



UM PRINTABLES
PREMIUM EDUCATIONAL RESOURCES

• GRADE 6 MATHEMATICS • PROJECT-BASED LEARNING
UNIT

Coordinate Plane Geometry PBL: Design a City Map

A four-day, four-quadrant project-based learning unit aligned to CCSS 6.G.A.3 and 6.NS.C.8.

Students act as city planners, designing a complete city map on a four-quadrant coordinate plane. Across four days, they place ten city buildings at specified coordinates, build a road network and calculate distances, design polygon-shaped parks with verifiable area and perimeter, and present the coordinate-plane reasoning behind every design choice. Three-tier differentiation, an analytic rubric, a complete answer key, and printable grid paper make this a classroom-ready mega unit.

CCSS 6.G.A.3

CCSS 6.NS.C.8

4-DAY PBL

3-TIER DIFFERENTIATION

DAY 1
City Layout

DAY 2
Road Network

DAY 3
City Parks

DAY 4
Presentation

RESOURCE TYPE

Mega Unit • Printable PDF

AUDIENCE

Grade 6 Mathematics

INCLUDES

Student Packet • Grid Paper (3 versions)
Rubric • Answer Key • Pacing Guide

CONTENTS

What's Inside This Mega Unit

This mega unit is organized into ten parts. Each part is self-contained and may be printed or projected independently. The recommended classroom flow is Parts 1–4 (teacher prep) → Part 5 (student packet, printed for each student) → Part 6 (grid paper) → Part 7 (reference sheet) → Part 8 (rubric) → Part 9 (answer key). Part 10 houses extension activities and the review request page.

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Time	Segment	Teacher Action	Student Action
40–48	Synthesis	Select 2 students with buildings in different quadrants to share. Highlight correct coordinate-pair reading.	Compare their placement with the shared examples. Self-check using the answer key.
48–50	Closure	Preview Day 2: "Tomorrow we connect our buildings with roads." Collect packets.	Packet pages 2–3 stay in folder.

Table 2.2 · Day 1 pacing (50-minute block).

Teacher Move · Day 1

Resist the urge to tell students which quadrant a building belongs in. Instead, ask: *"What sign does the x-coordinate have? What sign does the y-coordinate have? So which quadrant?"* This three-question sequence builds the reasoning habit, not just the answer. If a student misplaces a point, do not correct it immediately—ask them to read their coordinates back to you. Most students catch their own errors when they hear themselves say the coordinates aloud.

Day 1 — City Layout (Buildings 1–5)

Learning Target: *I can graph points in all four quadrants of the coordinate plane and label each point with its (x, y) coordinate pair. (CCSS 6.NS.C.8)*

Your first job as city planner is to place ten buildings on the town map. Each building has a specified location given as an (x, y) coordinate pair. Plot each point carefully, then label it with the building's name. Use the grid paper provided by your teacher. Today you will place buildings 1–5; buildings 6–10 are on page 3.

Building Coordinates (Part 1 of 2)

#	Building Name	Coordinates (x, y)	Quadrant	Sign of x	Sign of y
1	City Hall	(3, 2)	I	+	+
2	Library	(-4, 4)	II	–	+
3	School	(6, -3)	IV	+	–
4	Park Entrance	(-3, -5)	III	–	–
5	Fire Station	(4, 4)	I	+	+

Table 5.1 · Building coordinates (1–5). Plot each on grid paper.

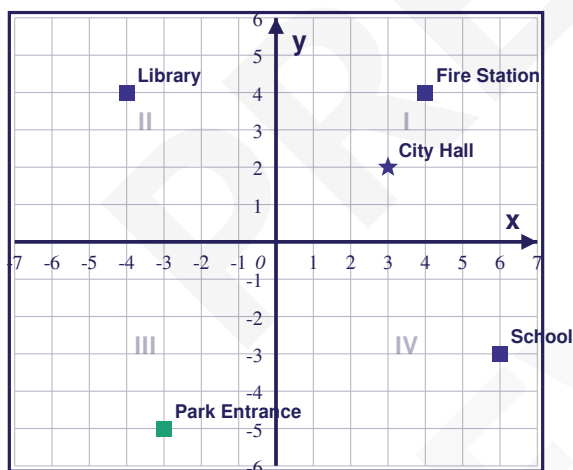


Figure 5.1 · Mini reference map showing buildings 1–5. Reproduce these positions on your own grid paper.

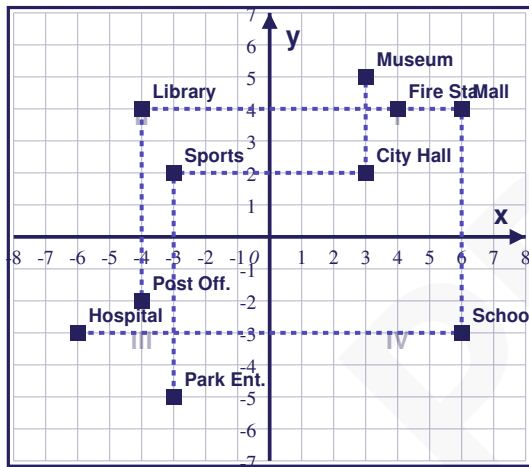


Figure 5.3 · The 8 recommended roads drawn on the city map. Buildings are marked with squares; roads are dashed segments.

Area (A) — Modified/On-Level	$A = \text{length} \times \text{width} = 7 \times 4 = \mathbf{28 \text{ square units}}$
Area (A) — Challenge (Trapezoid)	$A = \frac{1}{2} \times (b_1 + b_2) \times h = \frac{1}{2} \times (8 + 4) \times 4 = \frac{1}{2} \times 12 \times 4 = \mathbf{24 \text{ square units}}$

Version B — Standard Grid (–8 to 8)

ON-LEVEL TIER · VERSION B

Range: x from –8 to 8, y from –8 to 8. Cell size: 18 pt per unit. This is the default grid paper for the project. The range is wide enough to accommodate all ten buildings and all three parks in the on-level tier. Most students will use this version for all four days of the project.

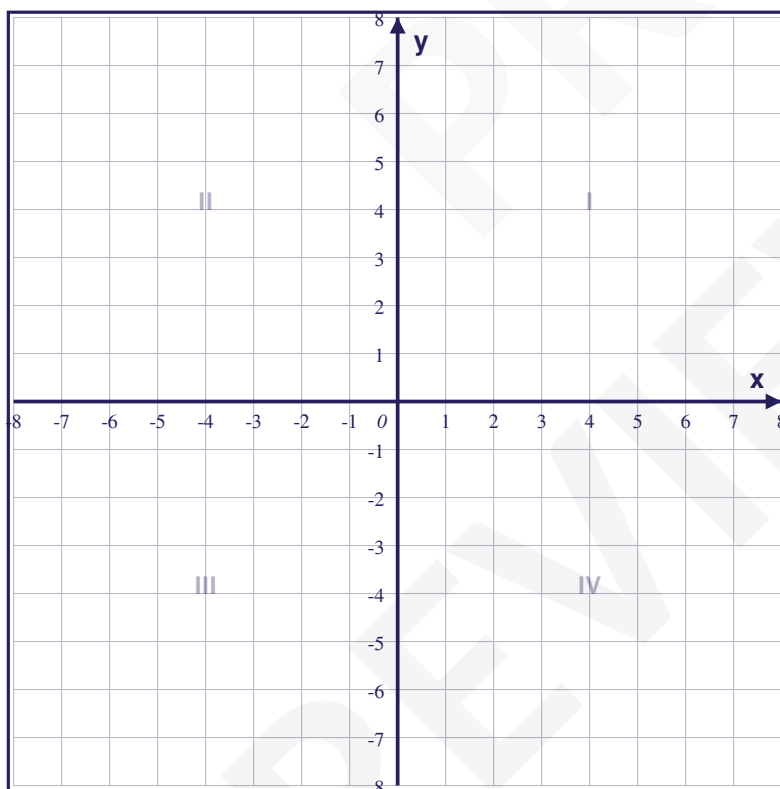


Figure 6.2 · Grid Paper Version B (On-Level tier). The recommended default grid for the project.

Criterion 1 — Coordinate Accuracy (6.NS.C.8)

What is being assessed: The student's ability to graph points accurately in all four quadrants of the coordinate plane, using correct (x, y) notation and identifying the correct quadrant for each point.

Score	Level	Indicators
4	Exceeds	All 10 buildings are plotted in the correct locations in the correct quadrants. Coordinates are recorded using correct (x, y) notation. Student can identify the quadrant of any plotted point from the signs of the coordinates alone. Buildings span all 4 quadrants.
3	Meets	8–9 of 10 buildings are plotted correctly. Coordinates use correct (x, y) notation with minor errors. Student correctly identifies the quadrant of most plotted points. Buildings span at least 3 quadrants.
2	Approaching	6–7 of 10 buildings are plotted correctly. Coordinates may have x/y reversals or sign errors. Student inconsistently identifies quadrants. Buildings may span only 2 quadrants.
1	Below	Fewer than 6 buildings plotted correctly. Frequent x/y reversals or sign errors. Student cannot reliably identify quadrants from coordinate signs. Buildings cluster in 1–2 quadrants.

Table 8.2 · Criterion 1 — Coordinate Accuracy rubric.

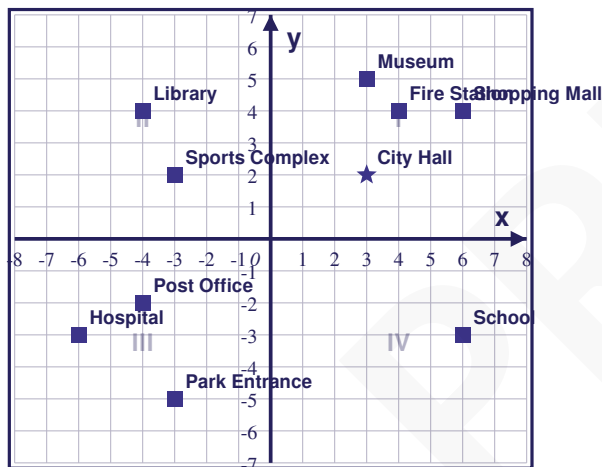


Figure 9.1 · Exemplar Day 1 city map with all 10 buildings in canonical positions.

PART 10 · VOCABULARY

Vocabulary & Concept Review

This section consolidates the key vocabulary and concepts from the four-day unit. Use it as a reference during the project, as a study guide before assessment, or as a quick refresher for students who need reinforcement. Each term includes a plain-language definition, an example from the city-map project, and a visual where helpful.

Key Vocabulary

Term	Definition	Example from the City Map Project
Coordinate plane	A two-dimensional plane formed by two perpendicular number lines (the x-axis and y-axis) that intersect at the origin (0, 0).	The entire city map is drawn on a coordinate plane.
x-axis	The horizontal number line in the coordinate plane. Positive values go right; negative values go left.	The x-axis is like the "main east-west street" of the city.
y-axis	The vertical number line in the coordinate plane. Positive values go up; negative values go down.	The y-axis is like the "main north-south street" of the city.
Origin	The point (0, 0) where the x-axis and y-axis intersect.	The origin is the center of the city—where the main streets cross.
Ordered pair (x, y)	A pair of numbers that gives the location of a point. The first number (x) tells how far left/right; the second (y) tells how far up/down.	City Hall is at (3, 2): 3 right, 2 up.
Quadrant	One of the four regions of the coordinate plane divided by the x-axis and y-axis. Numbered I, II, III, IV counterclockwise starting from the top-right.	City Hall is in Q I (+, +); Library is in Q II (–, +).
Absolute value	The distance of a number from zero on the number line. Always positive or zero. Written $ x $.	$ 3 = 3$; $ -3 = 3$; $ -4 - 4 = -8 = 8$.
Distance formula (horiz.)	For two points with the same y-coordinate, distance = $ x_1 - x_2 $.	Road 1: City Hall (3, 2) → Sports Complex (–3, 2). Distance = $ 3 - (–3) = 6$.
Distance formula (vert.)	For two points with the same x-coordinate, distance = $ y_1 - y_2 $.	Road 4: City Hall (3, 2) → Museum (3, 5). Distance = $ 2 - 5 = 3$.
Polygon	A closed shape formed by three or more line segments (sides) that meet only at their endpoints (vertices).	Each city park is a polygon (rectangle, triangle, trapezoid, or pentagon).
Vertex (pl. vertices)	A corner of a polygon where two sides meet. Listed in order going around the polygon.	A rectangle has 4 vertices; a pentagon has 5.
Perimeter	The total distance around a polygon. Sum of all side lengths.	Park 1 rectangle: $P = 7 + 4 + 7 + 4 = 22$ units.
Area	The number of square units inside a polygon. Rectangle: $A = l \times w$. Triangle: $A = \frac{1}{2} \times b \times h$. Trapezoid: $A = \frac{1}{2}(b_1 + b_2) \times h$.	Park 1 rectangle: $A = 7 \times 4 = 28$ sq units. Park 2 triangle: $A = \frac{1}{2} \times 4 \times 3 = 6$ sq units.

THE COMPLETE MEGA UNIT

QUADRANT II $(-, +)$

WHAT'S INSIDE THE FULL 84-PAGE UNIT

QUADRANT I $(+, +)$

1

Teacher Intro

Welcome, philosophy, materials checklist

2

Pacing Guide

4-day minute-by-minute lesson plan

3

CCSS Standards

6.G.A.3 & 6.NS.C.8 unpacked

4

Differentiation

Modified · On-Level · Challenge tiers

5

Student Packet

12 printable pages, Days 1–4

6

Grid Paper

3 versions: –5 to 5, –8 to 8, –12 to 12

7

Reference Sheet

Buildings, roads & park vertices

8

Analytic Rubric

4-criterion scoring guide

9

Answer Key

Full worked solutions + exemplars

10

Vocabulary

Terms, formulas, quadrant signs

11

Math Talks

16 number talks across 4 days

12

Assessments

Mid-unit + end-of-unit + family letter

QUADRANT III $(-, -)$ QUADRANT IV $(+, -)$

84

TOTAL PAGES

4

PROJECT DAYS

12

PAGE PACKET

3

DIFFERENTIATED TIERS

100%

CLASSROOM READY