Mystery Shape on the Grid

Teacher		**Class**	Grade 5
Subject	Math	**Topic**	Coordinate plane
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn how axes, origin and ordered pairs locate points. They plot pairs in order to reveal a mystery shape.

Curriculum links

- Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates [1].
- Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis [1].
- Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation [1].

Learning objectives

- Students will build a coordinate system with axes meeting at origin zero zero.
- Students will plot and read ordered pairs in the first quadrant correctly.
- Students will interpret coordinate values of points in simple everyday map situations.

Success criteria

- I can label axes and origin zero zero on my grid correctly.
- I can plot an ordered pair by going across then up from origin.
- I can read coordinates and explain what each number means in context.

What students already know

2-minute check: show a 0-6 number line, point to 4 and ask what number it is and what comes after 5, then ask what we would need to show a spot up from the line.

Key words

x-axis	flat number line going left to right [10]
y-axis	tall number line going bottom to top [10]
origin	start spot where both lines show zero [1]
ordered pair	two numbers in brackets showing across first, then up [22]
x-coordinate	first number telling how far to go across [1]
y-coordinate	second number telling how far to go up [1]

Materials

- Slides 1-5, 7, 9-12 on screen

Before the lesson

- Print first-quadrant 0-6 grids, one per student plus spares, with every line numbered

- First-quadrant grids 0-6 on graph paper
- Pencils and crayons
- List of ordered pairs for mystery shape in plotting order
- Worksheet Task B and Worksheet Task F copies
- Mini whiteboards and markers
- Print Worksheet Task B for guided practice and Worksheet Task F for main activity
- Load Slides 1-5, 7, 9-12 and check screen and markers
- Number the mystery pairs in plotting order: (1,1), (5,1), (5,4), (1,4) and roof points
- Set out pencils, crayons and rulers for joining dots

Lesson outline

0–7 min **Starter** 7 min · Whole class

Spark curiosity about grid addresses and recall number lines.

YOU DO

1. Show Slide 1 title Where in the Grid? and Slide 2 grid photo and point to the two crossing number lines.
2. Say the hook to preview the mystery picture.
3. Ask what a single number line shows and where 0 sits on it.
4. Tell class today two lines cross to give every spot an address.

STUDENTS DO

1. Look at the grid photo and listen to the hook.
2. Answer recall questions about number lines and zero.
3. Predict what kind of picture boring pairs could make.

Say: Plot these boring number pairs in order, connect the dots, and a mystery picture pops out! A number line tells you where you are on one line. Today two number lines cross at zero to make a flat grid where every spot has its own numbers.

Ask: What does a number on a number line tell you? (How far along the line you are from zero.) · What if we need to show a spot that is both across and up? (We need two number lines, one across and one up.)

Check understanding: Thumbs up if you can point across then up in the air; if unsure, trace across then up on Slide 2 with a finger again.

Support: Let students point to 0-6 on a large number line strip on the board before looking at the grid.
Stretch: Ask students to suggest where a spot far across but low down would be on the grid photo.

Use: Slides 1-2

7–20 min **Teaching** 13 min · Whole class

Teach axes, origin and across-then-up plotting in the first quadrant.

YOU DO

1. Show Slides 3-4 and draw two perpendicular lines crossing at 0, labeling the across line x-axis and the up line y-axis [10].
2. Mark the crossing point as the origin (0,0), zero on both lines [1].
3. Model Slide 7 steps: start at the origin, walk right to the x-number, then go up to the y-number [1].
4. Do Worksheet Task A together, reading arrows on the axes and marking the dots.

STUDENTS DO

1. Copy labels x-axis, y-axis and origin (0,0) onto their own 0-6 grid.
2. Count aloud right then up as the teacher plots (4,3).
3. Complete Worksheet Task A by marking dots on the two axes.

Say: Two number lines cross at zero to make our system. The flat line is the x-axis and the tall line is the y-axis, and they meet at the origin (0,0) [1][10]. An ordered pair like (4,3) means go right 4 on the across line, then up 3 [1].

Worked example: Plot (4,3). 1. Start at the origin (0,0). 2. Walk right along the x-axis to 4. 3. Go up to 3. 4. Mark the dot and say (4,3) where 4 is across and 3 is up [1][3].

Ask: Where do the two axes cross and what numbers are there? (At the origin (0,0), zero on both lines [1].) · To plot (4,3), which way do you move first and how far? (First right 4 along the x-axis, then up 3 [1][3].) · In (4,3), which number is the x-coordinate? (4, the first number is always across.)

Check understanding: All hold mini whiteboards showing (4,3) plotted; re-model start-at-origin if dots scatter.

Support: Give a sheet with axes and origin (0,0) already drawn and labeled to place and trace points on [10].
Stretch: Have students extend both axes to 10 and compare where (8,2) and (2,8) land.

Use: Slides 3-4, 7; Worksheet Task A

20–30 min **Guided Practice** 10 min · Pairs

Show why order matters in an ordered pair.

YOU DO

1. Show Slide 5 question: Is (3,5) the same spot as (5,3)? How do you know?
2. Plot (2,5) by going right 2 then up 5, and (5,2) by going right 5 then up 2, to show different locations [3].
3. Stress that an ordered pair lists the x-coordinate first and the y-coordinate second, so switching changes the address [22].
4. Start Worksheet Task B and have partners use the sentence frame to describe each point.

STUDENTS DO

1. Draw both (2,5) and (5,2) on mini whiteboards and hold up to compare.
2. Turn and talk with a partner about which move happens first.
3. Begin Worksheet Task B reading coordinates carefully and checking order.

Say: Order matters in an address. The first number is always across and the second is always up [22]. If you swap them, you walk a different path from the origin and land in a different spot [1].

Worked example: Plot (2,5): start at (0,0), right 2, up 5, dot. Plot (5,2): start at (0,0), right 5, up 2, dot. The dots are in different places, so (2,5) is not the same as (5,2) [3].

Ask: Are (2,5) and (5,2) the same spot? How do you know? (No, right 2 up 5 lands a different place from right 5 up 2 [3].) · Which part of (5,2) tells horizontal position? (The x-coordinate 5 tells the horizontal position along the x-axis [3].)

Check understanding: Scan whiteboards for two separate dots; if many swapped, re-plot (3,5) versus (5,3) step by step together.

Support: Provide sentence frames like First I go across __, then I go up __ to describe each point [3]. **Stretch:** Ask students to predict and test where (4,1), (1,4) and (4,4) will land without plotting first.

Use: Slide 5; Worksheet Task B

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30–50 min **Main Activity** 20 min · On their own

Plot ordered pairs in order and join them to reveal a shape.

YOU DO

1. Show Slide 9 task and hand out 0-6 grids, pencils and the numbered pair list for the mystery rectangle and roof.
2. Model the first point (1,1): start at origin, right 1 on the x-axis, up 1, dot it [10].
3. Set 12 minutes to plot 8 to 10 points in order, join dots in order then back to start, and color lightly.
4. Circulate to check across-then-up moves and have students label each corner with its coordinates [1].

STUDENTS DO

1. Plot the list points one by one starting fresh at the origin each time.
2. Join dots in order then back to start and color the shape with crayons.
3. Label each corner with its coordinates and read addresses to a partner across-then-up.

Say: Work in plotting order so the picture appears. Start at the origin for every new point, go across on the x-axis first, then up to the y-value [10]. After you dot all points, join them with straight lines and tell your partner each address across-then-up.

Worked example: Plot (1,1): start at (0,0), right 1, up 1, dot. Plot (5,1): start at (0,0), right 5, up 1, dot. Plot (5,4): start at (0,0), right 5, up 4, dot. Join (1,1) to (5,1) to (5,4) to (1,4) and back to (1,1) to make a rectangle.

Ask: How do you find (5,4) from the origin? (Right 5 along the x-axis, then up 4 [10].) · What shape appears when you join (1,1), (5,1), (5,4), (1,4) in order? (A rectangle with straight sides.)

Check understanding: Check each student has four labeled corners and can point from origin across then up; if lost, trace with ruler from x-axis and y-axis to where lines meet [10].

Support: Number the pairs in plotting order and give a grid with every line already numbered to reduce counting errors [3]. **Stretch:** Have students add two more pairs of their own to add a door or chimney to the shape and list the new coordinates.

Use: Slide 9; Worksheet Task F

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50–60 min **Plenary** 10 min · Whole class

Connect coordinates to real life and check the objectives.

YOU DO

1. Show Slide 10 cards and link across-then-up to map squares, game screen moves and plant growth graph with days across and height up.
2. Show Slide 11 mystery: a dot sits at 5 across, then 3 up, and confirm its address is (5,3) with first number x and second y.
3. Run Slide 12 quiz aloud for origin, x in (4,3), and how to get to a point.
4. Collect exit answers on whiteboards.

STUDENTS DO

1. Explain map, game and plant examples in across-then-up words.
2. Answer quiz questions and show moves with a finger from the origin.
3. Write exit answers and self-check against success criteria.

Say: The same idea works in real life. On a map or game screen, across then up finds the spot, and on a plant graph days go across and height goes up. That is graphing points in the first quadrant to show a real situation [1]. Tell me each address across-then-up and what each number means [1].

Worked example: A dot sits at 5 across, then 3 up. Start at (0,0), go right 5, go up 3. Its address is (5,3). First number is x, second is y.

Ask: Where do the two axes cross? (At the origin (0,0), zero on both.) · In (4,3), which number is x and why? (4, the first number is always across.) · On a plant graph with days across and height up, what does (3,5) mean? (Day 3, height 5, so interpret coordinate values in context [1].)

Check understanding: Use whiteboard show for all three quiz answers; reteach origin and order with Slide 7 steps if errors remain.

Support: Point to printed small numbers next to dots for the first quiz round so students can match the called pair directly. **Stretch:** Ask students to give directions from (2,3) like go right 3 and up 1 and name the new point.

Use: Slides 10-12

Common mistakes

Mistake	How to spot it	How to fix it
Swapping x and y, plotting (5,2) as (2,5)	Dot is mirrored across the diagonal line from the origin	Rehearse across first then up, and check x-coordinate is horizontal position and y-coordinate is vertical [3].
Starting count at 1 on the axis instead of at the origin (0,0)	All points shifted one unit right or up	Always place finger on origin where lines cross at 0 then count moves, since intersection coincides with 0 on each line [1].
Thinking order does not matter, so (3,5) and (5,3) are the same	Student says both pairs land together	Plot both from origin step by step to show different spots, since x is listed before y [22].

Support

- Number the pairs in plotting order and give a grid with every line already numbered to reduce counting errors

Stretch

- Have students add two more pairs of their own to add a door or chimney to the shape and list the new coordinates

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For the LSE or teaching assistant

Support table group during main shape task: keep finger on origin, prompt across then up, check first two dots before independent finish.

Check for understanding

Question	Answer
Where do the x-axis and y-axis meet?	At the origin (0,0).
Plot (2,4) in words: which moves do you make?	Start at (0,0), right 2, up 4.
Is (3,5) the same as (5,3)? Explain.	No, order matters; they land in different spots.

Homework

Plot (0,2), (4,2), (4,5) on a first-quadrant grid, join them and name the shape.

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