

MATHEMATICS TEACHING AND ASSESSMENT

Coordinate distance



Grade 8 • NC.8.G.8

Teacher models • Seven instructional sections
30 multiple-choice tasks • 30 open/performance tasks
Worked keys • Student workspaces • Observation tools

Reusable across several lessons. Select evidence purposefully; this is not a 60-item single-session assessment.

Free sample | Contents

NC.8.G.8 | Eighth Grade mathematics

This sample contains 18 complete selected pages from the 91-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-14, 29-30, 59, 74

Representative activities

M01: sample PDF page(s) 15; original page(s) 14

M02: sample PDF page(s) 15; original page(s) 14

O01: sample PDF page(s) 16; original page(s) 29

O02: sample PDF page(s) 17; original page(s) 30

Selected teacher prompts and keys: original page(s) 59, 74

Using this sample

Read the preparation and access guidance before using a selected activity.

Keep teacher keys and private preparation pages separate from student copies.

Use the original resource contents to see the scope of the complete packet.

Complete paid download

The complete resource includes the full PDF task bank and teaching materials.

ALIGNMENT

Standard and scope

Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Current North Carolina Standard Course of Study, adopted June 2017. Source-verified for the 2026-2027 and 2027-2028 school years. Newly adopted standards begin in 2028-2029.

- Construct perpendicular coordinate differences and identify the straight segment as hypotenuse.
- Find exact and approximate distances, including horizontal and vertical cases.
- Interpret map scales, compare routes, and use distance constraints.

The blank grids support construction. Coordinates outside the grid range may be modeled on additional squared paper; no printed grid is used as an actual-size measuring model.

PLANNING

Use the bank across sessions

Warm-up: M01-M04 and O01-O04.

I Do: M05-M08 and O05-O08.

We Do: M09-M13 and O09-O13.

Collaborative practice: M14-M18 and O14-O18.

Independent practice: M19-M23 and O19-O23.

Small-group reteach: M24-M27 and O24-O27.

Exit ticket: M28-M30 and O28-O30.

Suggested sequence: launch and model; shared reasoning; collaborative application; independent evidence and responsive reteach. A section may span several meetings. Choose 2-4 tasks for a session, then revisit remaining tasks as needed.

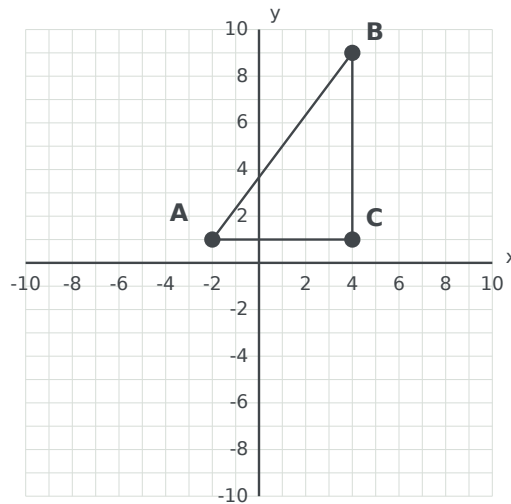
Materials: pencil, eraser, ruler, squared paper, calculator for checking approximations, scissors and plain paper for teacher-supervised models. For volume investigations, use waterproof solids with matching dimensions or the supplied numerical data. No purchased software is required.

Prerequisites: squares and square roots, positive lengths, area of a square/circle, coordinate differences, and consistent units. Check these orally before scored tasks. Read prompts aloud, enlarge diagrams, and offer tactile or high-contrast grids without supplying the relation being assessed.

TEACHER MODEL

Build the distance, then calculate

Plot A(-2, 1) and B(4, 9). A horizontal move of 6 and a vertical move of 8 reach the same endpoint. Complete the right triangle at C(4, 1).



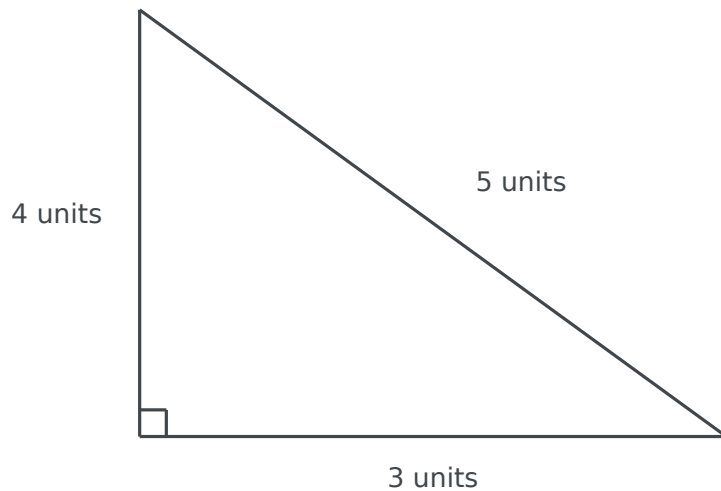
Say: “AB is opposite the right angle. Its length is not $6 + 8$; that is the two-leg route. $AB^2 = 6^2 + 8^2 = 100$, so $AB = 10$ positive units.” Connect this to $d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$. Subtract coordinates before squaring; using the other subtraction order gives the same squares.

TEACHER MODEL

Check scale and reasonableness

On a map with 2 km per coordinate unit, a difference of 3 horizontally and 4 vertically gives $d = \sqrt{9 + 16} = 5$ coordinate units. The physical distance is $5 \times 2 = 10$ km.

Schematic; use labels, not measured lengths.



Anchor: identify endpoints → find coordinate differences → draw perpendicular legs → add their squares → take the positive square root → apply the map scale once → state units. For a noninteger result, preserve an exact radical until an approximation is requested. A direct distance is shorter than a nondegenerate two-leg route.

REPRODUCIBLE ORGANIZER

Make reasoning visible

Name: _____ Date: _____

Givens and what I need to find**Representation and calculations****Justification or independent check****Conclusion with units and meaning**

TEACHING SEQUENCE

Warm-up

Optional bank: M01-M04; O01-O04. Core: O01. Suggested time: 15-25 minutes; extend construction and discussion as needed.

Launch

Ask learners to read the givens and sketch the situation without calculating. Invite two explanations of what the unknown measures.

Teacher language

“Which two perpendicular moves join these endpoints?”

Elicit and examine

Ask: “Why does your equation match this diagram?” Look for labels linked to quantities, a justified operation, and a conclusion that addresses the original question.

Respond to a gap

If the response uses an unconnected formula, ask the learner to identify each quantity on the model. Record any formula or numerical hint you supply as a cue, then reassess with a new task.

Closure

Have a learner summarize the key relationship in words and identify one condition needed for it to apply.

Core solution and look-fors

One valid third vertex is (1, 2). The horizontal and vertical legs have lengths 4 and 3; their axes are perpendicular. $AB^2 = 4^2 + 3^2 = 25$, hence $AB = 5$. The plot must place each point correctly and show a right-angle marker at the third vertex.

TEACHING SEQUENCE

I Do

Optional bank: M05-M08; O05-O08. Core: O05. Suggested time: 15-25 minutes; extend construction and discussion as needed.

Model aloud

Work through the core task, pausing before each equation. Say why the relation applies, what each symbol means, and how the conclusion answers the question.

Teacher language

“Every term in my equation names a side of my constructed right triangle.”

Elicit and examine

Ask: “Why does your equation match this diagram?” Look for labels linked to quantities, a justified operation, and a conclusion that addresses the original question.

Respond to a gap

If the response uses an unconnected formula, ask the learner to identify each quantity on the model. Record any formula or numerical hint you supply as a cue, then reassess with a new task.

Closure

Have a learner summarize the key relationship in words and identify one condition needed for it to apply.

Core solution and look-fors

One valid third vertex is (4, 1). The horizontal and vertical legs have lengths 3 and 4; their axes are perpendicular. $AB^2 = 3^2 + 4^2 = 25$, hence $AB = 5$. The plot must place each point correctly and show a right-angle marker at the third vertex.

TEACHING SEQUENCE

We Do

Optional bank: M09-M13; O09-O13. Core: O09. Suggested time: 15-25 minutes; extend construction and discussion as needed.

Share the work

Ask partners to propose the first representation, then compare equations. Record both a valid approach and a plausible error; have learners explain the difference.

Teacher language

“How does the scale change a coordinate length into a physical length?”

Elicit and examine

Ask: “Why does your equation match this diagram?” Look for labels linked to quantities, a justified operation, and a conclusion that addresses the original question.

Respond to a gap

If the response uses an unconnected formula, ask the learner to identify each quantity on the model. Record any formula or numerical hint you supply as a cue, then reassess with a new task.

Closure

Have a learner summarize the key relationship in words and identify one condition needed for it to apply.

Core solution and look-fors

One valid third vertex is (5, -4). The horizontal and vertical legs have lengths 8 and 6; their axes are perpendicular. $AB^2 = 8^2 + 6^2 = 100$, hence $AB = 10$. The plot must place each point correctly and show a right-angle marker at the third vertex.

TEACHING SEQUENCE

Collaborative practice

Optional bank: M14-M18; O14-O18. Core: O14. Suggested time: 15-25 minutes; extend construction and discussion as needed.

Partner roles

One learner constructs or labels the model; the other checks the equation and units. Switch roles on the next task. Both write an individual explanation.

Teacher language

“Does the proposed answer measure the route or the straight segment?”

Elicit and examine

Ask: “Why does your equation match this diagram?” Look for labels linked to quantities, a justified operation, and a conclusion that addresses the original question.

Respond to a gap

If the response uses an unconnected formula, ask the learner to identify each quantity on the model. Record any formula or numerical hint you supply as a cue, then reassess with a new task.

Closure

Have a learner summarize the key relationship in words and identify one condition needed for it to apply.

Core solution and look-fors

Legs: 8 and 6 map units. Direct distance $\sqrt{(64+36)} = 10$ units, or 40 m. Axis-aligned travel is 14 units, or 56 m. The direct route saves 16 m. The sketch must distinguish the hypotenuse from the two-leg route.

TEACHING SEQUENCE

Independent practice

Optional bank: M19-M23; O19-O23. Core: O19. Suggested time: 15-25 minutes; extend construction and discussion as needed.

Collect independent evidence

Give the core prompt without an example visible. Preserve the first response. Ask only neutral clarifications such as “What does this label represent?”

Teacher language

“Which coordinate values satisfy both the equation and the direction condition?”

Elicit and examine

Ask: “Why does your equation match this diagram?” Look for labels linked to quantities, a justified operation, and a conclusion that addresses the original question.

Respond to a gap

If the response uses an unconnected formula, ask the learner to identify each quantity on the model. Record any formula or numerical hint you supply as a cue, then reassess with a new task.

Closure

Have a learner summarize the key relationship in words and identify one condition needed for it to apply.

Core solution and look-fors

The sum is d^2 , not d . $d = \sqrt{25} = 5$. A valid sketch places the endpoints and labels perpendicular coordinate differences. Check by squaring the reported positive length or using bounding squares.

TEACHING SEQUENCE

Small-group reteach

Optional bank: M24-M27; O24-O27. Core: O24. Suggested time: 15-25 minutes; extend construction and discussion as needed.

Diagnose and reteach

Use one previously observed error to select a model. Reconnect the diagram to each term, then remove the model and offer a different item in this range.

Teacher language

“Show two endpoint pairs and verify both; a picture alone is not enough.”

Elicit and examine

Ask: “Why does your equation match this diagram?” Look for labels linked to quantities, a justified operation, and a conclusion that addresses the original question.

Respond to a gap

If the response uses an unconnected formula, ask the learner to identify each quantity on the model. Record any formula or numerical hint you supply as a cue, then reassess with a new task.

Closure

Have a learner summarize the key relationship in words and identify one condition needed for it to apply.

Core solution and look-fors

Vertical difference = 15. $(x - (-4))^2 + 15^2 = 17^2$. Thus $(x - (-4))^2 = 64$ and $x = -4 \pm 8$. The direction condition selects $x = 4$; the other value -12 lies on the wrong side. Check: $8^2 + 15^2 = 289$.

TEACHING SEQUENCE

Exit ticket

Optional bank: M28-M30; O28-O30. Core: O28. Suggested time: 15-25 minutes; extend construction and discussion as needed.

Close and decide

Ask learners to complete the core task independently and explain one check. Use the remaining exit tasks later to distinguish a one-time slip from a persistent gap.

Teacher language

“Which squared bounds justify the reported approximation?”

Elicit and examine

Ask: “Why does your equation match this diagram?” Look for labels linked to quantities, a justified operation, and a conclusion that addresses the original question.

Respond to a gap

If the response uses an unconnected formula, ask the learner to identify each quantity on the model. Record any formula or numerical hint you supply as a cue, then reassess with a new task.

Closure

Have a learner summarize the key relationship in words and identify one condition needed for it to apply.

Core solution and look-fors

$AB = BC = \sqrt{9 + 16} = 5$, so the two-segment route is 10. AC is horizontal and 6 units long. Direct travel saves 4 units.

MULTIPLE-CHOICE BANK

M01 - M02**M01 | Warm-up**

Target: Find a distance from coordinate differences.

Find the straight-line distance from A(-3, 2) to B(1, 5), in coordinate units.

- A. 5
 - B. 3
 - C. 25
 - D. $\sqrt{7}$
-

M02 | Warm-up

Target: Find a distance from coordinate differences.

Find the straight-line distance from A(2, -4) to B(8, 4), in coordinate units.

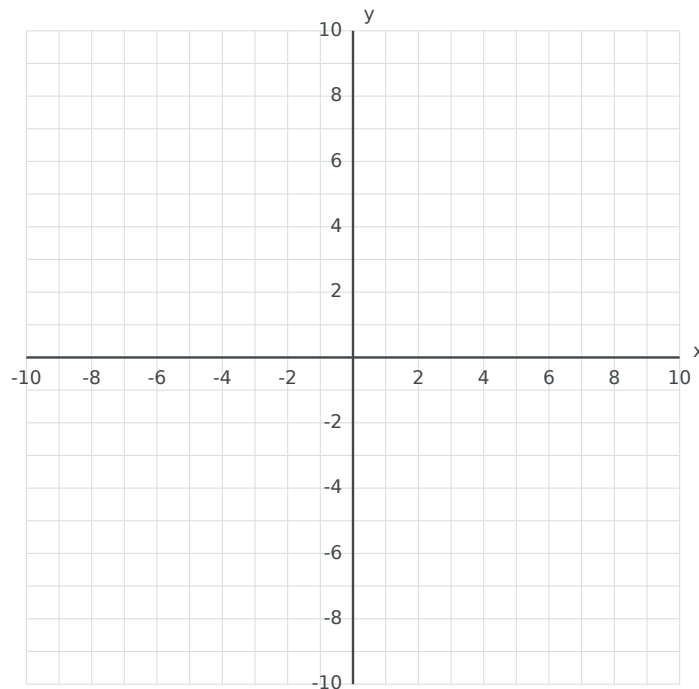
- A. 8
 - B. $\sqrt{200}$
 - C. 10
 - D. $\sqrt{28}$
-

WARM-UP

001 | Show your reasoning

Target: Construct a coordinate model and justify distance.

Plot A(-3, 2) and B(1, 5) on the blank grid. Draw AB and an axis-aligned right triangle with AB as hypotenuse. Label both leg lengths and find the exact distance. Explain how your triangle proves the equation.



Model, construction, or calculations

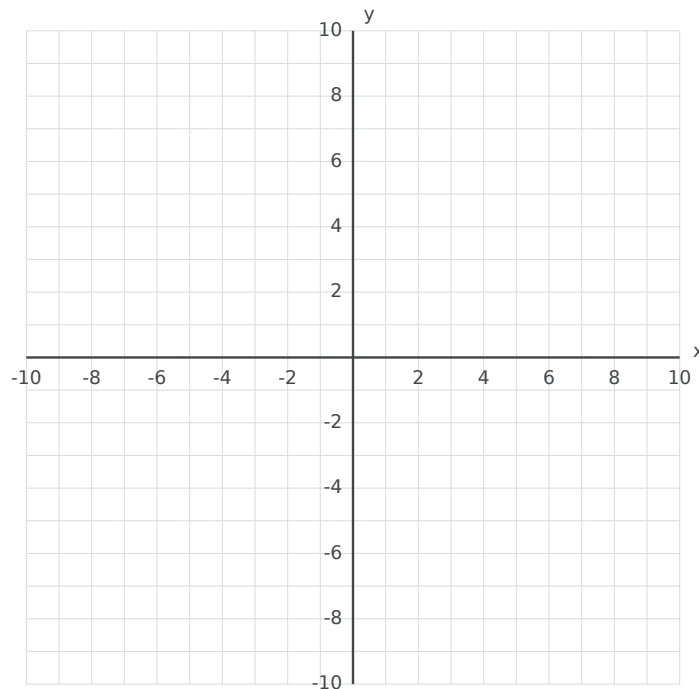
Explanation, check, and conclusion

WARM-UP

002 | Show your reasoning

Target: Construct a coordinate model and justify distance.

Plot A(2, -4) and B(8, 4) on the blank grid. Draw AB and an axis-aligned right triangle with AB as hypotenuse. Label both leg lengths and find the exact distance. Explain how your triangle proves the equation.



Model, construction, or calculations

Explanation, check, and conclusion

WORKED KEYS

M01 - M02

M01 | Warm-up

Target: Find a distance from coordinate differences.

Answer: A • 5

Horizontal change 4; vertical change 3. $d^2 = 4^2 + 3^2 = 25$; $d = 5$ units.

B: This is only the vertical change.

C: This is the square of the distance, not the distance.

D: This subtracts squared legs even though the unknown is the hypotenuse.

A selection alone does not establish a misconception; ask for the reasoning.

M02 | Warm-up

Target: Find a distance from coordinate differences.

Answer: C • 10

Horizontal change 6; vertical change 8. $d^2 = 6^2 + 8^2 = 100$; $d = 10$ units.

A: This is only the vertical change.

B: This doubles the sum of squared leg lengths before taking a root.

D: This subtracts squared legs even though the unknown is the hypotenuse.

A selection alone does not establish a misconception; ask for the reasoning.

WORKED KEYS

001 - 002**001 | Warm-up**

Target: Construct a coordinate model and justify distance.

Result: 5 units

One valid third vertex is (1, 2). The horizontal and vertical legs have lengths 4 and 3; their axes are perpendicular. $AB^2 = 4^2 + 3^2 = 25$, hence $AB = 5$. The plot must place each point correctly and show a right-angle marker at the third vertex.

Assess the requested representation, reasoning, accuracy, and interpretation separately. Equivalent exact forms and valid alternative constructions are acceptable.

002 | Warm-up

Target: Construct a coordinate model and justify distance.

Result: 10 units

One valid third vertex is (8, -4). The horizontal and vertical legs have lengths 6 and 8; their axes are perpendicular. $AB^2 = 6^2 + 8^2 = 100$, hence $AB = 10$. The plot must place each point correctly and show a right-angle marker at the third vertex.

Assess the requested representation, reasoning, accuracy, and interpretation separately. Equivalent exact forms and valid alternative constructions are acceptable.