

# Module 9

## Advanced Game

### Lesson 1 Advanced Game Design

Students will design a game on paper. Students will implement their design using Scratch. This lesson introduces 3 sprites, the mouse, cat and piece of cheese. Students choose 4 backgrounds for different stages of their game. The mouse is programmed to move around using the keyboard.



Computer



Scratch



Projector



Printable Resource



CD Resource

### Lesson 2 Advanced Game Improvements

Variables are introduced to the game to keep count of the number of lives, the score and the amount of time remaining. Students will program the mouse to react when touching the cheese. The cat is programmed to chase the mouse



Computer



Scratch



Projector



Printable Resource



CD Resource

### Lesson 3 Advanced Game Finishing Touches

The game is programmed to end when the number of lives reaches 0. The game progresses to level 2 and eventually a game win scenario as the countdown timer advances. The cat is programmed to increase in speed when level 2 begins. Students will then add their own enhancements to the game including sound graphics and new functionality.



Computer



Scratch



Projector



Printable Resource



CD Resource

### Lesson 4 Advanced Game Testing

Students will test their game to make sure it satisfies all of the elements outlined in the design. The testing phase will give students an opportunity to correct any errors.



Computer



Scratch



Group Work



Printable Resource



CD Resource



## Lesson 1 – Advanced Game Design

### Resources:

Advanced Game Design (Resource 1), Advanced Game Version 1 (Resource 2)

### Key Vocabulary:

Background

### Description:

Students will learn how to make a game. They start by using a worksheet that helps them create a design for the look and feel and behaviour of the game. In Scratch 3 characters are introduced, a mouse, a cat and a piece of cheese. A suitable background is then chosen for 4 stages of the game level 1, level 2, the 'game over win' scenario, and the 'game over lose' scenario. The mouse is programmed to move around using the keyboard. Version 1 of the game is saved ready for further development in the next lesson.

### Learning Objectives:

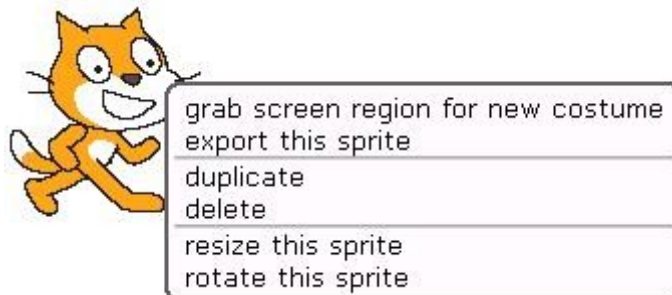
1. Design and implement a game in Scratch.

### Lesson Introduction:

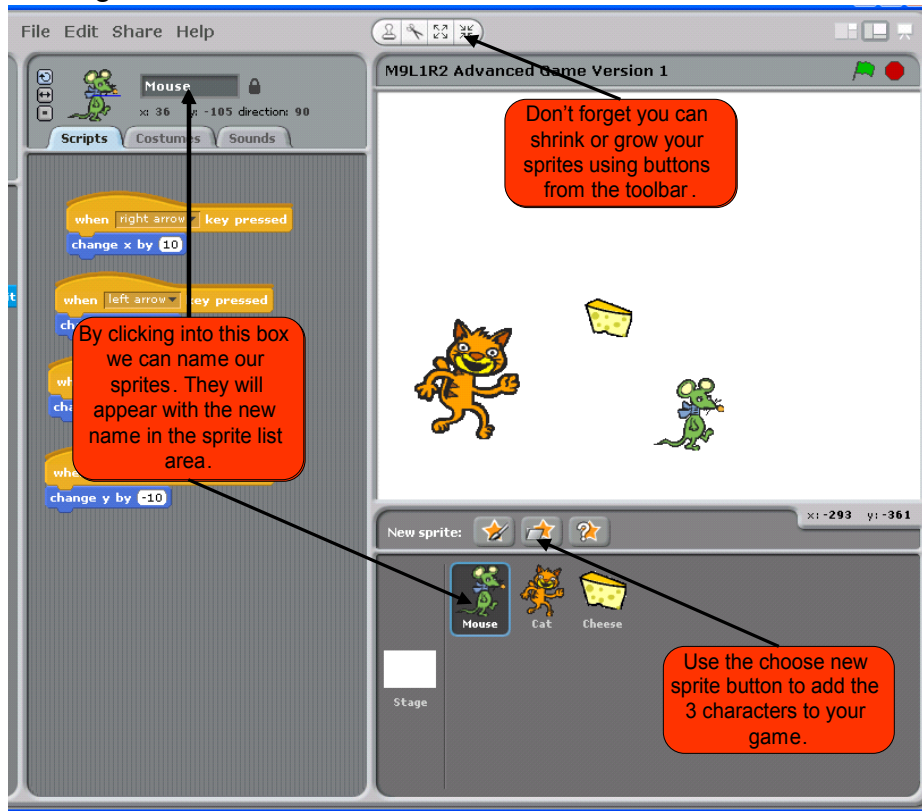
- Tell students that the upcoming lessons involve making a game.
- It is useful to show the students the finished game (CD Resource 'M9L3R3 Advanced Game Version 3' available as Resource 3 in Lesson 3 for this Module) at the start so they have an idea what they are aiming for.
- The first part of the lesson involves examining the Advanced Game Design (Resource 1). This will allow the students to design the game on paper before writing the game in Scratch.
- Once the design is complete students will create the game in Scratch.

### Lesson Breakdown:

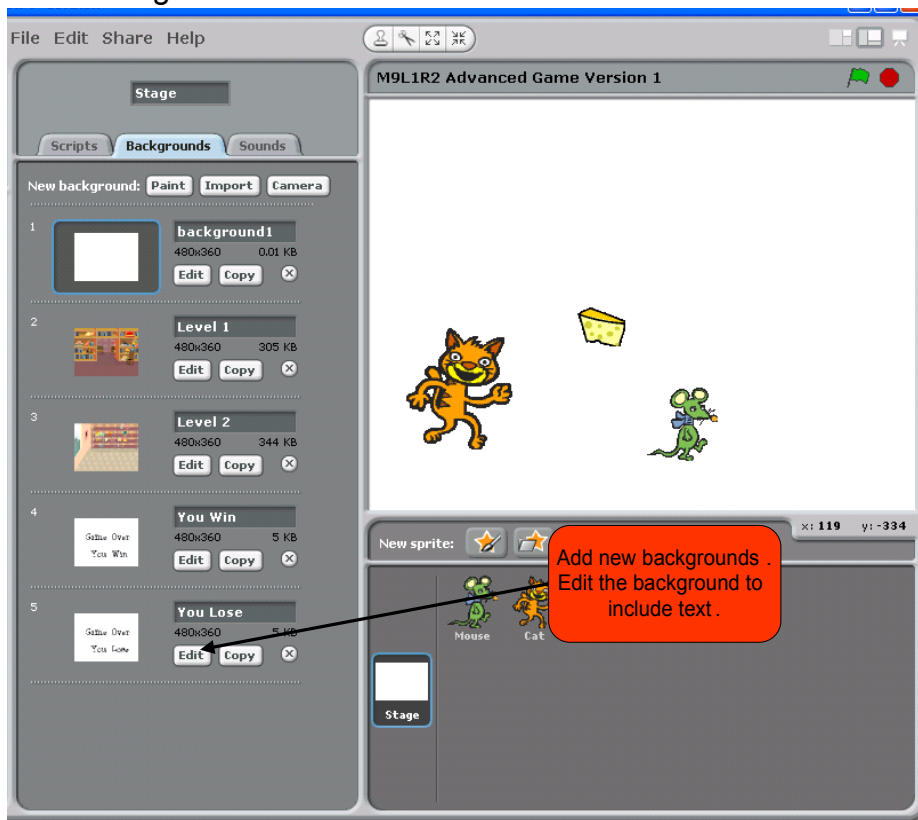
1. Use the Advanced Game Design worksheet (Resource 1) to guide students through the process of design.
2. After reviewing the design document, students choose the characters and backgrounds for the game. First Scratch needs to be opened and the default character removed by right clicking as shown below.



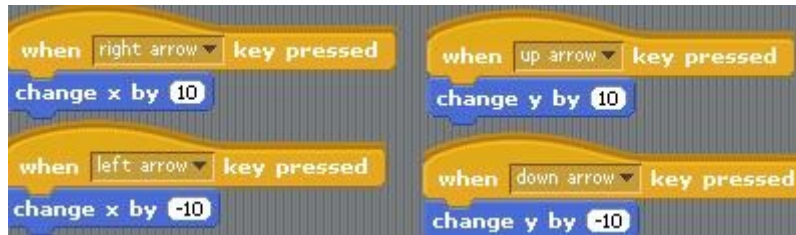
3. Add the 3 characters for the game. It is useful to give your sprites meaningful names.



4. Add 4 backgrounds for the game. The level 1 background, level 2 background, 'game over you win' background and the 'game over you lose' background.



5. Program the mouse to move using the keyboard according to step 3 of your design. This is an example of code that uses the arrow keys.



6. Don't forget to save your file as Advanced Game Version 1 as the next lesson will build new features into the game. The Advanced Game Design sheet will be used in the next lesson. Advanced Game Version 1 is available as Resource 2 for this lesson.

 **Extension activity**

- Students could use a graphics package to design their own backgrounds and sprites.

## Resource 1

### **Advanced Game Design**

A worksheet that guides students through the game design.

# Advanced Game Design

1. The game will have 3 sprites. A mouse, a cat and a piece of cheese.
2. There will be 4 backgrounds corresponding to different stages of the game. Use the boxes below to describe the look and feel for each background

Level 1 Background	Level 2 Background
Game over you win Background	Game over you lose Background

3. Next you need to control the mouse. Describe the keyboard keys and actions involved.

Key Used	Movement

4. Program the game as follows:
  - a. The mouse starts the game with 5 lives and a score of 0 points and 100 seconds on a countdown timer.
  - b. Each time the mouse touches a piece of cheese he will say "Yummy!" and a sound will play. The score will increase by 2 points and the cheese will move to a new random location on the stage.
  - c. Program the cat to follow the mouse.
  - d. Decrease the number of lives by 1 each time the mouse touches the cat.
  - e. If the number of lives equals 0 the game finishes and the 'game over you lose' background appears.
  - f. When the countdown timer reaches 50 seconds the game moves to level 2. The speed of the cat will increase for level 2.
  - g. When the countdown reaches 0 the game finishes and the 'game over you win' background appears.

5. List some extra features that you would like to include in your game.  
E.g. Sounds, graphics, new rules

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## Resource 2

### Advanced Game Version 1

A sample game in Scratch for the lesson.



CD Resource

"M9L1R2 Advanced Game Version 1.sb"

## Lesson 2 – Advanced Game Improvements

### Resources:

Advanced Game Design sheet from Lesson 1 (Resource 1), Advanced Game Version 1 as created in Lesson 1 (Resource 2), Advanced Game Version 2 (Resource 3)

### Key Vocabulary:

Initialise, Broadcast, Variable

### Description:

Students add new functionality to the game developed in lesson 1 (Using the Advanced Game Design Part 4 a-d). Variables are introduced to keep count of the number of lives, the score and the amount of time remaining. The cheese is programmed to move to a new random location when touched by the mouse. The cat is programmed to follow the mouse.

### Learning Objectives:

1. To program a project according to a specification from a design.
2. To revise using broadcast messages to trigger events in Scratch.

### Lesson Introduction:

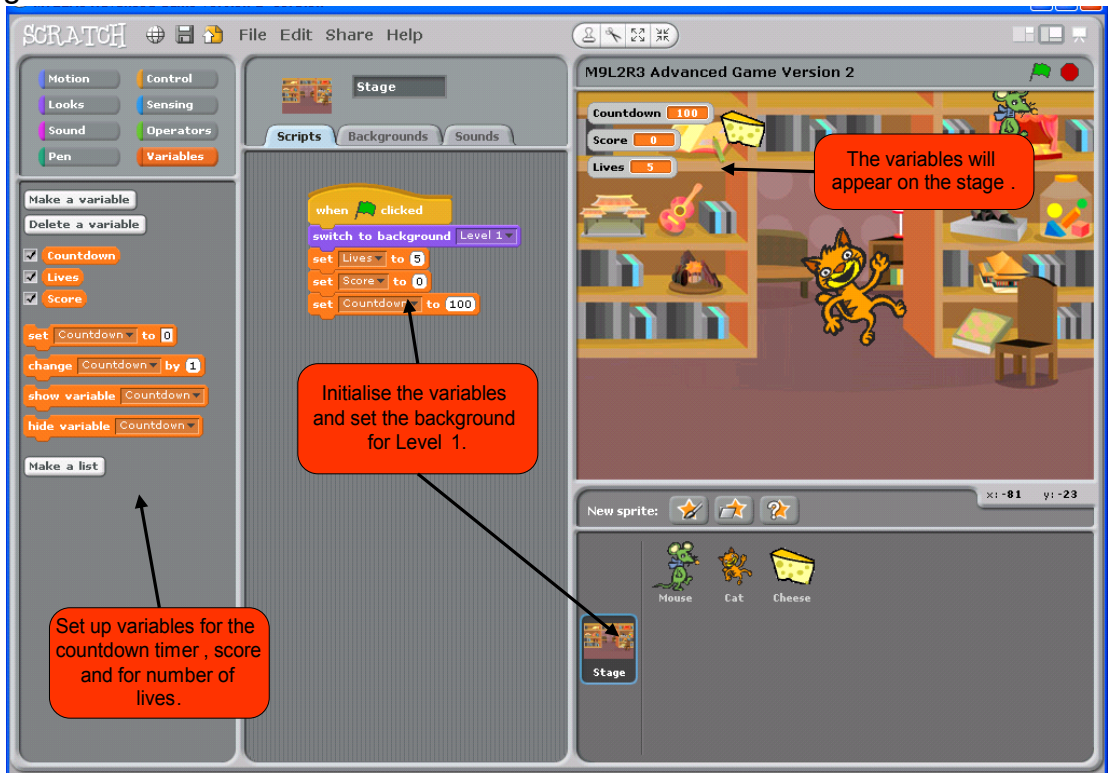
- Tell students they will further develop the game created in the previous lesson using the design (Part 4 a-d) from the previous lesson.
- Variables to create a countdown timer, to track the number of lives and the score will be set up and initialised.
- The mouse is programmed to react when it touches a piece of cheese.
- The cat is programmed to follow the mouse.

### Lesson Breakdown:

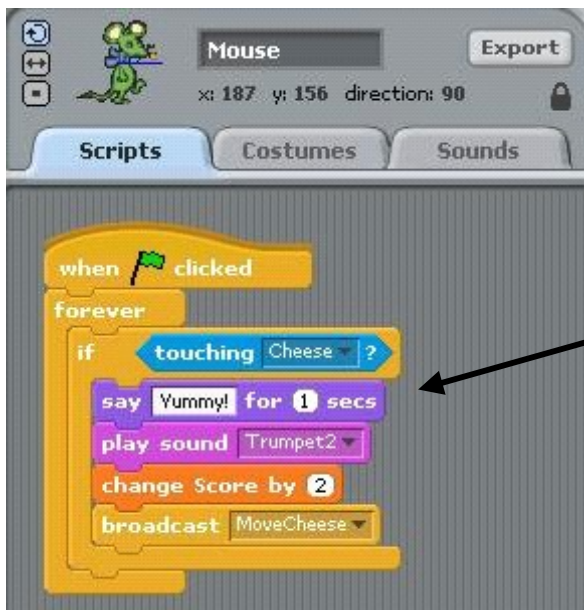
1. Use the Advanced Game Design sheet (Resource 1) to guide students through the lesson. Open Advanced Game Version 1 that was saved at the end of lesson 1. Students who do not have this file can use a copy of Resource 2.



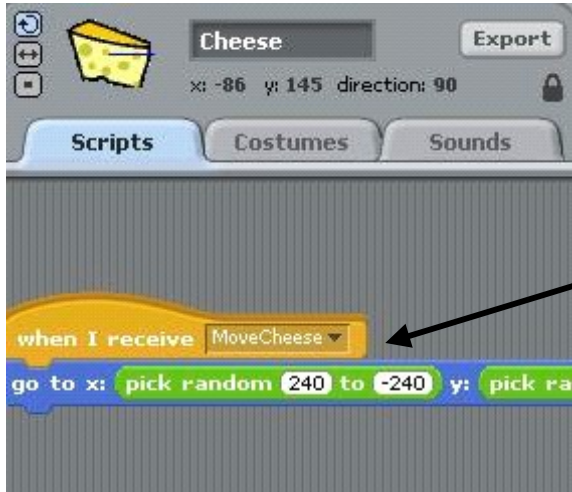
- In the stage script area, set up the variables described in 4a of the Advanced Game Design sheet. Program the Green Flag to start the game. Program the Level 1 stage background to appear when the game is started and initialise the 3 variables.



- As described in 4b of the Advanced Game Design program the mouse to say “Yummy!” and to play a sound when it touches a piece of cheese. Increase the score by 2 points, and broadcast a message to move the cheese to a new random location on the stage.



When the mouse touches a piece of cheese react by saying “Yummy!” and play a sound . Change the score by 2. Broadcast a message to move the cheese .



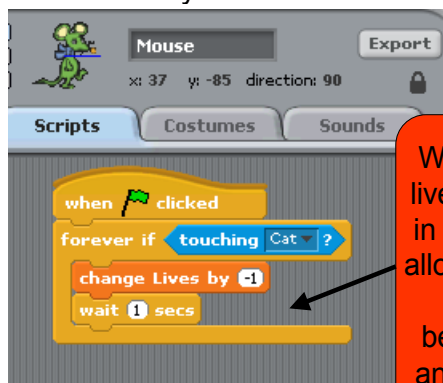
When the cheese receives the MoveCheese message, program the cheese to move to a new random location on the stage.

4. As described in 4c of the Advanced Game Design program the cat to follow the mouse.



The Cat will move one step towards the mouse at all times during the game.

5. As described in 4d of the Advanced Game Design program the number of lives to decrease by 1 when the mouse touches the cat.



When the number of lives is decreased put in a wait command to allow the mouse to get free from the cat before trying to take any more lives away.

6. Don't forget to save your file as Advanced Game Version 2 as the next lesson will build new features into the game. The Advanced Game Design sheet will be used in the next lesson.  
Advanced Game Version 2 is available as Resource 3 for this lesson.



**Extension activity**

- Introduce extra effects for the game.  
E.g. The cat could make a sound when touching the mouse or students could create background music for the game.

## Resource 1

### **Advanced Game Design**

A worksheet that guides students through the game design (This was used as Resource 1 in Lesson 1).

## Resource 2

### Advanced Game Version 1

A sample game in Scratch created in the previous lesson. This is used as the starting point for this lesson.



CD Resource

“M9L1R2 Advanced Game Version 1.sb”

## Resource 3

### Advanced Game Version 2

A sample game in Scratch for this lesson.



CD Resource

"M9L2R3 Advanced Game Version 2.sb"

## Lesson 3 – Advanced Game Finishing Touches

### Resources:

Advanced Game Design sheet from Lesson 1 (Resource 1), Scratch file created in the lesson 2 (Resource 2), Scratch file with game for this lesson (Resource 3)

### Key Vocabulary:

Broadcast

### Description:

Students add new functionality to the game developed in the lesson 2 (Using the Advanced Game Design Part 4 e-g). The game is programmed to end when the number of lives reaches 0. If the number of lives remaining does not reach 0, the game progresses to level 2 and eventually a game win scenario as the countdown timer advances. The cat is programmed to increase in speed when level 2 begins. Students will then add their own enhancements to the game including sound, graphics and new functionality.

### Learning Objectives:

1. To program a project according to a specification from a design.
2. To enhance the game play aspect of the game project.

### Lesson Introduction:

- Tell students they will further develop the game created in the previous lesson according to the design specified in Part 4e-g.
- When the game is completed students will add their own enhancements.

### Lesson Breakdown:

1. Use the Advanced Game Design sheet (Resource 1) to guide students through the lesson. Open the Advanced Game Version 2 that was saved at the end of lesson 2. Students who do not have this file can use a copy of Resource 2.

2. Make sure students have selected the Stage sprite from the sprite list. As described in 4e of the Advanced Game Design program the game to finish with the 'You Lose' screen appearing when the number of lives becomes equal to 0.

The image shows a Scratch script editor for a Stage sprite. The script is as follows:

```
when clicked
  switch to background Level 1
  set Lives to 5
  set Score to 0
  set Countdown to 100
  forever
    forever if Lives = 0
      broadcast Game Lose
  end
end

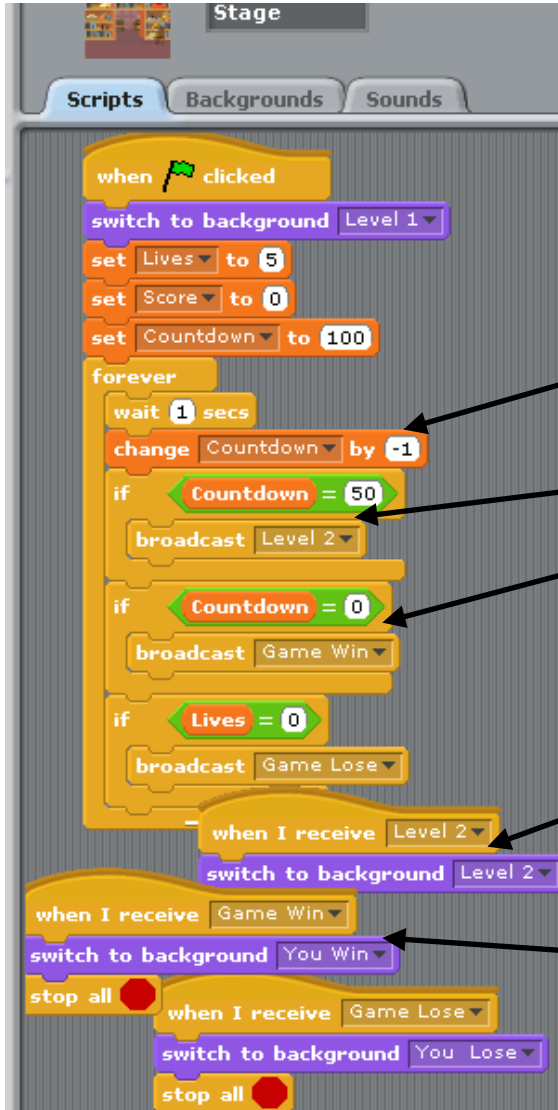
when I receive Game Lose
  switch to background You Lose
  stop all
```

Two red callout boxes with arrows point to specific parts of the script:

- The top callout box points to the `broadcast Game Lose` block within the `forever if Lives = 0` loop. The text reads: "Broadcast the Game Lose message when the number of lives reaches 0."
- The bottom callout box points to the `switch to background You Lose` block within the `when I receive Game Lose` event. The text reads: "When the Game Lose broadcast message is received, switch to the appropriate background and stop the game script."



3. Program the countdown timer outlined in 4f and 4g of the Advanced Game Design sheet. When the countdown timer reaches 50 seconds the games moves to level 2. When the countdown reaches 0 the game finishes and the game over you win background appears



Use a loop to program the countdown timer to decrease by 1 every second .

Broadcast messages when the countdown timer equals 50 and 0 .

When Level 2 broadcast message is received , switch to the appropriate background .

When the Game Win broadcast message is received , switch to the appropriate background and stop the game script .

- As described in 4f of the Advanced Game Design increase the speed of the cat in level 2.

The image shows a Scratch script for a character named 'Cat'. The script is as follows:

```

when clicked
  forever loop
    point towards Mouse
    if Countdown > 50
      move 1 steps
    else
      move 3 steps
  
```

Three callout boxes provide context for the script:

- Left box:** The cat will point towards the mouse at all times during the game.
- Top-right box:** If the countdown timer is greater than 50, the game is at Level 1 and the cat moves towards the mouse 1 step at a time.
- Bottom-right box:** Otherwise the game is at Level 2 and the cat will move 3 steps at a time.

- Ask pupils to fill out number 5 of the Advanced Game Design Sheet. This will list extra features that they wish to include in their game.
- Students will spend the rest of the lesson programming the extra features into their games.
- At the end of the lesson the game will be saved as Advanced Game Version 3 ready for testing in the next lesson. Advanced Game Version 3 is available as Resource 3 for this lesson.

## Resource 1

### **Advanced Game Design**

A worksheet that guides students through the game design (This was used as Resource 1 in Lessons 1 and 2).

## Resource 2

### Advanced Game Version 2

A sample game in Scratch created in the previous lesson. This is used as the starting point for this lesson.



CD Resource

“M9L2R3 Advanced Game Version 2.sb”

## Resource 3

### Advanced Game Version 3

A sample game in Scratch for this lesson.



CD Resource

"M9L3R3 Advanced Game Version 3.sb"

## Lesson 4 – Advanced Game Testing

### Resources:

Advanced Game Test Suite (Resource 1), Advanced Game Version 3 (Resource 2), Unit Marking Sheet (See Appendix 1)

### Key Vocabulary:

Test Suite, Testing, Acceptance Testing, End User, Debugging

### Description:

Students will test their game, Advanced Game Version 3, created in the previous lessons for this module, to make sure it satisfies all of the elements outlined in the design. It will also provide an opportunity to correct any errors.

### Learning Objectives:

1. To learn about the importance of testing software.
2. To use a test suite for the Advanced Game.

### Lesson Introduction:

- Tell students they will test the Advanced Game Version 3, as created in the previous lesson, to make sure that it satisfies all of the elements outlined in the design.
- During testing, students may also encounter errors. These errors are commonly known as bugs. The process of fixing the bugs is known as debugging.

### Lesson Breakdown:

1. Give students a copy of the Advanced Game Test Suite. Each student then asks a classmate to perform a peer check. The classmate will examine the student's game and place a tick beside any test case that is passed successfully. Any unsuccessful test case is marked using an x.
2. Pupils are given time to review the feedback so that any requirements not met, or any errors present that are identified during testing can be dealt with. Test cases for any extra features that are included by a student in their game will also be included at this stage.
3. When software is prepared for release, acceptance testing is performed by a person who will use the software. It will determine whether the software is ready to be used. The teacher will perform the role of an end user. Marks that contribute to the final grade for the unit will be given to judge the quality of the software based on the test cases that have been passed. These marks are outlined in the Unit Marking Sheet contained in Appendix 1.

## Resource 1

### **Advanced Game Test Suite**

A worksheet that guides students through game testing.

# Advanced Game Test Suite

Test Cases	Peer Check	Teacher Check
<b>3 sprites exist</b>		
Cat		
Mouse		
Cheese		
<b>4 Backgrounds exist</b>		
Level 1		
Level 2		
Game Win		
Game Lose		
<b>Game Initialised When the Green Flag is clicked</b>		
Countdown = 100		
Score = 0		
Lives = 5		
<b>Sprite behaviour</b>		
Mouse moves using keyboard keys		
Cheese moves to random location when touched by mouse		
Cat moves in direction of the mouse		
Cat increases in speed in level 2		
<b>Variables</b>		
Countdown timer decreases by 1 every second		
Lives decrease by 1 when the mouse touches the cat		
Score increases by 2 when the cat touches cheese		
<b>Backgrounds</b>		
Background for Level 1 appears when the green flag is clicked to start the game		
Background changes to Level 2 when countdown is less than 50		
Background changes to Game Win and the game stops when countdown = 0		
Background changes to Game Lose and the game stops when lives = 0		
<b>Extra Features</b>		



## Resource 2

### Advanced Game Version 3

A sample game in Scratch for this lesson.



CD Resource

"M9L3R3 Advanced Game Version 3.sb"