

NORTH CAROLINA MATHEMATICS

Grade 7 | Ratio reasoning

Proportional relationships



NC.7.RP.2 | Ratios and proportional relationships

Teacher scripts, worked models, original student tasks, reusable organizers, worked keys and performance evidence.

30 multiple-choice + 30 open/performance tasks in seven teaching sections. Select a small core across multiple lessons.

Current NC standards for 2026-27 and 2027-28. The standards adopted in 2026 for implementation in 2028-29 are not substituted.

Free sample | Contents

NC.7.RP.2 | Seventh Grade mathematics

This sample contains 13 complete selected pages from the 103-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-11, 71-72

Representative activities

M01: sample PDF page(s) 9; original page(s) 8

M02: sample PDF page(s) 11; original page(s) 10

O01: sample PDF page(s) 10; original page(s) 9

O02: sample PDF page(s) 12; original page(s) 11

Selected teacher prompts and keys: original page(s) 71-72

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.

TEACHER GUIDE

Exact standard and navigation

Recognize and represent proportional relationships between quantities.

a. Understand that a proportion is a relationship of equality between ratios.

Represent proportional relationships using tables and graphs.

Recognize whether ratios are in a proportional relationship using tables and graphs.

Compare two different proportional relationships using tables, graphs, equations, and verbal descriptions.

b. Identify the unit rate (constant of proportionality) within two quantities in a proportional relationship using tables, graphs, equations, and verbal descriptions.

c. Create equations and graphs to represent proportional relationships.

d. Use a graphical representation of a proportional relationship in context to:

Explain the meaning of any point (x, y) .

Explain the meaning of $(0, 0)$ and why it is included.

Understand that the y -coordinate of the ordered pair $(1, r)$ corresponds to the unit rate and explain its meaning.

Contents

Next: targets, planning and access; two worked-model pages; a reusable organizer. Each of seven section plans precedes its student bank. Complete keys, a performance rubric, inquiry and official sources follow the bank.

Print selected student pages, not the entire bank as one test. Keep teaching models and keys separate from independent assessment. All contexts and data are invented for instruction.

TEACHER GUIDE

Targets, evidence and planning

a | I can recognize equal ratios and represent proportional relationships.

a.compare | I can compare proportional relationships across representations.

b | I can identify the constant of proportionality in four representations.

c | I can create equations, tables and graphs for proportional relationships.

d | I can interpret any point, the origin and the unit-rate point in context.

What to collect

Collect a representation, calculation and contextual explanation for each relevant target. Ask “What quantity is one? What stays constant? How can you check?” A choice answer alone is insufficient evidence for creating a graph, table or model.

Prerequisites and materials

Equivalent fractions, fraction multiplication/division, coordinate axes, ratio language and percent as per 100. Provide pencil, paper, ruler and these blank organizers. A calculator may verify arithmetic after reasoning is recorded; note its use.

Selected core and pacing

Use the first M and O in each section, swapping for missing targets. The 80-minute core is split across three or more sessions: warm-up/I Do/We Do; collaborative/independent; reteach/exit. The full bank supports later practice, conferences and reassessment.

Neutral access

Read directions without choosing a rate, base or scale. Allow AAC, signed/oral/dictated explanations, enlarged grids and student-directed plotting. Record answer-supplying hints separately. Do not score spelling, handwriting or accent.

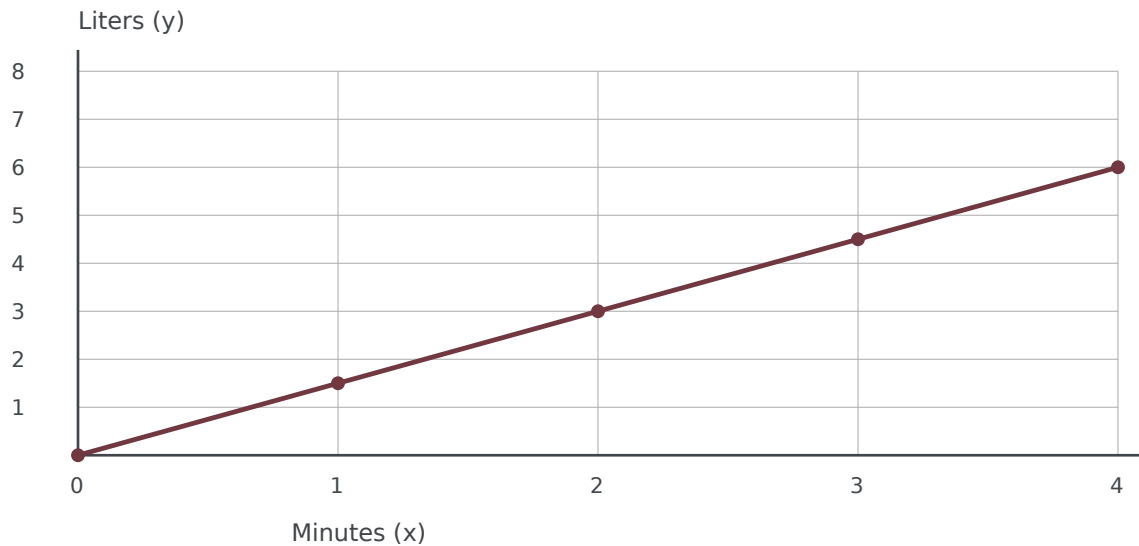
TEACHER MODEL

Think aloud with quantities

Continuous water flow: $y = (3/2)x$

Let x be elapsed minutes and y be liters delivered since starting. Say: “Every nonzero table row has $y/x=3/2$. At $x=0$, no time has passed and zero liters have been delivered. At $x=1$, the y -coordinate is $3/2$; that is the unit rate.”

Minutes x	Liters y
0	0
1	$3/2$
2	3
4	6



Explain (2,3): 3 liters are delivered in 2 minutes. The straight line through the origin represents all nonnegative times in this constant-flow model.

TEACHER MODEL

Connect, test and explain

A straight line is not enough

Compare $y=(3/2)x$ with $y=(3/2)x+2$. The second starts with 2 liters already in a container; it gives $(0,2),(1,7/2),(2,5)$. Its ratios at positive x are $7/2$ and $5/2$, so they are not constant. It is straight but not proportional.

Compare across representations

Pump A has $y=(3/2)x$. Pump B delivers 8 L in 4 min, so $k=2$ L/min. At 1 minute A has 1.5 L and B has 2 L. At 4 minutes A has 6 L and B has 8 L. B has the larger unit rate; the output difference grows with time.

Create, do not copy

For a new pump delivering 9 L in 3 min, students build their own table, choose equally spaced scales and draw $y=3x$. Require labels, $(0,0)$, $(1,3)$ and another contextual point. For continuous flow connect points; for indivisible objects show only admissible discrete inputs.

Proportion means equality

A proportion is an equation of ratios, such as $3/2 = 6/4$. It is not merely a pair of numbers that both increase. Discuss ratio order before comparing cross-products.

Teacher response to errors

Ask the learner to name numerator and denominator units or identify the 100% base. Test one known pair. If you supply a missing multiplier, ratio direction or graph scale, record that support and reassess with a fresh task.

REUSABLE STUDENT ORGANIZER

Represent and check

Name: _____ Date: _____

Question / requested unit: _____

Input / base: _____	Output / part: _____

Model or equation: label quantities and units

Calculation, check and contextual explanation

TEACHER | Warm-up

Warm-up | 8 minutes

Bank: M01-M04; O01-O04. Suggested core: M01, O01. Use other items later or substitute for a missing target.

Purpose: Activate equivalent-ratio reasoning.

0-2 min | Ask “What quantities and units are compared?” Let each student label them before calculation.

2-6 min | Work on O01. Say: “Show your quantities, model and calculation. Explain what your answer means, then check it.” Pause at a key step and ask the learner to justify it.

Target evidence: Create equations, tables and graphs for proportional relationships.

Expected reasoning: $k=12/4=3$ dollars per meter. The context specifies a constant price and no extra charge. $y=(3)x$. Plot $(0,0),(1,3),(2,6),(4,12)$. The point at $x=1$ is the unit-price point; $(4,12)$ means 4 meters cost 12 dollars.

6-8 min | Compare methods or revise a misconception, then request an individual explanation.

If stuck / extend

Support vocabulary and access without choosing a rate or percent base. For reteaching, rebuild one known pair and explicitly record the hint. Early finisher: change one quantity and predict how the output changes, then verify. Record item/date, actual model, computation, interpretation and next step.

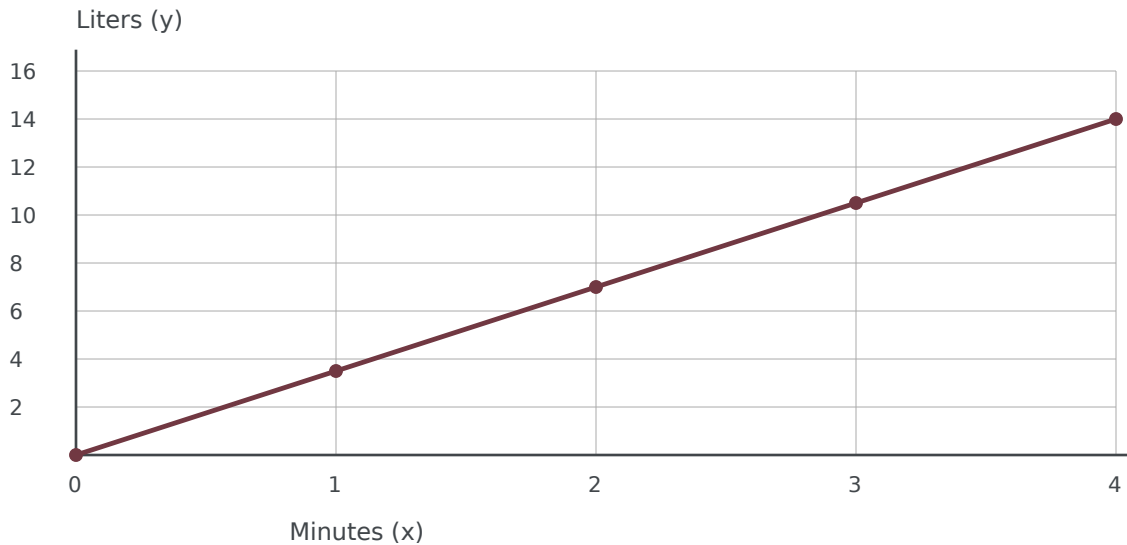
WARM-UP

M01 + O01 | Student tasks

Name: _____ Date: _____

M01 | Target b

The graph shows volume delivered at a constant rate. What is the constant of proportionality in liters per minute?



- A. $2\frac{1}{4}$
- B. $2\frac{1}{2}$
- C. $7\frac{1}{2}$
- D. 7

Reasoning / calculations for the choice

WARM-UP

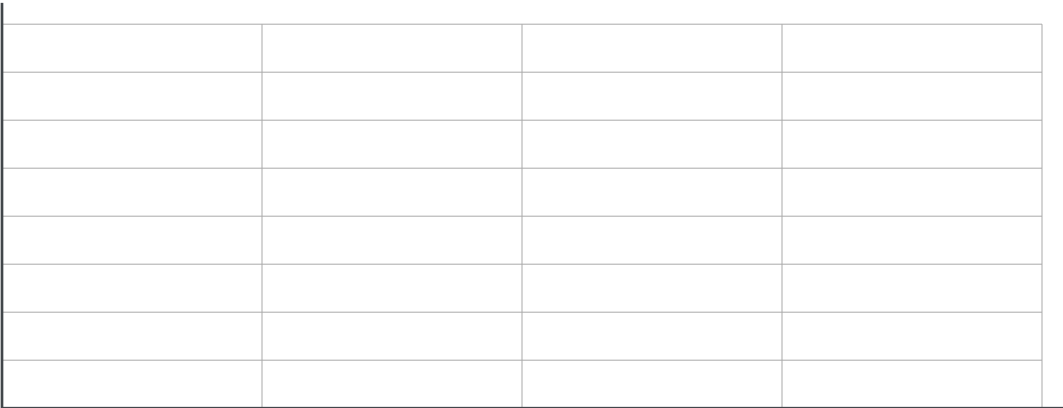
001 | Performance task

Name: _____ Date: _____

001 | Target c | Show and explain

A fabric seller charges 12 dollars for 4 meters with a constant unit price and no extra charge. Create an equation and graph. Label a point at $x=1$ and a second nonzero point. Explain both.

Vertical quantity / unit: _____



0

Horizontal quantity / unit: _____

Table, equation and explanation

WARM-UP

M02 + 002 | Student tasks

Name: _____ Date: _____

M02 | Target b

A proportional relationship is written $y = (7/2)x$, where x is kilograms and y is dollars. What is the unit price in dollars per kilogram?

A. $21/2$ B. $7/2$

C. 7

D. $21/4$ **Reasoning / calculations for the choice**

WARM-UP

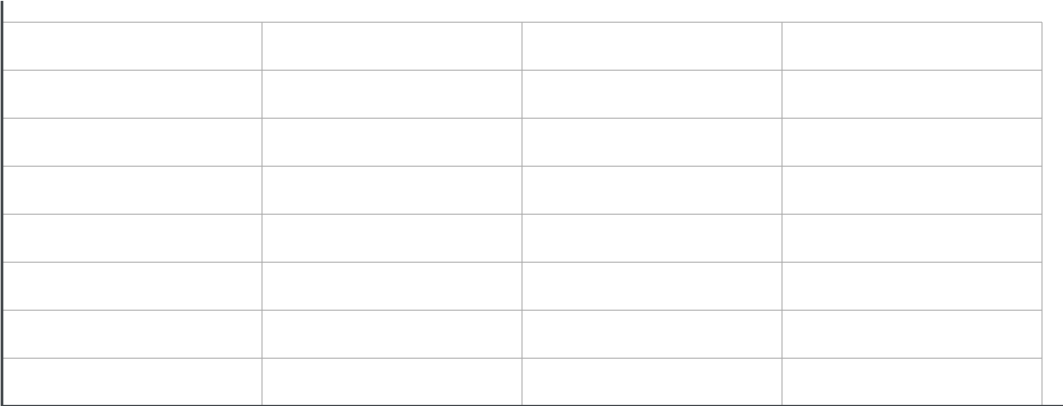
002 | Performance task

Name: _____ Date: _____

002 | Target d | Show and explain

For the relationship $y=(2)x$, x is elapsed minutes and y is liters delivered since starting. Create a labelled graph, then explain (2,4), (0,0), and (1,2). Why must the origin belong to this model?

Vertical quantity / unit: _____



0

Horizontal quantity / unit: _____

Table, equation and explanation

TEACHER ONLY | WORKED KEY

M01 and O01

M01 | C. 7/2

The graph contains $(1, 7/2)$ and $(2, 7)$. Divide y by x : $7/2 = 7/2$ L/min.

A | $21/4$ is $3/2$ times the required result. Substitute it into the worked relationship: it does not recover the given quantities. Ask the learner to show the ratio order, base or scaling step; this choice alone does not prove a specific misconception.

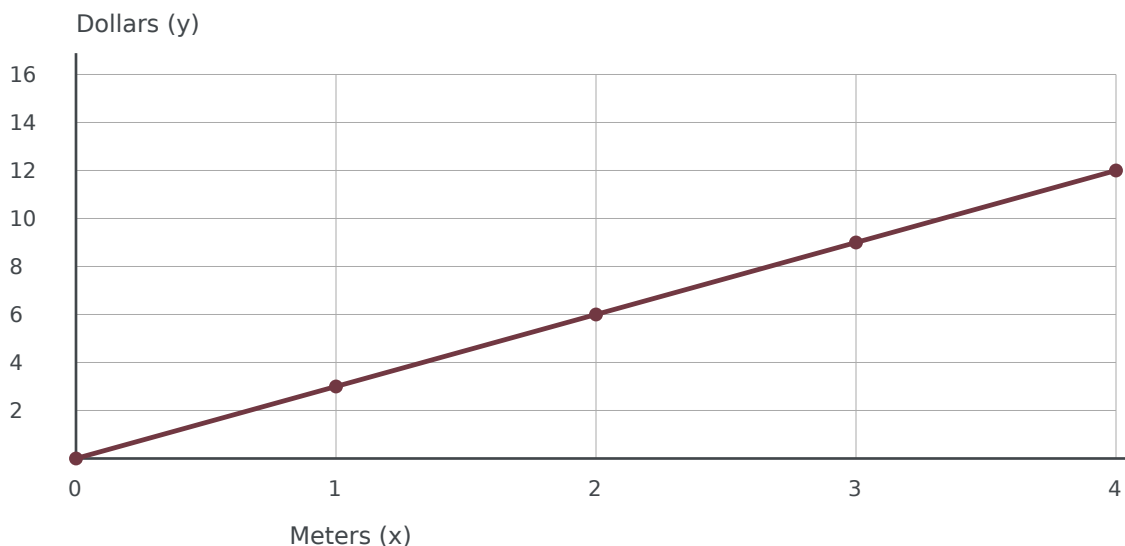
B | $21/2$ is 3 times the required result. Substitute it into the worked relationship: it does not recover the given quantities. Ask the learner to show the ratio order, base or scaling step; this choice alone does not prove a specific misconception.

D | 7 is 2 times the required result. Substitute it into the worked relationship: it does not recover the given quantities. Ask the learner to show the ratio order, base or scaling step; this choice alone does not prove a specific misconception.

O01 | Complete sample response

$k=12/4=3$ dollars per meter. The context specifies a constant price and no extra charge.
 $y=(3)x$. Plot $(0,0)$, $(1,3)$, $(2,6)$, $(4,12)$. The point at $x=1$ is the unit-price point; $(4,12)$ means 4 meters cost 12 dollars.

Evidence to record: Create equations, tables and graphs for proportional relationships.



TEACHER ONLY | WORKED KEY

M02 and O02

M02 | B. $\frac{7}{2}$

At $x=1$, $y=\frac{7}{2}$. The coefficient $\frac{7}{2}$ is dollars per kilogram, not kilograms per dollar.

A | $\frac{21}{2}$ is 3 times the required result. Substitute it into the worked relationship: it does not recover the given quantities. Ask the learner to show the ratio order, base or scaling step; this choice alone does not prove a specific misconception.

C | 7 is 2 times the required result. Substitute it into the worked relationship: it does not recover the given quantities. Ask the learner to show the ratio order, base or scaling step; this choice alone does not prove a specific misconception.

D | $\frac{21}{4}$ is $\frac{3}{2}$ times the required result. Substitute it into the worked relationship: it does not recover the given quantities. Ask the learner to show the ratio order, base or scaling step; this choice alone does not prove a specific misconception.

O02 | Complete sample response

The horizontal coordinate measures 2 minutes; the vertical coordinate measures 4 liters delivered. Their ratio is 2 L/min. (0,0) means no elapsed time and no volume delivered since starting. (1,2) means 2 liters in 1 minute, the unit rate. Because $y=kx$, setting $x=0$ gives $y=0$; the model has no initial delivered volume. Plot these three points and connect them with a straight line on nonnegative axes; label minutes and liters with equal scale intervals.

Evidence to record: Interpret any point, the origin and the unit-rate point in context.

