Translation: matching points and invariant lengths — Teacher answers

Year 7, lower volume • text pp. 25–28 • textbook lessons 13–14

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.

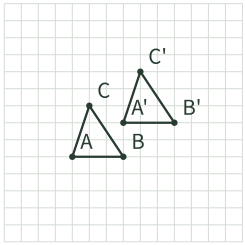
Prerequisites: Count equal grid squares, recognise direction, match labelled vertices and identify a midpoint; coordinates are not required.

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

Inquiry and discussion: 18 minutes on squared paper: use the labelled triangle ABC in the guided grid, without coordinate notation. Predict the image after moving every vertex right 2, down 3 (3 min), then construct and match all three vertices and edges (6 min). Keep A and B moves unchanged but move C right 3 instead of 2; compare whether one translation still describes the result (4 min). Restore the common move and compare lengths, angles and a marked midpoint (3 min). Explain why same direction alone is insufficient and why the whole figure must share one direction-and-distance move (2 min).

Worked example 1

Translate every labelled point on the squared grid 3 squares right, then 2 squares up. Mark the corresponding image points and join matching edges.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

Every image is 3 squares right, then 2 squares up from its original point; the teacher image shows the labelled positions.

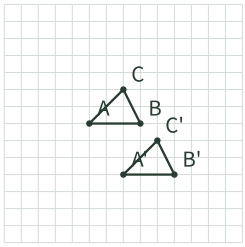
1. Use one horizontal move of 3 squares and one vertical move of 2 squares, in the stated directions.
2. Repeat this move at every labelled point, then match original and image labels.
3. Corresponding moves must have the same direction and number of squares; matching lengths and angles remain unchanged.

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

Guided attempt 2

Translate every labelled point on the squared grid 2 squares right, then 3 squares down. Mark the corresponding image points and join matching edges.

1. For A′: right 2 squares, down ____ squares.
2. For B′: right ____ squares, down 3 squares.
3. For C′: complete the same two moves; mark A′,B′,C′ and join them in matching order.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

Every image is 2 squares right, then 3 squares down from its original point; the teacher image shows the labelled positions.

1. Use one horizontal move of 2 squares and one vertical move of 3 squares, in the stated directions.
2. Repeat this move at every labelled point, then match original and image labels.
3. Corresponding moves must have the same direction and number of squares; matching lengths and angles remain unchanged.

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

Prerequisite 3

Which idealised motion is a translation of the whole object?

A. A clock hand turns about its centre.

B. A page folds over a crease.

C. A drawer slides straight out without turning.

Reference answer

A drawer slides straight out without turning.

1. A translation has a common direction and distance for every point.
2. Sliding without turning meets this condition.

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

Prerequisite 4

A figure translates 4 grid units right. How many grid units right does each vertex move?

Reference answer

4.

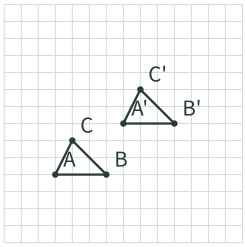
$$4$$

1. One translation applies to the whole figure.
2. Every vertex moves 4 units right.

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

Independent practice 5

Translate every labelled point on the squared grid 4 squares right, then 3 squares up. Mark the corresponding image points and join matching edges.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

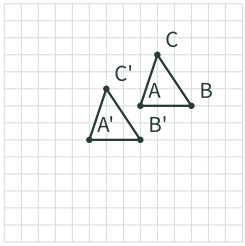
Every image is 4 squares right, then 3 squares up from its original point; the teacher image shows the labelled positions.

1. Use one horizontal move of 4 squares and one vertical move of 3 squares, in the stated directions.
2. Repeat this move at every labelled point, then match original and image labels.
3. Corresponding moves must have the same direction and number of squares; matching lengths and angles remain unchanged.

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

Independent practice 6

Translate every labelled point on the squared grid 3 squares left, then 2 squares down. Mark the corresponding image points and join matching edges.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

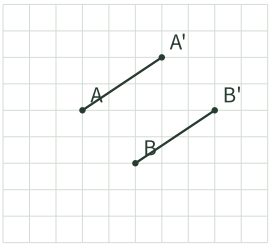
Every image is 3 squares left, then 2 squares down from its original point; the teacher image shows the labelled positions.

1. Use one horizontal move of 3 squares and one vertical move of 2 squares, in the stated directions.
2. Repeat this move at every labelled point, then match original and image labels.
3. Corresponding moves must have the same direction and number of squares; matching lengths and angles remain unchanged.

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

Independent practice 7

The given A→A′ move is 3 squares right and 2 up. Under the same translation, mark B′ on the squared grid.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

B′ is 3 squares right and 2 up from B.

1. Read the given A→A′ move as right 3, up 2.
2. Repeat exactly that move from B; the teacher diagram locates B′.

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

Independent practice 8

AB=6 cm and angle ABC=42°. A translation sends A,B,C to A′,B′,C′. State A′B′ and angle A′B′C′, with a reason.

Reference answer

6 cm and 42°; translation preserves lengths and angles.

1. Corresponding segments and angles have the same size.
2. Therefore the image length is 6 cm and image angle is 42°.

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

Exit question 9

One vertex moves right 2 units, another right 3 units. Can these be corresponding moves of one translation?

A. Yes; both move right.

B. Yes; lengths always change.

C. No; the displacement is not common.

Reference answer

No; the displacement is not common.

1. Equal direction alone is insufficient.
2. A translation also requires equal distance, but 2 differs from 3.

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

Exit question 10

The whole figure moves 3 squares right, then 1 squares down. State how its point P must move.

Reference answer

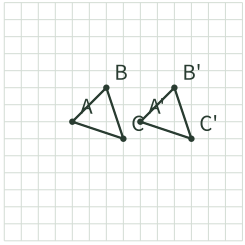
Every image is 3 squares right, then 1 squares down from its original point; the teacher image shows the labelled positions.

1. Use one horizontal move of 3 squares and one vertical move of 1 squares, in the stated directions.
2. Repeat this move at every labelled point, then match original and image labels.
3. Corresponding moves must have the same direction and number of squares; matching lengths and angles remain unchanged.

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

Further practice 11

Translate every labelled point on the squared grid 4 squares right.
Mark the corresponding image points and join matching edges.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

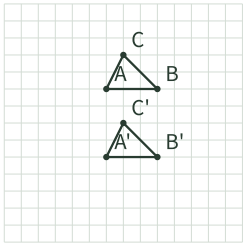
Every image is 4 squares right from its original point; the teacher image shows the labelled positions.

1. Use one horizontal move of 4 squares and one vertical move of 0 squares, in the stated directions.
2. Repeat this move at every labelled point, then match original and image labels.
3. Corresponding moves must have the same direction and number of squares; matching lengths and angles remain unchanged.

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

Further practice 12

Translate every labelled point on the squared grid 4 squares down.
Mark the corresponding image points and join matching edges.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

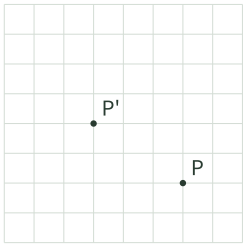
Every image is 4 squares down from its original point; the teacher image shows the labelled positions.

1. Use one horizontal move of 0 squares and one vertical move of 4 squares, in the stated directions.
2. Repeat this move at every labelled point, then match original and image labels.
3. Corresponding moves must have the same direction and number of squares; matching lengths and angles remain unchanged.

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

Further practice 13

P′ is marked on the squared grid after a translation left 3 and up 2. Mark the original point P.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

P lies 3 squares right and 2 down from P′.

1. Reverse each direction: right 3 and down 2.
2. Start at P′ and make that reverse move; moving forward again must return to P′.

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

Further practice 14

M is the midpoint of AB. Under a translation, where is its image M′ relative to A′B′?

Reference answer

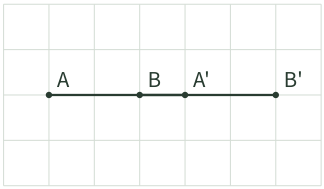
M′ is the midpoint of A′B′.

1. Collinearity and the two equal half-lengths are preserved.
2. Thus A′M′=M′B′ on A′B′.

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

Extension 15

A and B lie two squares apart on the same horizontal grid row. Both move right 3 squares to A′,B′. A learner says AA′ and BB′ must lie on two distinct parallel lines. Correct the claim.



Squared grid; each square is one unit. Use the stated directions and counts.

Reference answer

The displacement segments are equal and same-direction, but their supporting lines coincide here.

1. All four marked points lie on the same horizontal row.
2. Corresponding move segments are equal and same-direction, but here their supporting lines coincide.

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

Extension 16

Translate a figure right 4 and up 1, then left 2 and down 3. Give the single equivalent translation and explain why the figure does not rotate.

Reference answer

Right 2 squares and down 2; every vertex receives the same net move.

1. Horizontally, right 4 then left 2 gives right 2.
2. Vertically, up 1 then down 3 gives down 2. The same changes apply to every vertex.

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