

NORTH CAROLINA MATHEMATICS

Grade 7 | Ratio reasoning

Scale factors and percents



NC.7.RP.3 | 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.3 | Seventh Grade mathematics

This sample contains 12 complete selected pages from the 80-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-10, 48-49

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) 11; original page(s) 10

Selected teacher prompts and keys: original page(s) 48-49

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

Use scale factors and unit rates in proportional relationships to solve ratio and percent 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 use scale factors and unit rates in ratio problems.

B | I can convert both units of a rate using supplied equivalences.

C | I can solve percent increase, decrease and inverse problems.

D | I can model multiple percent changes with an explicit base.

E | I can interpret circle graphs with proportional reasoning.

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.

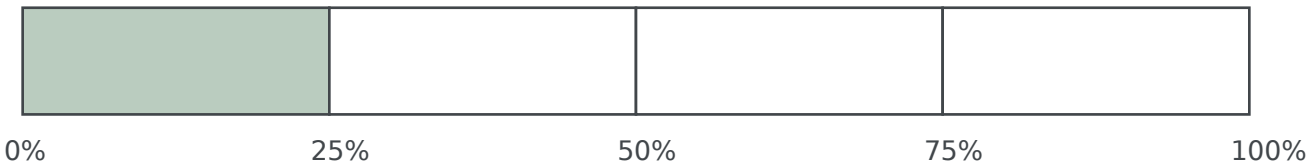
TEACHER MODEL

Think aloud with quantities

A \$80 jacket: 25% off, then 5% tax

Say: “Original price is 100%. A quarter of \$80 is \$20, so 75% remains: \$60. The tax uses this new \$60 base. Five percent of \$60 is \$3. The final cost is \$63, not \$64.”

Stage	Base / factor	Result
Discount	$\$80 \times 3/4$	\$60
Tax	$\$60 \times 1/20$	\$3
Final	$\$60 + \$3$	\$63



80 dollars total; each quarter is 20 dollars.

For this model, the bar’s 80 units are dollars: one shaded quarter is the \$20 discount; the other three quarters total the \$60 sale price. Overall factor = $(3/4)(21/20)=63/80=0.7875$; the final price is 78.75% of the original.

TEACHER MODEL

Connect, test and explain

Change both units of a rate

A cart moves 12 km/hour. Given $1 \text{ km} = 1000 \text{ m}$ and $1 \text{ hour} = 60 \text{ min}$: 12 km in one hour is 12000 m in 60 min, or 200 m/min. Explain each scale factor; formal dimensional-analysis notation is optional.

Recover the original

A sale price of \$60 follows a 25% discount. The \$60 is 75%, so 1% is \$0.80 and 100% is \$80. Adding 25% of \$60 gives \$75, which uses the wrong base.

Interpret circle graphs

A full circle is 360 degrees. For 200 votes, an Art sector of 108 degrees represents $108/360 = 3/10 = 30\%$, or 60 votes. Music occupies 162 degrees: $162/360 = 45\%$, or 90 votes. The missing Sport sector is $360 - 108 - 162 = 90$ degrees, so $90/360 = 25\%$, or 50 votes. Check totals: 360 degrees, 100%, and 200 votes. The largest share (45%) is not a majority. Use equivalent part-to-whole ratios, not a memorized rule.

Instructional boundaries

Current unpacking includes rate conversions in both units, percent increases/decreases and circle-graph interpretation. Fractions, decimals and multistep problems are included. Formulas or dimensional analysis are not required strategies; prefer explained unit-rate and scale-factor reasoning.

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: Solve percent increase, decrease and inverse problems.

Expected reasoning: Change magnitude = $|69 - 60| = 9$ members. Compare with the original: $9/60 = 3/20 = 15\%$. The base is 60, not 69. Ratio table (percent, members): (100, 60), (15, 9), (115, 69).

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.

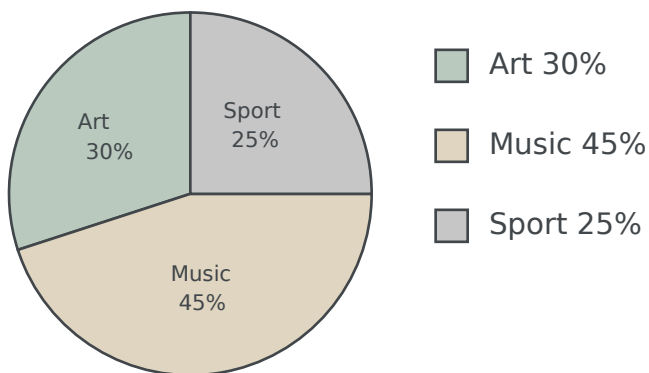
WARM-UP

M01 + O01 | Student tasks

Name: _____ Date: _____

M01 | Target E

The circle graph represents 40 votes, one vote per person. How many votes were for Art?



- A. 18
- B. 24
- C. 12
- D. 9

Reasoning / calculations for the choice

WARM-UP

001 | Performance task

Name: _____ Date: _____

001 | Target C | Show and explain

A club changes from 60 members to 69 members. What is the percent increase? Represent the original membership as 100%. Show the change-to-original ratio and explain why the denominator matters.

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

WARM-UP

M02 + O02 | Student tasks

Name: _____ Date: _____

M02 | Target C

A club changes from 40 members to 46 members. What is the percent increase?

- A. $15/4$
- B. 15
- C. $45/4$
- D. $15/2$

O02 | Target B | Show and explain

A pump moves 35 milliliters per second. Using $1000 \text{ mL} = 1 \text{ L}$ and $60 \text{ seconds} = 1 \text{ minute}$, what is its rate in liters per minute? Show both conversion steps and use the converted rate to find the volume moved in $5/2$ minutes.

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

TEACHER ONLY | WORKED KEY

M01 and O01

M01 | C. 12

Art is $30/100 = 3/10$ of the total. $40 \times 3/10 = 12$ votes. The three sectors total 100%.

A | 18 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 | 24 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 | 9 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.

O01 | Complete sample response

Change magnitude = $|69 - 60| = 9$ members. Compare with the original: $9/60 = 3/20 = 15\%$. The base is 60, not 69. Ratio table (percent, members): (100, 60), (15, 9), (115, 69).

Evidence to record: Solve percent increase, decrease and inverse problems.

TEACHER ONLY | WORKED KEY

M02 and O02**M02 | B. 15**

Change magnitude = $|46 - 40| = 6$ members. Compare with the original: $6/40 = 3/20 = 15\%$. The base is 40, not 46.

A | $15/4$ is $1/4$ 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.

C | $45/4$ 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.

D | $15/2$ 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.

O02 | Complete sample response

In one minute it moves $35 \times 60 = 2100$ mL. Divide by 1000: $21/10$ L/min. Both units change, with opposite conversion directions. Volume = $21/10 \times 5/2 = 21/4$ L. Check in original units: $150 \text{ seconds} \times 35 \text{ mL/s} = 5250 \text{ mL} = 21/4 \text{ L}$.

Evidence to record: Convert both units of a rate using supplied equivalences.