Worksheet - Reflection and translation

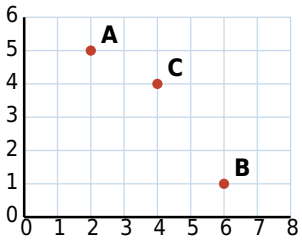
Year: Year 5 · 20

Show your working.

Question 1

Question 1 – Reading coordinates *(Section A · Practice)*

Look at the grid. Write down the coordinates of the points A, B and C.

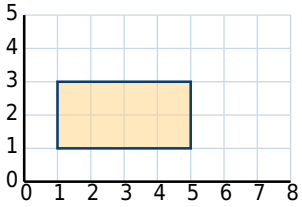


a. Point A
b. Point B
c. Point C
d. Which point is nearest to the origin (0, 0)?

Question 2

Question 2 – Plotting a shape *(Section A · Practice)*

A rectangle has corners (1, 1), (5, 1), (5, 3) and (? , 3).



a. Find the missing x value of the fourth corner.
b. What are the lengths of the sides?
c. Find the perimeter and area of the rectangle in squares.

Question 3

Question 3 – Translating points *(Section A · Practice)*

Write the coordinates of each point after the translation.

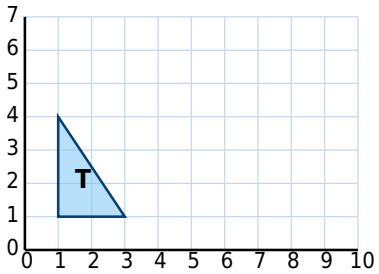
a. A(2, 3) moved 4 squares right and 2 squares up
b. A(7, 5) moved 3 squares left and 4 squares down
c. A(1, 1) moved 6 squares right

d. A(4, 6) moved 2 squares left and 5 squares down

Question 4

Question 4 – Translating a triangle *(Section A · Practice)*

A triangle has corners (1, 1), (3, 1) and (1, 4).

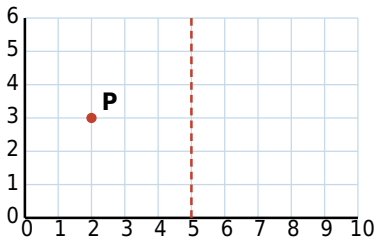


a. Write the new corners after a translation of 5 squares right and 2 squares up.
b. Write the new corners after a translation of 4 squares right.
c. Is the image the same size as the object? Explain.

Question 5

Question 5 – Reflect in a vertical line *(Section A · Practice)*

The mirror line is x = 5. Find the image of each point.

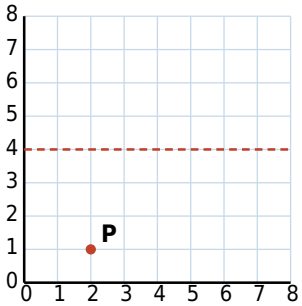


a. (2, 3)
b. (4, 5)
c. (1, 2)
d. (5, 1)

Question 6

Question 6 – Reflect in a horizontal line *(Section A · Practice)*

The mirror line is y = 4. Find the image of each point.

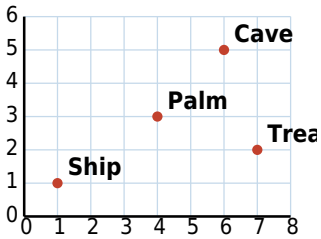


a. (2, 1)
b. (3, 2)
c. (5, 4)
d. (1, 6)

Question 7

Question 7 – Treasure map *(Section B · Real-life practice)*

Pirate Pete draws a treasure map on a grid. The ship is at (1, 1), the palm tree at (4, 3), the cave at (6, 5) and the treasure at (7, 2).



a. How many squares right and up must you move from the ship to reach the palm tree?
b. From the palm tree to the treasure, how many squares right and how many down?
c. Pete moves the treasure 2 squares left and 3 squares up. What are its new coordinates?
d. Which place is at the coordinates (6, 5)?

Question 8

Question 8 – Robot on the grid *(Section B · Real-life practice)*

A robot starts at (2, 2) on a grid. It follows these steps: right 4, up 3, left 2, down 1.

a. Write the robot's coordinates after each step.
b. What single translation takes the robot from the start to the finish?
c. The robot wants to return to the start. What translation is needed?
d. The robot is at the finish. It is reflected in the line x = 6. Where does it end up?

Question 9

Question 9 – A game of draughts *(Section B · Real-life practice)*

Tom and Zara play a board game on a grid. Tom's counter is at (2, 1) and Zara's counter is at (6, 5). The mirror line between them is x = 4.

a. How many squares is Tom's counter from the mirror line x = 4?
b. If Tom's counter is reflected in x = 4, where does it land?
c. Zara moves her counter 3 squares left and 2 squares down. Where does it land?
d. Are the two counters in the same place after these moves? Explain.

Question 10

Question 10 – Reflection in the lake *(Section B · Real-life practice)*

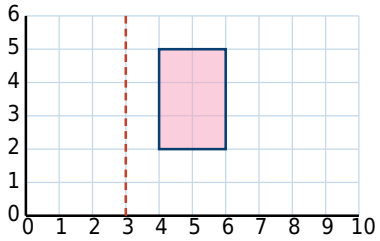
A tree stands next to a lake. The surface of the water is the mirror line y = 4 on a grid. The top of the tree is at (4, 7) and the base of the tree is at (4, 4) on the water line.

a. How high is the tree above the water line?
b. Where does the top of the tree appear in the reflection in the lake?
c. Where does the base of the tree appear in the reflection? Explain.
d. How long is the tree and its reflection together?

Question 11

Question 11 – Butterfly wing *(Section B · Real-life practice)*

One wing of a butterfly has corners at (4, 2), (6, 2), (6, 5) and (4, 5) on a grid. The other wing is the reflection of the first in the line x = 3.



a. How far is the corner (6, 2) from the line x = 3?
b. Write the coordinates of the reflected wing.
c. Which corners are the same distance from the mirror line?

Question 12

Question 12 – Kite design *(Section B · Real-life practice)*

Ali is designing a kite. The top half has corners (3, 4), (5, 4) and (4, 6). He reflects the top half in the line y = 4 to make the bottom half.

a. Which corners of the top half lie on the mirror line?

b. Find the corner of the bottom half that matches (4, 6).
c. Write all the corners of the whole kite in order.
d. What is the height of the whole kite from top to bottom?

Question 13

Question 13 – Moving the garden shed *(Section B · Real-life practice)*

On a plan the shed has corners (2, 1), (4, 1), (4, 3) and (2, 3). The gardener moves the shed 5 squares right and 3 squares up to give room for a patio.

a. Write the coordinates of the shed in its new position.
b. What is the area of the shed on the plan, in squares? Does it change after the move?
c. The shed is now reflected in the line x = 9 to make a second shed. Where are its corners?

Question 14

Question 14 – The football pitch plan *(Section B · Real-life practice)*

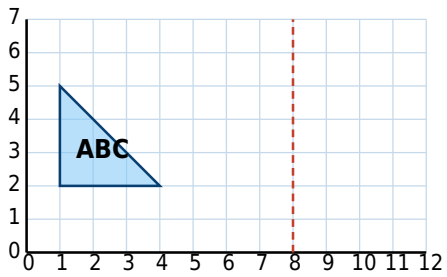
A football pitch is drawn on a grid. The goal posts are at (0, 3) and (0, 5). The coach reflects the goal in the line x = 6 to find the position of the other goal.

a. How far from the mirror line is each goal post of the first goal?
b. What are the coordinates of the other goal posts?
c. How wide is the pitch from one goal to the other?
d. The coach moves the first goal 1 square right. Where are the posts now?

Question 15

Question 15 – Triangle journey *(Section C · Problem solving)*

Triangle ABC has corners A(1, 2), B(4, 2) and C(1, 5). It is first translated 3 squares right and 1 square up to make triangle A'B'C'. Then A'B'C' is reflected in the line x = 8.



a. Write the corners of A'B'C'.
b. Write the corners after the reflection in x = 8.
c. Is the final triangle the same size as ABC? Explain.
d. Which single translation (no reflection) would take ABC to a triangle with the same corner positions as A'B'C'?

e. Does the final triangle face the same way as ABC? Explain.

Question 16

Question 16 – Missing coordinates *(Section C · Problem solving)*

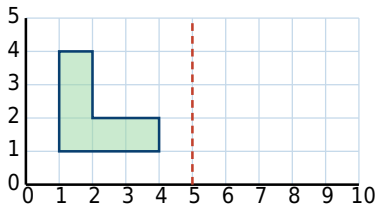
Otto has a puzzle about coordinates. Find the missing numbers.

a. The point (3, 4) is translated to (8, 6). Describe the translation.
b. The point (9, 7) is translated 4 left and 5 down. Find the image.
c. A point is reflected in x = 5 and its image is (8, 2). Find the original point.
d. A point is reflected in y = 3 and its image is (4, 1). Find the original point.
e. A triangle with corners (2, 2), (4, 2) and (3, 5) is translated so that (2, 2) goes to (6, 3). Find the other two corners.

Question 17

Question 17 – Designing a tile *(Section C · Problem solving)*

A designer makes a pattern from an L-shaped tile with corners (1, 1), (4, 1), (4, 2), (2, 2), (2, 4) and (1, 4). She makes a second copy by reflecting it in the line x = 5.

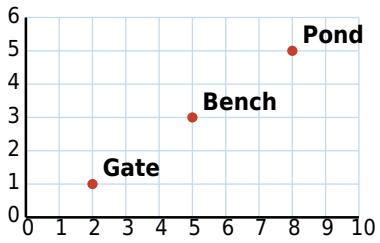


a. Write the corners of the reflected tile.
b. Which corners of the first tile are closest to the mirror line? How far away are they?
c. She now translates the reflected tile 1 square down. Write its new corners.
d. Are the two tiles together symmetrical about the line x = 5? Explain.

Question 18

Question 18 – Moving across the school field *(Section C · Problem solving)*

A plan of a school field has the gate at (2, 1). A path goes from the gate to the pond at (8, 5). A bench is at (5, 3).



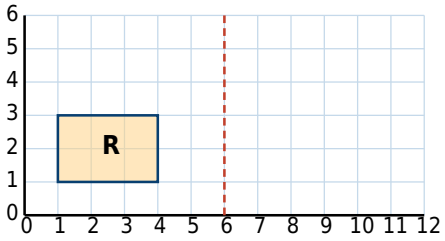
a. Describe the translation from the gate to the pond.

b. Is the bench on the path in a straight line from the gate to the pond? Check by moving 3 right and 2 up from the gate.
c. The caretaker reflects the pond in the line x = 5. Where is the reflected pond?
d. Another pond is made by translating the first pond 2 squares left and 4 squares down. Where is it?
e. Is the reflected pond in (c) in the same place as the translated pond in (d)? Explain.

Question 19

Question 19 – The rectangle and its images *(Section C · Problem solving)*

A rectangle has corners (1, 1), (4, 1), (4, 3) and (1, 3). It is reflected in the line x = 6 and the image is then translated 2 squares up.



a. Find the perimeter and the area of the rectangle in squares.
b. Write the corners of the reflected rectangle.
c. Write the corners after the translation 2 squares up.
d. Find the perimeter and the area of the final rectangle. What do you notice?
e. Which corner of the original is nearest to the mirror line? How far is it?

Question 20

Question 20 – Challenge: two reflections *(Section D · Challenge)*

Otto reflects the point P(2, 3) in the line x = 5 and then reflects the image in the line x = 8.

a. Find the image of P after the first reflection.
b. Find the image after the second reflection.
c. Describe the single translation that takes P to the final image.
d. What do you notice about the translation and the distance between the two mirror lines?