7.RP.2 Use proportional relationships to solve ratio and percent problems with multiple operations (e.g., simple interest, tax, markups, markdowns, gratuities, convert across measurement systems, and percent increase and decrease). (E)

Reporting Category: Algebra & Functions, Ratios & Proportional Reasoning	**Subdomain**: Proportional Relationships

7.RP.2 Instructional Framework

Assessed On:

☐ Checkpoint 1 ☑ Checkpoint 2 ☐ Checkpoint 3 ☑ Summative

Content Limits:
- Limit to rational numbers.

Clarifications:
- Allowable contexts will include percent increase or decrease.
- Real world contexts will be more common in assessing this standard.
- Calculations in the context of gratuities should not tax on the tip or tip on the tax. In other words, tip and sales tax are both based on the subtotal.
- Measurement conversions are allowed within the context of an item when the conversion is embedded in the item stim.
- The keypad in the ILEARN testing system does not allow students to enter a comma between each period in a multi-digit number. (Example: 13,323 would be entered as 13323.)

Calculator Availability: Allowed

Expected Academic Vocabulary: ratio, proportion, percent increase, percent decrease, simple interest, gratuities, tip, markup, markdown, on sale, original price, sale price, discount

Examples of Context and Varying Difficulty Levels	
Context: Easy	Use percentages for increase/decrease that are a multiple of 5 or 10. Limit decrease problems to familiar numbers. Represent problems with equations instead of solving percent problems.
Context: Medium	Calculate the tip *and* sales tax on a restaurant bill. Use percentages that are not a multiple of 5 or 10. Calculate percent using original and final amounts.
Context: Difficult	Work backwards from a given total and the percent of increase/decrease, to find the original amount. Percents may include decimals, fractions, or be greater than 100. Measurement conversions may be included to solve.
Proficiency Level Descriptors and Example Items	

Looking Back: 6.RP.1 ILEARN Item Specification 6.RP.2 ILEARN Item Specification 6.RP.4 ILEARN Item Specification	Looking Ahead: This concept is not specifically addressed in the Indiana Academic Standards in the subsequent grade levels.

Below Proficiency: Use multiplication or addition to find missing ratio values in simple mathematical problems involving ratio or percent.

What is 60% of 240? **Answer:** 144	This is DOK 1 because students must calculate the solution to a percent problem. This is easy because the percentage used is a multiple of 10%.
Fifteen is what percent of 50? **Answer:** 30%	This is DOK 1 because students must calculate the percent of a number. This is easy because the percentage used is a multiple of 10%.
Enter the unknown value to make this statement true. Round to the nearest whole number. ☐ is 33 1/3 % of 45. **Answer:** 15	This is a DOK 1 because the students must calculate the percent. This is a difficult item because the percent is in the form of a fraction.

Approaching Proficiency: Analyze and apply proportional relationships to solve simple real-world and mathematical problems, including simple ratio/percent problems.

The original price of a basketball costs $25. It is on sale for 35% off. What is the sale price of the basketball? **Answer:** $16.25	This is a DOK 2 item because students must apply their understanding of proportional relationships and percents to solve the problem. This is easy because

	the percentage used is a multiple of 5%.
A store sells winter coats. • The original price of a coat is $119. • A 5% sales tax is added. What is the total cost of the coat? **Answer:** $124.95	DOK 1 This is a DOK 2 item because students must apply their understanding of proportional relationships and percents to solve the problem. This is an easy item because the percentage used is a multiple of 5%.
A student answers 85% of the questions on a test correctly. The student correctly answers 34 questions. What is the total number of questions on the test? **Answer:** 40	This is a DOK 2 item because students must apply their understanding of proportional relationships and percents to solve the problem. This is easy because the percentage used is a multiple of 5%.
An athlete played in a basketball tournament last year and this year. • The athlete scored 15 points last year. • The athlete scored 25 points this year. What is the percent of change in points from last year to this year? Round to the nearest whole percent. **Answer:** 67%	This is a DOK 2 item because students must apply their understanding of proportional relationships and percents to solve the problem. This is an easy item because the given numbers are multiples of 5.
A person invests $600 in an account that earns 3% simple interest. How much interest is earned in 1 year?	This is a DOK 2 item because students must

Answer: $18	apply their understanding of proportional relationships and percents to solve the problem.
	This is a medium difficulty item because the percent is not a multiple of 5 or 10.

At Proficiency: Analyze and apply proportional relationships to solve more complex or multi-step real-world and mathematical problems.

A person buys a meal and tips 20%.
 	
Select ALL the meals the person could buy for a total of $15 or less.
 	
  a. $10.00 meal
  b. $11.75 meal
  c. $12.50 meal
  d. $13.25 meal
  e. $15.00 meal
 	
Answer: a, b, c
	This is a DOK 2 item because students must calculate multiple solutions to a percent problem.
	
	This is easy because the percentage used is a multiple of 10.

A family of five goes to dinner. ● The food costs $122.35. ● The family gave the server a 20% tip before tax was applied. ● There is a 6.5% sales tax on the food only. What is the total cost of the meal? **Answer:** $154.77	This is a DOK 2 item because students must apply their understanding of proportional relationships and percents to solve a multi-step problem. This is a difficult item because it includes tip, tax, and a percent in decimal form.
A shirt is on sale. ● The original price of the shirt is $11.50. ● The sale price of the shirt is $10.12. What percent discount did the store apply to the shirt?	This is a DOK 2 item because students must apply their understanding of proportional relationships and percents to solve the

Answer: 12%	problem. This is a medium difficulty item because it provides the original and final amounts.
A business borrows $1,500 at an interest rate of 6.95%. What is the total that the business will owe after 7 years? **Answer:** $2,229.75	This is a DOK 2 because students apply their understanding of simple interest to solve the problem. This is a difficult problem because the interest is in the form of a decimal.

Above Proficiency: Analyze and apply proportional relationships to solve complex real-world and mathematical problems, including working backwards problems to find the original cost/value.	

A person buys a meal. ● A 9% sales tax was applied to the original cost. ● She tips 19% on the original cost. ● She pays a total of $23.35. What was the original cost of her meal? **Answer:** $18.24	This is a DOK 3 because students must analyze and apply their understanding of percents to work backwards using multiple steps to find the original cost/value. This is a difficult item because it includes the final total and percentages to assist in calculating the original amount.
A golfer wants to buy a new set of golf clubs. The same set is sold at two different stores. ● Store #1 has a 20%-off sale. His sale price will be $120. ● Store #2 sells the golf clubs for $8.00 less than Store #1's original price. ● Store #2 is having a 13% off sale. What is the total cost of the golf clubs at the second store?	This is a DOK 3 because students must use percent increase or decrease to find two quantities given their relationship in a real world context. This is difficult because the student works

Answer: $123.54	backward to find the original amount.

A student compares his height at the beginning and end of middle school.
 	
   ● He was 54 inches tall at the beginning.
   ● He was 172 cm tall at the end.
 	
        1 in ≈ 2.54 cm
 	
What is the percent change of the student's height from the beginning of middle school to the end of middle school? Round to the nearest whole number percent.
 	
Answer: 25% increase
	This is a DOK 3 item because students must analyze and apply their understanding of percent increase/decrease using multiple steps to solve the problem.
	
	This is a difficult item because it includes a measurement conversion.

A family invests $5225 in an account that earns simple interest each year. After 42 months, the account's value is $5868.25. 12 months = 1 year What is the simple interest rate? Round to the nearest tenth. **Answer:** 3.5%	This is a DOK 3 item because students must analyze and apply their understanding of simple interest using multiple steps to solve the problem. This is a difficult item because it includes a measurement conversion.