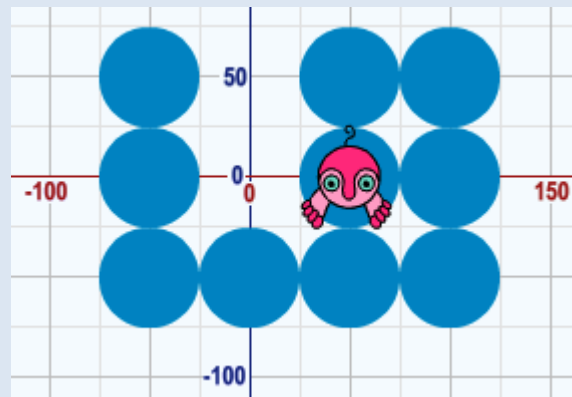
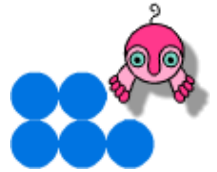


# COORDINATES AND GEOMETRY

## MODULE 6: INVESTIGATION 1

# Emerging Shapes



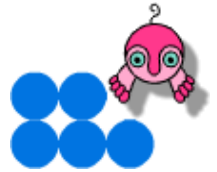


### ACTIVITY 6.1.1

# Restless Fleeeee

## MODULE 6: INVESTIGATION 1

### Activity 6.1.1 – Restless Fleeeee



Open project **61-Fleeeee Dots**.

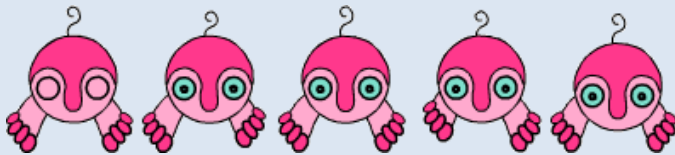
- Explore the project, its backdrops, the sprite and its *setup script*.  
**Run the *setup script*.**

- Explore the definitions of the blocks:

dot

set random pen colour and shade

- **[Extension]** Explore the costumes of **Fleeeee** and the blocks:



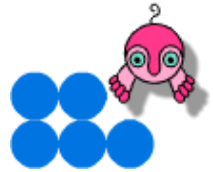
blink

nod

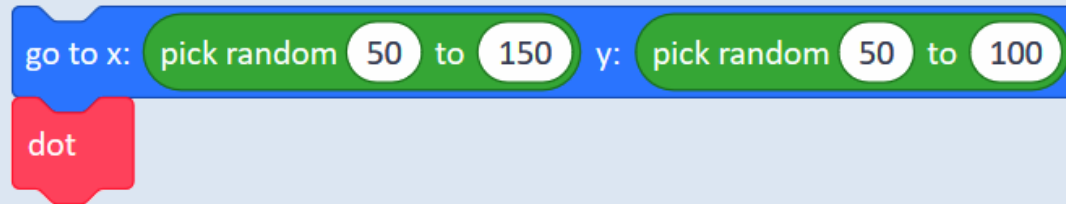
walk

run

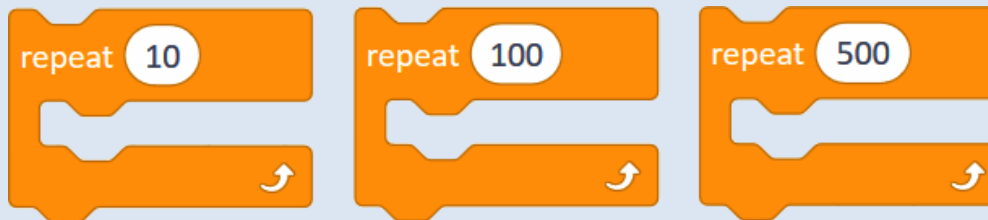
Do not run the **walk** and **run** blocks at the same time.



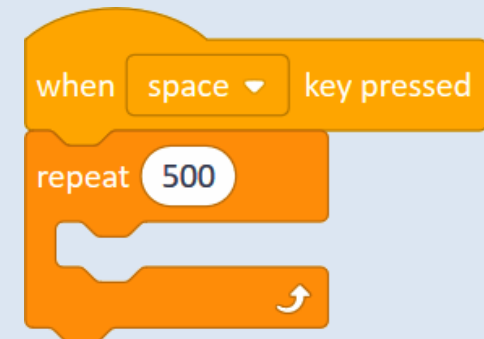
- Envisage, discuss and run the below *jumping script*:



- Add **repeat** around the jumping script with different numbers of repetition:

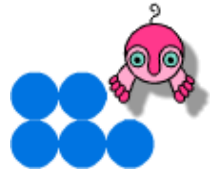


- Add the **Events** hat block:

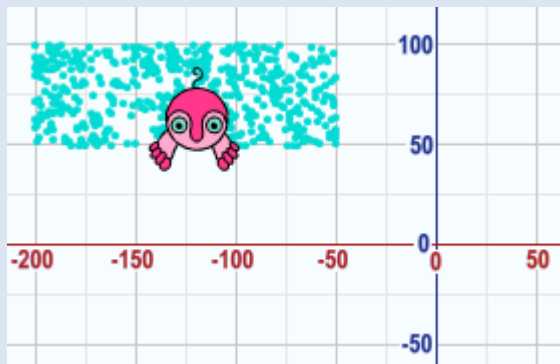


# MODULE 6: INVESTIGATION 1

## Activity 6.1.1 – Restless Fleeeee



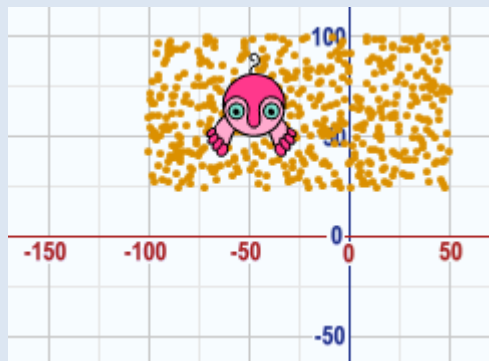
- Explore the pictures carefully then fill in the missing coordinates in the scripts. Run the scripts and experiment.



```

set random pen colour and shade
repeat 500
  go to x: pick random -200 to 
  y: pick random 50 to 100
  dot

```



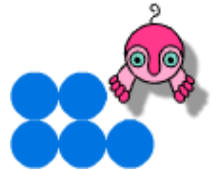
```

set random pen colour and shade
repeat 500
  go to x: pick random -100 to 
  y: pick random 25 to 
  dot

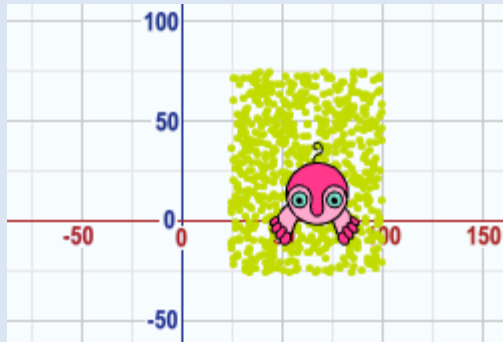
```

# MODULE 6: INVESTIGATION 1

## Activity 6.1.1 – Restless Fleeeee

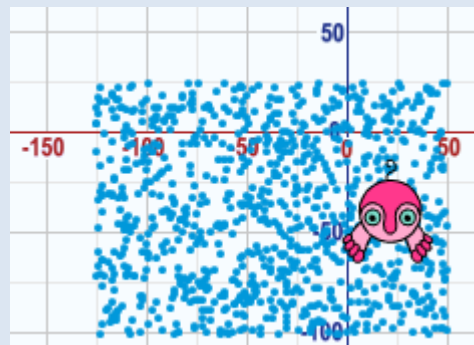


*... continued*



```

set random pen colour and shade
repeat (500)
  go to x: pick random 25 to [ ] y: pick random [ ] to 75
  dot
  
```

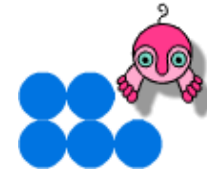


```

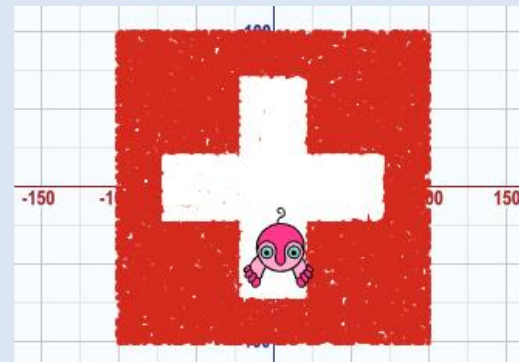
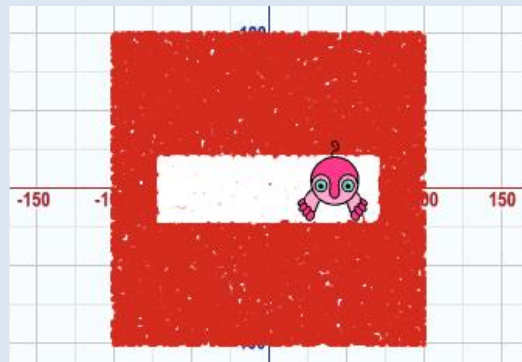
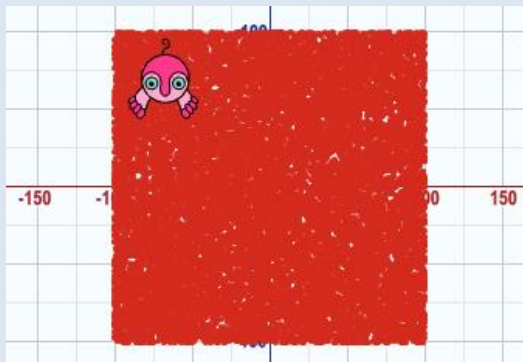
set random pen colour and shade
repeat (1500)
  go to x: pick random [ ] to [ ] y: pick random [ ] to [ ]
  dot
  
```

# MODULE 6: INVESTIGATION 1

## [Extension] Activity 6.1.1 – Restless Fleeeee



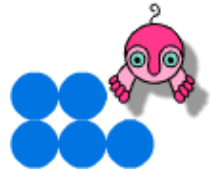
- **[Extension]** Explore the following sequence of steps in creating a complex picture. Build the corresponding jumping scripts. Use high **repeat** numbers, work in the **Turbo mode**.



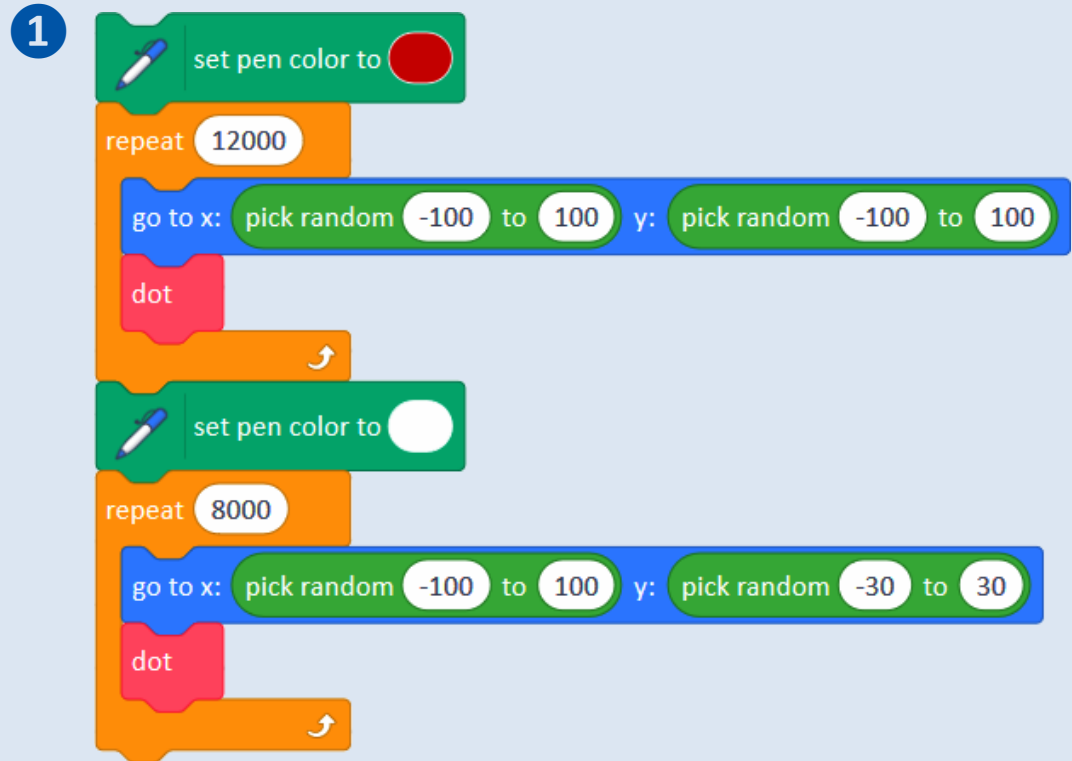
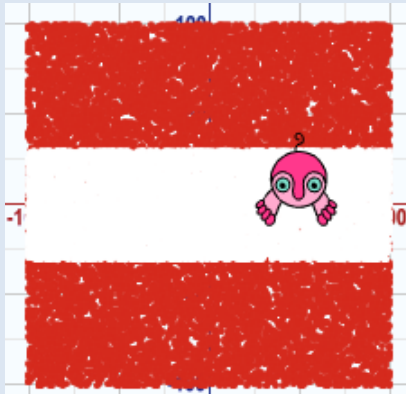
- **[Extension]** Think of any other *flags* you could recreate in similar pictures...

# MODULE 6: INVESTIGATION 1

## [Extension] Activity 6.1.1 – Restless Fleeeee



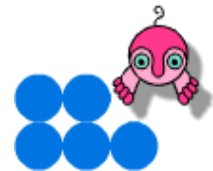
**[Extension]** Explore and discuss the differences between the following three algorithms:



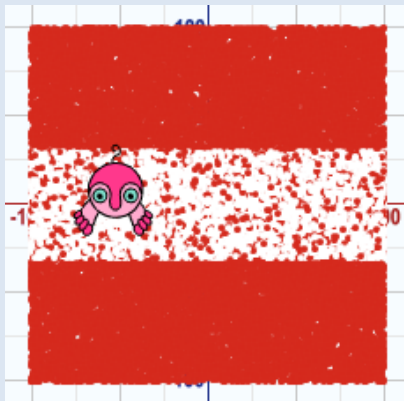


# MODULE 6: INVESTIGATION 1

## [Extension] Activity 6.1.1 – Restless Fleeeee



... continued



2

```

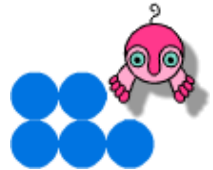
when space key pressed
  forever
    go to x: pick random -100 to 100 y: pick random -100 to 100
    set pen color to red
    dot
  
```

```

when space key pressed
  forever
    go to x: pick random -100 to 100 y: pick random -30 to 30
    set pen color to white
    dot
  
```

# MODULE 6: INVESTIGATION 1

## [Extension] Activity 6.1.1 – Restless Fleeeee



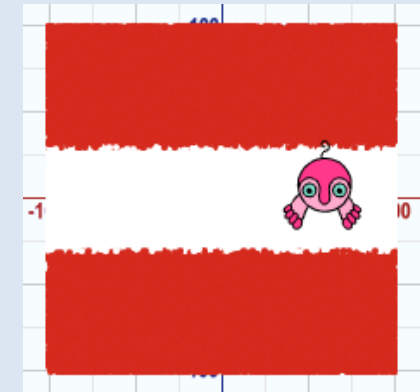
3

... continued

```
when a key pressed
  forever
    go to x: pick random -100 to 100 y: pick random 30 to 100
    set pen color to red
    dot
```

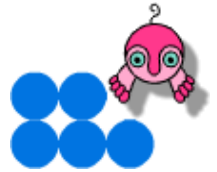
```
when a key pressed
  forever
    go to x: pick random -100 to 100 y: pick random -100 to -30
    set pen color to red
    dot
```

```
when a key pressed
  forever
    go to x: pick random -100 to 100 y: pick random -30 to 30
    set pen color to white
    dot
```



## MODULE 6: INVESTIGATION 1

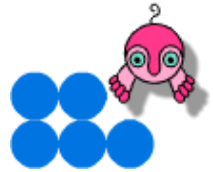
### [Extension] Activity 6.1.1 – Restless Fleeeee



- Why are there red dots in the 'white' area in the second algorithm? ?
- Why did we have to move the *set pen color to...* blocks inside the *forever*?
- Can you think of a fourth strategy (similar to the third one) which would use *repeat* blocks instead of *forever*?

## **MODULE 6: INVESTIGATION 1**

### **Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain**

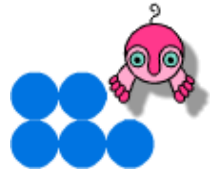


#### **ACTIVITY 6.1.2**

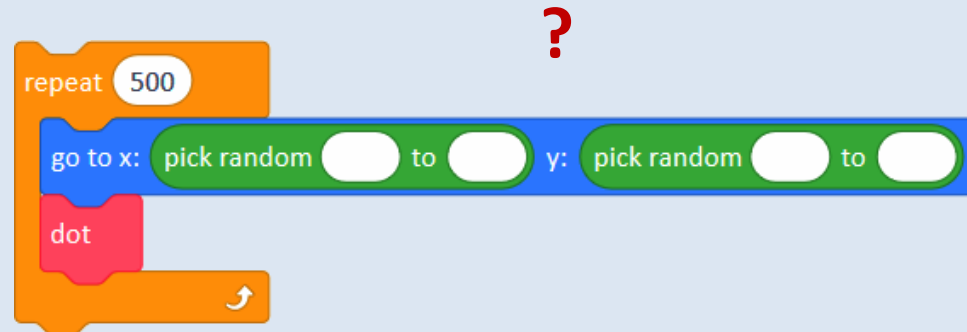
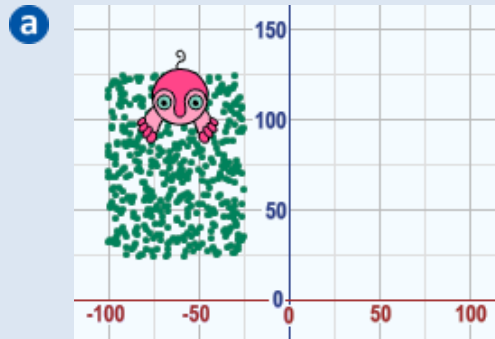
# **Unplugged and Hands-on: Envisage and Explain**

## MODULE 6: INVESTIGATION 1

### Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain

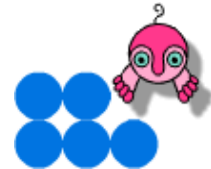


- 1 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **y axis**.

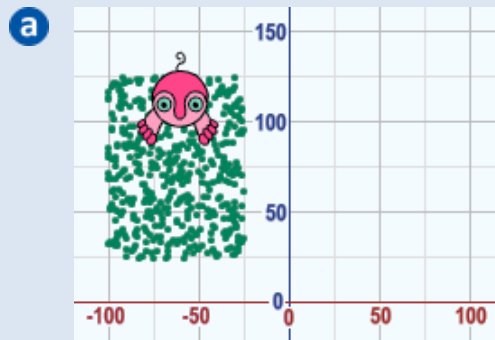


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 1 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **y axis**.



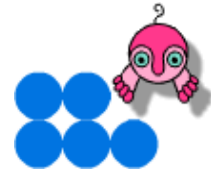
```

repeat 500
  go to x: pick random -100 to -25 y: pick random 25 to 125
  dot
end repeat

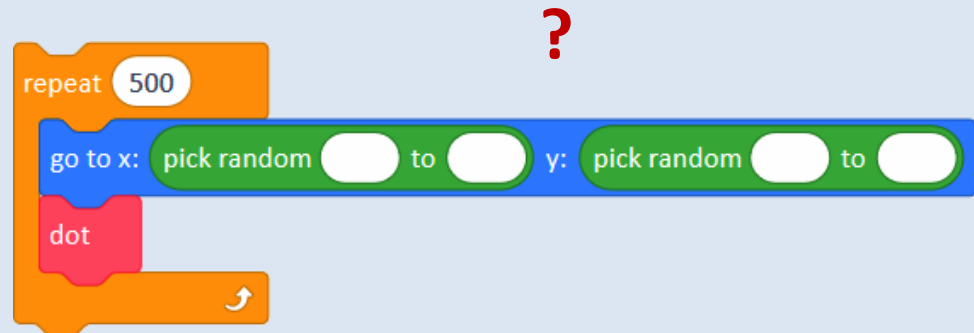
repeat 500
  go to x: pick random 25 to 100 y: pick random 25 to 125
  dot
end repeat
  
```

# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain

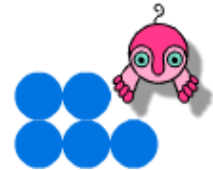


- 1 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **y axis**.

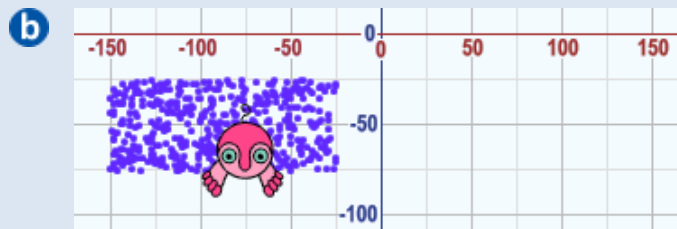


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 1 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **y axis**.



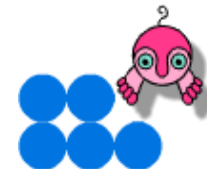
```

repeat 500
  go to x: pick random -150 to -25 y: pick random -75 to -25
  dot
repeat 500
  go to x: pick random 25 to 150 y: pick random -75 to -25
  dot
  
```

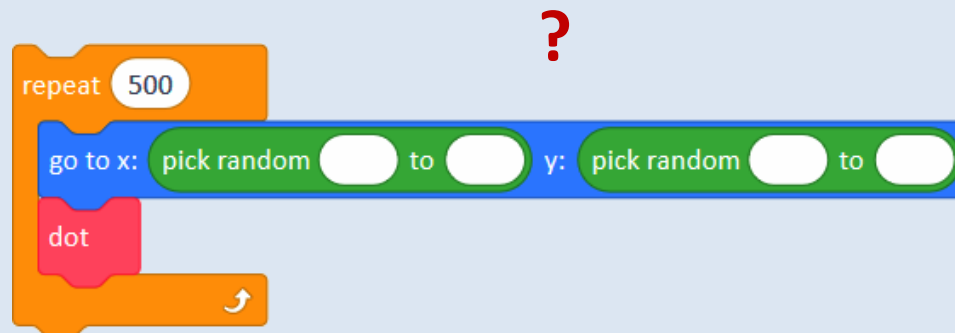
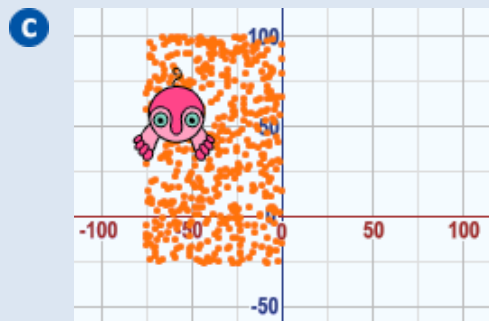


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain

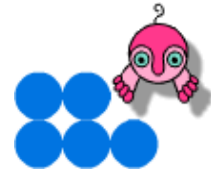


- 1 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **y axis**.

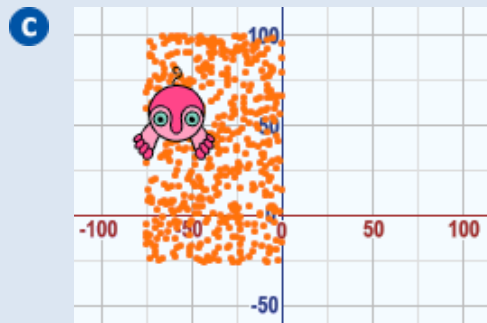


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 1 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **y axis**.

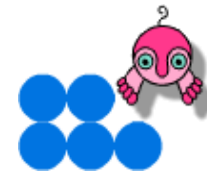


```

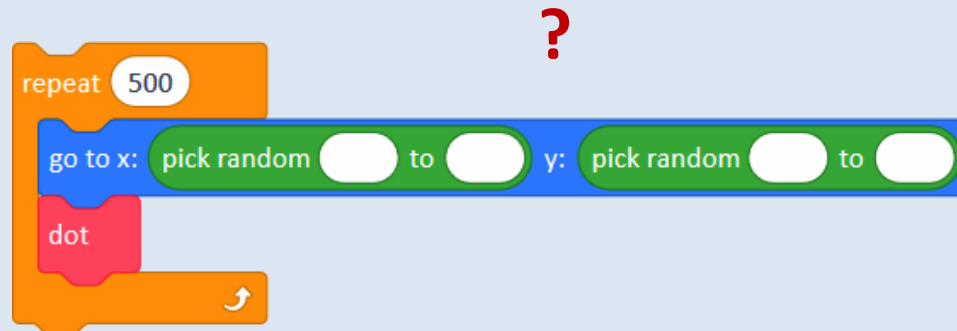
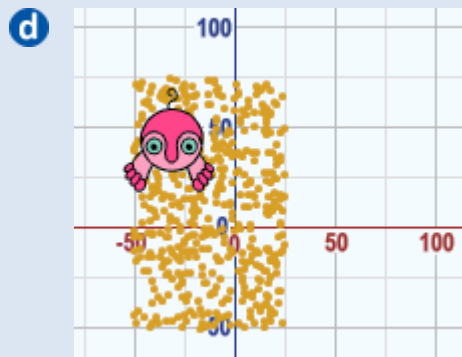
repeat 500
  go to x: pick random -75 to 0 y: pick random -25 to 100
  dot
repeat 500
  go to x: pick random 0 to 75 y: pick random -25 to 100
  dot
  
```

# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain

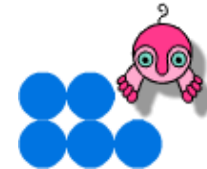


- 1 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **y axis**.

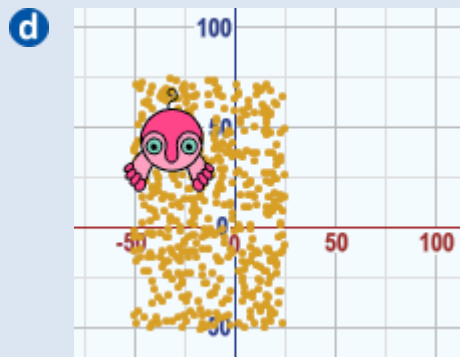


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 1 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **y axis**.

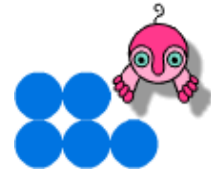


```

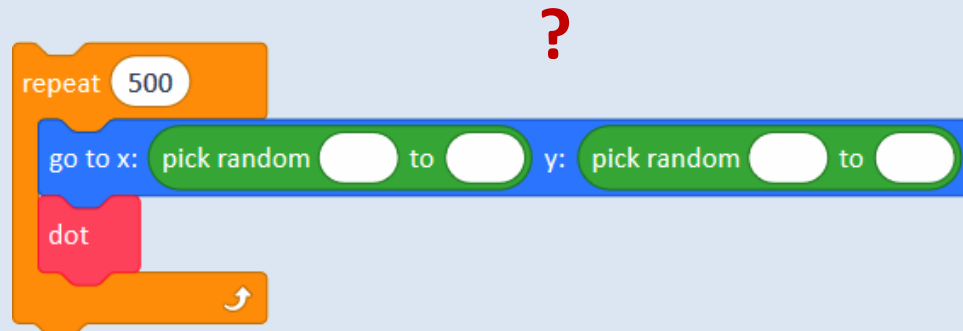
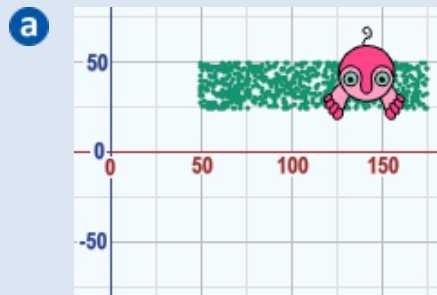
repeat 500
  go to x: pick random -50 to 25 y: pick random -50 to 75
  dot
set random pen colour and shade
repeat 500
  go to x: pick random -25 to 50 y: pick random -50 to 75
  dot
  
```

## MODULE 6: INVESTIGATION 1

### Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain

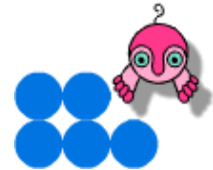


- 2 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **x axis**.

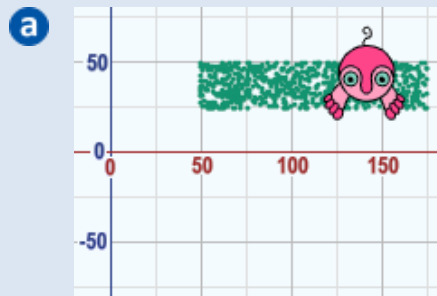


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 2 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **x axis**.

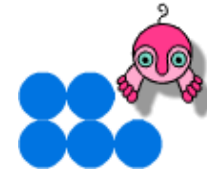


```

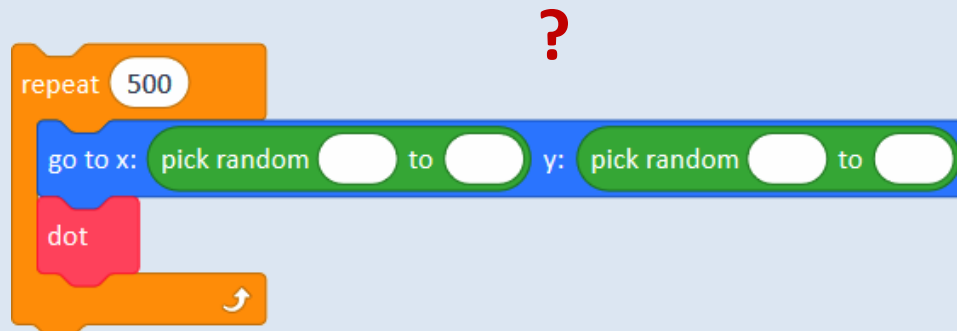
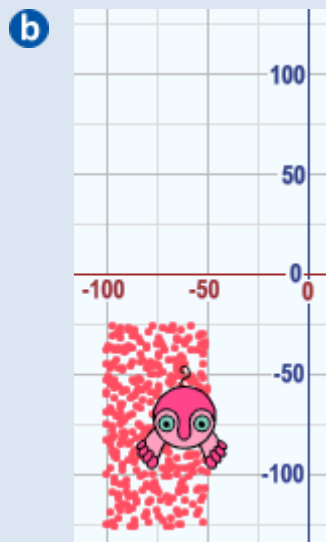
repeat 500
  go to x: pick random 50 to 175 y: pick random 25 to 50
  dot
repeat 500
  go to x: pick random 50 to 175 y: pick random -50 to -25
  dot
  
```

# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain

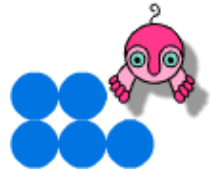


- 2 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **x axis**.

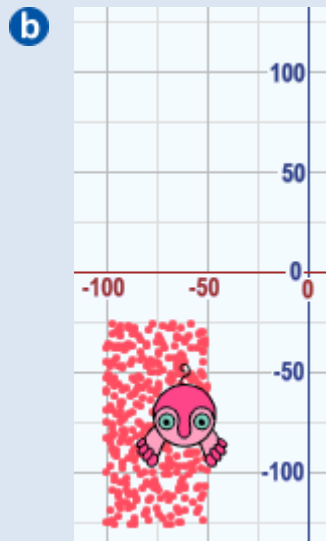


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 2 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **x axis**.



```

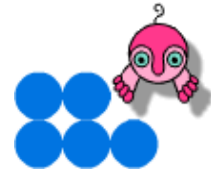
repeat 500
  go to x: pick random -100 to -50 y: pick random -125 to -25
  dot
end repeat

repeat 500
  go to x: pick random -100 to -50 y: pick random 25 to 125
  dot
end repeat
  
```

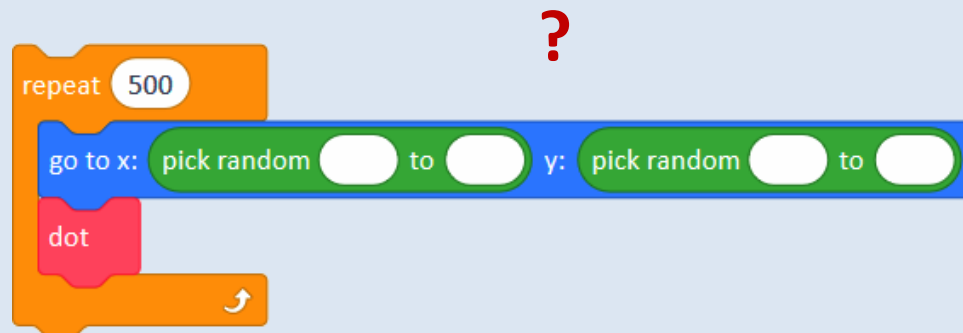
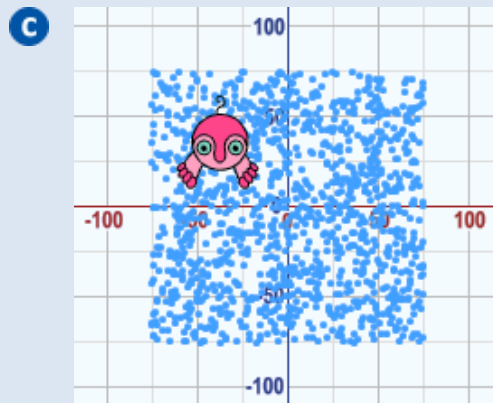


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain

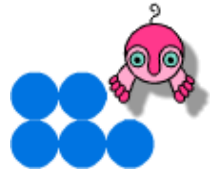


- 2 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **x axis**.

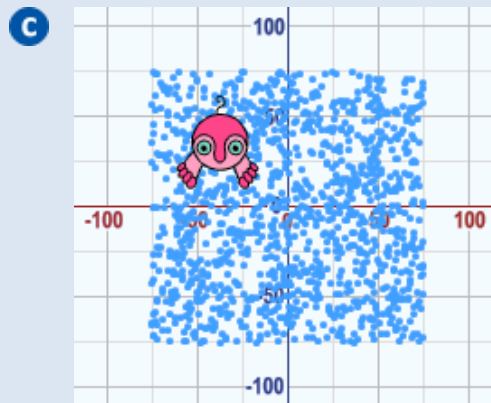


## MODULE 6: INVESTIGATION 1

### Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 2 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **x axis**.

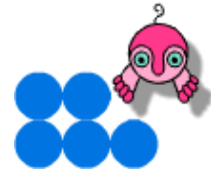


```

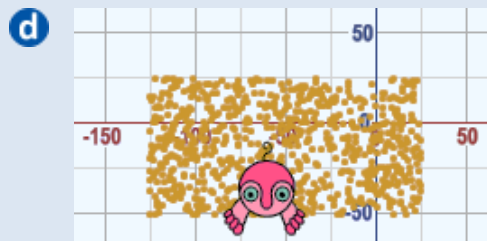
repeat 500
  go to x: pick random -75 to 75 y: pick random -75 to 75
  dot
  ↻
  set random pen colour and shade
  repeat 500
    go to x: pick random -75 to 75 y: pick random -75 to 75
    dot
    ↻
  
```

# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 2 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **x axis**.



?

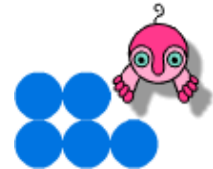
```

repeat 500
  go to x: pick random [ ] to [ ] y: pick random [ ] to [ ]
  dot

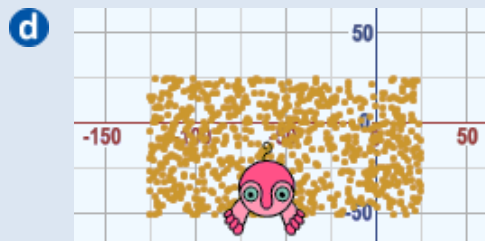
```

# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 2 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape reflected in the **x axis**.

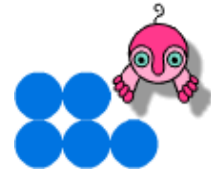


```

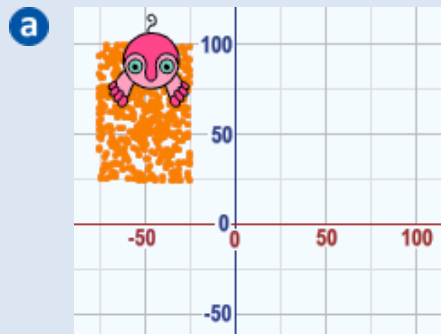
repeat 500
  go to x: pick random -125 to 25 y: pick random -50 to 25
  dot
end
set random pen colour and shade
repeat 500
  go to x: pick random -125 to 25 y: pick random -25 to 50
  dot
end
  
```

# MODULE 6: INVESTIGATION 1

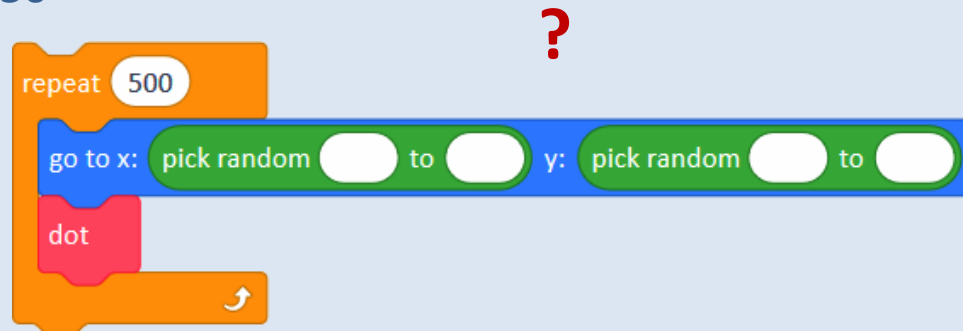
## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 3 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape translated by ...

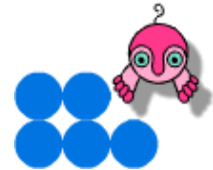


right 100  
down 50

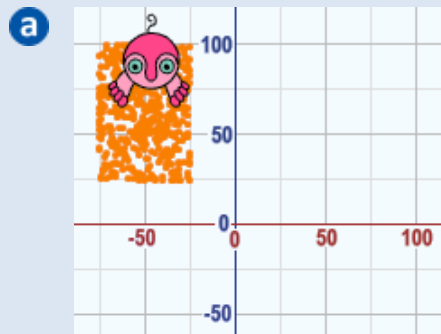


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 3 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape translated by ...



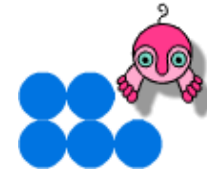
right 100  
down 50

```

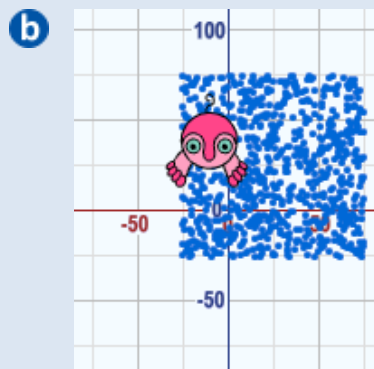
repeat (500)
  go to x: (pick random -75 to -25) y: (pick random 25 to 100)
  dot
end repeat
set random pen colour and shade
repeat (500)
  go to x: (pick random 25 to 75) y: (pick random -25 to 50)
  dot
end repeat
  
```

# MODULE 6: INVESTIGATION 1

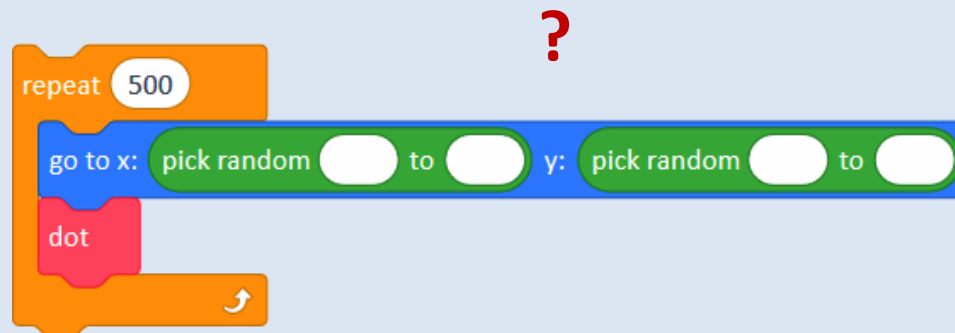
## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 3 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape translated by ...

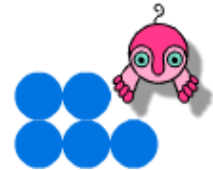


left 100  
down 50

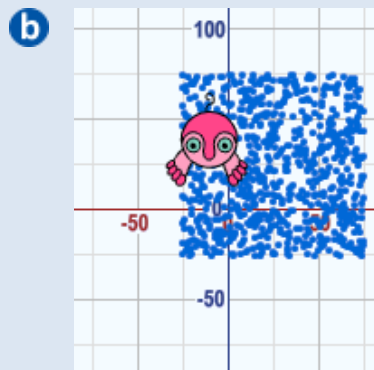


# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 3 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape translated by ...



left 100  
down 50

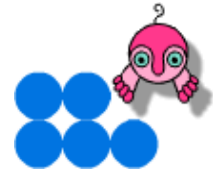
```

repeat 500
  go to x: pick random -25 to 75 y: pick random -25 to 75
  dot
end
set random pen colour and shade
repeat 500
  go to x: pick random -125 to -25 y: pick random -75 to 25
  dot
end
  
```

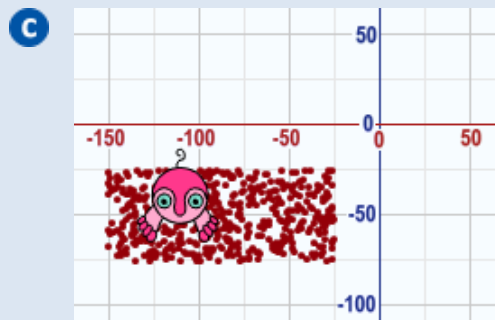


# MODULE 6: INVESTIGATION 1

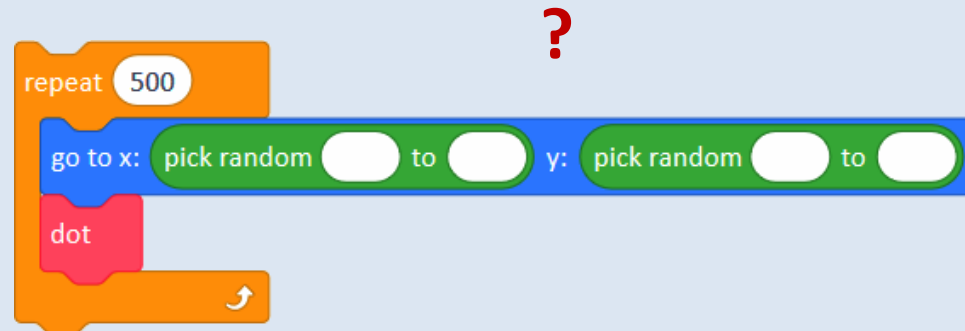
## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 3 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape translated by ...

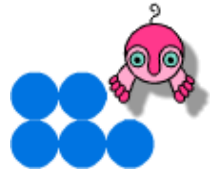


up 75  
right 50  
down 100

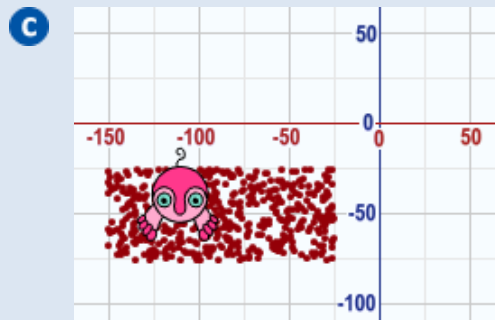


## MODULE 6: INVESTIGATION 1

### Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 3 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape translated by ...



up 75  
right 50  
down 100

```

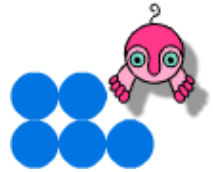
repeat (500)
  go to x: pick random (-150) to (-25) y: pick random (-75) to (-25)
  dot
end repeat

set random pen colour and shade

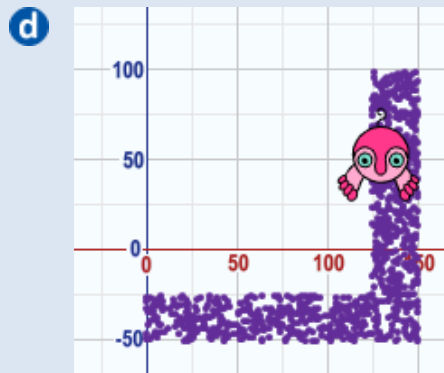
repeat (500)
  go to x: pick random (-100) to (25) y: pick random (-100) to (-50)
  dot
end repeat
  
```

# MODULE 6: INVESTIGATION 1

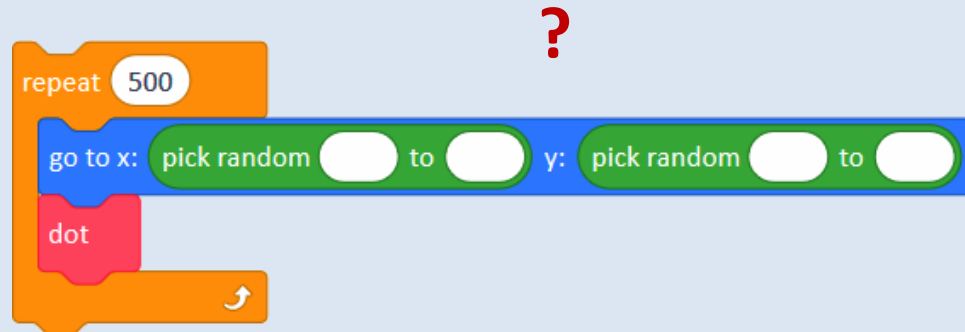
## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 3 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape translated by ...

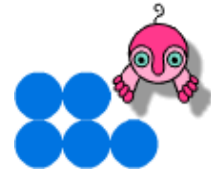


up 25  
left 50

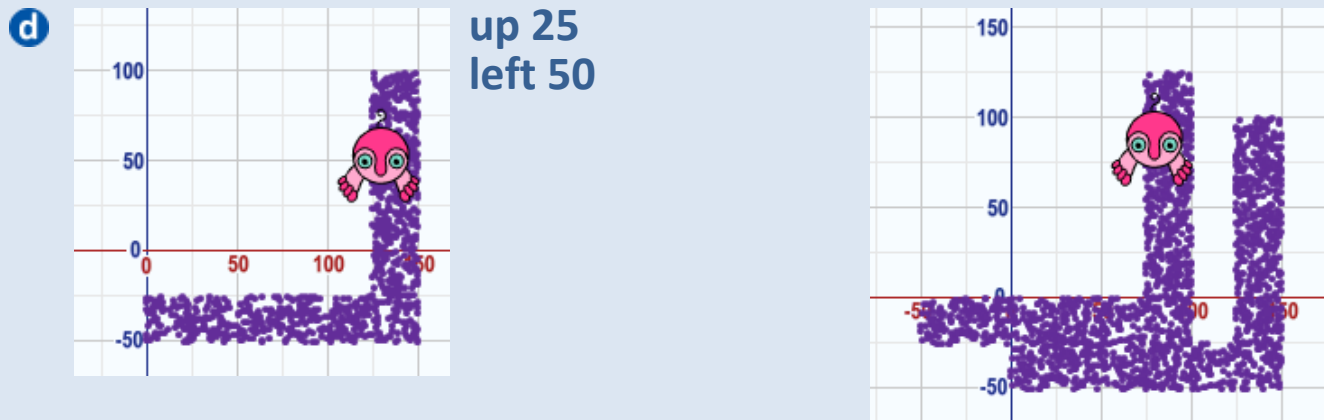


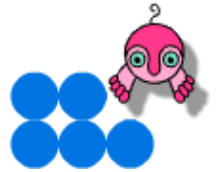
# MODULE 6: INVESTIGATION 1

## Activity 6.1.2 – Unplugged and Hands-on: Envisage and Explain



- 3 Fill in the missing coordinates so that the script produces the emerging rectangle in the picture. Then build the second script to produce the same shape translated by ...



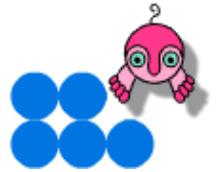


## ACTIVITY 6.1.3

# Introducing Scale

# MODULE 6: INVESTIGATION 1

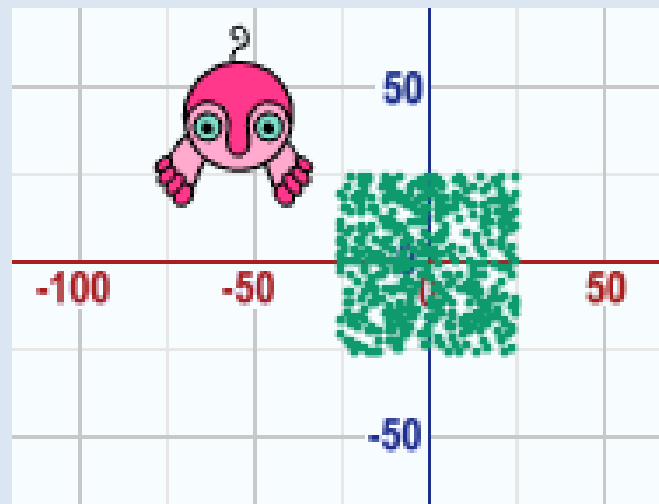
## Activity 6.1.3 – Introducing Scale



Continue in your **61-Fleeeee Dots** project.

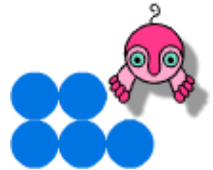
- Build a script to produce a small emerging rectangle like this:

Pull out the second **pick random ...** block and run the script again. Explore different numbers in the **y:** hole like 0, -25... etc.



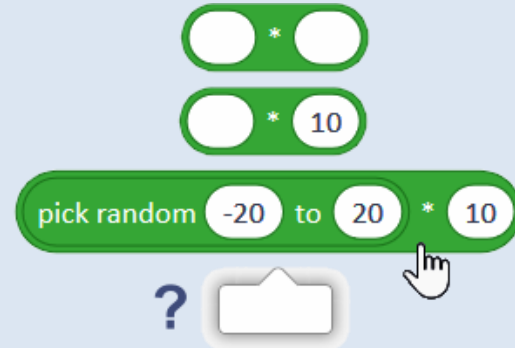
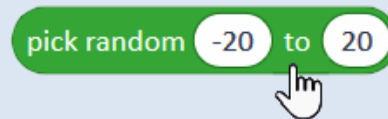
# MODULE 6: INVESTIGATION 1

## Activity 6.1.3 – Introducing Scale



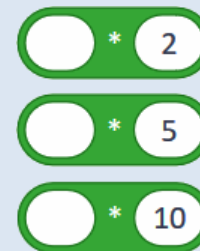
- Pull out the first **pick random ...** block as well and use it in an isolated multiplication block as below.

**Explore the generated the numbers.**

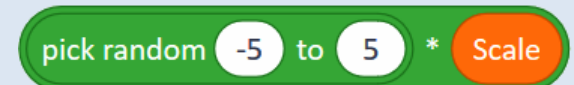
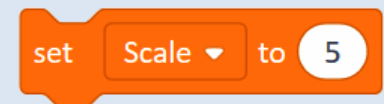


- Explore different multipliers.

● What role does the multiplier play here?  
What if we replace it by 1, or 5, or 20?

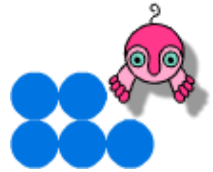


- Then make a variable **Scale**, set its value and use it instead.

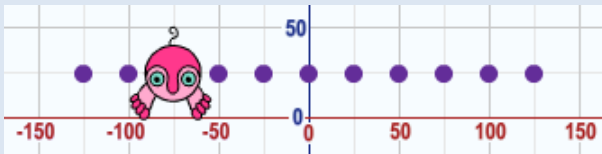


# MODULE 6: INVESTIGATION 1

## Activity 6.1.3 – Introducing Scale



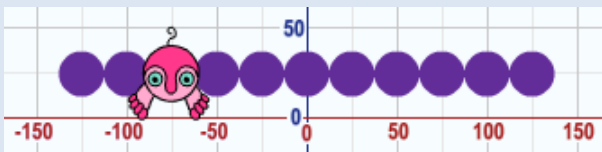
- Insert the multiplication block into the **x**: hole of the *jumping script*.
- Run the script with different (small) values of **pick random ...**, **Scale** and **pen size**.



```

set Scale to 25
set pen size to 10
repeat 30
  go to x: pick random -5 to 5 * Scale y: 25
  dot

```



```

set Scale to 25
set pen size to 25

```

➡

```

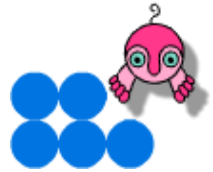
set Scale to 25
set pen size to Scale

```



# MODULE 6: INVESTIGATION 1

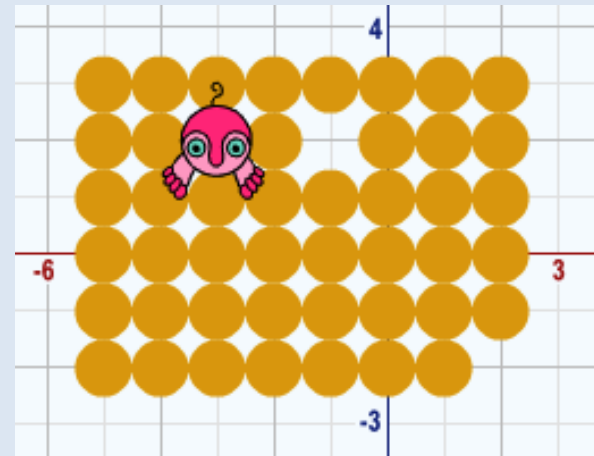
## Activity 6.1.3 – Introducing Scale



- Move the **set Scale to ...** and **set pen size to ...** blocks into the *setup script*.
- Duplicate the multiplication block into the **y:** hole and explore.

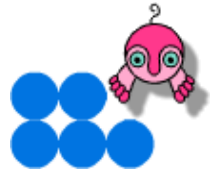
- If we set **Scale** to 10, which values can you use in both **pick random ...** blocks so that the emerging shape fits within the stage?
- What if we set **Scale** to 20?

?

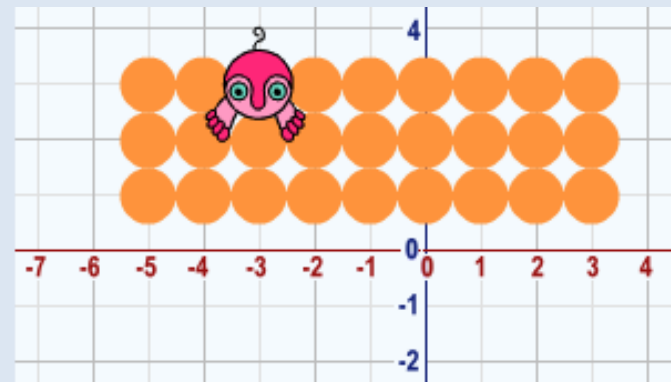
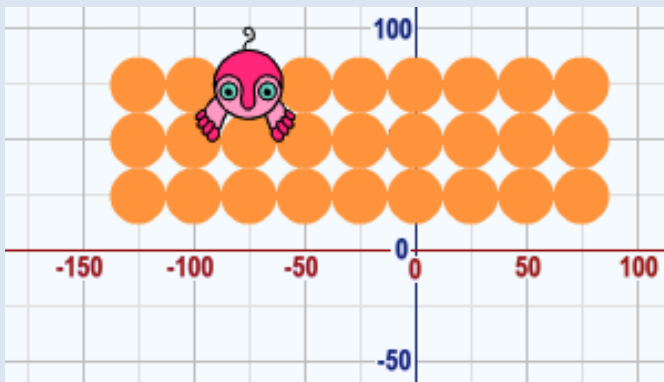


# MODULE 6: INVESTIGATION 1

## Activity 6.1.3 – Introducing Scale



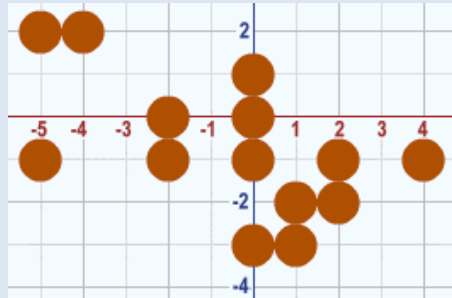
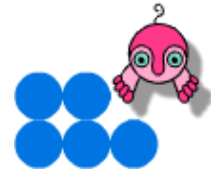
- Switch backdrop to *grid 25*, set **Scale** to 25 and explore.  
Big dots will now have **grid co-ordinates**.  
Therefore **rename** your variable **Scale** to **grid**.



switch backdrop to *grid 25* ▼

# MODULE 6: INVESTIGATION 1

## Activity 6.1.3 – Introducing Scale



```

set Scale to 25

set random pen colour and shade

repeat 15
  go to x: pick random -5 to 5 * grid y: pick random -3 to 3 * grid
  dot

```

Scatter several big dots along the *grid 25*. Discuss the difference between **Scratch co-ordinates** and **grid co-ordinates**.

For some dots in the grid fill in the table:

```

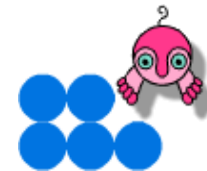
set Scale to 25

```

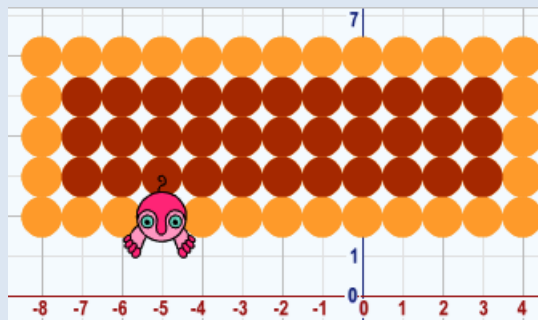
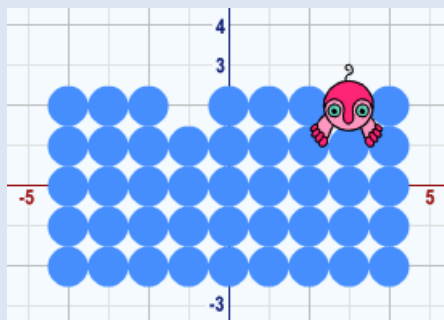
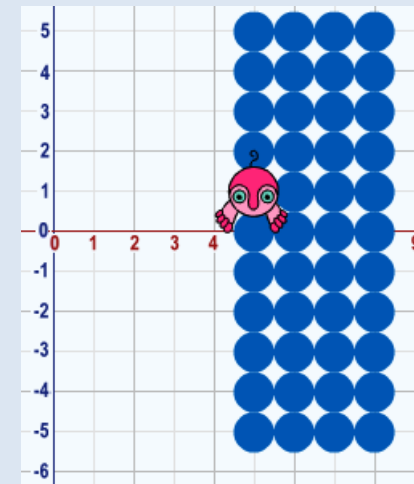
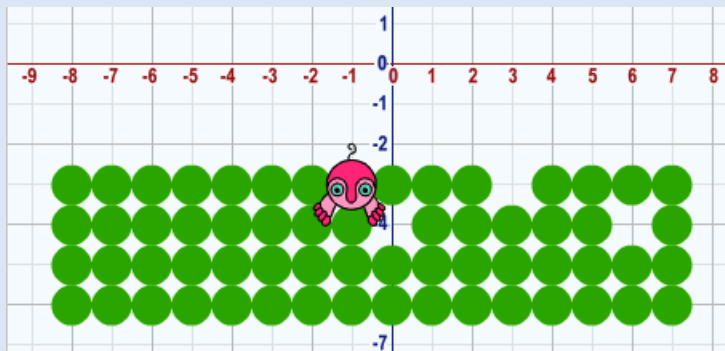
x position	y position	x grid	y grid
-125	50	-5	2
-100	50	0	1
...			

# MODULE 6: INVESTIGATION 1

## Activity 6.1.3 – Introducing Scale

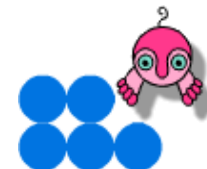


- Use *grid 25* or *grid 10* backdrops (and set **grid** to 25 or 10) and create similar emerging shapes. Discuss their properties, symmetries etc.

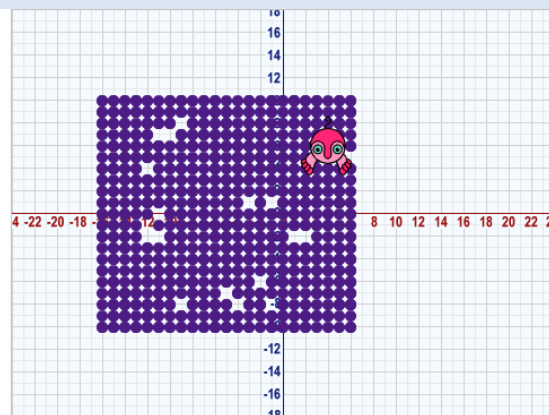
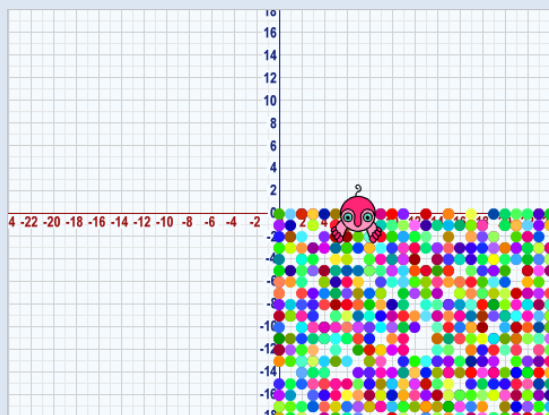
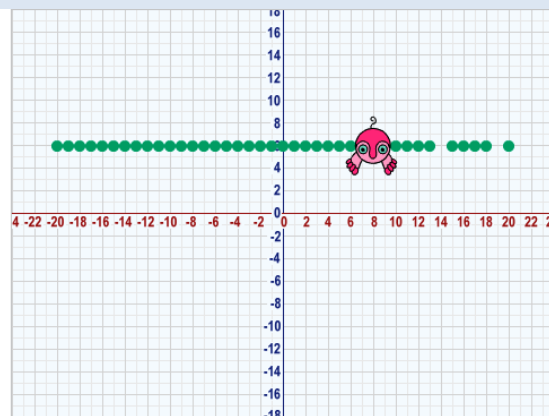
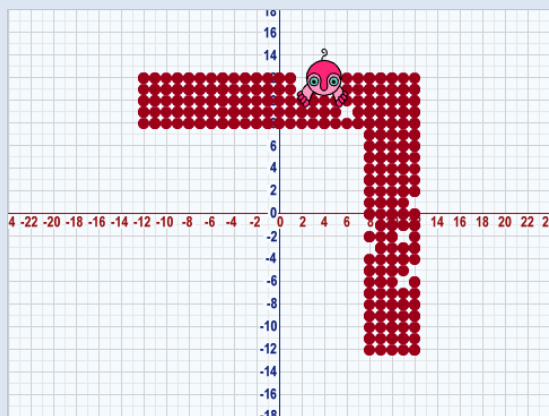


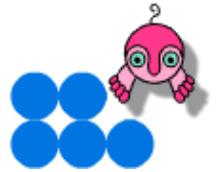
# MODULE 6: INVESTIGATION 1

## Activity 6.1.3 – [Extension] Introducing Scale



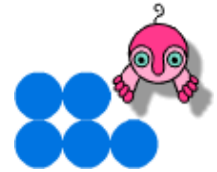
**[Extension]** Try to create some of the emerging shapes below.





**EXTENSION ACTIVITY 6.1.4**

# **Dotty Patterns**



Continue in your project **61-Fleeeee Dots**.

- Note that the long **go to ...** block can be divided into **set x to ...** and **set y to ...** blocks.

```

set x to pick random -5 to 5 * grid
set y to pick random -3 to 3 * grid
  
```

- Now we want to draw **all dots in a single line**, e.g. with **y grid coordinates** being always -3...

```

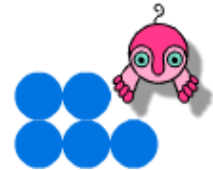
set random pen colour and shade
set y to -3 * Scale
one line jumping
  
```

```

define one line jumping
repeat 80
  set x to pick random -7 to 1 * grid
  dot
  
```

# MODULE 6: INVESTIGATION 1

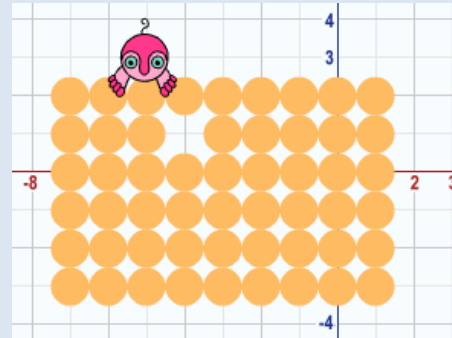
## Ext. Activity 6.1.4 – Dotty Patterns



- After drawing one line of dots, we may move **Fleeeee** to the 'line' above by

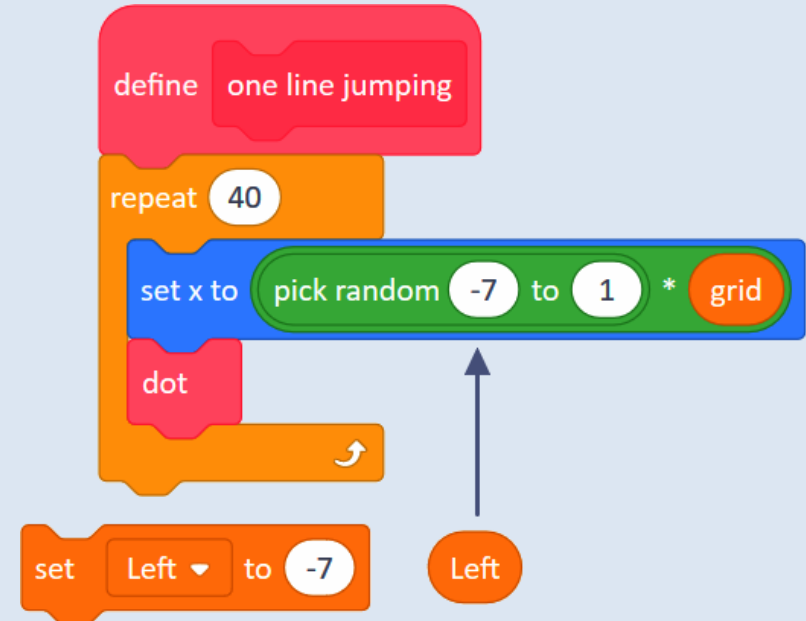
change y by **grid**

Use it inside **repeat** to draw several lines.



- Study the **one line jumping** definition carefully. What sets the **x grid coordinate** of the left most dot?

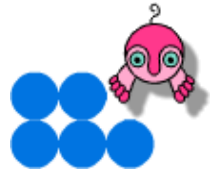
Make a variable **Left** and use it instead of that left most number.



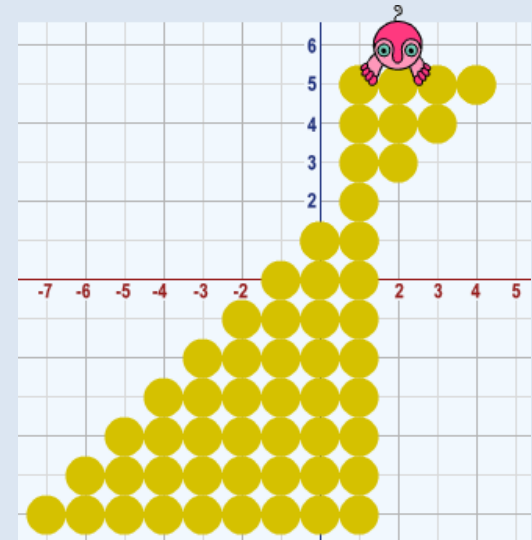
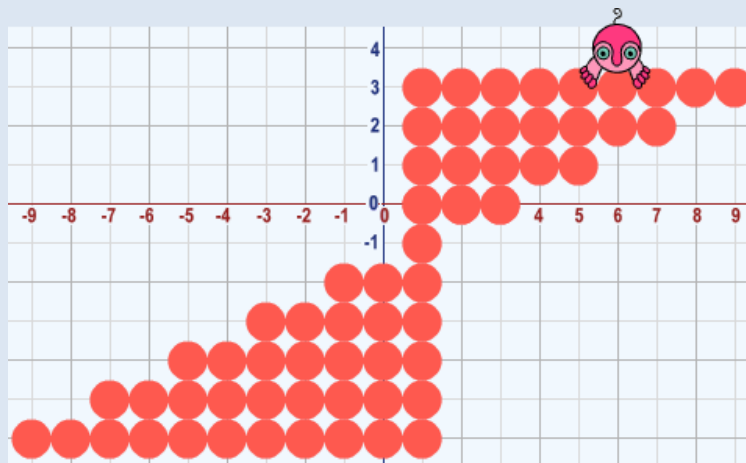
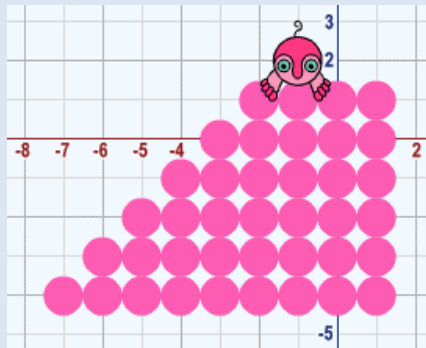


# MODULE 6: INVESTIGATION 1

## Ext. Activity 6.1.4 – Dotty Patterns

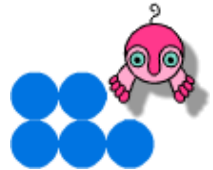


Insert the **change Left by 1** block in your **repeat** and explore different values and created patterns.



# MODULE 6: INVESTIGATION 1

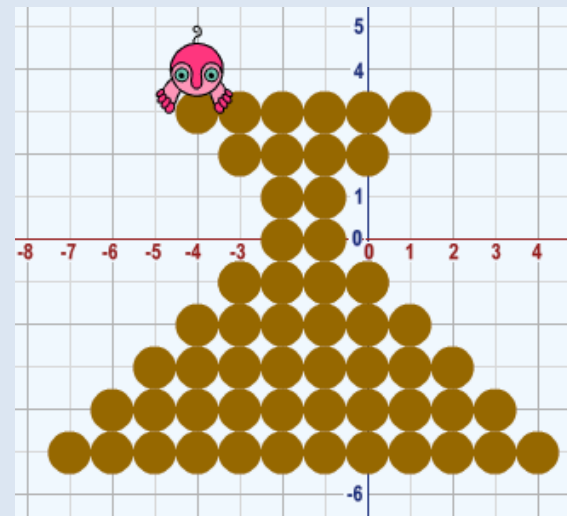
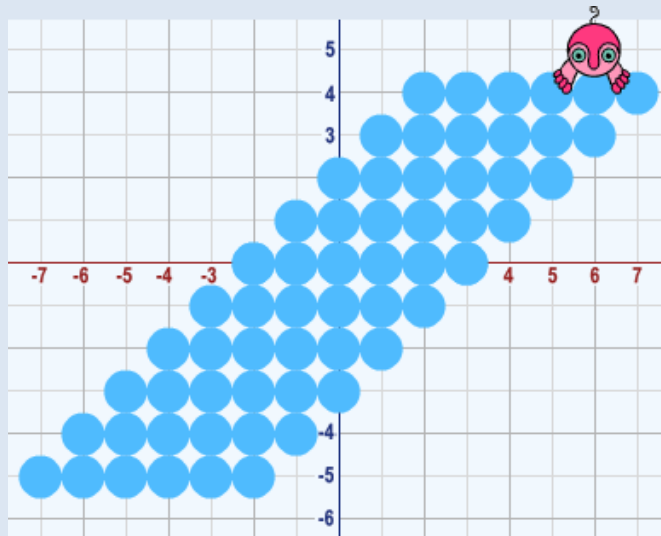
## Ext. Activity 6.1.4 – Dotty Patterns



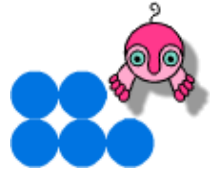
■ The right most x grid coordinate in the **one line jumping** is currently **1**. Change it to...

- ▶ be specified by an expression like **Left + 5**
- ▶ be specified by another variable, e.g. **Right**.

Modify both **Left** and **Right** inside **repeat**.



# MODULE 6: INVESTIGATION 1



## My **Investigation 1** check list:

- ☐ I recreated different emergent rectangles by identifying the maximum/minimum x and y coordinates.
- ☐ **[Extension]** I built a script to create an emergent flag pattern.
- ☐ I envisaged a script that reflects an emergent shape in the x and y axis.
- ☐ I envisaged a script that would translate an emergent shape up, down, left and/or right.
- ☐ I created emergent shapes of different scale factors.
- ☐ **[Extension]** I simplified my jumping script to a single line.