Percent Problems Using Proportions

Summary

Solve Percent Problems Using Proportions

Main Core Tie

Mathematics Grade 6

Strand: RATIOS AND PROPORTIONAL RELATIONSHIPS (6.RP) Standard 6.RP.3

Additional Core Ties

Mathematics Grade 7

Strand: RATIOS AND PROPORTIONAL RELATIONSHIPS (7.RP) Standard 7.RP.3

Materials

Calculators
one deck of cards (without faces gives you # 1-10)
Several Sales Ads

- Percent Concentration Game
on Transparency
Percent Estimator manipulative (made from card stock) for each pair, Percent Estimator Template for Smart Pal, Smart Pals, markers and cleaning cloths
Book "If The World Were A Village" (David Smith)
Worksheets: Percent Estimator, If The World Were A Village, The Bargain Store, Just Put It On My Credit Card, Payday Loans

Background for Teachers

Enduring Understanding (Big Ideas):
Proportional reasoning is essential in problem solving
Essential Questions:
How can proportions be used to solve percent problems?
Skill Focus:
Apply proportions to percent problems
Vocabulary Focus:
Ratio, numerator, proportion, denominator, percent
Ways to Gain/Maintain Attention (Primacy):
manipulative, calculators, literature, real world connections, games

Instructional Procedures

Starter:
Solve these proportions
2.5/7 = 7.5/x
x/4 = 15/20
Write the decimal for each
30%
5/100
6.5%
Lesson Segment 1: How can proportions be used to solve percent problems?
Do Stand-Up If, where the students stand for a statement if they believe it is true. Ask a few students

to justify their choice to stand or not.

Percent means a part out of 100.

If we say 50% of our class prefers chocolate ice cream, this means 50 of us prefer chocolate ice cream.

50% of our class would be about 18 people.

Q. So if 50% means 50 out of every 100, how can we know how many that is out of 36 (or whatever number of students is in the class)?

To help students visualize the percent of a number, give student pairs a Percent Estimator and Smart Pal with Percent Estimator graphic to shade. Students work together to slide a covered card stock bar on the % side and on the part to total number side to see the ratios. They should also shade the Smart Pal for both % and part to total. Using the bar, they should try to determine about what fraction of the whole represents the percent given. Use:

25% of 20
40% of 30
10% of 50
75% of 10

After estimating using the Percent Estimator, have the students set up a proportion using part/total = %/100 as the ratios, and have them find the exact number.

Q. What if we knew the part to total ratio, but didn't know what percent that would be. How could we find a percent?

Repeat the visualization with the Percent Estimator and Smart Pals. This time have them estimate about what the part to total ratio bar would look like and slide the bar up the % side to estimate the percent. Use:

30/40 is what %?
12/48 is what %?
10/25 is what %
1/12 is what %?

Read parts of the book, "If The World Were A Village" by David Smith. Use the attached worksheet to find out how many people that would be in the classroom if the class were typical of the world.

Lesson Segment 2: How can proportions be used to solve tax and interest problems?

Use appropriate text problems involving tax and interest to practice setting up proportions to solve. Students will need to determine what the part represents, and what the total represents in the first ratio if you use:

If you are finding the total cost after tax is being paid, it is helpful for students to consider the part as original price plus tax, the total as original price, and the percent as 100% plus the tax percent. To help with this have students model purchasing something and ask questions such as:

Q. What is the tax?

Q. Is tax added or subtracted for the item price?

Q. Will the total cost including tax be more or less than 100% of the original price?

The attached Shopping Spree Worksheet helps students connect to their world. Give groups several sales ads to look through to spend their "$1000" limit.

Lesson Segment 3: How can proportions be used to solve percent increase and decrease problems?

Game: Ups and Downs of Life

Tell students you want to play a game "with their lives". This means you will work on problems they can relate to in their lives. Discuss ideas for things that may be increasing or decreasing in their lives such as height, allowance, GPA, cost of items they buy, number of hours they can watch TV or play electronic games, family size, etc. Ask for someone to give tell you something that has increased or decreased in their life. Help them set up a couple of problems focusing on:

Q. What was the original?

Q. How much did it change?
Q. How will I set up a proportion?
To identify the position of the numbers in the ratios, you might use a mnemonic such as, "Down with 100, Up with percent. Down with the old, UP with the difference."
To play the game, divide the class in half creating teams A and B. Shuffle a deck of cards without the faces to get numbers 1--10. Black cards are positive numbers. Red are negative. Ask students to give you an idea for something that has changed in their lives. Nearly every change can be described using numbers. Have students set up the problem and find the percent increase or decrease. You may want to give them time to work with their small group before calling on a student.
Both teams start with a score of 0. Have a student from The A team explain the problem to the class. If they do well, they choose a card from the deck. Positive numbers are added to their teams score. Negative numbers are subtracted from the other team's score. Continue asking for situations and having students set up proportions to find the percent increase or decrease, alternating teams to answer. The team with the most points at the end of the allotted time, wins.
The attached "The Bargain Store" worksheet is a good investigation. Students often mistakenly think taking an additional percent off can eventually result in paying nothing. This worksheet investigates the idea of accumulated percent decrease.
Lesson Segment 4: Practice Game - Play Percent Concentration (attached)

Assessment Plan

Performance tasks

Bibliography

This lesson plan was created by Linda Bolin

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