

A fair dip

Purpose:

The purpose of this activity is to engage students in solving a financial problem using decimal arithmetic techniques.

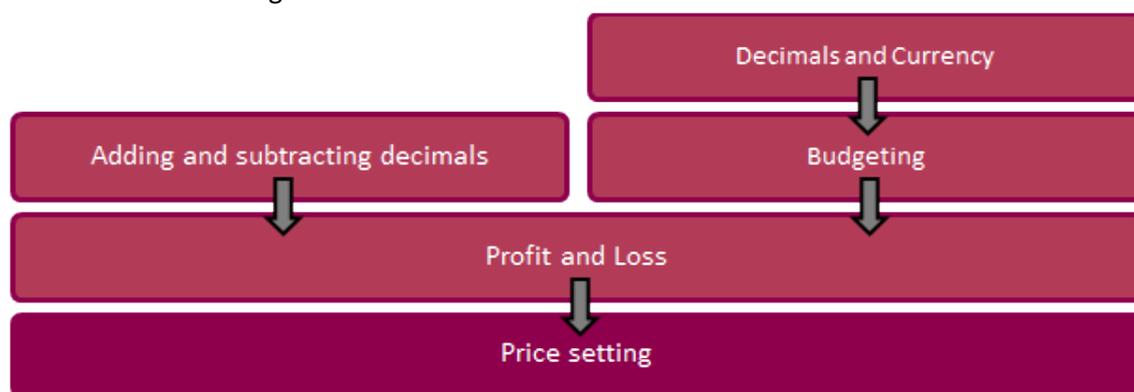
Achievement Objectives:

NA4-2: Understand addition and subtraction of fractions, decimals, and integers.

NA4-4: Apply simple linear proportions, including ordering fractions.

Description of mathematics:

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



Adding and subtracting decimals

A piece of string starts at the 2.4 cm mark on a ruler and ends at the 12.3 cm mark. How long is the piece of string?

Decimals and currency

If I count up all the coins in my wallet, I have 420 cents. How much is this in dollars?

Budgeting

How many \$2.95 blocks of chocolate can you buy with \$20?

Profit and loss

A retailer makes 20% profit on an item that is sold for \$45.00. Calculate this profit in dollars.

Price setting

A product costs \$2.50 per unit to produce. A retailer has 1000 units to sell and needs to make \$200 profit after all the production costs are met. What should they price the units at if they expect to sell all 1000? What if they expect to sell only 500?

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 year 8 class is making a fundraising stall for the school fair.

They have decided to make chocolate coated strawberries in white, dark and milk chocolate and to present these in boxes made from origami.

The goal is to raise at least \$250 for the school. They plan to sell boxes of six strawberries for \$2.

The local supermarket sells punnets of a dozen strawberries for \$2.50, and cooking chocolate for \$3.95 per bag.

A bag of chocolate should be enough to coat two dozen strawberries.

The boxes take one sheet of coloured paper (10 cents) to make.

Is this plan going to work?

How could it be modified to make this fundraising goal realistic?



The procedural approach

The student is able to follow a series of steps to find the solution to a price setting problem.

Prompts from the teacher could be:

1. Calculate the profit or loss that will be made if the punnets sell for \$2.50
2. Would the class make a profit?
3. What would the profit or loss be if they only put five pieces in each box and kept the price at \$2.50?
4. How many boxes would the class need to sell to reach their target?

T: How did you work out this loss?

S: Well, I added up all the parts. Strawberries are \$2.50, so six must be half of that. The chocolate should be a bit less, but the difference is smaller than 10c so I just rounded it up to \$4 (so \$1 for six strawberries).

\$250 raise
Six berries sold for \$2
\$1.25 per box for berries
0.10 for paper
\$1.00 for chocolate
2.35 to make
lose 15¢ per box sold so never meet target

\$100
\$0.10
\$0.25
1.20 to make
10¢ profit for 5 berries per box
sell 2,500 boxes

The arithmetic approach

The student is able to explore, with appropriate calculations, to solve a problem involving proportional reasoning.

Prompts from the teacher could be:

1. What do you need to find out first?
2. The costs are given for different proportions of the product for sale. How can you work around this?
3. Will the class make a profit on the current pricing?
4. Suggest a way the class can change the product or its pricing to be able to make a profit.
5. How many boxes would they have to sell to meet the target?

Handwritten student work on graph paper:

2 dozen chocolate 3.95
boxes .40
berries 5.00
9.35

cost 9.35
get $4 \times 2 = 8.00$
loss $9.35 - 8.00 = \$1.35$

If we sell for \$2.50 get $4 \times 2.50 = \$10$
profit = $10 - 9.35 = .75$
 $2 \times .75 = 1.50$ 8 boxes
15.00 from 80 boxes
\$150.00 from 800 boxes
\$100 from $\frac{2}{3}$ of 800 = $\frac{800}{3} + \frac{100}{3} = 400 + 67 + 67 = 534$
 $\$150 + \$100 = \$250$
 $800 + 534 = 1334$ boxes too many!

\$3 per box: $12 - 9.35 = 2.75$ profit for 4
\$5.50 for 8
\$275.00 for 80
\$275.00 for 400
\$250.25 for $400 - 36 = 364$ boxes

\$11 for 16
\$22 for 32
\$27.75 for 36

too big \$25 →

My advice: sell for \$3

Teacher's response in a speech bubble:
T: I see you've based your calculations on multiples of 4 boxes.
S: I didn't want to divide so I looked for the smallest number that 2 dozen, 1 dozen and 6 go into.

The conceptual approach

The student is able to find the solution to a proportional reasoning problem in context.

Prompts from the teacher could be:

1. What do you need to find out first?
2. Will the class make a profit on the current pricing?
3. Suggest a way the class can change the product or its pricing to be able to make a profit.
4. How many boxes would they have to sell to meet the target?

Finance 2

Strawberry punnet = 2 boxes
 Chocolate = 4 boxes
 Paper

| | |
|--------------|----------------------------------|
| 1 box cost | \$1.25 |
| | \$1 <small>Rounded up to</small> |
| | 10c |
| Cost per box | \$2.35 |

Possible solution to make profitable:

1. Cut strawberries in half
 8 halves = \$1.66 for strawberry
 Save: 83¢ Profit = 48¢ Boxes = 520

6 halves = \$1.25 for strawberry
 Save: \$1.25 Profit = 90¢ Boxes = 278

T: Tell me about this rounding.

S: Well we've just got lots and lots of bags of chocolate going to get melted. And the strawberries will be different shapes, so its not going to matter if the bag is 5 cents more because we might have that much chocolate left over anyway.

T: How did you arrive at these savings of 83 cents and \$1.25?

S: Well all the costs of the box and the chocolate would be the same, because I'd put thicker chocolate on the half strawberry to make it look bigger and so use the same amount. So I'm just taking off the strawberry costs

T: Which you've worked out, how?

S: 12 cost \$2.50 so each half strawberry costs $2.50/12 = 0.208$

6 strawberries is 12 halves so 8 halves saves 4 halves or 83 cents. And 6 halves save 6 halves or \$1.25.

T: Which suggestion did you like the best?

S: The six halves per box because you might be able to sell that many and it's a much better profit.