Worksheet - Four-quadrant coordinates and transformations

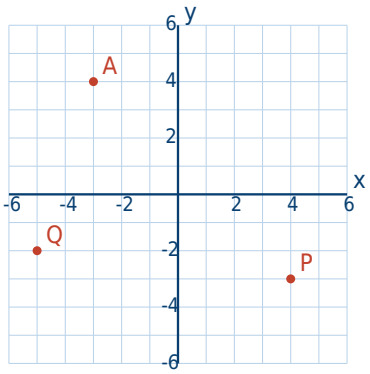
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Show your working.

Question 1

Question 1 – Quadrants and positions *(Section A · Skills practice)*

The coordinate grid has four quadrants numbered 1 to 4 anticlockwise, starting at the top right. Look at the grid and answer the questions.

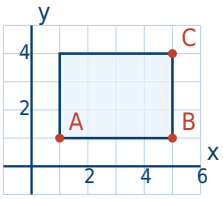


a. In which quadrant is the point A(−3, 4)?
b. Point P is 4 squares right and 3 squares down from the origin. Write its coordinates.
c. Describe how to get from the origin to the point Q(−5, −2).
d. Write the coordinates of a point in quadrant 1 and a point in quadrant 3.

Question 2

Question 2 – Finding the fourth corner *(Section A · Skills practice)*

Three corners of each shape are given. Find the coordinates of the fourth corner.



a. A rectangle has corners A(1, 1), B(5, 1) and C(5, 4).
b. A square has corners (−2, −2), (2, −2) and (2, 2).
c. A parallelogram has corners (0, 0), (4, 0) and (6, 3). Find the fourth corner.

Question 3

Question 3 – Translating points *(Section A · Skills practice)*

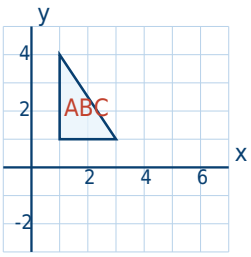
A translation slides a point without turning it. Find the image of each point.

a. Translate (2, 3) by 4 to the right and 5 down.
b. Translate (−3, 1) by 2 to the left and 4 up.
c. Translate (−4, −1) by 5 to the right and 3 up.
d. Describe the translation that moves (2, 5) to (−1, 3).

Question 4

Question 4 – Translating a shape *(Section A · Skills practice)*

Triangle ABC has corners A(1, 1), B(3, 1) and C(1, 4). It is translated 3 to the right and 2 down.



a. Write the coordinates of the new corners A′, B′ and C′.
b. Does the translation change the size or the shape of the triangle? Explain.
c. Work out the area of the triangle ABC and of the image.

Question 5

Question 5 – Reflecting points *(Section A · Skills practice)*

Reflect each point in the axis given. Remember that a point and its reflection are the same distance from the mirror line.

a. Reflect (3, 2) in the y-axis.
b. Reflect (3, 2) in the x-axis.
c. Reflect (−4, −1) in the x-axis.
d. Reflect (−4, −1) in the y-axis.
e. The point A(−2, 3) is reflected and its image is (−2, −3). In which axis was it reflected?

Question 6

Question 6 – Distances on the grid *(Section A · Skills practice)*

Find each distance by counting squares or by subtracting the coordinates. Take care when you cross the axes.

a. From (−4, 3) to (2, 3).
b. From (5, −2) to (5, 4).
c. From (−3, −1) to (2, −1).
d. From (0, −6) to (0, 5).

Question 7

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

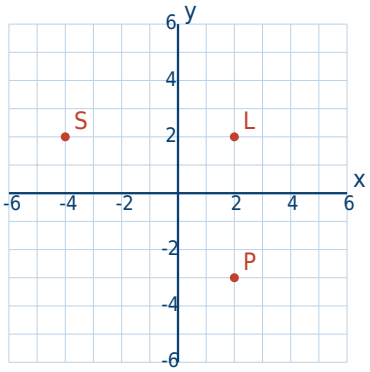
On a treasure map the starting point is at (−2, −3). Each square on the map is 10 m wide.

a. You move 5 squares to the right and 6 squares up. Where do you end up?
b. From there you move 4 squares to the left and 7 squares down. Where are you now?
c. Describe how to get back to the start from your final position.
d. How far in metres are you from the start, measured along the x-axis and then along the y-axis?

Question 8

Question 8 – The playground plan *(Section B · Real-life practice)*

A playground is planned on a coordinate grid. One unit on the grid stands for 5 m. The swings are at S(−4, 2), the slide is at L(2, 2) and the sandpit is at P(2, −3).



a. How many units is it from the swings to the slide? How far is it in metres?
b. How far is it from the slide to the sandpit in metres?
c. The swings, the slide and the sandpit are three corners of a rectangle. Find the fourth corner.
d. A fence goes all the way round this rectangle. Work out the length of the fence in metres.

Question 9

Question 9 – The rectangular garden *(Section B · Real-life practice)*

The corners of a rectangular garden on a plan are (−3, −1), (2, −1), (2, 3) and (−3, 3).

Each unit on the plan is 2 m.

a. Work out the width and the height of the garden on the plan.
b. Work out the real width and real height in metres.
c. Work out the perimeter of the garden in metres and the cost of a fence at £7.50 per metre.
d. Work out the real area of the garden in square metres.

Question 10

Question 10 – Flying the drone *(Section B · Real-life practice)*

A drone starts at the origin (0, 0) on a grid. Each unit is 10 m. It makes three moves: 6 right and 4 up, then 9 left and 3 down, then 2 right and 5 down.

a. Write the position of the drone after each move.
b. How far is the drone from the starting point (horizontally and vertically) at the end?
c. The pilot wants the drone to return to (0, 0). Describe the move that is needed.
d. What is the total distance flown in units, counting every horizontal and vertical step? Convert this into metres.

Question 11

Question 11 – Ships on a grid *(Section B · Real-life practice)*

Hana and Omar play a game of ships on a four-quadrant grid. Hana has ships at (−2, 1), (3, −2) and (0, 4).

a. Omar calls out (3, 2). Is it a hit or a miss? Explain.
b. Omar calls (−2, −1). Is this a hit? He says "it is the reflection of one of the ships in the x-axis". Which ship?
c. Omar then calls the reflection of (3, −2) in the y-axis. What are the coordinates and is it a hit?
d. Hana moves the ship at (0, 4) down by 7 and then 3 to the left. Where is it now?

Question 12

Question 12 – The town map *(Section B · Real-life practice)*

A map of a town uses a coordinate grid. Each unit on the grid stands for 100 m.

Place	Coordinates
School	(−4, 2)
Library	(2, 2)
Park	(2, −3)
Swimming pool	(−4, −3)

a. How far is it from the school to the library, in metres?
b. How far is it from the library to the park, in metres?
c. The four places are the corners of a rectangle. Work out its perimeter in metres.
d. A bus drives from the school to the library, then to the park, then to the swimming pool. What is the total length of this route in metres?

Question 13

Question 13 – The butterfly pattern *(Section B · Real-life practice)*

Amy is making a butterfly pattern. She draws one wing with corners at (1, 1), (4, 2), (3, 5) and (1, 3), and then reflects it in the y-axis to make the other wing.

a. Write the coordinates of the corners of the second wing.
b. What do you notice about the y-coordinates of the corresponding corners?
c. Amy then reflects the pair of wings in the x-axis. Write the coordinates of the corners of the first wing's image in the x-axis.
d. How many wings are in her complete pattern?

Question 14

Question 14 – The robot vacuum cleaner *(Section B · Real-life practice)*

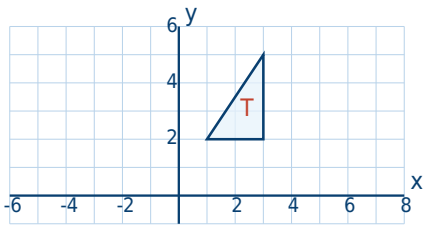
A robot vacuum cleaner starts at the point (−5, −4) on a plan of a room. It then follows these instructions: move 6 right, 3 up, 4 left and 5 up.

a. Where does the robot end up?
b. The robot has to stop 2 units from the wall at y = 6. Has it done so? Explain.
c. Write one single translation that would take the robot from the start to the end.
d. If each unit is 50 cm, how far has the robot moved in total, counting every step?

Question 15

Question 15 – Reflect, then translate *(Section C · Problem solving)*

Triangle T has corners (1, 2), (3, 2) and (3, 5). It is reflected in the y-axis to give triangle R. Then R is translated 6 to the right to give triangle S.



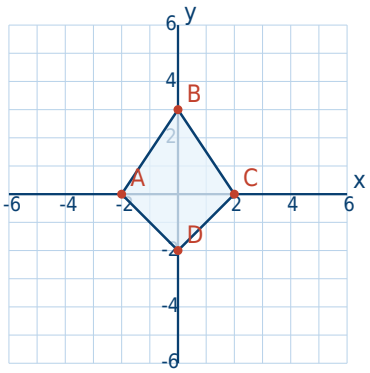
a. Write the coordinates of the corners of R.
b. Write the coordinates of the corners of S.
c. What is the area of triangle T? Does the area of S change?
d. Are T and S in the same position, or is one a reflection of the other? Explain using

the coordinates.

Question 16

Question 16 – The kite *(Section C · Problem solving)*

A kite has corners at A(−2, 0), B(0, 3), C(2, 0) and D(0, −2).



a. Work out the lengths of the two diagonals, AC and BD.
b. The area of a kite is half the product of its diagonals. Find the area of the kite.
c. Reflect the kite in the x-axis. Write the coordinates of the new corners A′, B′, C′ and D′.
d. Translate the original kite 5 units to the right and 1 up. Write the new corners.
e. Do the original kite and its reflection in the x-axis overlap? Explain.

Question 17

Question 17 – Delivery routes *(Section C · Problem solving)*

A delivery van starts at a shop at the origin (0, 0) on a map. Each unit on the map is 1 km. The van delivers parcels to four customers: A(3, 4), B(−2, 5), C(−4, −3) and D(2, −4).

a. Which customers are in quadrant 1, 2, 3 and 4?
b. The van drives along the grid lines. How far is it from the shop to A, to B, to C and to D, counting along the x-axis and then the y-axis?
c. The van goes A, then B, then C, then D and then back to the shop, driving along the grid lines. What is the total distance?
d. The van uses 1 litre of fuel for 8 km. How many litres does the whole route use?

Question 18

Question 18 – Which transformation? *(Section C · Problem solving)*

Triangle T has corners (1, 1), (3, 1) and (1, 3). Each of these triangles is the image of T under one transformation. Say which transformation it is.

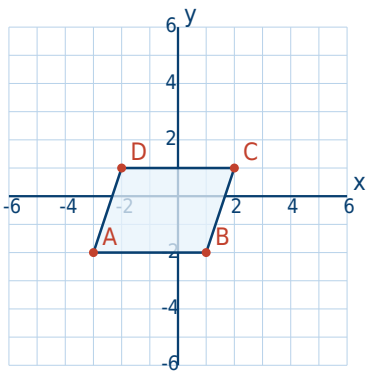
Image	Corners
P	(−1, 1), (−3, 1), (−1, 3)
Q	(1, −1), (3, −1), (1, −3)
R	(4, 0), (6, 0), (4, 2)
S	(−2, 2), (0, 2), (−2, 4)

a. Describe the transformation that maps T onto P.
b. Describe the transformation that maps T onto Q.
c. Describe the transformation that maps T onto R.
d. Describe the transformation that maps T onto S.
e. Which of P, Q, R and S are in the same orientation as T (not a mirror image)?

Question 19

Question 19 – The parallelogram *(Section C · Problem solving)*

A parallelogram ABCD has corners A(−3, −2), B(1, −2), C(2, 1) and D(−2, 1).



a. Work out the length of the base AB and the perpendicular height of the parallelogram.
b. Work out the area of the parallelogram.
c. Translate the parallelogram 4 to the right and 3 up. Write the new corners.
d. Reflect ABCD in the x-axis. Write the new corners.
e. Does the area change in parts (c) and (d)? Explain.

Question 20

Question 20 – Challenge: reflect and translate *(Section D · Challenge)*

Triangle T has corners (1, 2), (3, 2) and (3, 5). The triangle is reflected in the y-axis and then translated 6 units to the right. Aisha says "the final triangle is a reflection of T in a mirror line". Is she right?

a. Write the corners of the final triangle S.
b. Which vertical line is the mirror line that maps T onto S?
c. The triangle is now reflected in the x-axis. Write the new corners of S′.

d. How many of the points of triangle S have the same x-coordinate as a point of triangle T?