

Making Flubber

Purpose:

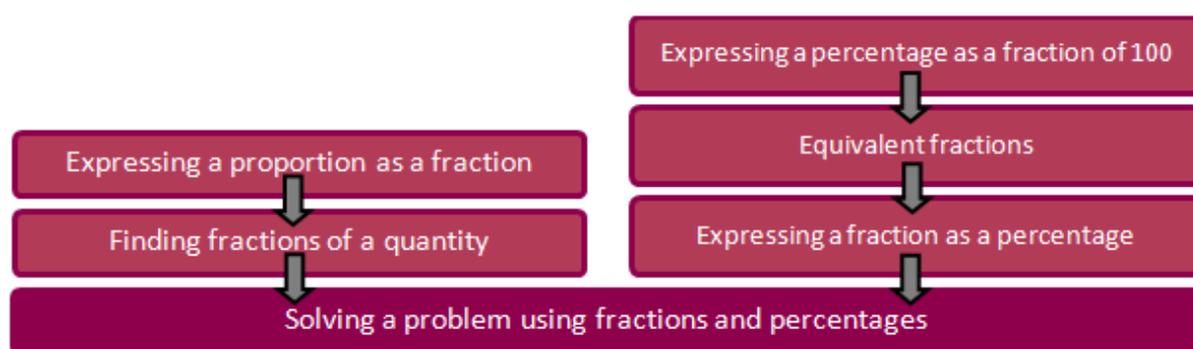
The purpose of this activity is to engage students in using fractions, proportions and percentages to solve a problem.

Achievement Objectives:

NA3-5: Know fractions and percentages in everyday use.

Description of mathematics:

The background knowledge and skills that should be established before and/or during this activity are outlined in the diagram below:



Expressing proportion as a fraction

7 out of 10 people floss their teeth. Write this as a fraction.

Finding fractions of a quantity

If $\frac{7}{10}$ people floss, how many people, out of 30, use dental floss?

Expressing a percentage as a fraction of 100

84% people use a fluoride toothpaste. Express this percentage as a fraction (out of 100).

Equivalent fractions

Write $\frac{84}{100}$ as a fraction of 25.

Expressing a fraction as a percentage

15 out of 20 children have at least one dental filling. What is this as a percentage?

Solving a problem using fractions and percentages

15 out of 20 children have at least one dental filling. What percentage of children do not have any dental fillings?

This activity may be carried out with step by step guidance, or by allowing the student to follow their own method of solution. The approach should be chosen in sympathy with students' skills and depth of understanding.

Activity:

A class wants to make Flubber.

Their teacher gives them a recipe which uses 4 $\frac{1}{4}$ cups of water, 4 cups of PVA glue and 4 teaspoons of Borax. She says that they have all the ingredients but only a teaspoon for measuring.

The teacher tells them that Borax makes up 1% of the final mixture, so they should be able to work out how many teaspoons of water and PVA glue to add.

How can the class use this information to work out how many teaspoons in a cup?



The procedural approach

The student is able to use their knowledge of simple percentages and fractions to solve a problem involving proportion.

Prompts from the teacher could be:

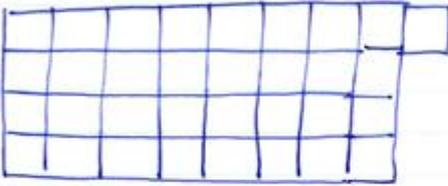
1. If Borax makes up 1% of Flubber, what do you know about the percentage of water and PVA glue?
2. How many teaspoon measures is this percentage of flubber equivalent to?
3. How many cups of water and PVA glue are needed in total?
4. How many quarter cups of water and PVA glue are needed in total?
5. Are your answers to Q2 and Q4 the same volume?
6. Compare your values for the total volume of water and PVA glue in quarter cups with the total volume in teaspoons. How many teaspoons in a quarter cup?
7. How many teaspoons in a cup?

$4\frac{1}{4} + 4$ cups are 99%

↓

$8\frac{1}{4}$ cups

↘ 99 × 4 teaspoons



= 33 $\frac{1}{4}$ cups

$33 \times \frac{1}{4}$ cups = 3×33 $\frac{1}{4}$ cups = 99 $\frac{1}{4}$ cups

$\frac{1}{4}$ cup = 3 × 4 teaspoons

$\frac{1}{4}$ cup = 12 teaspoons

$\frac{1}{2}$ cup = 24 teaspoons

1 cup = 48 teaspoons,

The conceptual approach

The student is able to use their knowledge of equivalent percentages and fractions to solve a problem involving proportion.

Prompts from the teacher could be:

1. If Borax makes up 1% of Flubber, what do you know about the percentage of water and PVA glue?
2. How is the remaining percentage shared between water and PVA glue? How can you represent this as numbers or an image?
3. How many teaspoons in a cup?

T: What made you decide on a 10 x 10 grid?

S: Well, there are one hundred squares, one for each percent.

T: And you know how many teaspoons for each square?

S: Yeah – four.

T: Then how did you go about sharing the remaining squares?

S: Well, I did it by proportion. There would be four and a quarter squares of water for every four of PVA, so I just counted those out until I got to the end.

100% → 1% is 4t
→ is 400t

B Borax
W Water
P PVA

B	W	W	W	W	W	P	P	P	P
W	W	W	W	P	P	P	P	W	W
W	W	P	P	P	P	W	W	W	W
P	P	P	P	W	W	W	W	W	P
P	P	P	W	W	W	W	P	P	P
P	W	W	W	W	P	P	P	P	W
W	W	W	P	P	P	P	W	W	W
W	P	P	P	P	W	W	W	W	W
P	P	P	P	W	W	W	W	P	P
P	P	W	W	W	W	P	P	P	P

1% Borax
48% PVA
51% Water

PVA 4 cups is 48% is 4 x 48 t
1 cup is 12% is 1 x 48 t
48 t
answer

T: How did you work this out?

S: Trial and error in a table. I started with half and half of water and glue because four is pretty close to four and a half. Then I changed the numbers until I found ones that worked.

$$100\% - 1\% = 99\%$$

$$4\frac{1}{4} + 4 = 99\%$$

4 cups 48%
1 cup 12%
 $\frac{1}{4}$ cup 4%

4	$4\frac{1}{4}$	$\frac{1}{4}$
50	50	0
49	51	2
48	52	4
47	53	6
46	54	8
45	55	10
44	56	12

$$1\% = 4t \quad \downarrow \times 12$$
$$12\% = 48t$$