

NORTH CAROLINA MATHEMATICS

Grade 7 | Ratio reasoning

Unit rates with fractions



NC.7.RP.1 | 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.1 | Seventh Grade mathematics

This sample contains 11 complete selected pages from the 77-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-9, 45-46

Representative activities

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

M02: sample PDF page(s) 10; original page(s) 9

O01: sample PDF page(s) 9; original page(s) 8

O02: sample PDF page(s) 10; original page(s) 9

Selected teacher prompts and keys: original page(s) 45-46

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

Compute unit rates associated with ratios of fractions to solve real-world and mathematical problems.

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 compute a unit rate from a ratio of fractions.

B | I can interpret a rate and its reciprocal with contextual units.

C | I can use fraction unit rates to compare and solve problems.

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

A pump transfers 3/4 liter in 2/3 minute.

Say: “The question asks liters per minute, so liters is the numerator quantity. I scale 2/3 minute to 1 minute by multiplying by 3/2. The same factor sends 3/4 liter to 9/8 liters. Dividing the two fractions is the same operation: $(3/4) \div (2/3) = (3/4)(3/2) = 9/8$.”

Minutes	Liters
0	0
2/3	3/4
1	9/8
2	9/4

Ask: “Why is the unit output larger than 3/4?” One full minute is longer than 2/3 minute. Check: $(9/8)(2/3)=3/4$. The numerical answer is exact; 9/8 L/min also equals 1 1/8 L/min.

Reverse the question

For minutes per liter, compute $(2/3) \div (3/4) = 8/9$ min/L. This is the time for one liter. It is not 9/8 with unit labels swapped. The numerical rates are reciprocals: $(9/8)(8/9)=1$.

TEACHER MODEL

Connect, test and explain

Scale factor and unit rate agree

At $\frac{3}{4}$ liter per $\frac{2}{3}$ minute, find liters in $\frac{5}{2}$ minutes. Unit-rate path: $(\frac{9}{8})(\frac{5}{2}) = \frac{45}{16}$ L. Scale-factor path: $(\frac{5}{2}) / (\frac{2}{3}) = \frac{15}{4}$; $(\frac{3}{4})(\frac{15}{4}) = \frac{45}{16}$ L. Ask learners to locate the same multiplier in a table.

Interpret a reciprocal carefully

For 3 liters, use $\frac{8}{9}$ min/L: $3(\frac{8}{9}) = \frac{8}{3}$ minutes. Check with the forward rate: $(\frac{9}{8})(\frac{8}{3}) = 3$ liters. Rate direction follows the question, not a rule that the larger number goes first.

Minutes



Liters



The matching marks above are equally spaced because each top step is $\frac{2}{3}$ and each bottom step is $\frac{3}{4}$. A different set of values may require different spacing.

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: Use fraction unit rates to compare and solve problems.

Expected reasoning: First rate = $14/9$. Second = $61/60 \div 3/4 = 61/45$. Difference = $|14/9 - 61/45| = 1/5$ liters/minute. The first system has the higher rate. Both original inputs are $3/4$ minute, so direct output comparison is fair. Their output difference is $3/20$ liters; dividing by $3/4$ gives $1/5$ liters/minute.

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 C

A pump transfers $\frac{5}{6}$ liters in $\frac{3}{4}$ minutes at a constant rate. How many minutes are needed to produce $\frac{3}{2}$ liters?

- A. $\frac{27}{20}$
- B. $\frac{81}{20}$
- C. $\frac{27}{10}$
- D. $\frac{81}{40}$

O01 | Target C | Show and explain

A pump transfers $\frac{7}{6}$ liters in $\frac{3}{4}$ minutes at a constant rate. A second system produces $\frac{61}{60}$ liters per $\frac{3}{4}$ minute. By how many liters per minute do the unit rates differ? Find both rates, identify the faster/higher-output system, and decide whether comparing only the given outputs is fair. Justify your decision using the two input amounts.

Model / table / calculation**Answer, units and explanation**

WARM-UP

M02 + O02 | Student tasks

Name: _____ Date: _____

M02 | Target A

A belt moves $11/6$ meters in $7/8$ minutes at a constant rate. What is the rate in meters per minute?

- A. $44/21$
- B. $22/21$
- C. $22/7$
- D. $11/7$

O02 | Target C | Show and explain

A belt moves $13/6$ meters in $7/8$ minutes at a constant rate. A second system produces $281/140$ meters per $3/4$ minute. By how many meters per minute do the unit rates differ? Find both rates, identify the faster/higher-output system, and decide whether comparing only the given outputs is fair. Justify your decision using the two input amounts.

Model / table / calculation

Answer, units and explanation

TEACHER ONLY | WORKED KEY

M01 and O01**M01 | A. 27/20**

Rate = 10/9 liters/minute; input needed = $3/2 \div 10/9 = 27/20$ minutes. Check: $27/20 \times 10/9 = 3/2$ liters.

B | 81/20 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 | 27/10 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 | 81/40 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.

O01 | Complete sample response

First rate = 14/9. Second = $61/60 \div 3/4 = 61/45$. Difference = $|14/9 - 61/45| = 1/5$ liters/minute. The first system has the higher rate. Both original inputs are $3/4$ minute, so direct output comparison is fair. Their output difference is $3/20$ liters; dividing by $3/4$ gives $1/5$ liters/minute.

Evidence to record: Use fraction unit rates to compare and solve problems.

TEACHER ONLY | WORKED KEY

M02 and O02**M02 | A. 44/21**

$11/6 \div 7/8 = 11/6 \times 8/7 = 44/21$ meters per minute. Multiplying by $7/8$ minute gives $11/6$ meters again.

B | $22/21$ is $1/2$ 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.

C | $22/7$ 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.

D | $11/7$ is $3/4$ 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

First rate = $52/21$. Second = $281/140 \div 3/4 = 281/105$. Difference = $|52/21 - 281/105| = 1/5$ meters/minute. The second system has the higher rate. The original inputs differ, so compare outputs for the same one-unit input.

Evidence to record: Use fraction unit rates to compare and solve problems.