Academic Intervention Services (AIS) Math Unit: Fractions, Decimals, and Percents

Page references are for *Instruction for All Students* by Paula Rutherford

Unit Title: Fractions, Decimals, and Percents

Grade Level/Subject: Eighth Grade Academic Intervention Services (AIS) Math

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Effectively communicating mathematical ideas is a critical component in solving real-life problems. In this unit, students will relate math concepts to everyday life to better understand the concepts of fractions, decimals, and percents.

1st Oval: What should students know and be able to do?

1. **On which content standard(s) will the students be working?**
   The following standards will be used to guide the development of this 8th grade math unit on fractions, decimals, and percents. These standards are based on the **Common Core State Standards**.

Problem-Solving Strand
Students will build new mathematical knowledge through problem solving.
Problem-Solving Strand 1: Use a variety of strategies to understand new mathematical content and to develop more efficient methods.
Students will apply and adapt a variety of appropriate strategies to solve problems.
Problem-Solving Strand 11: Work in collaboration with others to solve problems.

Representation Strand
Students will create and use representations to organize, record, and communicate mathematical ideas.
Representation Strand 10: Use mathematics to show and understand social phenomena (e.g., determine profit from sale of yearbooks).

Number Sense and Operations Strand
Students will understand meanings of operations and procedures, and how they relate to one another.
Number Stand 3: Read, write, and identify percents less than 1% and greater than 100%.
Number Strand 4: Apply percents to:

- Tax
- Simple interest
- Commission
- Gratuities
- Percent increase/decrease
- Sale price
- Interest rates

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Connections Strand
Students will recognize and apply mathematics in contexts outside of mathematics.
Connections Strand 6: Recognize and provide examples of the presence of mathematics in their daily lives.

2. **What are the big ideas, major themes, key concepts or essential understandings embedded in, or which transcend, the standards listed above?** See pages 43-45.
   - People use percents in a variety of ways: sales tax, interest, shopping, commission, tip, and more.
   - Students will learn to convert fractions, decimals, and percents interchangeably.
   - Students will be able to use and apply percent vocabulary to solve real-life math problems.

3. **Given the essentials to know/key concepts identified in #2, how will this unit be different from what/how I taught and asked students to do in years past? If this is a new unit, skip this question.**
   This is a new unit for me. I would like to make the learning more meaningful by make real-life connections with the content.

4. **When and where, inside and outside of school, have the students encountered information about and had experience with these key concepts/big ideas before? Think horizontally and vertically across the curriculum. This will help you select engaging, and perhaps, interdisciplinary performance tasks.**
   - People use percents in a variety of ways: sales tax, interest, shopping, commission, tip, and more.
     - When buying items at the store (sales tax, sale price, discount, etc.)
     - Going to a restaurant (total price, tip, etc.)
   - Students will be able to use and apply percent vocabulary to solve real-life math problems.
     - **Think-pair-shares**
     - **Cooperative groups**
     - **Real-life math connections**
     - **Vocabulary Bingo**

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2nd Oval: How will the students and I know when they are successful?

5. **What would it look like when students can demonstrate that they understand the big ideas and have mastered their essential skills? That is, what are some ways they might demonstrate their capacity to use the newly learned concepts/information appropriately in a new situation.** See pages 124-140, 159-174, and 176-180.
   - **Restaurant Creation Project:** The students will develop a creative restaurant menu that is theme-based. The menu must include the names and prices of the following: 5 appetizers, 5 main courses, 3 desserts, and 3 beverages. Students will then make various calculations based on their information, which will then be shared with the class.
   - **Shopping List Activity:** The students will find several shopping list items in local store ads. Students will then calculate the total with and without tax.
   - **RAFT:** The students will become an 8th grade math teacher to write test questions on the topic of fractions, decimals, and percents. These questions will be used on upcoming "warm up" and "class work" problems.
   - **M & M Activity:** The students will count the number of M & M's in a bag. They will then calculate this as a fraction, decimal, and percent.
   - **Percent Bingo:** The students will create their own bingo board using a given list of vocabulary terms related to the unit. They will then play the bingo game by having to match the definition being read by the caller and the term on their board.
   - **Class work:** Class work in AIS is given to pre-teach skills or concepts before the classroom teacher introduces them, re-teach concepts again, and/or to reinforce information by providing extra practice on a skill or concept. Work will be collected or reviewed with the class.

6. **Consider the list generated in #5, and determine which tasks/products would best demonstrate student understanding. Decide whether to use a rubric or a performance task and the criteria to be included.** See pages 175-180.

   Restaurant Creation Project
   - You are developing a restaurant that is theme based. Your restaurant must include a menu with a name based on your theme. All food and beverages must be name and based on your theme. Your menu must include (at least) the following: 5 appetizers, 5 main courses, 3 desserts and 3 beverages. Beverages cannot be alcoholic in nature. Create prices for each of the items in your menu.
   - Ask four of your friends or family to order what they want to eat from your menu. Each person must pick one appetizer, main course, dessert, and a beverage. Please include each person's name and order in your "Step-by-Step" portion of your report. All calculations must be included in the "Solutions and Computations" portion of your report. Figure out the price for the food that your family or friends have ordered; this is a subtotal. After figuring the subtotal, find the amount of tax for the meal based on the tax rate of 8%. List it separately, and then add it to the subtotal to get the total price of the meal. After calculating the total price with tax, figure out the tip for the server, use 20%. List it separately and then add it to the total price of the meal to figure out how much the whole meal (food and service) would be for your friends.

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- Determine the amount that each one of your friends must pay based on the whole meal cost, tax and tip included.
- **The Surprise**: You have decided to pay for your friends' dinner. You charge the dinner of your credit card which has an interest rate of 15%. How much will the interest for the meal be, based on the price of the dinner with tax and tip included?

Shopping List Activity
- Find shopping list items in the sale ad
- Record the price of each item.
- Calculate the subtotal, tax, and total price.

M & M Activity
- Students will count the number of M & M's in their bag. They will also count the number of each color.
- They will then calculate the amount as a fraction, decimal, and percent.
- Then pair together and combine their numbers together and look at how their results have changed/stayed the same.
- All calculations will be evaluated based on a rubric.

RAFT
- This assignment will be used to evaluate how well the students understand the concepts of fractions, decimals, and percents.
- Students are given the opportunity to create warm-up questions on this topic in a variety of forms including: multiple choice, true false, matching, fill in the blank, and one of their choice.

Percent Bingo
- This assignment is sued to help the students become familiar with the math vocabulary and how to apply this information when solving problems.
- Students' progress will be assessed by their progress in class and how well they are able to match the term and the definition.

7. **What does a task analysis reveal about the skills, the knowledge, and the level of understanding required by the task? Include the task analysis with your unit.** See pages 46-47.

Skills	Knowledge
• Converting fractions, decimals, and percents. • Apply their knowledge of percents to real life situations including: sales tax, total price, discount, gratuity, commission, etc. • Accurately identify and use percent vocabulary.	• Use these skills to understand where these concepts relate to their everyday life: shopping, restaurants, budget, etc.

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8. **Do I already have sufficient pre-assessment data or do I need to gather more, if so, what method shall I use? Active learning strategies can often be used as pre-assessments. What does the pre-assessment data tell me about the skills and knowledge on which the entire group will need to focus? Are there individual students who will need additional support if they are to have a realistic opportunity to demonstrate mastery? In which areas will they need support? Are there students who would be best served by extensions to the learning experiences?** See page 153.

In terms of content, most eighth grade students have heard of the terms fractions, decimals, and percents in lower grades. Most are also able to understand that these terms and concepts are a part of their own lives. I used a pre-assessment test to determine the areas that need a lot of focus. This pre-assessment test consisted of a variety of fraction, decimal, and percent questions to help me gain an understanding of where they are struggling with this topic. The test included very specific questions like "What percent of 15 is 3?" and also very broad questions like "where have you see or used percents in your everyday life?" I used this information to determine what they know about this topic, where/how it is used in their own lives, and if these calculations can be made. After analyzing the results I found that my students were struggling with the concepts across the board, especially with making the calculations and understanding what the question is asking them to do. My students will greatly benefit from additional support and practice with this topic.

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3rd Oval: What learning experiences will facilitate student success?

9. **How will I Frame the Learning so that students know what they are going to be doing, what they will know and be able to do as a result of those activities, how they will be assessed, and how everything they are doing is aligned with the standards?** See pages 57-61.
   - Provide students with engaging learning experiences, which relate to their everyday life.
   - Warm up problems will provide an insight into what the student remembers from the previous class. This gives the students a chance to ask questions and to reflect back on what they know about the topic.
   - Explain the "Restaurant Menu" and the **RAFT** assignment by showing them the performance task list and emphasize the expectations/rubric.
   - Explain the "Must Knows" at the beginning of the unit. These key ideas will be revisited throughout future lessons to ensure students are working towards understanding these key ideas. It also gives the students an opportunity to self-assess and figure out what they are not getting.
   - Students in AIS are not given a grade. So it will be very important to rely on classroom observations of how they are doing with the topic. Communicating with the classroom teacher is another way that I will ensure they are taking the knowledge they learn in AIS and applying it to their regular math class.
   - **Ticket to Leave** is a method I use to make sure students are grasping the concepts they learned before they leave my classroom. It also gives me a chance to see who understands and who needs some additional practice or instruction.

10. **How will I help students to access prior knowledge and use it productively, either building on it or reframing their thinking as appropriate? Include some of the strategies explained in *Instruction for All Students*.** See pages 88-116.
    - **Graffiti:** Use this strategy to have students brainstorm places, etc. where fractions, decimals, and percents are used in their everyday life.
    - **Think-Pair-Share:** Through lessons students will be asked periodically to check their understanding with their partner to make sure that they are grasping the material.
    - **Three-Column Chart:** Have students write about what they know about percents, what they would like to know, and then at the end of the unit have the students revisit the chart to add what they learned.
    - **Ticket to Leave:** To conclude the lesson students will be asked to complete a **Ticket to Leave** assignment consisting of a review problem. These questions will check for accuracy to see if the student is grasping the material and to determine if re-teaching is necessary. It also helps to plan the next lesson according to the needs of each individual student.
    - **Whole Group:** Throughout the lessons, students may ask questions about the topic. These questions will be addressed as a whole group and individually.

11. **What methods of presentation and what active learning experiences can I use to help students achieve the standard? Could I provide multiple sources of information and exercises that would help all students to make real-world connections and use rigorous thinking skills?** See pages 12-19, 63-82, 157-158, and 219-248.
    - **Video:** Have students watch ***Brain Pop*** videos where Tim and Moby, two cartoon characters, explore percents, interest, and taxes. It provides a great visual explanation of the topic and is done in a way that is engaging.
    - **Percent Vocabulary Buddies:** To summarize the learning in the lesson, students will meet with their buddies (one student will have the vocabulary word and they will match up with the student that has the definition) and summarize what they learned and one question they still have.
    - **3-2-1:** Students will summarize their learning at the end of a lesson by listing 3- important facts about converting fractions and decimals to percents and vice-versa, 2- reasons you will need to do this in real life, and 1- question you have.

12. **What assignments, projects, and homework will help students see the relevance of the learning and help them not only meet the standard but retain their learning? How might I provide multiple pathways to learning?** See pages 123-148 and 201-216.
    - **Math with Pizzazz Activities:** "Where is Moscoq?" (Converting fractions to percents), "What is the Title?" (finding interest), "What happened after Old King Cole ordered that chopped cabbage must be mixed with mayonnaise" (converting percents to decimals), and "Double Cross" (converting fractions, decimals, and percents). These activities are in a puzzle format which catches the student's attention, while also allowing them to self-assess since all of the answers can be found in the puzzle.
    - **Board Game "Fractions, Decimals, and Percents":** With a partner students will take turns moving through a game board and answering various questions. When a student lands on a question, both students must answer the question. After they are both finished, they make check their answer with the answer key. If either student got a correct answer they get a token. The student with the most tokens at the end of the time wins.
    - **"Budget" Board Game:** This game exposes students to real-life economics including: home ownership, insurance, writing checks/deposits, budgeting, and learning to overcome unexpected events. Students spin their way through the game spaces which ask the students to pay and collect various amounts. They must keep track of their finances, deposit/withdraw money from their pretend bank account, and write checks to pay for items.
    - **Tic-Tac-Toe:** This activity requires students to fill out a Tic-Tac-Toe board from a given list of answers. These answers are the answers to problems that the students will solve. These questions will be chosen randomly; each student will answer, and correctly mark the answer on their game board. The first student to get the appropriate number of questions in a row wins.
    - **Jeopardy:** In this activity, students work in teams. Each team takes turns picking a category and amount from the jeopardy game board. The teams are given a problem to solve. They must show all work when solving the problem. Each team will be rewarded points for a correct answer.

- **Vocabulary Bingo:** The students will work individually to create their own bingo board from a list of words. The caller will read a definition and/or example of one of the terms. The student's job will be to correctly identify this word by putting a chip on their board over the correct term. Once a student has 5 words marked in a row they must raise their and say "math-o."

13. **What are the ways I can gather formative assessment data that will provide me and my students' information on their progress toward meeting the standard?** See pages 22-25 and 154-155.
    Students in AIS math are not given a formal grade on their report card. So formative quizzes and tests will not be given. Student progress will be based on classroom observations and class assignments. I will make careful observations when the students are meeting with their partners or working on an assignment. Using a progress chart will help me to assess who is grasping the material and who is still struggling. I will also use the **Ticket to Leave** activity to assess student learning.

14. **What materials and resources do I need to locate and organize to provide multiple pathways to learning?**
    - Set up and use technology using the Elmo and projector, which will be used to display information. This will allow me to display student work and show sample problems and videos.
    - Prepare and set up materials for projects and activities.
    - Assign **vocabulary buddies**.
    - Teach students how to use **graphic organizers**.
    - Post must-know standards on chart paper and display around the room.
    - Display percent vocabulary on bulletin **word wall**.

    How should I organize the classroom and the materials to provide easy student access? See pages 202-203 and 251-266.
    - Arrange desks to accommodate individual and partner activities.
    - Organize classroom materials to minimize cleanup time.

15. **What else might I do to provide challenging and meaningful experiences for both struggling and advanced learners? Are there other human, print or electronic resources I might consult to refine/review my plan?** See pages 12-22, 26-27, 133-134, and 197-216.
    - **Review book:** provides students with a step-by-step explanation of how to solve various fraction, decimal, and percent problems. It also provides a lot of examples that might benefit a struggling learner.
    - **Online resources:**
      - http://www.tozzo.net/Integrated%20Algebra.htm
      - http://drjosephburo.com
      - http://www.purplemath.com
      - http://www.montgomeryschoolsmd.org/departments/itv/mathdude/

4th Oval: Based on data, how do I refine the learning experiences and/or the assessment?

16. **How did students do on the performance task? Were there some students who were not successful? What might account for that? What might I do differently next time?** See pages 273 and 283-285.
    There were students that struggled with some of the tasks, however, I found that the more practice they got with the topic the more confident they became. The students I have in AIS are in my class because they failed the previous year state assessment, so it is evident that they find math challenging. I always tell my student that the first time they try a problem it is difficult, but the more practice the easier it will become. I saw this happening with my students. Next time, I want to continue breaking down the process of converting fractions, decimals, and percents. It is so important that my students understand this process so they can then apply the information to other situations. I also saw the benefit of spending a lot of time on the vocabulary in this unit. By being familiar with the terms, the student has an easier time answering questions related to the topic since they understand what the question is asking. We will revisit this topic again before the state test in May.

17. **What else do I need to consider in my advance planning the next time I am focusing on this standard?**
    I would like to take more time with the basics in the beginning and continue to build on these ideas throughout the unit. My students need to have a firm understanding of the vocabulary in order to apply this information in other problems. When completing projects, I found it beneficial to show the students a finished project and provide a rubric. This helps students to understand exactly what is expected of them.

18. **Did all the activities guide students toward mastery of the standard? Are there activities that need to be added, modified, or eliminated? Am I using these activities because I have always used them or have I analyzed them to be sure that they are the most effective and efficient tools at my disposal?**
    I think that all of the activities I used throughout this unit helped to motivate my students to want to gain a better understanding of fractions, decimals, and percents. I feel that these activities helped because it allowed my students to make meaningful connections with the content since it related to real life. So many times I hear students saying, "so when are we ever going to use this?" This unit allowed them to realize that they do use fractions, decimals, and percents in their own lives and that the information they are learning about is meaningful. By making the content more significant, my students were able to remember the information better. Overall, I felt that the unit was successful, but to make it even better I would add an activity dealing with creating a budget. I touched on this topic, but I feel the students could benefit from doing more with it. I would also modify a few of the activities.
    - Reducing the number of requirements for the restaurant creation project. Specifically, I would have them have fewer appetizers, main courses, desserts, and beverages on their menu. This would give them more time to work on their calculations which was the main purpose of the assignment. I might also consider having the work with a partner, rather than doing it individually.

- Use more of a variety of summarizing strategies. I frequently used the **ticket to leave** strategy, so in the future I would like to alternate with a few different strategies.
- Spend more time on the steps needed to solve the problems. My students may do well with a topic in isolation, but when it is mixed with other types of problems they struggle. So, more practice with cumulative assignments would be helpful.

I feel that making these changes would make better use of the class time. I see these students every other day, so doing lengthy projects takes up a lot of this time. I would like to share some of my ideas with my math department and see if we can coordinate doing a project in regular math class and AIS. These activities helped my students become more familiar with solving problems that deal with fractions, decimals, and percents.

19. **Overall, was this unit effective for addressing the standard(s)? Are there other standards that I could incorporate into this unit or are there other units of study where I can have the students revisit these standards or essential understandings?**
Overall, I felt that this unit was very effective in addressing the math standards. It is so important for students to see that the math content relates to their everyday life and that math is meaningful. So many times teachers get wrapped up into teaching for the test and teaching an extensive curriculum that they forget that the goal of teaching is to enhance student learning. By starting with the end in mind, I was able to create a unit that let me look at what I wanted my students to learn and how I was going to help them accomplish this goal. I feel that it's something that all educators can use and benefit from.

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Quiz #1: Percents/Proportions

Directions: With your partner, find the items on your shopping list. Write the price of each item in the space below. Find the sales tax and total cost for each item, then calculate the total cost of all three items.

Shopping List # _____

Cost of each item:	**Sales Tax: (8%)**	**Total Cost:**
Item 1:		
Item 2:		
Item 3:		

Grand Total: _____

Shopping List # _____

Cost of each item:	**Sales Tax: (8%)**	**Total Cost:**
Item 1:		
Item 2:		
Item 3:		

Grand Total: _____

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Name: _____ Date: _____ Period: _____

Percents

Directions: You, as an eighth grade math teacher, are to write test questions on the topic of percents. The question format must include: one multiple choice, one true-false, one fill-in-the-blank, one matching, and one question in the form of your choice. Provide the answers and turn in your work at the end of class. These questions will be used on upcoming "warm-up" and "class work" problems.

Multiple Choice:

_____ _____ _____ A) B) C) D)	Work Area:

True-False:

_____ _____ _____ True or False	

Matching:

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Fill-in-the-blank:

Your choice:

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Percent Fun with M&M's

1. Which color of M&M's do you think there will be most of in your bag? _____

2. Estimate the number of M&M's in your bag. Estimate _____ Actual _____

3. Sort your M&M's by color and then fill in the chart with the following calculations:

	# of color in bag	Total # of M&Ms in bag	Fraction?	Decimal?	Percent?
Red					
Yellow					
Brown					
Blue					
Green					
Orange					

4. Using your data above, calculate the number of each color M&M you would estimate there would be in a bag of 1,000 M&Ms. (Hint: Multiply percent by the total # in the bag.)

	Percent	Total # in bag	Estimated # each color
Red		1,000	
Yellow		1,000	
Brown		1,000	
Blue		1,000	
Green		1,000	
Orange		1,000	

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5. Share and record the percentages from two classmates, then calculate the average. (Hint: Average = add all of them up and divide by the number of samples).

	Percent-Your	Percent-Partner #1	Percent-Partner #2	Average % (3 samples)
Red		1,000		
Yellow		1,000		
Brown		1,000		
Blue		1,000		
Green		1,000		
Orange		1,000		

6. The official M&M's site gave the following information on the breakdown of colors: "Brown - 17%, Yellow - 17%, Red - 17%, Blue - 17%, Orange - 16%, Green - 16%"

How do you average percentages you calculated compared to those figures? Be specific. (Example: write about which colors had great/lower/same percentages, etc.)

_____

_____

_____

_____

7. Based on your samples, what can you say about the colors in a bag of M&Ms.

_____

_____

_____

_____

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M&M Math Rubric

	Great	Good	Keep Trying
Fractions	All numerical calculations correct	80% calculations correct	Less than 80% calculations correct
Decimals	All numerical calculations correct	80% calculations correct	Less than 80% calculations correct
Percent	All numerical calculations correct	80% calculations correct	Less than 80% calculations correct

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Name: _____ Date: _____ Period: _____

Restaurant Creation Project

Four of your friends (or family members) decide to get together to have dinner out in your new restaurant. Your restaurant has a menu that includes appetizers, main courses, desserts, and beverages. Each of your friends must order one appetizer, main course, dessert, and a beverage. You must figure out the total for the bill, including tax and tip. After figuring out the amount of the bill, you must figure the amount each person must pay. When your friends try to pay the bill, you'll have a nice surprise for them.

Guidelines:

1. You are developing a restaurant that is theme-based. Your restaurant must include a menu with a name based on your theme. All food and beverages must be named and based on your theme. Your menu must include (at least) the following: 5 appetizers, 5 main courses, 3 desserts, and 3 beverages. Beverages cannot be alcoholic in nature. Create prices for each of the items in your menu.
2. Ask four of your friends and family to order what they want to eat from your menu. Each person must pick on appetizer, main course, dessert, and a beverage. Please include each person's name and order in your "Step-by-Step" portion of your report. All calculations must be included in the "Solutions and Computations" portion of your report.
3. Figure out the price for the food that your family or friends have ordered; this is a subtotal. After figuring the subtotal, find the amount of tax for the meal based on a tax rate of 8%. List this separately, and then add it to the subtotal to get the total price of the meal. After calculating the total price with tax, figure out the tip for the server, use 20%. List it separately and then add it to the total price of the meal to figure out how much the whole meal (food and service) would be for your friends.
4. Now determine the amount that each one of your friends must pay based on the whole meal cost, tax and tip included.
5. **The Surprise**: You have decided to pay for your friends' dinner. You charge the dinner on your credit card which has an interest rate of 15%. How much will the interest for the meal be based on the price of the dinner with tax and tip included?

Remember: Your project must include a menu and a report based on the rubric that is included on the front of this page. Your report must have a cover page but it does not need to be decorated, it can be attached to the back of the menu with a staple or paperclip. Your **menu** must be decorated! You must follow the rubric to receive points for each specific part. Your menu should be based on an appropriate theme to receive a grade. Any themes that are deemed inappropriate will result in "no grade" for the project, which will count as missing the assignment completely. If you have any questions about this project, please ask at any time **before** it is due.

___ ___

This tear-off entitles you to five points on this project, given that you handed it in on time. No, it won't get you a free, savory Big Mac or a delicious chicken sandwich. So, it is still a pretty sweet deal, but only if you hand it in ASAP. You and your friends can celebrate with one of these fine sandwiches, after you get a good grade, okay?

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Percent Bingo

Principal	**Interest**	**Ratio**	**Cross Multiply**	**Percent Decrease**
Percent Increase	**Proportion**	**Mark-up**	**Decimal**	**Fraction**
Rate	**Percent**	**Free**	**Sale Price**	**Unit Rate**
Move 2 Places Left	**Simple Interest Formula**	**Divide Numerator by Denominator**	**Move 2 Places Right**	**Percent Evaluation**
Percent Proportion	**Percent Change**	**Discount**	**Tax**	**Commission**

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