Coordinates: location and translation — Teacher answers

Year 7, lower volume • text pp. 39–50 • textbook lessons 20–25

Use the worked and guided tasks selectively. The eight core paper tasks are prerequisites, independent tasks and exits; further practice and extensions are optional.

Ordinary route: prerequisites 4, short inquiry 5, worked/guided 8, independent 15, correction 5, exit 3 minutes. Advanced route: inquiry 18, organise 4, selected practice 13, exit 5 minutes.

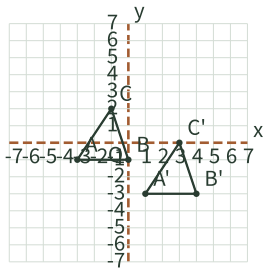
Prerequisites: Use signed numbers, horizontal/vertical direction, ordered pairs and a stated unit length.

Ordinary route: use the first fixed case for the five-minute demonstration. Advanced route: complete the full investigation.

Inquiry and discussion: 18 minutes in the routes lab: set start (−1,−2), target (2,2). Predict endpoint and route length for RRRUUUU and UUUURRR (3 min). Run both, then insert the return pair LR before RRRUUUU, changing only the route (7 min). Record net coordinate change (3,4), common endpoint, and lengths 7,7,9; explain why a return pair changes length but not endpoint (5 min). Give a lower-bound explanation of 7 steps when movement is restricted to horizontal/vertical grid edges (3 min); this is not unrestricted straight-line distance.

Worked example 1

Translate $A(-3,-1)$, $B(0,-1)$, $C(-1,2)$ 4 units right, then 2 units down. Give every image coordinate and plot it.



Use the labelled axes and unit grid.

Reference answer

$A'(1,-3)$, $B'(4,-3)$, $C'(3,0)$.

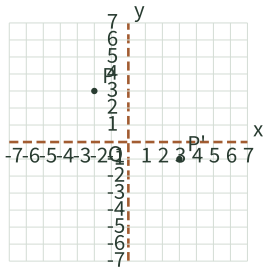
1. Every point uses the same change $(x,y)\mapsto(x+(4),y+(-2))$.
2. The image coordinates are $A'(1,-3)$, $B'(4,-3)$, $C'(3,0)$.
3. Check that corresponding coordinate differences all equal $(4,-2)$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Guided attempt 2

Translate $P(-2,3)$ 5 units right, then 4 units down. Give every image coordinate and plot it.

1. Horizontal coordinate: $x' = -2+5 = \square$.
2. Vertical coordinate: $y' = 3-4 = \square$.
3. Write $P' = (\square,\square)$ and plot it in the correct quadrant.



Use the labelled axes and unit grid.

Reference answer

$P'(3,-1)$.

1. Every point uses the same change $(x,y)\mapsto(x+(5),y+(-4))$.
2. The image coordinates are $P'(3,-1)$.
3. Check that corresponding coordinate differences all equal $(5,-4)$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Prerequisite 3

Locate $P(-3, 2)$: which quadrant?

A. Quadrant III.
B. Quadrant IV.
C. Quadrant II.
D. Quadrant I.

Reference answer

Quadrant II.

1. Read the horizontal coordinate first, then the vertical coordinate.
2. The sign pair is (−,+); match it to the quadrant definition.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Prerequisite 4

Locate $P(4, 0)$: on which axis or at the origin?

A. On the x-axis.
B. In a quadrant.
C. No location is determined.

Reference answer

On the x-axis.

1. Read the horizontal coordinate first, then the vertical coordinate.
2. A zero second coordinate puts a point on the x-axis; a zero first coordinate puts it on the y-axis. Both zero gives the origin.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 5

Locate $P(-4, -2)$: which quadrant?

A. Quadrant III.
B. Quadrant I.
C. Quadrant II.
D. Quadrant IV.

Reference answer

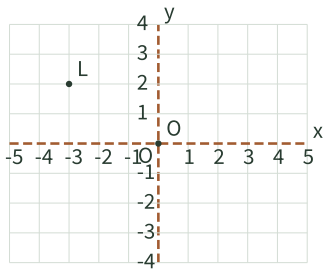
Quadrant III.

1. Read the horizontal coordinate first, then the vertical coordinate.
2. The sign pair is (−,−); match it to the quadrant definition.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 6

On a map, O is the school; east is positive x, north positive y, and one unit is 100 m. A library is 300 m west and 200 m north of the school. Give its coordinates.



Use the labelled axes and unit grid.

Reference answer

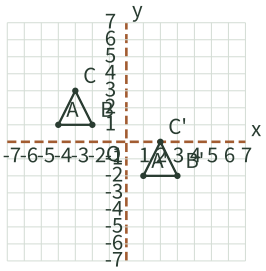
$(-3, 2)$.

1. West means a negative horizontal coordinate: −300/100=−3.
2. North gives positive vertical coordinate 200/100=2.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 7

Translate $A(-4, 1)$, $B(-2, 1)$, $C(-3, 3)$ 5 units right, then 3 units down. Give every image coordinate and plot it.



Use the labelled axes and unit grid.

Reference answer

$A'(1, -2)$, $B'(3, -2)$, $C'(2, 0)$.

1. Every point uses the same change $(x, y) \mapsto (x + (5), y + (-3))$.
2. The image coordinates are $A'(1, -2)$, $B'(3, -2)$, $C'(2, 0)$.
3. Check that corresponding coordinate differences all equal $(5, -3)$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Independent practice 8

A(−1,2) becomes A′(3,−1). Under the same translation, find the image of B(2,4).

Reference answer

$B'(6, 1)$

1. A changes by (4,−3).
2. Apply the same change to B: (2+4,4−3)=(6,1).

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Exit question 9

Locate $P(0, -5)$: on which axis or at the origin?

A. In a quadrant.
B. No location is determined.
C. On the y-axis.

Reference answer

On the y-axis.

1. Read the horizontal coordinate first, then the vertical coordinate.
2. A zero second coordinate puts a point on the x-axis; a zero first coordinate puts it on the y-axis. Both zero gives the origin.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Exit question 10

Translate $P(2, -3)$ 4 units left, then 2 units up. Give every image coordinate and plot it.

Reference answer

$P'(-2, -1)$.

1. Every point uses the same change $(x, y) \mapsto (x + (-4), y + (2))$.
2. The image coordinates are $P'(-2, -1)$.
3. Check that corresponding coordinate differences all equal $(-4, 2)$.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 11

Locate $P(2, 5)$: which quadrant?

A. Quadrant III.
B. Quadrant IV.
C. Quadrant I.
D. Quadrant II.

Reference answer

Quadrant I.

1. Read the horizontal coordinate first, then the vertical coordinate.
2. The sign pair is (+,+); match it to the quadrant definition.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 12

Locate $P(3, -4)$: which quadrant?

A. Quadrant I.
B. Quadrant II.
C. Quadrant III.
D. Quadrant IV.

Reference answer

Quadrant IV.

1. Read the horizontal coordinate first, then the vertical coordinate.
2. The sign pair is (+,−); match it to the quadrant definition.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 13

Locate $P(0,0)$: on which axis or at the origin?

A. At the origin.
B. In a quadrant.
C. No location is determined.

Reference answer

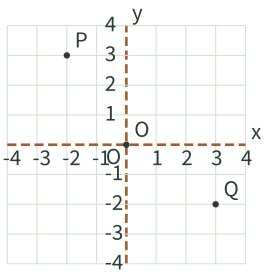
At the origin.

1. Read the horizontal coordinate first, then the vertical coordinate.
2. A zero second coordinate puts a point on the x-axis; a zero first coordinate puts it on the y-axis. Both zero gives the origin.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Further practice 14

Plot P(−2,3) and Q(3,−2). Explain why the points differ.



Use the labelled axes and unit grid.

Reference answer

P is in quadrant II; Q is in quadrant IV. Ordered coordinates cannot be interchanged.

1. Move horizontally first, then vertically.
2. P uses negative x, positive y; Q uses positive x, negative y.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Extension 15

From (−1,−2), walk right 4, left 1, up 3 and down 2 grid steps. Find the endpoint and total grid-route length.

Reference answer

Endpoint (2,−1); route length 10 grid units.

1. Net horizontal and vertical changes are (3,1).
2. Endpoint is (−1+3,−2+1)=(2,−1); all steps count toward 4+1+3+2=10.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.

Extension 16

In a map with the same east/north directions and unit, a park is (2,3) relative to the old origin O. The new origin is the old point (1,−1). Find the park coordinates relative to the new origin.

Reference answer

$(1,4)$

1. Subtract the new origin coordinates from the old park coordinates.
2. (2−1,3−(−1))=(1,4). The park itself has not moved.

- Use the given conditions and show a justified intermediate step.
- State and check the requested result accurately.