Mystery Rectangle in Four Quadrants

Teacher		**Class**	Grade 6
Subject	Math	**Topic**	Points in all four quadrants
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Students learn to plot points in all four quadrants and find distances with absolute value. They plot four mystery points, build a rectangle, and measure its sides.

Curriculum links

- graph points in all four quadrants using ordered pairs of rational numbers [1]

Learning objectives

- Students will graph integer and decimal ordered pairs in all four quadrants.
- Students will plot four points to build a rectangle and find its side lengths.
- Students will use absolute value to find distances with same x or same y.

Success criteria

- I can plot a point by going across first, then up or down.
- I can name the quadrant from plus and minus signs.
- I can find distance with absolute value when x or y matches.

What students already know

Show a first-quadrant grid. Ask: Where would you plot (3, 4)? Listen for across 3 then up 4.

Key words

ordered pair	two numbers in parentheses that give a spot, across first then up or down [8]
origin	the center point (0, 0) where the flat line and up-down line cross [3][4]
quadrant	one of four areas made when the two number lines cross [4]
x-axis	the flat number line that goes left and right [4]
absolute value	how far a number sits from zero, always given as a positive count

Materials

- Slide deck with Slides 1-3, 5-12
- Video clip 5 (0:00–5:00) on Slide 6 and Video clip 3 (0:00–5:00) on Slide 8
- Printed coordinate grids from -6 to 6
- Rulers
- Clue cards showing (2, 3), (-3, 3), (-3, -2), (2, -2)
- Worksheet Task E copies
- Mini whiteboards and markers

Before the lesson

- Print coordinate grids from -6 to 6, one per student plus spares, and Worksheet Task E copies
- Print clue cards with the four ordered pairs (2, 3), (-3, 3), (-3, -2), (2, -2)
- Test Slides 1-3, 5-12 and Video clip 5 (0:00–5:00) and Video clip 3 (0:00–5:00) with sound
- Set out rulers, whiteboards, and markers for pairs

Lesson outline

0–8 min **Starter** 8 min · Whole class

Hook students with the mystery shape and recall first-quadrant plotting.

YOU DO

1. Show Slides 1-2 and read the goals for graphing with negatives and solving problems.
2. Say the hook: Plot these four mystery points in order — a secret shape will pop out.
3. Show Slide 5 and take a quick vote on where a 4-quadrant grid helps most.
4. Ask students to recall how they plotted (3, 4) in Grade 5 using across then up.

STUDENTS DO

1. Vote on Slide 5 choices and listen to the rectangle challenge.
2. Show on fingers or whiteboards where (3, 4) would go.
3. Tell a partner what across first means.

Say: Today we plot, solve, and measure with negatives. You will plot four mystery points in order and a secret shape will pop out. First, remind me how you plotted in the first quadrant.

Ask: When you plot (3, 4), which number tells you to go across? (The first number, 3, the x-coordinate.) · Where would a 4-quadrant grid help you most and why? (Answers vary, for example game maps or GPS, because they need negatives in all directions.)

Check understanding: Hold-up: students point right-up for (3, 4). If unsure, model one more first-quadrant point before moving on.

Support: Show a large first-quadrant grid with arrows for right and up. **Stretch:** Ask where (-3, 4) would go if left were allowed, to preview negatives.

Use: Slides 1-2, 5

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8–20 min **Teaching: Plot in four quadrants** 12 min · Whole class

Teach accurate plotting and quadrant signs in all four quadrants.

YOU DO

1. Show Slide 3 cards for Quadrant I, II, III, and IV sign patterns.
2. Play Video clip 5 (0:00–5:00) on Slide 6 and ask what negative tells you to do.
3. Model (-3, 2) on the board using Slide 7 steps, starting at the origin every time.
4. Label the quadrant and stress that order matters.

STUDENTS DO

1. Watch the clip and track moves in the air: across first, then up or down.
2. Plot (3, 4), (-3, 2), (-5, -2), and (4, -3) on whiteboards.
3. Hold up boards to show quadrant numbers I to IV.

Say: Start at the origin (0, 0) where the lines cross every time [3][4]. Go across with x: right for positive, left for negative. Then go up-down with y: up for positive, down for negative. The four areas are numbered I to IV counterclockwise from the top right [7][9].

Worked example: Plot (-3, 2). Start at the origin (0, 0) [3][4]. The x is -3, so move 3 left [9]. The y is 2, so move 2 up. Mark and label (-3, 2). Signs are (-, +), so Quadrant II [8]. The reverse (2, -3) is not the same point [8][9].

Ask: How do you plot (4, -3) step by step? (Start at (0, 0), go 4 right for x, then 3 down for y, Quadrant IV because (+, -) [8].) · Is (3, 2) the same as (2, 3)? How do you know? (No, order matters, across first then up, so they land in different spots [8][9].)

Check understanding: Whiteboard check: call (-4, 1) and look for Quadrant II. Reteach left for negative x and down for negative y if many miss [9].

Support: Give grids with axes labeled, origin marked, and arrows for left for negative x and down for negative y [4][9]. **Stretch:** Add halves like (-2.5, 1.5) and ask where they land and why.

Use: Slides 3, 6-7, Video clip 5 (0:00–5:00)

20–32 min **Teaching: Distance with absolute value** 12 min · Whole class

Teach finding vertical and horizontal distance when x or y matches.

YOU DO

1. Show Slide 8 and play Video clip 3 (0:00–5:00) about absolute value distance.
2. Model (-2, 3) and (-2, -4): same x means a vertical line, use only y [3].
3. Model (-4, 1) and (2, 1): same y means a horizontal line, use only x [3].
4. Show Slide 10 to compare Same x: Up-Down with |y2 - y1| and Same y: Left-Right.

STUDENTS DO

1. Copy the two models and circle the shared x or shared y.
2. Tell a partner whether a new pair is vertical or horizontal and why.
3. Write one absolute-value subtraction for each model.

Say: If two spots share x, they line up up-down and make a vertical line [3]. If they share y, they line up left-right and make a horizontal line [3]. Use absolute value on the numbers that change to get the distance, in units.

Worked example: Distance from (-2, 3) to (-2, -4): same x, so vertical [3]. Distance = |3 - (-4)| = |7| = 7 units. Distance from (-4, 1) to (2, 1): same y, so horizontal [3]. Distance = |2 - (-4)| = |6| = 6 units. If each unit stands for 2 feet, 7 units = 14 feet.

Ask: Why do we use only y for (-2, 3) and (-2, -4)? (Same x means vertical, so only the up-down numbers change [3].) · How do you find distance from (2, 3) to (2, -2)? (Same x, vertical, |3 - (-2)| = 5 units.)

Check understanding: Hinge question on boards: vertical or horizontal for (1, 4) to (1, -3)? Expect vertical. Re-model shared-coordinate check if split.

Support: Lay 3 and -4 on a vertical number line so students see the gap adds both parts. **Stretch:** Use decimals like (-1.5, 2.5) and (-1.5, -3.5) and ask for a rule in words.

Use: Slides 8, 10, Video clip 3 (0:00–5:00)

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32–52 min **Main activity: Mystery Rectangle Reveal** 20 min · Pairs

Apply plotting and absolute-value distance to build a rectangle.

YOU DO

1. Hand out grids, rulers, and clue cards with (2, 3), (-3, 3), (-3, -2), (2, -2).
2. Direct pairs to plot in order, connect, and name each quadrant using Slide 9 as a guide.
3. Remind pairs that same y makes a horizontal side and same x makes a vertical side [3].
4. Circulate, check absolute-value work, and push early finishers to feet and perimeter.

STUDENTS DO

1. Plot A (2, 3), B (-3, 3), C (-3, -2), D (2, -2) in order, connect, and confirm a rectangle.
2. Complete Worksheet Task E: plot the four points, join them in order, then find the side lengths.
3. Hold up the rectangle and list each ordered pair with its quadrant and the two side lengths.

Say: Plot the four mystery points in order and connect them to reveal the shape. Across first for x, then up or down for y, always from the origin [8][9]. For sides that share x or y, find the length with absolute value. Each unit stands for 2 feet.

Worked example: Top side (2, 3) to (-3, 3): same y, horizontal [3]. Width = |2 - (-3)| = 5 units = 10 feet. Right side (2, 3) to (2, -2): same x, vertical [3]. Height = |3 - (-2)| = 5 units = 10 feet. Signs place one point in each quadrant: (+, +) in I, (-, +) in II, (-, -) in III, (+, -) in IV [8].

Ask: Which points share y and which share x? What does that tell you? (Top and bottom share y, so horizontal; left and right share x, so vertical [3].) · How far is (2, 3) from (-3, 3) and how do you show it? (5 units, because |2 - (-3)| = 5, which is 10 feet.)

Check understanding: Teams hold up rectangle, table of points with quadrants, and two side lengths. If sides are off, check across-first moves and shared-coordinate pairs.

Support: Show how a missing rectangle corner can be found from the other three corners by keeping sides straight [6]. **Stretch:** Ask for the perimeter in feet and where a fifth point inside the rectangle could go.

Use: Slide 9, Worksheet Task E

52–60 min **Plenary** 8 min · Whole class

Check quadrant naming and absolute-value reasoning before exit.

YOU DO

1. Show Slide 11 and let pairs discuss the claim about (-4, 5) to (3, 5).
2. Take answers and confirm correct absolute-value thinking for same y.
3. Show Slide 12 quiz and cold-call quadrant and distance with reasons.
4. Link back to objectives and hand out exit tickets.

STUDENTS DO

1. Think, pair, share on Slide 11: decide if the student is correct and why.
2. Answer Slide 12 quiz on boards: quadrant for (-5, 2) and distance for (1, 4) to (1, -3).
3. Complete exit ticket on their own.

Say: Talk it out: is adding the positives the same as using absolute value of the difference? Same y means horizontal, so use x only. Tell me the distance and the quadrant proof in full sentences.

Worked example: From (-4, 5) to (3, 5): same y, horizontal [3]. Distance = |3 - (-4)| = 7 units. Thinking |-4| + |3| = 7 gets 7 here because the points are on opposite sides of zero, but the safe method is |x2 - x1|.

Ask: A student says distance from (-4, 5) to (3, 5) is |-4| + |3| = 7. Correct thinking? (Answer 7 is correct, but use |3 - (-4)| = 7 to work for all same-y pairs.) · Which quadrant holds (-5, 2) and how do you know? (Quadrant II because x is negative and y is positive [8].)

Check understanding: Board check on Slide 12: expect Quadrant II and 7 units because |4 - (-3)| = 7. Re-teach sign chart if needed.

Support: Give a color-coded sign chart for I to IV for quick checks. **Stretch:** Include rational numbers like (-4.25, 2.75) and axis points like (0, -3).

Use: Slides 11-12

Common mistakes

Mistake	How to spot it	How to fix it
Swapping x and y, thinking (3, -2) is the same as (-2, 3)	Point lands in wrong quadrant or mirrored across diagonal	Rehearse x before y in alphabetical order and across before up; plot both orders to compare [8][9].
Counting moves from the last point or grid corner instead of the origin	All points shift or line up in one quadrant	Point back to (0, 0) where axes cross for every new plot and start there [3][4][9].
Using both coordinates or forgetting absolute value for shared-x or shared-y distance	Negative distance or adding x and y together	Circle the shared number, use only the numbers that change, and write |y2 - y1| or |x2 - x1| [3].

Support

- Show how a missing rectangle corner can be found from the other three corners by keeping sides straight [6].
- Provide pre-labeled grids from -6 to 6 with origin marked and left/down arrows for negatives [4][9].

Stretch

- Ask for the perimeter in feet and where a fifth point inside the rectangle could go.
- Add rational numbers like (-2.5, 1.5) or (-4.25, 2.75) and axis points like (0, -3) [1][8].

For the LSE or teaching assistant

Stay with target pairs during main activity: prompt start at origin, check across-then-up moves, and prompt circling of shared x or y before subtraction.

Check for understanding

Question	Answer
Which quadrant holds (-5, 2)? Explain with signs.	Quadrant II because x is negative and y is positive.
Find distance from (1, 4) to (1, -3). Show working.	7 units, because |4 - (-3)| = 7.
Plot (3, -2). Which quadrant and why?	Quadrant IV, go 3 right then 2 down; signs (+, -).

Homework

Plot (-2, 1) and (4, 1), name the quadrant for each, and find the distance with absolute value.

Sources

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