are your scripts similar to the below?
Discuss any alternative solutions.



21:42





MODULE 4: INVESTIGATION 2

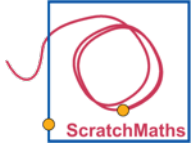
Activity 4.2.1 – Extension: Build a Stopwatch



- ☐ **[Extension]** Measure the accuracy of the stopwatch and discuss.
- ☐ **[Extension]** Explore how to make the time pass more quickly or slowly.
- ☐ **[Extension]** Extend your stopwatch to show a more accurate time by showing tenths of seconds.

- ◆ Does it work properly? If not, why do you think that is?
- ◆ How would the model work if you extended it to include hours? How many costumes would each sprite need?





MODULE 4: INVESTIGATION 2

Activity 4.2.2 – Unplugged: Nudge Nudge Get Get



ACTIVITY 4.2.2

Unplugged:

Nudge Nudge Get Get

MODULE 4: INVESTIGATION 2

Activity 4.2.2 – Unplugged: Nudge Nudge Get Get



- ☐ Three pupils stand at the front (hundreds, tens and ones).
- ☐ Set the initial number by giving each pupil a flip book – **pupils at the front must not see each others' flip books, everyone else must check they don't cheat!**
- ☐ Agree a target number – teacher explains the rules.
- ☐ Play the game!



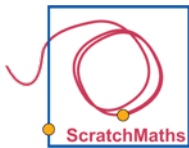
hundreds



tens



ones



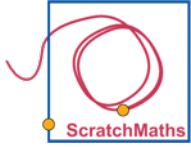
MODULE 4: INVESTIGATION 2

Activity 4.2.2 – Unplugged: Nudge Nudge Get Get



- ◆ Can you explain what you have seen during this activity?
- ◆ What is the smallest (or the largest) number of rolls of the die to get from 111 to 90. How can we calculate this?





MODULE 4: INVESTIGATION 2

Activity 4.2.3 – Countdown Conundrum



ACTIVITY 4.2.3

Countdown Conundrum

MODULE 4: INVESTIGATION 2

Activity 4.2.3 – Countdown Conundrum



Open project **4-Timer**

- if online Save as a copy and add your name
- if offline Save as and add your name

- Explore the project. Look at the scripts of each of the sprites
1 secs, 10 secs and 1 mins.

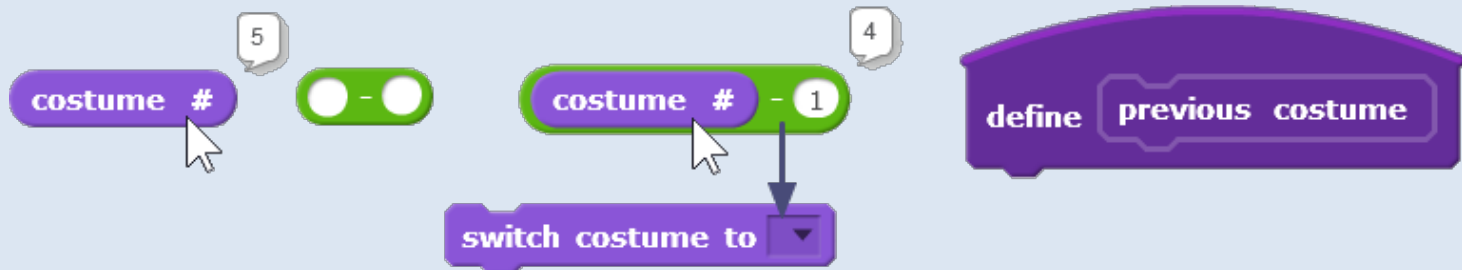
0:00 3:25

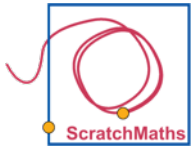


◆ How can we set the initial time? E.g. 3:25? Or 1:58?



- ☐ Set the initial time e.g. to 3 minutes 25 seconds...
... by changing the values of the **switch costume to...** blocks in the *setup scripts*.
- ☐ For the **1 secs** sprite make a new block called **previous costume** to decrease its value (i.e. costume) by one.





MODULE 4: INVESTIGATION 2

Activity 4.2.3 – Countdown Conundrum



- ☐ Explore and compare by clicking: **next costume** **previous costume**
- ☐ For **1 secs** sprite build a script: **when this sprite clicked** it will **wait 1 secs** then display its **previous costume** again and again in a **forever** loop.



- ◆ What should happen when the **1 secs** sprite reaches 0 and wants to decrease by 1? **?**

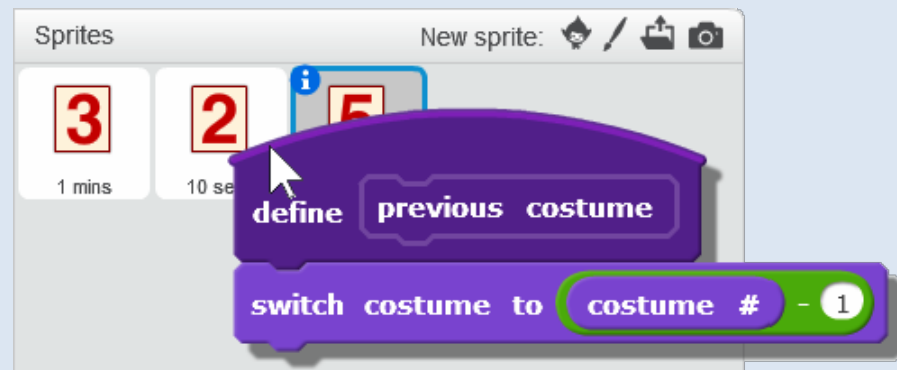
- For **1 secs**: before it goes to **previous costume**, it checks if it has not already reached 0 and if it has it broadcasts a message **get 10 secs**. Only then it decreases its value.



◆ Who will react to the message *get 10 secs*? How?



- Copy the **previous costume** definition into the **10 secs** sprite by dragging it from **1 secs**.



MODULE 4: INVESTIGATION 2

Activity 4.2.3 – Countdown Conundrum



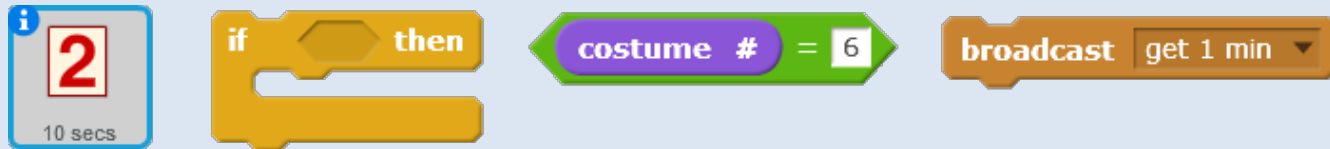
- For the **10 secs** sprite build a script that will decrease its number (i.e. **costume #**) by 1 when it receives *get 10 secs* message.



- ◆ What should happen when the **10 secs** sprite reaches 0? When exactly should it ask **1 mins** to get 'more'? What should **10 secs** 'flip' its costume to? ?



- ☐ Extend the script of **10 secs**: before it goes to **previous costume** it must check whether it needs to get extra from **1 mins** – by broadcasting *get 1 min*.

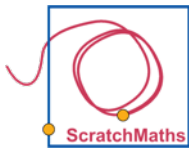


- ☐ Build correct reaction of **1 mins**.

◆ Will **1 mins** need the definition of **previous costume** as well? What happens after 2:01? And the next second? **?**

- ☐ Debug all scripts, experiment with 'quicker' or 'slower' time passing.





MODULE 4: INVESTIGATION 2

Activity 4.2.3 – [Extension] Countdown Conundrum



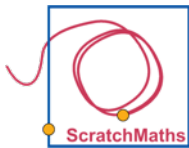
- ☐ **[Extension]** What happens when your timer gets to 0:00 (or 00:00 if you added **10 mins**)?

Think of a strategy (algorithm) to make your timer stop at that point. You may need the block:



You may also need to replace 'simple getting' by more 'safe getting' – when a sprite broadcasts a message, it may wait to ensure the reaction is successfully completed. For this, use the second type of broadcast block:





MODULE 4: INVESTIGATION 2

Ext. Activity 4.2.4 – Dizzy Dials



EXTENSION ACTIVITY 4.2.4

Dizzy Dials

Open project **4-Dials**

- if online Save as a copy and add your name
- if offline Save as and add your name

- ☐ Explore the project. Look at the scripts of each of the sprites **1 secs**, **10 secs**, **1 mins**, **seconds hand** and **minutes hand**.



- ☐ Run the project by clicking the green flag then clicking **1 secs**.

◆ What new sprites do you have?



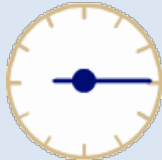
- ☐ Explore the **seconds hand** sprite. Note **point in direction 0** block in its *setup script*. Explore several similar blocks like:



point in direction 90

point in direction 180

point in direction -90



turn 15 degrees

- ☐ We want **seconds hand** to follow broadcasts from **1 secs**. In the **1 secs** sprite add the behaviour to **broadcast** the message **tick** every second, i.e. each time the **costume #** increases by 1.

◆ How should the second hand react?



- For the **seconds hand** sprite build a script to **turn right ... degrees** each time it receives the message **tick**.



- What angle should the **seconds hand** sprite turn after one second has passed? Why?



- Now explore the minutes hand.
Why don't we see it?
Make it visible.
Can it turn as well? Explore.



MODULE 4: INVESTIGATION 2

Ext. Activity 4.2.4 – Dizzy Dials



- ◆ When should the minute hand sprite turn? How can we tell it to turn at that point?
- ◆ What angle should the **minutes hand** sprite turn after one minute has passed? Why?



- ☐ In the **minutes hand** sprite build a script to **turn right ... degrees** each time it receives the message *add 1 min* – it is already being broadcast by **10 secs**:



- ☐ Test out your dials!



- ☐ **[Advanced extension]** Explore the **go to front** block to ensure the **minutes hand** is in front of the **seconds hand**.
- ☐ **[Advanced extension]** Edit the project so that when the **second hand** turns it gradually fills the dial with colour.

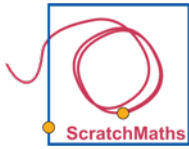
Hint: Seconds hand is normal sprite and as such it can also draw. Set its pen size and colour properly and make the sprite draw a line then move back and only then turn.
Experiment and explore.



1:08



2:48



MODULE 4: INVESTIGATION 2



My **Investigation 2** check list:

- ☐ I built a stopwatch that counts up in seconds and minutes.
- ☐ **[Extension]** I changed the speed of my stopwatch.
- ☐ **[Extension]** I added tenths of seconds to my stopwatch.
- ☐ I built a timer that counts down in seconds and minutes.
- ☐ I built a new block **previous costume** that switches the sprite's costume to the previous one.
- ☐ **[Extension]** I stopped my timer at 0:00.
- ☐ **[Extension]** I built an analogue clock that mirrors the same time as my digital display.

MODULE 4 INVESTIGATION 2: **Key Vocabulary**



is used to stop all running scripts in a project at the same time