

Coordinates and transformations

Pearson Edexcel GCSE Mathematics 1MA1 • L029
Foundation and Higher • 60 minutes • Lesson resources

REACH FOR THE STAR | GCSE MATHEMATICS

Transform points and shapes by translation, reflection and rotation, and describe each transformation completely.

No calculator needed. Check each coordinate separately; use squared distance from the centre if verifying a rotation numerically, but do not rely on a single vertex to describe a whole shape.

Follow the task-specific calculator guidance below. Write on the lines or replace them with typed answers. Attempt before reading intentional practice feedback.

Connect & Check

Object: starting shape. Image: transformed shape. Translation vector (a,b): move a horizontally, b vertically. Mirror line: reflection axis. Centre of rotation: fixed turning point.

R1

Plot $(-2,3)$: which direction is x from the origin?

R2

Find $-2+5$.

R3

How many degrees is a quarter turn?

Share | In pairs, predict the first step for this problem: Translation adds the same vector to every vertex. Reflection places each image the same perpendicular distance on the other side of the mirror. Rotation preserves distances from it Compare your reasons before using the worked model.

Present through worked examples

Translation adds the same vector to every vertex. Reflection places each image the same perpendicular distance on the other side of the mirror. Rotation preserves distances from its centre and turns all points through the same directed angle. These three transformations preserve lengths and angles.

D1

Model: $(1,2)+(3,-1)=(4,1)$. Translate $(-2,4)$ by $(5,-3)$.

D2

Model: reflect $(2,3)$ in $x=0$ to $(-2,3)$. Reflect $(-4,1)$ in $x=0$.

D3

Model: reflect $(4,2)$ in $x=1$ to $(-2,2)$. Reflect $(3,-1)$ in $x=1$.

D4

Model: 90° anticlockwise about origin sends $(2,1)$ to $(-1,2)$. Rotate $(3,-2)$ the same way.

Apply with less support

Plot vertices accurately; transform each one; join in the same order. Describe translation by a vector, reflection by a line equation, rotation by angle, direction and centre. Check lengths and orientation.

A1

Translate $(2, -1)$ by $(3, 0)$, $(0, 3)$, then $(3, 3)$, each from the original point.

A2

Triangle $A(1, 1)$, $B(3, 1)$, $C(1, 2)$: reflect in $y = 0$. Give image vertices and check one side.

A3

Triangle $A(1, 1)$, $B(3, 1)$, $C(1, 2)$ moves to $(-1, 4)$, $(1, 4)$, $(-1, 5)$. Describe the transformation.

Optional support: Change one coordinate at a time.

No calculator needed. Check each coordinate separately; use squared distance from the centre if verifying a rotation numerically, but do not rely on a single vertex to describe a whole shape.

Apply and extend reasoning

C1

A point lies on the mirror line. Does it move under reflection? Explain.

C2

Compare rotating $(2,3)$ by 90° clockwise and 90° anticlockwise about the origin. Explain why the direction must be stated.

Intentional practice feedback — read after attempting

A1: $(5, -1)$; $(2,2)$; $(5,2)$.

A2: $A'(1, -1)$, $B'(3, -1)$, $C'(1, -2)$; $AB=A'B'=2$.

A3: Translation vector $(-2,3)$.

C1: No; its perpendicular distance is zero.

C2: Clockwise $(3, -2)$; anticlockwise $(-3,2)$. They are different images.

Correct one response and explain your change. Stretch is available to either tier; temporary support needs do not determine entry tier.

Recall & Review through retrieval

Work without notes. Six retrieval points; this attempt does not establish mastery. Equivalent exact numeric forms are accepted. Where accuracy is requested, also state the requested form in your written work.

Q1 x of $(-2,4)+(5,-3)$

Q2 y of $(-2,4)+(5,-3)$

Q3 x of reflection of $(4,2)$ in $x=1$

Q4 y after $(3,-2)$ turns 90° anticlockwise at origin

Q5 Clockwise half-turn in degrees

Q6 Supplement of 112° , degrees

Intentional retrieval feedback

Q1 3; Q2 1; Q3 -2 ; Q4 3; Q5 180; Q6 68. Correct and retry tomorrow, then in one week.

Prove independently and improve

P1–P2: five minutes without notes; 4 marks. Your teacher reviews explanations and method marks.
P3 has no mark.

P1

Reflect $(5, -2)$ in $x=2$. Give image and explain the distance check. [2]

P2

Rotate $(2,4)$ through 90° clockwise about origin. State the image and rule. [2]

P3

Explain one corrected error. Record a fresh question and a date to check it without support.

Teacher feedback: _____

Fresh question and retry date: _____

Delayed independent evidence: _____

Prepare for the next lesson

L030: Enlargement and scale factors

F1

Tomorrow translate $(-3, 2)$ by $(4, -5)$.

F2

Before L030, double the distance from origin to $(2, 1)$ along the same ray. State the point.

Read and prepare

An enlargement multiplies every displacement from a fixed centre by a scale factor. It changes lengths by that factor while preserving shape. The centre need not be the origin.

Digital workbook: save locally where available; export a JSON backup before closing or moving the file. Restore only this lesson/version. Printing records answers, not mastery. Live browser checks remain pending; use Word/PDF if required.

Optional extension activities

Allow 10–15 minutes for learners who have secured the main practice. Show a method, explain a check and justify your conclusion.

Stretch

Translate $(-3, 4)$ by $(5, -7)$ and reflect the result in the x -axis.

Deep challenge

Do reflection and translation always commute? Use a point and transformations as a counterexample.

Recall & Review: feedback and extension integration

Lesson L029: Coordinates and transformations

Objective: Transform points and shapes by translation, reflection and rotation, and describe each transformation completely.

Timing for a 60-minute lesson

0-7 Connect & Check; 7-14 Share; 14-25 Present/model; 25-44 Apply route choice/practice; 44-52 independent exam-style check; 52-60 Recall & Review, WWW/EBI and next step.

Recall & Review evidence

At the end of the lesson, solve a fresh question without prompts, explain one check, correct one error and record the next practice step.

What Went Well (WWW)

I selected the correct geometric fact, theorem, formula or transformation and used a clear diagram with appropriate labels and units.

Even Better If (EBI)

I will name the fact or theorem, show the substitution or construction step and check whether the size, direction and units of the result are reasonable.

Integrated stretch and deep challenge

Stretch: Translate $(-3, 4)$ by $(5, -7)$ and reflect the result in the x-axis.

Deep challenge: Do reflection and translation always commute? Use a point and transformations as a counterexample.

My next-step response
