MODULE 4: INVESTIGATION 2

Timers and Stopwatches

ACTIVITY 4.2.1

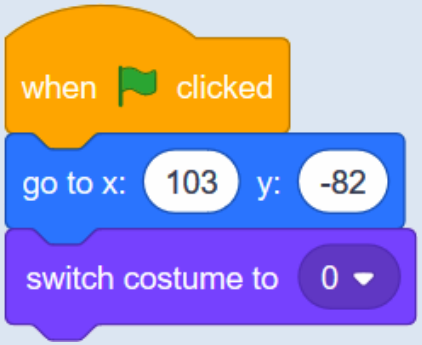
Build a Stopwatch

Module 4: Investigation 2

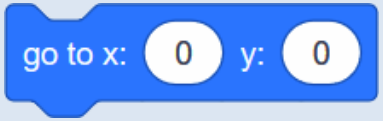
Activity 4.2.1 – Build a Stopwatch

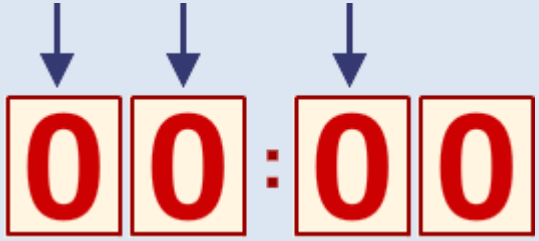
Open project **43-Stopwatch**.

- 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?

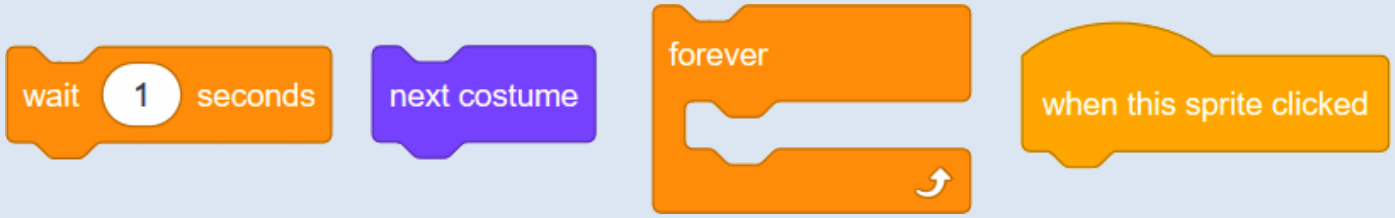
?

- What happens when 1 secs gets to 0 again? Does it nudge 10 secs?

Module 4: Investigation 2

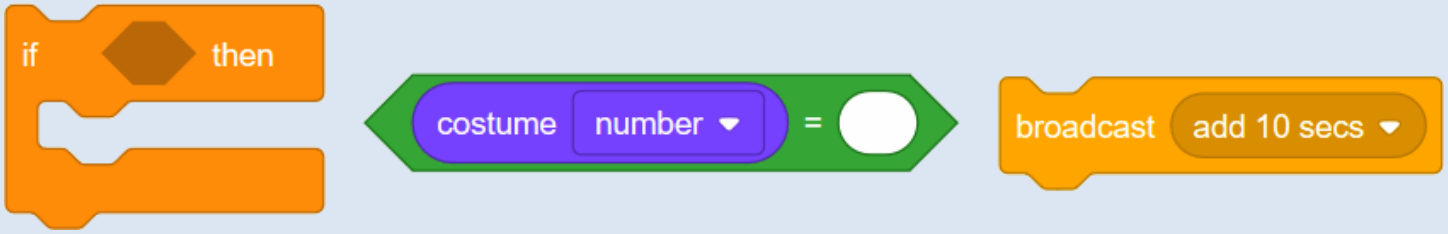
Activity 4.2.1 – Build a Stopwatch

- 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.

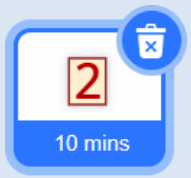
- **What happens 1 second after 00:59?**
- **Which costumes does 10 secs actually need?**
- **Have you deleted or skipped the other costumes?**

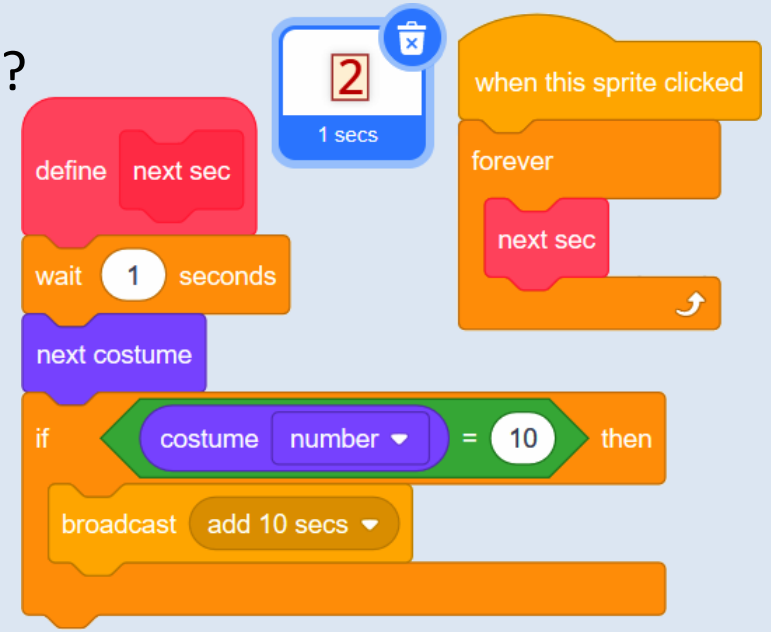
?

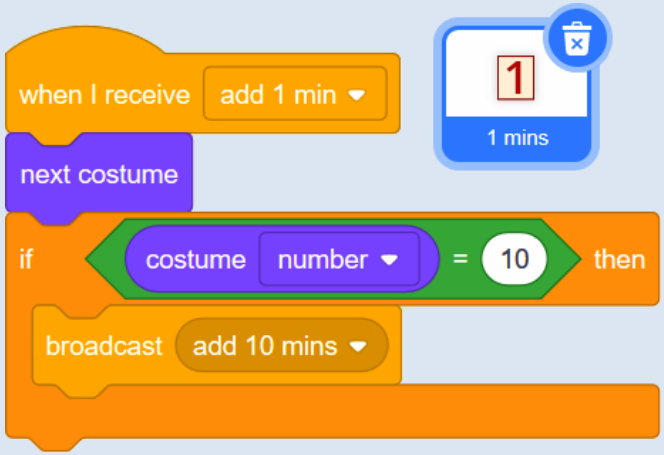
Module 4: Investigation 2

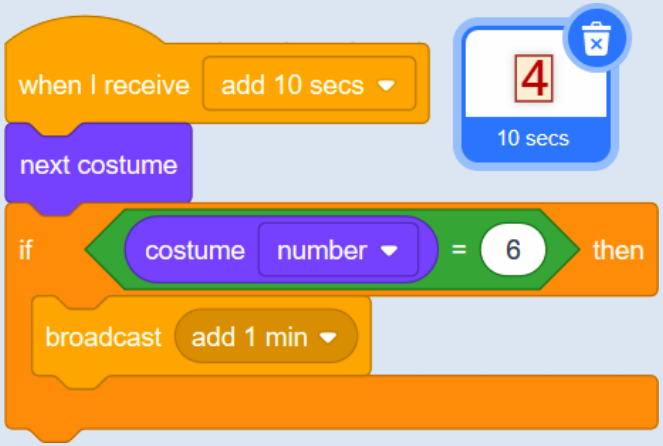
Activity 4.2.1 – Build a Stopwatch

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









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. Is it possible?

- **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?**

?

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?

?

ACTIVITY 4.2.3

Countdown Conundrum

Module 4: Investigation 2

Activity 4.2.3 – Countdown Conundrum

Open project **44-Timer**.

- 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?** ?

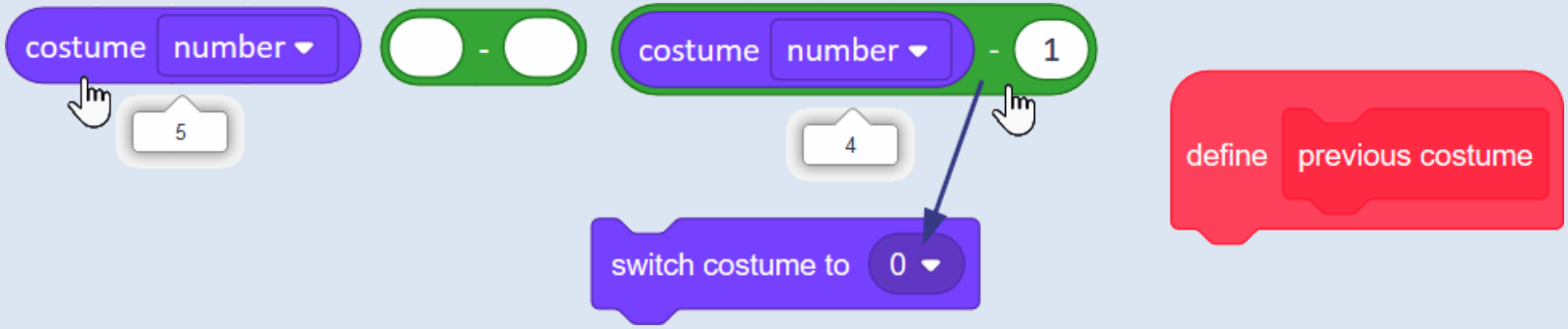
Module 4: Investigation 2

Activity 4.2.3 – Countdown Conundrum

- 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*.

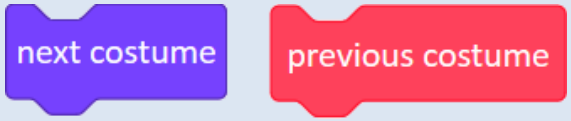
- For the **1 secs** sprite make a new block called **previous costume** to decrease its value (i.e. costume) by one.



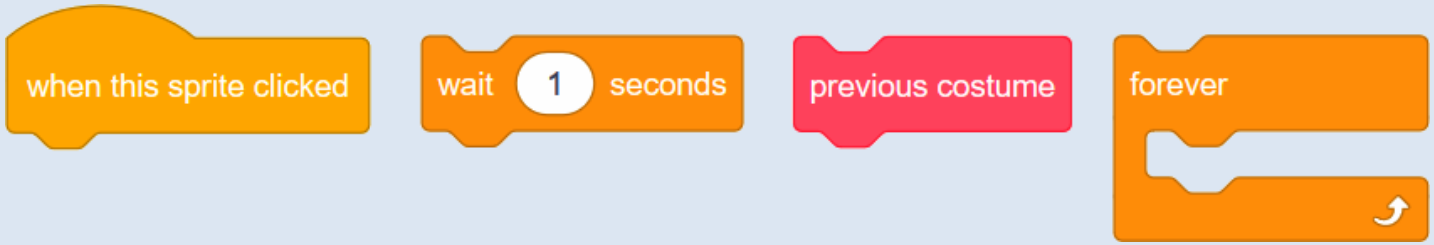
Module 4: Investigation 2

Activity 4.2.3 – Countdown Conundrum

- Explore and compare by clicking:



- 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.

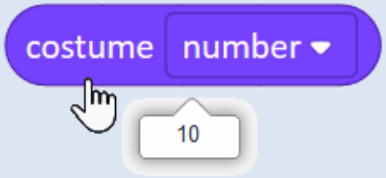


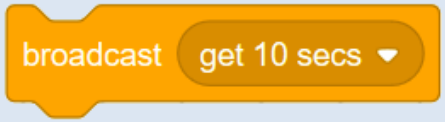
- **What should happen when the 1 secs sprite reaches 0 and wants to decrease by 1?** ?

Module 4: Investigation 2

Activity 4.2.3 – Countdown Conundrum

- 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

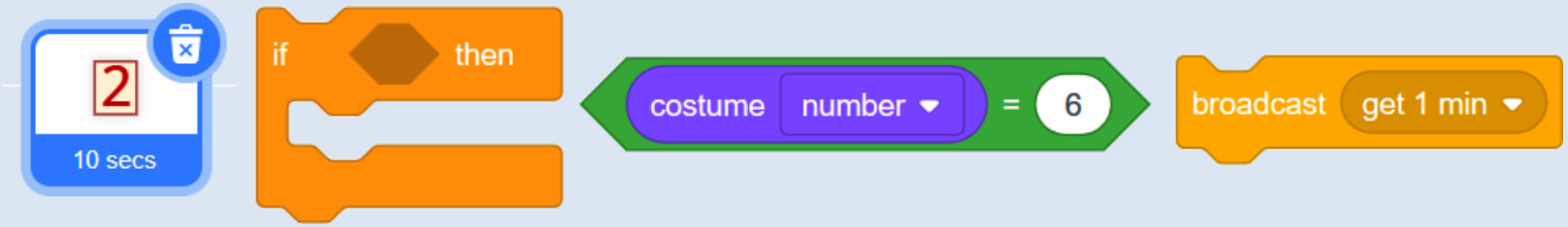
- For the **10 secs** sprite build a script that will decrease its number (i.e. **costume** *number*) by 1 when it receives *get 10 secs* message.

- **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?**

Module 4: Investigation 2

Activity 4.2.3 – Countdown Conundrum

- 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.

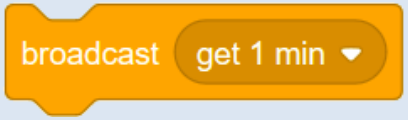
MODULE 4: INVESTIGATION 2

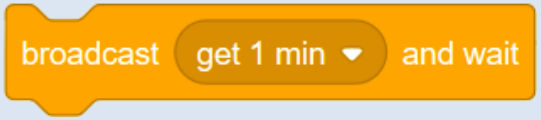
Activity 4.2.3 – [Extension] Countdown Conundrum

- **[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:





EXTENSION ACTIVITY 4.2.4

Dizzy Dials

Module 4: Investigation 2

Ext. Activity 4.2.4 – Dizzy Dials

Open project **45-Dials**.

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

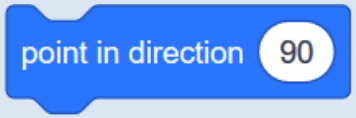
- Run the project by clicking the green flag then clicking **1 secs**.

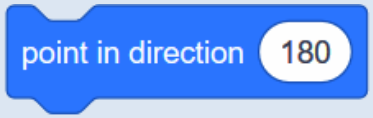
What new sprites do you have? ?

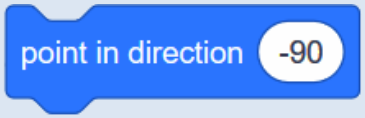
Module 4: Investigation 2

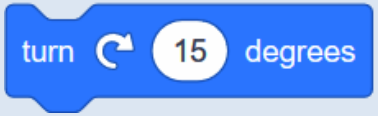
Ext. Activity 4.2.4 – Dizzy Dials

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









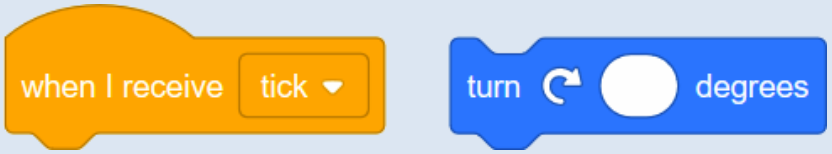
- We want **seconds hand** to follow broadcasts from **1 secs**. In the **1 secs** sprite add the behaviour to **broadcast** the message *tick* every second, i.e. each time the **costume** *number* increases by 1.

- **How should the second hand react?** ?

Module 4: Investigation 2

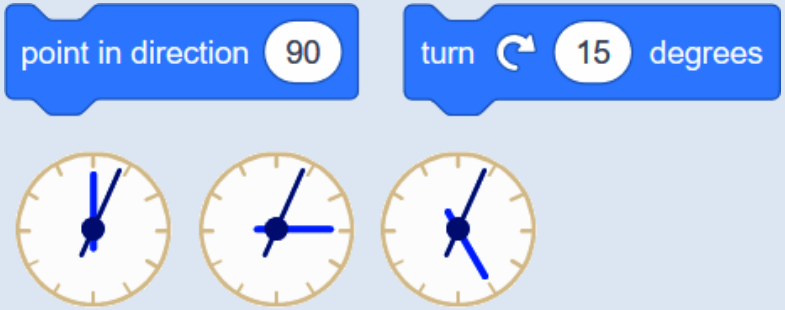
Ext. Activity 4.2.4 – Dizzy Dials

- 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.



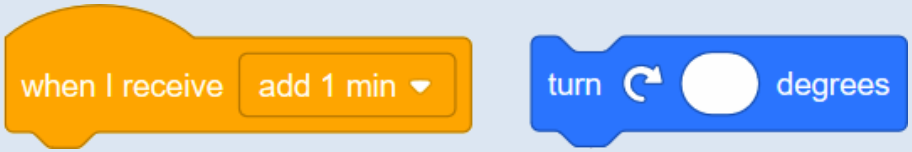
Module 4: Investigation 2

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!

Module 4: Investigation 2

Ext. Activity 4.2.4 – Dizzy 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.

Module 4: Investigation 2

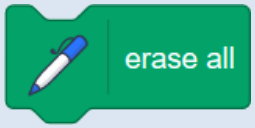
My Investigation 2 check list:

- ☐ 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

- 

clears all lines and stamps from the stage