

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**The coordinate grid.** Every point on the grid has two numbers: its  $x$  (how far across) and its  $y$  (how far up), written  $(x, y)$ . The middle, where the lines cross, is the **origin**  $(0, 0)$ . Right and up are positive; left and down are negative. A *turtle* sits on the grid and follows instructions to move around and draw.

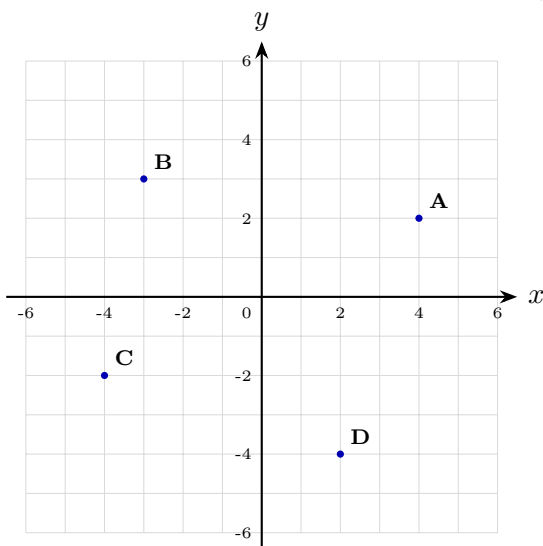
**This is exactly how Scratch works.** The Scratch stage is one big coordinate grid with  $(0, 0)$  in the middle:  $x$  runs from  $-240$  on the far left to  $240$  on the far right, and  $y$  from  $-180$  at the bottom to  $180$  at the top. The blocks go to  $x: y$ :, **change  $x$  by**, **change  $y$  by** and **move/turn** move a sprite around that grid — the very instructions you practise below.

**Command cheat sheet.** Write every answer using *only* these instructions — they are the real Scratch blocks. Fill the  $()$  slots with numbers.

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| <p>go to <math>x: (x) y: (y)</math></p> <p>change <math>x</math> by <math>(n)</math></p> <p>change <math>y</math> by <math>(n)</math></p> <p>move <math>(n)</math> steps</p> <p>turn right <math>(n)</math> degrees</p> <p>turn left <math>(n)</math> degrees</p> <p>pen up</p> <p>pen down</p> | <p>jump straight to the point <math>(x, y)</math></p> <p>move across: right is <math>+</math>, left is <math>-</math></p> <p>move up or down: up is <math>+</math>, down is <math>-</math></p> <p>go forward in the direction you are facing</p> <p>turn clockwise (changes facing, draws nothing)</p> <p>turn anticlockwise (changes facing, draws nothing)</p> <p>lift the pen: move without drawing</p> <p>put the pen down: draw as you move</p> |
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### Problem 1.

**Read the grid.** Write the coordinates  $(x, y)$  of each labelled point.



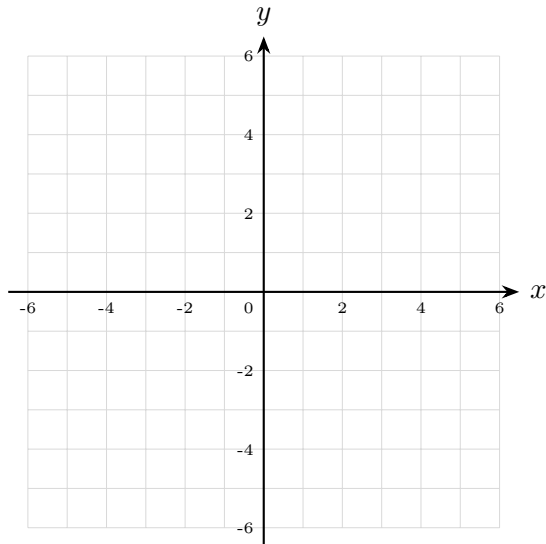
**A** = (\_\_\_\_, \_\_\_\_ )    **B** = (\_\_\_\_, \_\_\_\_ )    **C** = (\_\_\_\_, \_\_\_\_ )    **D** = (\_\_\_\_, \_\_\_\_ )

*Notice the signs: top-right is (+,+), top-left (-,+), bottom-left (-,-), bottom-right (+,-). Scratch points work the same way.*

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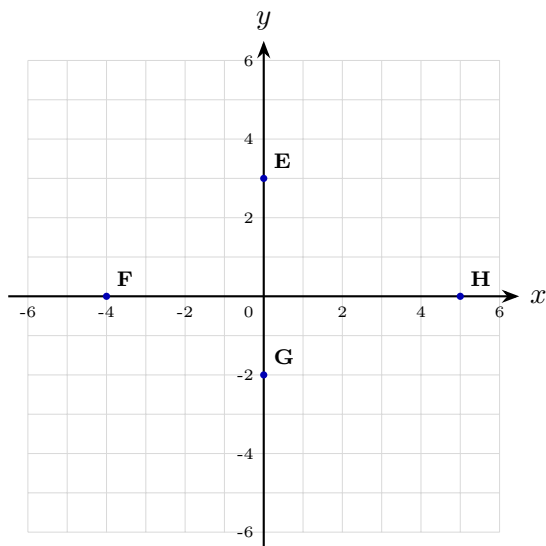
### Problem 2.

**Plot the points.** Mark and label these points on the grid: **P**= (2,4), **Q**= (-3,2), **R**= (-2,-4), **S**= (3,-1).



### Problem 3.

**Read the grid.** Write the coordinates ( $x, y$ ) of each labelled point.



**E** = (\_\_\_\_, \_\_\_\_ )    **F** = (\_\_\_\_, \_\_\_\_ )    **G** = (\_\_\_\_, \_\_\_\_ )    **H** = (\_\_\_\_, \_\_\_\_ )

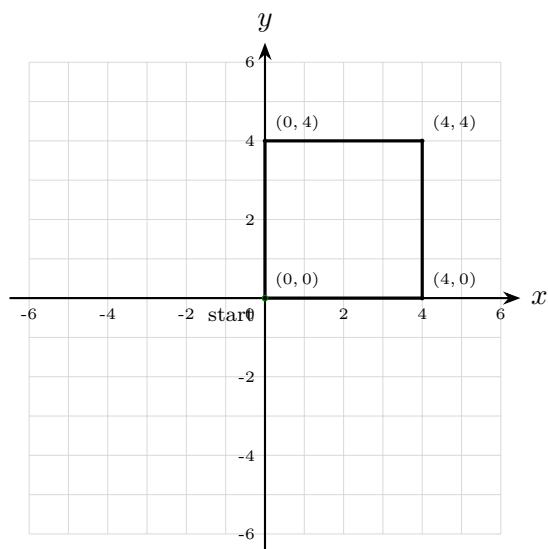
*These points sit on a line, not in a corner — so one of their two numbers is 0.*

*A point on the up-down line has  $x = 0$ ; a point on the across line has  $y = 0$ . The origin  $(0,0)$  is on both.*

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#### Problem 4.

**Instruct the turtle.** The turtle starts at the origin with its pen down. Write `go to` instructions to draw this square, visiting each corner in order.



*Write your instructions here:*

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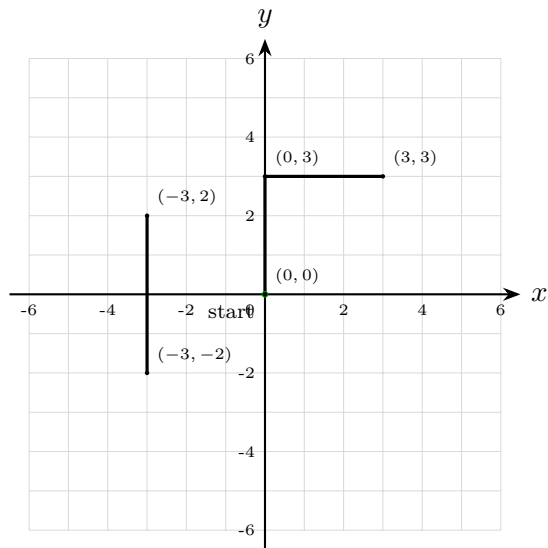
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#### Problem 5.

**Instruct the turtle.** Draw these two separate strokes. The turtle's pen must be lifted while it jumps from the end of the first stroke to the start of the second.

*Use **pen up** before the jump and **pen down** after it, or the jump will leave an unwanted line.*



Write your instructions here:

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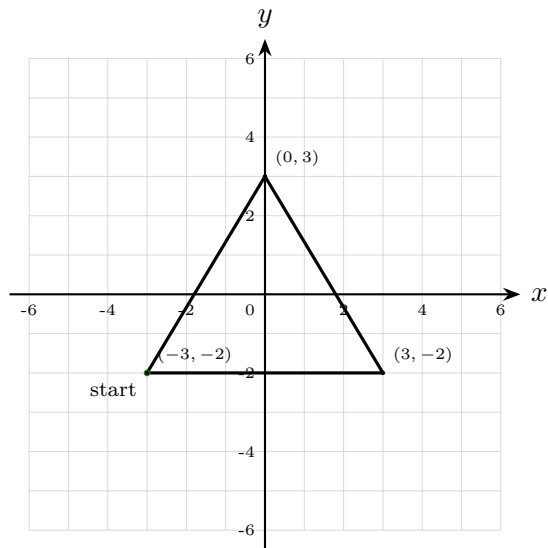


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A dashed line in the answer key means the pen was up — the turtle moved but drew nothing.

### Problem 6.

**Instruct the turtle.** Starting at the bottom-left spot, write `go to` instructions to visit the three treasure spots and return to the start, drawing the triangle.



Write your instructions here:

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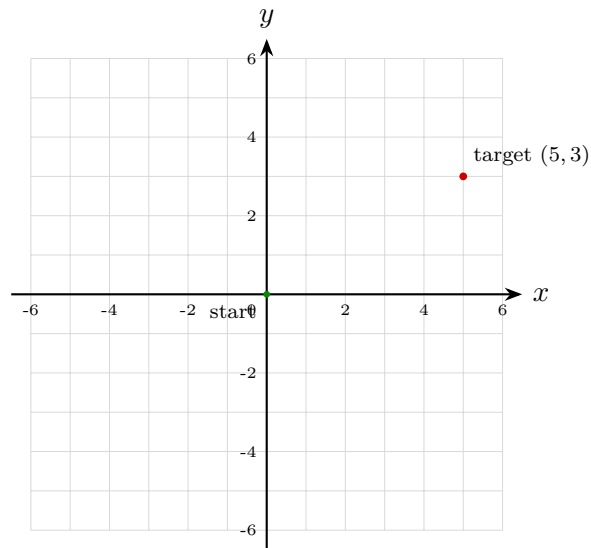
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### Problem 7.

**Instruct the turtle.** The turtle is at the origin. Write `change x` by and `change y` by instructions to move it to the target.

*change adds to where the turtle already is. How far across is the target, and how far up?*



Write your instructions here:

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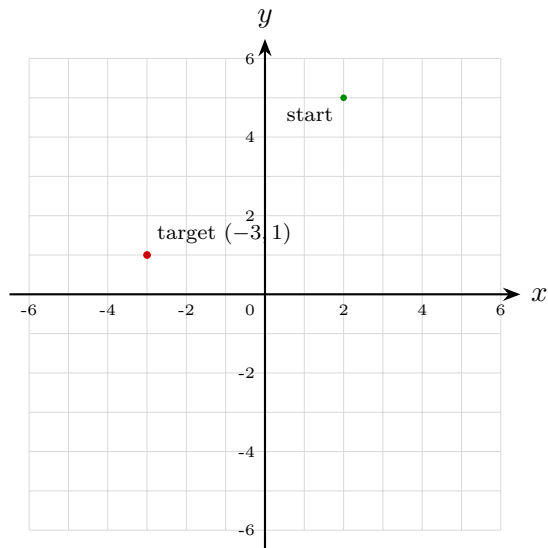
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### Problem 8.

**Instruct the turtle.** The turtle starts at  $(2, 5)$ . Write **change** instructions to move it to the target. You will need negative numbers.

*To move left, change  $x$  by a negative number; to move down, change  $y$  by a negative number.*



Write your instructions here:

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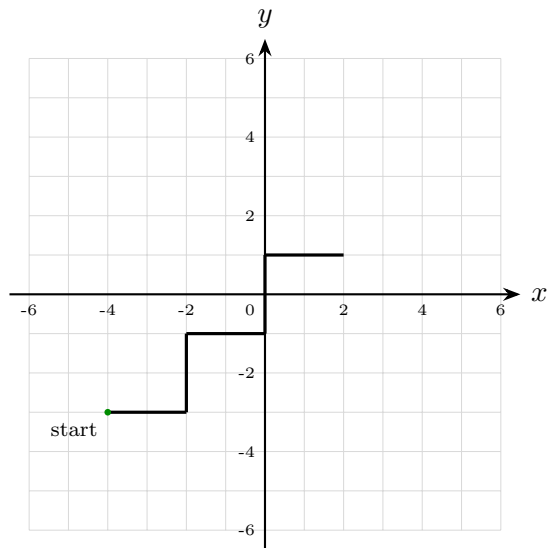
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### Problem 9.

**Instruct the turtle.** The turtle starts at  $(-4, -3)$  with its pen down. Write `change x by` / `change y` by instructions to draw this staircase.



Write your instructions here:

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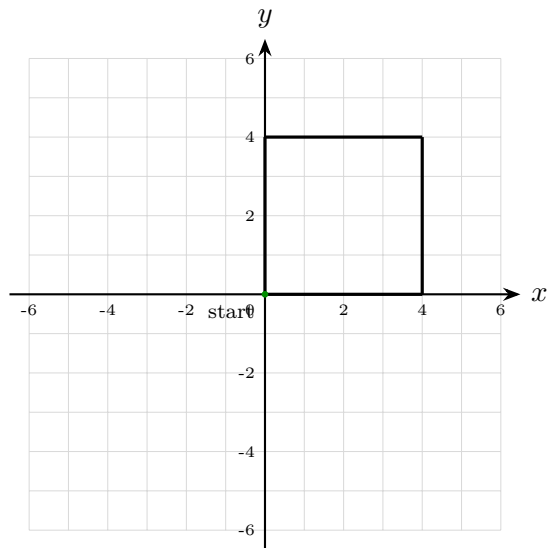


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### Problem 10.

**Instruct the turtle.** This time use `move` and `turn` instead of `go to`. The turtle starts at the origin facing up. Write the instructions to draw this square.

*`move` goes forward in whatever direction the turtle is facing; `turn` changes that direction without drawing.*



Write your instructions here:

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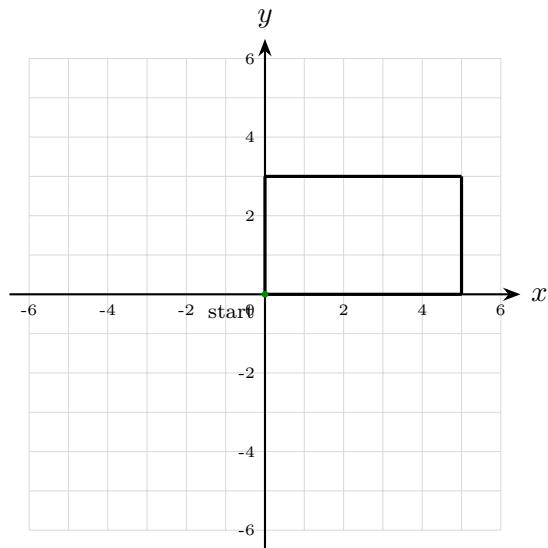
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### Problem 11.

**Instruct the turtle.** Using move and **turn**, draw this rectangle (5 across, 3 up). The turtle starts at the origin facing up.



Write your instructions here:

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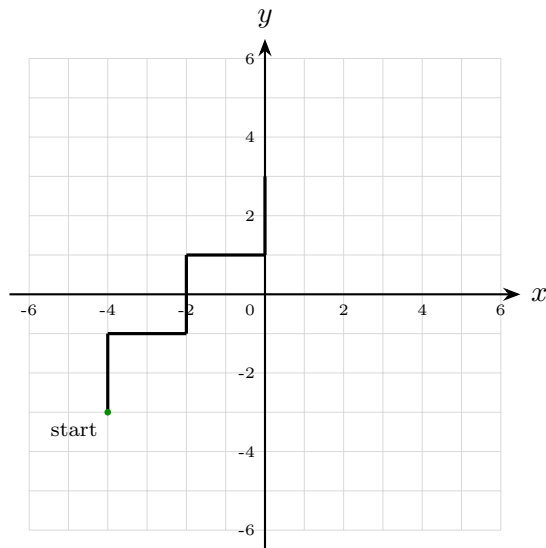


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### Problem 12.

**Instruct the turtle.** Using `move` and `turn`, draw these steps. The turtle starts at  $(-4, -3)$  facing up. Watch which way it must turn at each corner.

*Turning left then right then left keeps the turtle climbing in steps rather than closing a box.*



Write your instructions here:

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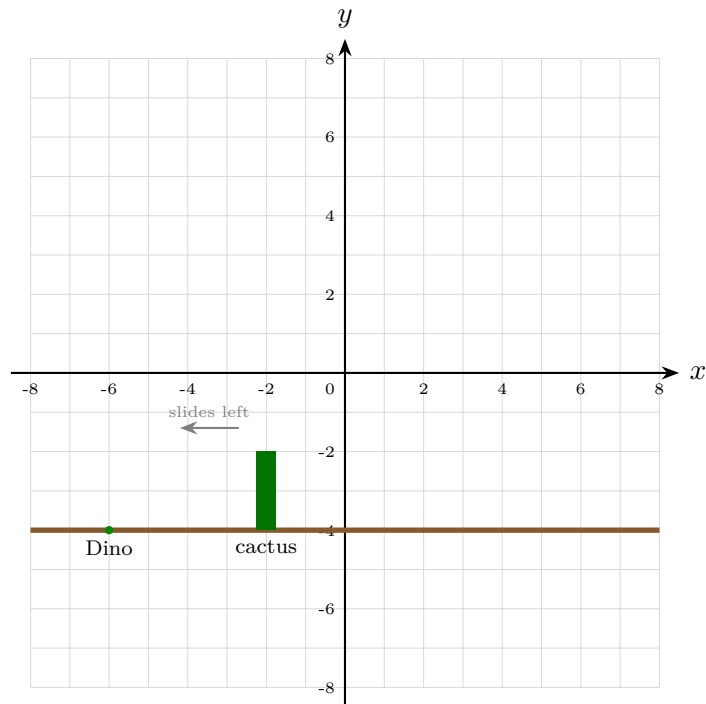


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### Problem 13.

**Instruct the turtle.** Here is a mini Scratch stage (1 square = 20 steps). The Dino rests on the floor; a cactus slides in from the right. Write the **change y by** instructions for the Dino's jump: go up 5, then come back down 5 to land on the floor.

*The Dino never moves across — it only changes y. The cactus passes underneath using **change x by** a negative number.*



Write your instructions here:

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In the real game the floor is at  $y = -80$  and the cactus spawns at  $x = 240$ . The Dino stays at one  $x$  and only **change  $y$  by** to jump, while the cactus slides left with **change  $x$  by**. You just wrote the heart of the game.

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