



UM Printables

PREMIUM EDUCATIONAL RESOURCES

GRADE 7 • CCSS 7.RP.A.3 • DISCOVERY-BASED UNIT

Percent Change & Percent Error

*Real-World Discovery — Stock Prices, Sports Stats
& Measurement Labs*

A discovery-based resource targeting two of the most under-taught subtopics of 7.RP.A.3. Students derive the percent-change and percent-error formulas themselves by analyzing real stock-price movements, sports-stat swings, and hands-on measurement labs — then rotate through three real-world practice stations.

2 Guided Discovery Lessons

24 Station Problems

Lab Recording Sheet

Exit Ticket + 10-Q Quiz

WHAT'S INSIDE

Inside this resource:

- Two 25-minute guided-discovery teacher lesson scripts
- Printable student discovery notes (fill-in-the-blank formula derivations)
- Hands-on measurement lab recording sheet
- Three station rotation cards — 8 real-world problems each (24 total)
- Labelled diagrams: percent-change number-line model & percent-error formula breakdown
- CCSS-aligned exit ticket & 10-question formative quiz with full answer keys

STANDARDS & TARGETS

CCSS Alignment & Learning Targets

This unit directly addresses **CCSS.MATH.CONTENT.7.RP.A.3**: *"Use proportional relationships to solve multistep ratio and percent problems."* While the standard is broad, this resource focuses on two of its most demanding sub-clusters: percent change (increase and decrease) and percent error. Both require students to identify the correct reference value as the denominator of a proportional comparison — a skill that also underwrites later work with relative growth in Grade 8 and beyond.

Standards Map

Component	7.RP.A.3 Sub-Skill	DOK
Lesson 1: Percent Change Discovery	Percent increase & percent decrease; identify original as reference	3
Lesson 2: Percent Error Discovery	Percent error; identify accepted value as reference	3
Station A: Retail Percent Change	Markdowns, markups, inflation — single-step percent change	2
Station B: Science & Weather Percent Error	Measurement error; forecast accuracy — single-step percent error	2
Station C: Mixed Multi-Step	Combine percent change & percent error in financial-literacy contexts	3
Exit Ticket	All four sub-skills — formative check	2
Formative Quiz	All four sub-skills + multi-step application	3

Learning Targets — "I Can" Statements

- ▶ I can **calculate percent change** (increase or decrease) by identifying the original value as the reference denominator.
- ▶ I can **calculate percent error** by identifying the accepted (true) value as the reference denominator.
- ▶ I can **derive** the percent-change and percent-error formulas from real-world data, not just memorize them.
- ▶ I can **distinguish** percent change from percent error and choose the correct tool for a given context.
- ▶ I can **interpret** a percent as a relative comparison to a specific reference value, and explain why the reference matters.
- ▶ I can **apply** percent change and percent error in multi-step real-world problems involving money, measurement, and forecasts.

Essential Questions

- ✧ Why is the **original** value the denominator in percent change — not the new value?

Guided Discovery: Percent Change

In this lesson, students examine *real stock-price movements* and *sports-stat swings* to discover the percent-change formula for themselves. The teacher's role is to surface the structural insight — the original value is the reference point — through careful questioning, not to deliver the formula.

Students derive the percent-change formula and apply it to increase and decrease contexts.

Project a one-week stock ticker (editable tickers below) and ask: "Which stock had the bigger move?"

Projector, calculators, Student Discovery Notes — Percent Change.

A student says "the original price is what we divide by" — that's the discovery.

Stock-Price Movement: AAPL vs TSLA (1-week)

Bars show closing price. Arrows show change from previous week.



Figure 1.1 — Visual hook: AAPL increased, TSLA decreased. Same dollar move can mean very different percents.

Editable Ticker Data (project or write on board)

These tickers are **editable placeholders** — swap in any current or historical prices your students will recognize. The numbers below are calibrated so the percent changes come out clean for first-time learners.

Ticker	Last Week Close	This Week Close	Dollar Change	% Change
AAPL	\$150.00	\$165.00	+\$15.00	+10%
TSLA	\$250.00	\$200.00	-\$50.00	-20%
MSFT	\$300.00	\$330.00	+\$30.00	+10%
AMZN	\$120.00	\$108.00	-\$12.00	-10%
GOOGL	\$140.00	\$154.00	+\$14.00	+10%

Lesson Script (25 minutes)

Phase 1 — The Hook (0:00 – 5:00)

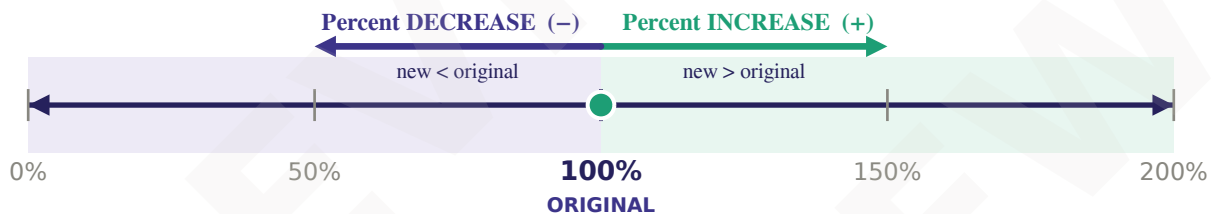
DIAGRAM 1

The Percent-Change Number-Line Model

This labelled diagram is the single most useful visual for percent change. Project it during Lesson 1 and refer back to it throughout the unit. The number line makes three ideas visible at once: (1) the **original value is always the 100% anchor**; (2) increases move right into the teal zone above 100%; (3) decreases move left into the purple zone below 100%. The anchor dot at 100% is the reference value that appears in the denominator of every percent-change calculation.

The Percent-Change Number Line

Original value is always the 100% anchor. Increases move right; decreases move left.



$$\text{Percent Change} = | \text{new} - \text{original} | \div \text{original} \times 100$$

Sign of (new - original) tells direction: + = increase, - = decrease

Figure 2.1 — The percent-change number line. The original value sits at the 100% anchor (teal dot). Increases push the new value into the right-hand teal zone; decreases push it into the left-hand purple zone.

How to Use This Diagram in Class

Walk students through three readings of the diagram, each at a different level of abstraction. The first reading is **positional**: ask students to point to where a 50% decrease would land, where a 25% increase would land, where a 100% increase (doubling) would land. The second reading is **computational**: given a starting value of \$80, ask students to compute the new value after a 25% increase (\$100) and after a 25% decrease (\$60), and to mark both points on a sketched copy of the number line. The third reading is **conceptual**: ask why a 25% increase followed by a 25% decrease does not return the value to its starting point — this asymmetry is the single most important idea about percent change that students must internalize before high school.

THE ASYMMETRY INSIGHT

A 25% increase on \$80 takes it to \$100 (because 25% of 80 = 20). A 25% decrease on \$100 takes it to \$75 (because 25% of 100 = 25). The value does NOT return to \$80. Why? Because the second calculation uses a **different reference value** as the denominator. This is the deepest idea in the unit — the reference value matters every single time.

Guided Discovery: Percent Error

*In this lesson, students **physically measure the same object** with two different tools (a ruler and a tape measure), compare their results to an accepted "true" value, and discover the percent-error formula. The hands-on component makes the abstract idea of "experimental vs. accepted" immediately concrete.*

Students derive the percent-error formula and connect it to real measurement uncertainty.

Hold up a textbook. "How long is this? Measure it twice — once with a ruler, once with a tape measure."

Rulers, tape measures, 5–10 identical objects (textbooks work well), Measurement Lab Recording Sheet.

A student asks "which one do we divide by?" and the class decides: the accepted value.

Lab Setup (before class)

Before students arrive, measure each textbook yourself with a calibrated meter stick and record the **accepted length** (e.g., 25.0 cm). This is the "true" value students will compare against. Place 5–10 textbooks at stations around the room — they should all be the same edition so the accepted value is constant. At each station place one ruler and one tape measure. Make the Measurement Lab Recording Sheet available for each student.

WHY A RULER AND A TAPE MEASURE?

Rulers and tape measures have different precision and different handling ergonomics. A ruler gives clean centimeter marks but is hard to align on long objects. A tape measure flexes and can sag, introducing small errors. By using both, students see concretely that **measurement is never perfectly exact** — every tool introduces some error. This is the physical intuition percent error quantifies.

Lesson Script (25 minutes)

Phase 1 — The Hook (0:00 – 5:00)

TEACHER SAYS

"I just measured this textbook with a calibrated meter stick. Its true length is **25.0 cm**. Now you try. Take this ruler, measure the same book, and write down your reading to the nearest millimeter. Then take the tape measure and measure it again. Do both. Go."

Anticipated student readings:

- Ruler: 24.8 cm • Tape: 25.3 cm
- Ruler: 25.1 cm • Tape: 24.9 cm
- Ruler: 25.0 cm • Tape: 25.4 cm

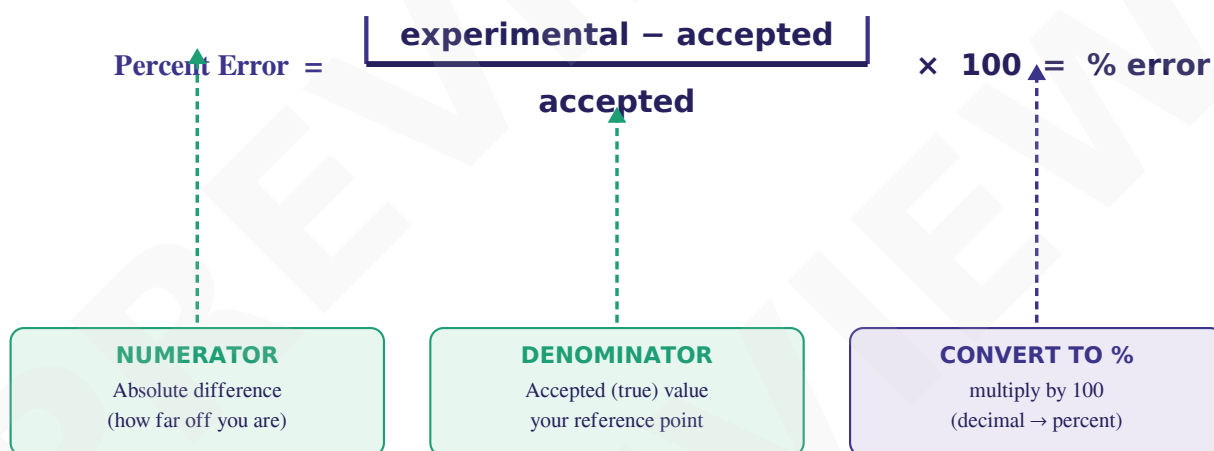
DIAGRAM 2

The Percent-Error Formula Breakdown

This annotated diagram decomposes the percent-error formula into its three building blocks: the **numerator** (the absolute difference between experimental and accepted values), the **denominator** (the accepted value, which is the reference point), and the **multiplication by 100** (which converts the resulting fraction into a percent). Each piece answers a different question, and students who can name all three pieces rarely make the classic denominator-error mistake.

Percent-Error Formula: Anatomy Breakdown

Three building blocks combine to measure how far a measurement is from the accepted truth.



KEY IDEA: Absolute value bars guarantee a NON-NEGATIVE error.
The accepted value is the benchmark — not the experimental one.

Figure 2.2 — Anatomy of the percent-error formula. The absolute-value bars in the numerator guarantee a non-negative result; the accepted value in the denominator is the benchmark all measurements are judged against.

The Three Common Mistakes This Diagram Prevents

Students who internalize this diagram avoid the three classic percent-error errors that show up year after year on state assessments. First, they avoid the **wrong-denominator mistake**: dividing by the experimental value instead of the accepted value. The diagram makes the accepted value visually prominent as the denominator, with its own annotation box, so students see it as the reference point. Second, they avoid the **negative-percent mistake**: forgetting the absolute value bars and reporting a negative percent error. The diagram's key-idea bar explicitly states that the absolute value bars guarantee a non-negative result. Third, they avoid the **forgot-to-multiply-by-100 mistake**: leaving the answer as a decimal (0.08) instead of a percent (8%). The ×100 conversion has its own labelled annotation in the diagram.



STATION A

Percent Change in Retail

Markdowns, markups, and inflation — single-step percent change.

You are a retail analyst. Use the real-world price list below to answer each problem. Show your work in the space provided. Round percent answers to the nearest tenth of a percent when needed.

Retail Price Dataset (use for problems 1–8)

Item	Original Price	New Price	Context
Sneakers	\$80.00	\$64.00	End-of-season sale
Hoodie	\$45.00	\$54.00	Style markup
Headphones	\$120.00	\$90.00	Black Friday markdown
Textbook	\$95.00	\$103.55	Annual inflation
Coffee mug	\$12.00	\$15.00	Boutique markup
Video game	\$60.00	\$42.00	Clearance markdown
Bicycle	\$320.00	\$368.00	Inflation + model upgrade
Watch	\$250.00	\$175.00	Holiday markdown

Problems

1 The **sneakers** went on sale. What is the percent change? Is it an increase or a decrease?

2 The **hoodie** received a style markup. What is the percent change? Is it an increase or a decrease?

3 The **headphones** had a Black Friday markdown. What is the percent change? Is it an increase or a decrease?

4 The **textbook** price changed due to annual inflation. What is the percent change? Round to the nearest tenth of a percent.

Percent Change & Percent Error

Name: _____ Date: _____ Score: ____ / 30

Complete all 10 questions in 30 minutes. Calculators permitted. Show your work for free-response questions. Multiple choice: circle the single best answer. Each question is worth 3 points (1 for setup, 1 for computation, 1 for correct answer).

Multiple Choice (2 pts each)

- 1 Which value goes in the DENOMINATOR of the percent-change formula?
 (A) the new value (B) the original value (C) the change (D) the average of new and original

- 2 Which value goes in the DENOMINATOR of the percent-error formula?
 (A) the experimental value (B) the accepted value (C) the absolute difference (D) the average of experimental and accepted

Short Answer — Percent Change (3 pts each)

- 3 A pair of jeans originally cost \$80. They are now marked up to \$96. What is the percent change? Is it an increase or a decrease?

- 4 A tablet was priced at \$250. It went on sale for \$200. What is the percent change? Is it an increase or a decrease?

Short Answer — Percent Error (3 pts each)



UM PRINTABLES • PREMIUM EDUCATIONAL RESOURCES

What's Inside This Resource

Percent Change & Percent Error — Real-World Discovery (Grade 7)

44

Total Pages

2

Discovery Lessons

24

Station Problems

10

Question Quiz

Complete Component Breakdown

Component	What Students Do	Pages
Cover & Overview	Pacing guide, materials, teacher tips	1–5
Lesson 1: Percent Change	Discover formula via stock prices & sports stats	7–9
Diagram 1: Number-Line Model	Labelled visual for percent change	10–11
Lesson 2: Percent Error	Discover formula via measurement lab	12–14
Diagram 2: Formula Breakdown	Annotated percent-error formula anatomy	15–16
Student Discovery Notes	Fill-in-the-blank formula derivations	17–20
Measurement Lab Sheet	Hands-on ruler vs. tape measure recording	21–22
Station A: Retail	8 percent-change problems (markdowns, markups)	23–24
Station B: Science/Weather	8 percent-error problems (density, forecasts)	25–26
Station C: Multi-Step	8 mixed financial-literacy problems	27–28
Full Answer Keys	Step-by-step solutions for all 24 station problems	29–34
Exit Ticket + Key	4-question CCSS-aligned formative check	35–37
Quiz + Answer Key	10-question formative assessment with rubric	38–42
Review Request	TPT review CTA & credits	43–44



FULL RESOURCE OVERVIEW

What the Full PDF Contains

Percent Change & Percent Error - Real-World Discovery | Grade 7

42

TOTAL PAGES

2

DISCOVERY LESSONS

24

STATION PROBLEMS

4

EXIT-TICKET QUESTIONS

10

QUIZ QUESTIONS

The complete resource combines teacher-facing guidance with student-facing practice. Students explore percent change and percent error through guided discovery, real-world datasets, a hands-on measurement lab, station rotations, an exit ticket, and a 10-question formative quiz. The full PDF also includes step-by-step answer keys and scoring guidance.

Complete Component Breakdown

FULL PDF SECTION	WHAT IT INCLUDES	PAGES
Cover + Teacher Overview	Cover, pacing guide, materials, teaching notes, standards and learning targets.	1-5
Lesson 1: Percent Change	25-minute guided-discovery lesson using stock-price scenarios and sports-stat data, with teacher scripting.	6-8
Diagram 1: Number-Line Model	Labelled percent-change number line, classroom-use prompts, and a worked example.	9-10
Lesson 2: Percent Error	25-minute guided-discovery measurement lesson with teacher script, lab setup, and student response prompts.	11-13
Diagram 2: Formula Breakdown	Annotated percent-error formula showing numerator, denominator, and the x100 conversion.	14-15
Student Discovery Notes	Fill-in-the-blank notes for deriving the percent-change and percent-error formulas.	16-19
Measurement Lab Recording Sheet	Hands-on ruler/tape-measure activity with data recording and follow-up questions.	20-21
Station A: Retail Percent Change	8 retail problems covering markdowns, markups, inflation, and price changes.	22-23
Station B: Science & Weather Percent Error	8 percent-error problems using measurement, density, and forecast contexts.	24-25
Station C: Multi-Step Mixed Problems	8 mixed problems combining percent change and percent error in real-world financial contexts.	26-27
Station Answer Keys	Step-by-step solutions for all 24 station problems.	28-33
Exit Ticket + Answer Key	4-question formative check plus detailed solutions and misconception notes.	34-36
10-Question Formative Quiz + Key	30-point quiz with step-by-step solutions, point allocations, and scoring guide.	37-41
Final Review / Credits	UM Printables review/feedback information, site information, and resource credits.	42

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