

30 STAR HUNTER

How to build Star Hunter

Welcome to your first Scratch game: Star Hunter, a fast-paced, underwater treasure hunt. Just follow the simple steps in this chapter to build the game, and then challenge a friend to beat your score.

AIM OF THE GAME

The aim of this game is to collect as many golden stars as you can. Use the cat to collect the stars, but watch out for deadly octopuses. You'll need to move quickly to succeed. The main sprites in the game are shown below.

Cat
Move the cat around the screen with your computer mouse or your finger if you're using a tablet.



Octopuses
The octopuses patrol the seas but they swim more slowly than you. If you touch one, it's game over!



Stars
These appear one at a time in random places. Touch a star to score a point.



Press the green flag to start a new game.
Press the stop sign to end a game.
The score shows how many stars you've collected.

An underwater backdrop image sets the scene.

Collect stars to score points.
Select this icon to make the game fill your screen.

Don't touch the octopuses! There are three octopuses and they move in different ways.

HOW TO BUILD STAR HUNTER 31

GAME CONTROLS
Use a computer mouse or touchpad – or your finger if you're using a tablet computer – to control this game.



Under the sea
Star Hunter is set in the deep sea, but you can change the backdrop to anything you like, from outer space to a picture of your bedroom.

Ready?
Let's code!



32 STAR HUNTER

Building code

Like any Scratch program, Star Hunter is made by joining together coloured blocks like jigsaw pieces. Each block is an instruction that tells a sprite what to do. Let's start by programming the game's main sprite: the cat.

1 Start Scratch and choose "New" from the "File" menu. You'll see a screen like the one below, with the cat sprite in place. On the left is a set of blue instruction blocks.

Selecting the buttons here reveals different sets of blocks.

Choose blocks from the list on the left.

2 We'll program the cat to move wherever the player moves it to – using the mouse on a computer or the player's finger on a tablet. Select the "go to random position" block and drag it to the middle of the screen – the code area.

The blue Motion blocks control the way sprites move.

Some blocks include a drop-down menu.

Choose mouse-pointer from the drop-down menu. Though we're specifying the mouse-pointer, this instruction will also work for using your finger on a tablet computer.

Select Control to reveal the orange blocks.

3 Now select the orange Control button and look for a "forever" block.

Drag the "forever" block to the code area.

4 Drag it to the right and drop it over the blue block. It will wrap around it like this:

5 Next, select the yellow Events button. Look for a block with a green flag. Drag it to the top of your code. Read through the code and think about what each block does.

This block starts the game when you click the green flag.

6 Now look at the top left of the stage – you'll see a green flag. Select this to run your code.

Select the green flag to play.

7 Move your mouse or your finger if you're using a tablet computer and watch what happens. If you followed all the steps, the cat will move with the mouse-pointer (or your finger) around the stage.

Well done!
You have created your first Scratch project. Let's add some more things to the project to build a game.

34 STAR HUNTER

8 The poor cat is called "Sprite1". Let's fix that. In the sprites list, select Sprite1 (the cat). Change the name to "Cat".

Type the sprite's name here.

The new name will appear here.

Setting the scene

At the moment the stage is just a boring white rectangle. Let's create some atmosphere by adding scenery and sound effects. To change the scenery, we add a "backdrop" image.

9 To the right of the sprites list is a button to add a picture from the backdrop library. Click it and look for "Underwater 2". Select the image. The backdrop will now fill the stage.

The backdrop is just decoration and doesn't affect the sprites.

Select this icon to open the backdrop library.

Choose a Backdrop

10 Go to the Sounds tab above the blocks palette. Select the speaker icon at the bottom left to choose a sound from the library.

11 Look for "Bubbles" in the library. You can preview sounds by holding your mouse over the icon. To add a sound into the game, click on its icon. Now you'll see Bubbles in your list of sounds.

Delete sounds here.

This is how long the sound lasts for.

12 Select the Code tab and add the following code to the cat sprite, but leave the old code in place as you need both. The new code repeats the bubbles sound. The "play sound until done" block waits for the sound to finish before letting it start again. Run the game to hear the sound effect.

when flag clicked
forever
play sound [Bubbles v] until done

when Sound selected
Select Sound in the blocks palette to find this block.

Choose "Bubbles" from the drop-down menu.

EXPERT TIPS

Loops

A loop is a section of code that repeats over and over again. The "forever" block creates a loop that carries on forever, but other types of loops can repeat an action a fixed number of times. Loops are very common in almost all computer programming languages.

Blocks run from top to bottom. The "forever" block makes the program return to the start of the block.

36 STAR HUNTER

Add an enemy

The game needs an enemy to make things more interesting. Let's add an octopus with a deadly sting. The octopus will patrol the stage, moving left and right, and the player will have to keep out of its way or it's game over.

13 To add a second sprite to the project, click the icon shown below to open up the sprites library. Look for "Octopus" and select it.

14 Add the following code to the octopus sprite. To find the blue blocks, select Motion in the blocks palette. The two Motion blocks used here make the octopus move left and right across the stage.

This block runs the code when the game begins.

Motion blocks are dark blue and control the way sprites move.

The "forever" block repeats everything inside.

This block stops the octopus from moving off the edge of the stage.

15 Now run the code. The octopus will patrol left and right, but you'll notice it's upside down half the time. You can fix this by changing the way the sprite turns around when it changes direction. Choose the blue "set rotation style" block and add it to the octopus's code.

This block makes the octopus face forward.

16 The octopus should now stay the right way up and facing forward all the time. You can adjust its starting position on the screen by dragging it with the mouse or your finger.

17 Highlight the octopus and drag an orange "if then" block to an empty part of the code area. Now add a pale blue "touching" block to the top of the "if then" block. Open the drop-down menu and choose "Cat". This code will help the octopus detect the cat.

Sensing blocks are pale blue.

This block detects a collision.

18 Choose Control in the blocks palette again, and add a "stop all" block to the middle of the "if then" block. This will stop all action if the octopus is touching the cat, ending the game.

This block ends the game when the sprites collide.

19 Now add the "if then" blocks you've built to the octopus's main code, placing it carefully after the blue Motion blocks. Also, add a "wait 0.5 seconds" before the loop. Run the project and see what happens.

The "wait" block adds a slight delay before the octopus starts moving.

The "stop all" block only runs if the answer to the question in the "touching" block is yes.

EXPERT TIPS

"if then"

You make decisions every day. If it's raining, you might use an umbrella. If it isn't, you don't. Computer programs do the same thing by using what programmers call conditional statements, such as "if then". When Scratch reaches an "if then" block, it runs the blocks inside only if the statement is true.

Octopus touching cat?

True → Stop the sprites
False → Keep going

38 STAR HUNTER

More enemies

Let's add more enemies to the game, but to make things more challenging, we'll set them moving in different directions. We can tell each sprite exactly which way to go by using a block that works like a compass.

20 Add a purple "set size to" block to the top of the octopus's code, after the "when clicked" block. Set the octopus's size to 35% to make the game a bit easier. Then add a blue "point in direction" block.

Select this window and type 35 to set the octopus's size to 35%.

This number tells the octopus which direction to set off in.

21 To change the octopus's direction, select the window in the "point in direction" block and type 135 in place of 90. This will make the octopus move diagonally.

22 Now we can duplicate our octopus to create more enemies. Right-click (if you're using a mouse) or long-press (if you're using a tablet) on the octopus in the sprites list and choose "duplicate". Copies of the Octopus sprite will appear in the sprites list, named Octopus2 and Octopus3. Each will have a copy of the first octopus's code.

-90° moves a sprite straight to the left.
0°
90°
180°
-90° moves a sprite straight down.

EXPERT TIPS

Directions

Scratch uses degrees to set direction. You can choose any number from -179° to 180°. Negative numbers point sprites left; positive numbers point them right. Use 0° to go up and 180° to go straight down.

-90° moves a sprite straight to the left.
0°
90°
180°
-90° moves a sprite straight down.

23 To make the octopuses move in different directions, change the number in the "point in direction" block for each new octopus. Leave the first Octopus sprite's direction as 135, but set Octopus2 to 0 and Octopus3 to 90. Run the project and try to avoid all the enemies.

24 If it's too hard to stay alive, make the octopuses slower by lowering the number of steps in their "move" blocks to 2. Remember to change the code for all three octopus sprites.

25 For more variety, let's make one of the octopuses set off in a random direction. To do this, we use a green "pick random" block. This is Scratch's way of rolling a dice to generate a random number. Choose Operators in the blocks palette to find the block and add it to the first octopus's code. Run the project a few times to see the octopus choose different starting directions.

EXPERT TIPS

Random numbers

Why do so many games use dice? Dice create surprises in a game because they make different things happen to each player. A random number is one you can't predict in advance, just like the roll of a dice. You can get the cat to say a random dice roll using this simple code.

2

40 STAR HUNTER

Collecting stars

In many games, the player has to collect valuable items to win points or to stay alive. In Star Hunter, we use golden stars as underwater treasure that the player has to collect. We'll use random numbers again to make each star appear in a new place.

26 Select the "Choose a Sprite" symbol in the sprites list and choose the Star sprite from the library.

The Star sprite will appear in your sprites list.

Select this symbol to open the sprites library.

27 Add the following code to Star. This code will make the star move to a random new location whenever the cat touches it. The green blocks create random numbers called coordinates, which Scratch uses to pinpoint locations on the stage.

The "if then" block checks whether the cat is touching the star.

The "go to" block only runs if the answer to the question is yes.

The "forever" block repeats the blocks inside it.

Type the numbers shown here into the green blocks.

28 To see the star's coordinates change when it moves, choose Motion in the blocks palette and put ticks by "x position" and "y position". Now run the game; you'll see the star's x and y coordinates update each time the cat makes it move. Untick both boxes before you carry on.

Star: x position 60
Star: y position 78

41

EXPERT TIPS Using coordinates

To pinpoint a location on the stage, Scratch uses numbers called coordinates. These work just like graph coordinates, with x numbers for horizontal positions and y numbers for vertical. To find the coordinates for a spot on the stage, just count the steps across and up from the centre of the stage. Positive coordinates are up or right; negative coordinates are down or left. Every spot on the stage has a unique pair of coordinates that can be used to send a sprite to that position.

The x axis is bigger than the y axis and extends from -240 to 240.

29 You can add a sound effect that plays when the cat touches a star. First make sure the star is selected in the sprites list, then go to the Sounds tab above the blocks palette. Select the speaker symbol to open the sound library and choose "Fairydust". Now add the pink "start sound" block to the star's code and choose "Fairydust" in the drop-down list.

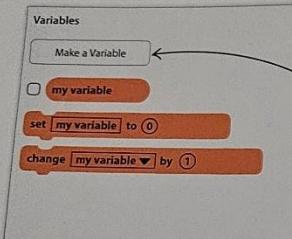
Insert the "start sound" block into the Star's existing code, then use the drop-down menu to choose which sound to play.

42 STAR HUNTER

Keeping score

Computer games often need to keep track of vital statistics such as the player's score or health. We call these changing numbers "variables". To keep track of the player's score in Star Hunter, we'll create a variable that counts the number of stars the player has collected.

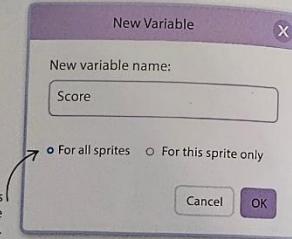
30 With any sprite selected, choose Variables in the blocks palette. Click on the button "Make a Variable".



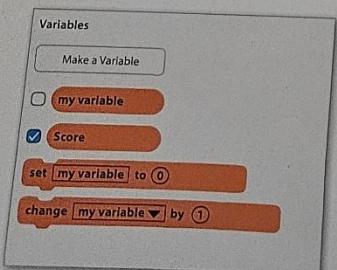
Click here to create a new variable.

This option makes the variable available for every sprite.

31 A pop-up box appears asking you to give your variable a name. Type "Score" in the box. Make sure the option "For all sprites" is selected and hit "OK".



32 You'll see a set of new blocks appear, including one for the score. Make sure the box next to it is ticked to make the score appear on the stage.

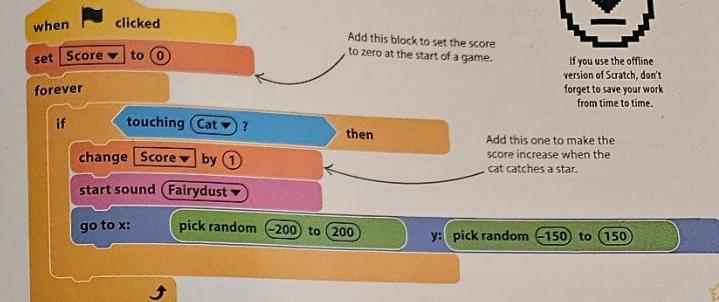


You can move the score display to wherever you like.

33 The score counter will appear in the top left of the stage but you can drag it anywhere you like.



34 We want the score to start at zero and increase by one each time the cat touches a star. Select the star sprite and add the two orange Variables blocks below to its code.



Add this block to set the score to zero at the start of a game.

If you use the offline version of Scratch, don't forget to save your work from time to time.

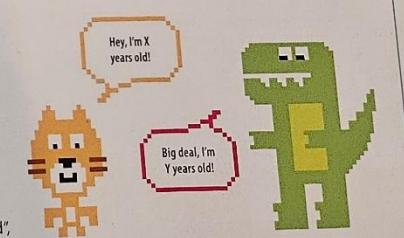
35 Now click the green flag to run the code and see what happens when the cat collects each star. See if you can collect 20 stars without bumping into an octopus.



EXPERT TIPS

Variables

A variable works like a box that you can store information in, such as a number that can change. In maths, we use letters for variables, such as x and y . In computer programming, we give variables names such as "Score" and use them for storing not just numbers but any kind of information. Try to choose a name that tells you what the variable is for, such as "Speed" or "Score". Most computer languages won't let you put spaces in the names of variables, so a good tip is to combine words. Instead of using "dog speed", for instance, type "DogSpeed".



44 STAR HUNTER

Better enemies

Now we have a working game, we can test it and experiment with changes that make it easier, harder, or – most important – more fun. One way to make the game more interesting is to make the three octopuses do different things.

36 Right-click (if you're using a mouse) or long-press (if you're using a tablet) the code for Octopus2 and select "Delete Block" to remove it. Replace it with the following code. This will make the octopus chase the cat.

```
when green flag clicked
  set size to (35 %)
  wait (0.5) seconds
  forever
    point towards (Cat)
    move (5) steps
    if touching (Cat) ? then
      stop all
```

37 Run the project and see how the game plays. You'll probably find it hard to escape the octopus as it moves quickly. To slow it down, change the number of steps to 2.

38 You can make the game get harder as you play. Select the original octopus sprite and go to Variables in the blocks palette. Drag the "Score" block into the octopus's "move" block. Now try the game. The more points you get, the faster the octopus swims.

39 If it gets too hard too quickly, we can make things more gradual. Choose Operators in the blocks palette and find the small green "divide" block. Rearrange the "move" block so it looks like the image below. Type "3" in the second round window.

```
move (Score / 3) steps
```

40 Now we'll make Octopus3 patrol in a regular pattern. To do this, point to point, rather than moving in steps. Replace the code for Octopus3 with the following two blocks of code. These run at the same time, one checking for collisions and the other moving the octopus around its patrol route.

The two blocks of code are separate in the code area.

Type these numbers into the "glide" blocks.

41 Now run the project and watch Octopus3. It should swim in a repeating triangle pattern.

I feel like I'm swimming in circles...

To change the shape of the triangle, try different numbers in the "glide" blocks.

45

46 STAR HUNTER

Hacks and tweaks

You've built a fun game, but that's just the beginning. Scratch makes it easy to change and adapt games as much as you want. You might find bugs that need fixing, or you might want to make the game harder or easier. Here are some suggestions to get you started.

▽ Debug Octopus2
If Octopus2 ends up in the top-right corner at the end of a game, it can trap the player in the next game and end it too quickly. This is a bug. To fix it, you could drag the octopus away from the corner before starting, but it's better to use code that moves it automatically. Insert a "go to" block at the start of the code for Octopus2 to send it to the centre of the stage.

```
when green flag clicked
  go to (0, 0)
```

Octopus2 can trap the player in the top-right corner.

Add this block to make Octopus2 start in the centre of the stage.

△ Fine-tuning
The best games have been carefully tested to make sure they play well. Test every change you make and get friends to play your games to see how well they work.

47 HACKS AND TWEAKS

Different colours

Make your octopuses different colours by using the "set color effect to" block from the Looks section. Place it under the "set size to" block at the start of the code.

```
set [color effect v] to (50)
```

Try setting this number anywhere from -100 to 100 to see the full range of colours.

Hey! Turn me back into a cat!

Flashing colours

You can make an octopus change colour continually to create a flashing effect. Add the code below to any octopus. Try experimenting with different numbers in the "change color effect by" block.

```
when green flag clicked
  forever
    change [color effect v] by (25)
```

Change this number to make colours change faster or slower.

Scuba diver

To make the underwater theme more convincing, replace the cat with a diver. Select the cat in the sprites list, then open the Costumes tab. Click on the sprite symbol to open the library, then find a diver costume.

```
set size to (50 %)
```

Play with size

You can change how easy the game is by adjusting the size of the sprites. Change the number in the octopuses' blue "move" blocks to alter their speed. Change the purple "set size to" blocks to make sprites larger or smaller. Fine-tune the numbers until the game is just hard enough to be fun.

```
set size to (100 %)
```

Swimming animation

To add a professional touch to Star Hunter, animate the octopuses so they look like they're swimming. Add this code to an empty part of the code area for each octopus to make them switch between two different poses.