

Scratch – Simple Programming

Variables Extension

<http://www.yahmad.co.uk/>

Unit Overview

Objectives

Understand why computer programming scripts are used.

Understand the use of Variables as place holders for information.

Understand the difference between the list and a normal variable.

Outcomes

Time

Task 1 Adding Numbers

Task 2 Pupil Age

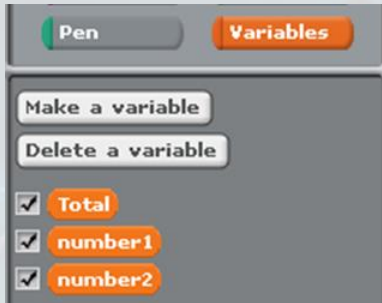
Task 3 Salary Calculator

Task 4 List Variables Part 1

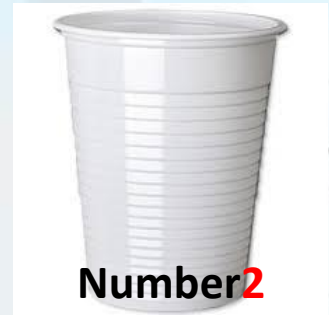
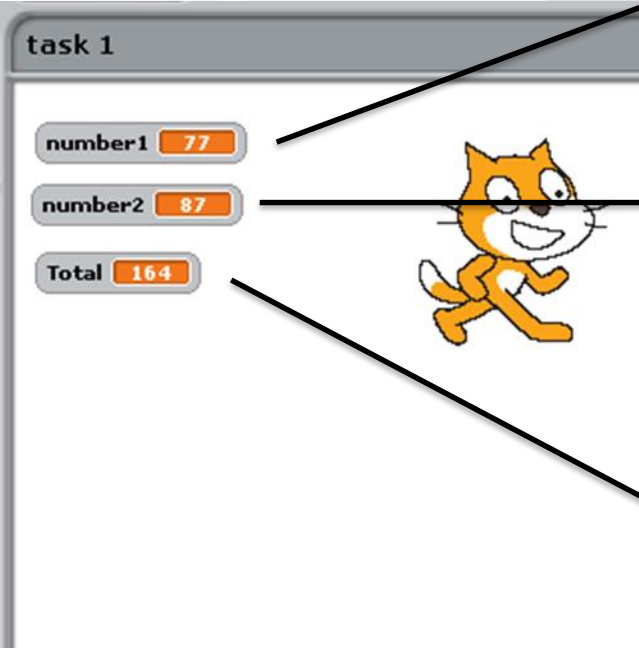
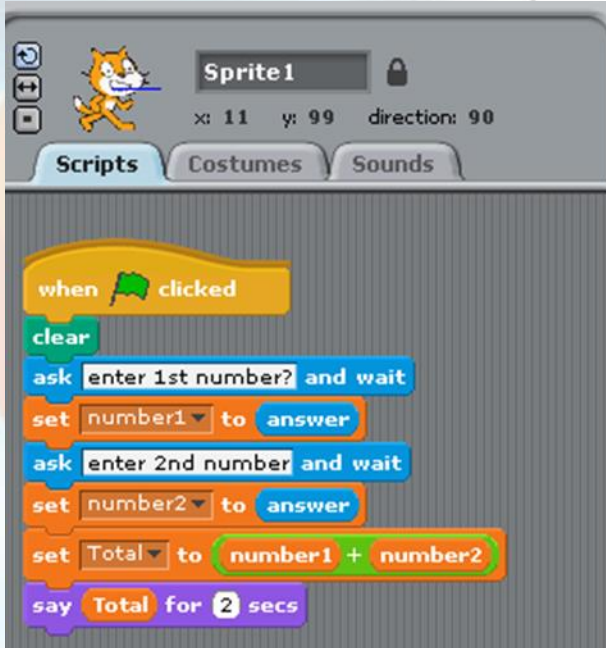
Task 5 List Variables Part 2

Task 6 Extension Task

Variables Overview



Variables are used to store data (Text/Numbers) in scratch and in programming. In the first task **three variables** are required to store the **1st** and **2nd** number. The **3rd variable** is used to store the sum of the two numbers contained in the variables.

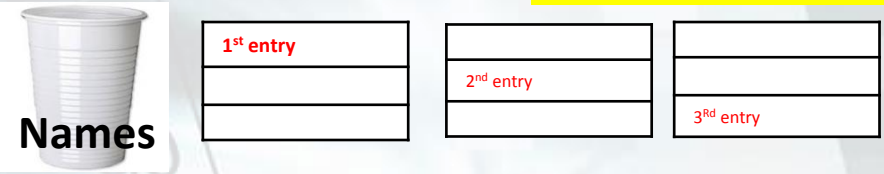


List Variables Overview

Make a list
Delete a list
English
Maths
Names
Science
Totals

```
repeat Students  
  ask Enter Student Name and wait  
  insert answer at last of Names
```

List variables allows you to type in a number of data into one variable. Data is stored as a list.



```
ask Enter maths grade? and wait  
insert answer at last of Maths  
ask Enter english grade? and wait  
insert answer at last of English  
ask Enter science grade? and wait  
insert answer at last of Science
```

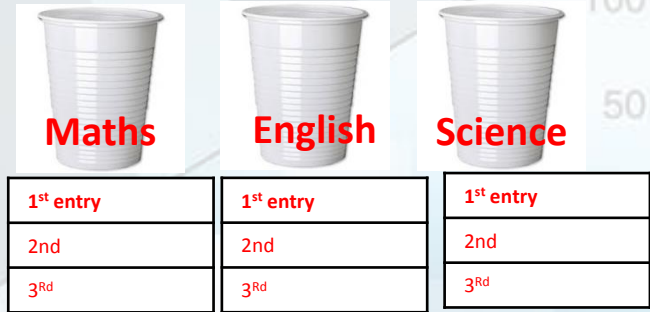
Students 2

Names	Maths	English	Science	Totals
1 a	1 22	1 22	1 22	1 66
2 b	2 44	2 44	2 44	2 132

+ length: 2 + length: 2 + length: 2 + length: 2 + length: 2

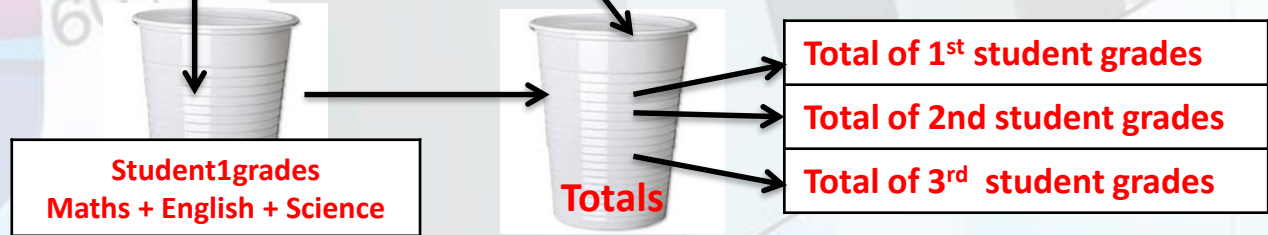
Every time you enter data into the list you can make it either the first or last entry.

Selecting Last would be useful if you want to type names in alphabetical order.



List Variables Overview

The image shows the Scratch code editor interface. On the left, the 'Variables' panel shows a variable named 'Student1grades' which is currently hidden. Below it, a list named 'Totals' is visible and checked. The 'Code' area contains a script with the following blocks: 'set Students to answer', a 'repeat Students' loop containing 'ask Enter Student Name and wait', 'insert answer at last of Names', 'ask Enter maths grade? and wait', 'insert answer at last of Maths', 'ask Enter english grade? and wait', 'insert answer at last of English', and 'ask Enter science grade? and wait', 'insert answer at last of Science'. A red box highlights a block: 'set Student1grades to item last of Maths + item last of English + item last of Science'. Below this, another red box highlights the block: 'insert Student1grades at last of Totals'. Arrows point from these highlighted blocks to the diagram below.



The data from the **student1grades** variable is now being stored in the **Totals** list variable.

Task 1 – Adding Numbers

1. You need to create a simple program to **calculate two numbers together**.
2. You need to create variables to store **each number** and the **total**.
3. Your program will have to allow the user to **input two different numbers**.

Pen Variables

Make a variable

Delete a variable

Total

number1

number2

Variables

Sprite1

x: 11 y: 99 direction: 90

Scripts Costumes Sounds

```
when clicked
clear
ask enter 1st number? and wait
set number1 to answer
ask enter 2nd number? and wait
set number2 to answer
set Total to number1 + number2
say Total for 2 secs
```

task 1

number1 77

number2 87

Total 164



Task 2 – Pupil Age

1. You need to create a simple program to **calculate the total and average age of the pupils in a class (Maximum 3).**

The screenshot shows the Scratch code editor with the following code:

```
when clicked
ask how many students in your class? and wait
set PupilNumber to answer
ask Pupil 1 what is your name? and wait
set pupilname1 to answer
ask what is your age? and wait
set pupil1age to answer
ask Pupil 2 what is your name? and wait
set pupilname2 to answer
ask What's is your age? and wait
set Pupil2age to answer
ask Pupil 3 what is your name? and wait
set pupilname3 to answer
ask What is your age? and wait
set total Age to pupil1age + Pupil2age + pupil3age
say total Age for 2 secs
set Average Age to total Age / PupilNumber
say Average Age for 2 secs
```

The right-hand side of the editor shows the 'task 2' stage with the following variable values:

PupilNumber	3	total Age	89	Average Age	29.7
pupil1age	33				
pupilname1	f				
pupilname2	g				
Pupil2age	56				
pupilname3	u				
pupil3age	0				

The 'Variables' panel on the left shows the following variables defined:

- Average Age
- Pupil2age
- PupilNumber
- pupil1age
- pupil3age
- pupilname1
- pupilname2
- pupilname3
- total Age

A yellow box labeled 'Variables' is positioned below the variable list.

Task 3 – Salary Calculator (Sprite 1)

1. You need to create a simple program to **calculate the total salary** for an employee.
2. Your program will include **two** sprites.
3. The first sprite will work out the **weekly salary** based on **hours worked** and **hourly rate**.

Pen Variables

Make a variable
Delete a variable

- Employee hours 1
- Employee name 1
- Employee pay 1
- Hourly Pay 1
- Monthly Pay 1
- Tax 1
- annual Salary

Variables

when green flag clicked

ask "What's your name?" and wait

set Employee name1 to answer

ask "Enter the hours you have worked this week" and wait

set Employee hours1 to answer

ask "What is your hourly rate of pay?" and wait

set Hourly Pay1 to answer

set Employee pay1 to $\text{Employee hours 1} * \text{Hourly Pay 1}$

say Employee pay 1 for 2 secs

Task3

Employee name 1 yasar

Employee hours 1 10

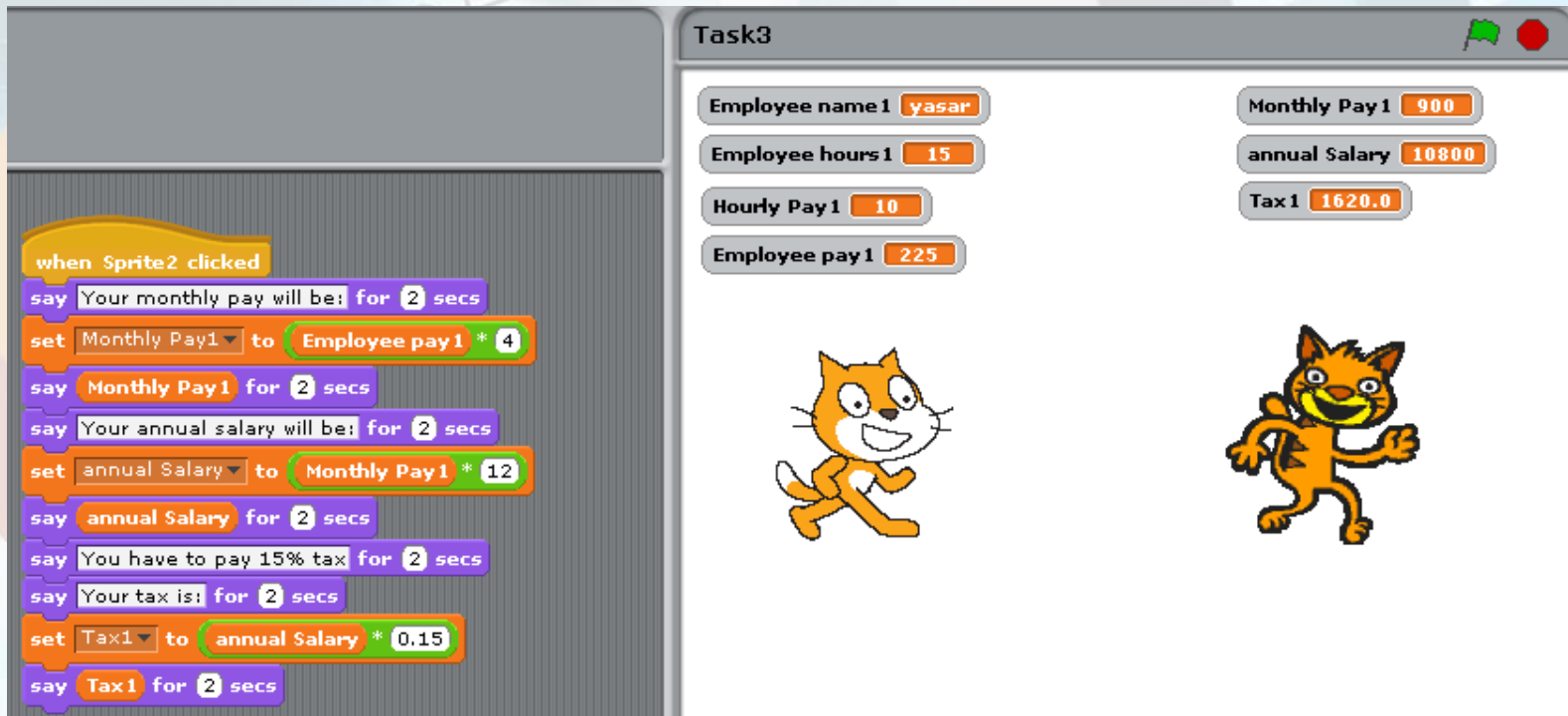
Hourly Pay 1 10

Employee pay 1 100



Task 3 – Salary Calculator (Sprite 2)

1. The second sprite **when clicked** will work out the following:
 - **Monthly Pay**
 - **Annual Salary**
 - **Tax (15% or 0.15)**



The screenshot shows a Scratch project window titled "Task3". On the left, the code editor displays the following script for "Sprite 2":

```
when Sprite2 clicked
say Your monthly pay will be: for 2 secs
set Monthly Pay1 to Employee pay1 * 4
say Monthly Pay1 for 2 secs
say Your annual salary will be: for 2 secs
set annual Salary to Monthly Pay1 * 12
say annual Salary for 2 secs
say You have to pay 15% tax for 2 secs
say Your tax is: for 2 secs
set Tax1 to annual Salary * 0.15
say Tax1 for 2 secs
```

On the right, the project's stage displays the results of the code. The "Employee name" is "yasar", "Employee hours" is "15", "Hourly Pay" is "10", and "Employee pay" is "225". The calculated values are: "Monthly Pay" is "900", "annual Salary" is "10800", and "Tax" is "1620.0". Two instances of the Scratch cat sprite are visible on the stage.

Task 4 - List Variables Part 1

A **List variable** will store a **number of values** in one **Variable**.

1. You need to create a **simple program** which will store a number of **English grades** (Maximum 3).
2. The program will **total up the grades** and **work out a class average**.

The screenshot shows the Scratch IDE with the following components:

- Variables Panel:**
 - Variables: AVGrade, Eng Grade, PupilNumber
 - Lists: ENG, n1
- Scripts Panel:**
 - when clicked
 - ask "how many students in your class (Max 3)?" and wait
 - set PupilNumber to answer
 - repeat PupilNumber times:
 - ask "What is your name?" and wait
 - insert answer at 1 of n1
 - ask "Enter English grade?" and wait
 - insert answer at 1 of ENG
 - set Eng Grade to item 1 of ENG + item 2 of ENG + item 3 of ENG
 - set AVGrade to Eng Grade / PupilNumber
 - say AVGrade for 2 secs
 - stop all
- Stage Panel:**
 - task 4
 - PupilNumber: 2
 - Eng Grade: 66
 - AVGrade: 33
 - Lists: n1 (b, a), ENG (43, 23)
 - Scratch Cat

Variables


Task 5 – List Variables Part 2

1. You need to create a **simple program** which will store a number of **Maths**, **English** and **Science** grades for a **named pupil**.
2. The program will **total up the grades** and **for each student**.

Repeat based on
number of pupils
entered

The image shows a Scratch script and a data table. The script starts with a 'when clicked' event, followed by a 'clear' block. A yellow box highlights the 'ask Enter the number of students and wait' block, the 'set Students to answer' block, and a 'repeat Students' loop. Inside the loop, there are four 'ask' blocks for 'Enter Student Name', 'Enter maths grade?', 'Enter english grade?', and 'Enter science grade?'. Each 'ask' block is followed by an 'insert answer at last of' block for 'Names', 'Maths', 'English', and 'Science' respectively. After the loop, a 'set Student1grades to' block contains the expression 'item last of Maths + item last of English + item last of Science'. This is followed by an 'insert Student1grades at last of Totals' block. A blue arrow points from the 'repeat' block to the text 'Repeat based on number of pupils entered'. Another blue arrow points from the text back to the 'insert Student1grades at last of Totals' block.

Students		Maths	English	Science	Totals
1	a	22	22	22	66
2	b	44	44	44	132



Task 5 – List Variables Part 2

The image shows the Scratch interface with several components:

- Variables Panel:** Shows 'Student1grades' and 'Students' as list variables. 'Student1grades' is currently set to 0.
- Scripts Panel:** A 'when clicked' script block containing 'delete all of' blocks for Names, Maths, English, Science, and Totals, followed by 'set Students to 0' and 'set Student1grades to 0'. A red box highlights the 'Stage' button in the bottom right of the Scripts panel.
- Stage:** Displays a table of student data and a cat sprite.
- Table:**

Names	Maths	English
1 a	1 22	1 22
2 b	2 44	2 44

Two yellow callout boxes provide instructions:

- Variables:** Points to the 'Variables' tab in the top left.
- This will clear the value of each variable when the green flag is clicked.** Points to the script block in the Scripts panel.

Task 6 - Extension

Can you make your own program containing list and normal variables?

Plenary – Refer to the Lesson Objectives

Objectives

Understand why computer programming scripts are used.

Understand the use of Variables as place holders for information.

Understand the difference between the list and a normal variable.

Plenary Task (Q&A)

Peer assess each other scripts.

Discuss the levels pupils have achieved for this task.

Question: What is the purpose of variables?

Question: What is the difference between the list and a normal variable?