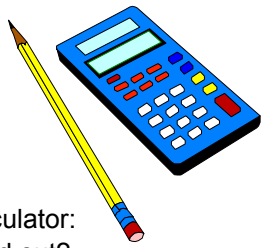
11. Fractions with Calculators



1. Jane baked 60 biscuits. She gave $\frac{2}{5}$ of the biscuits to the bazaar.

   (a) How many biscuits did she give to the bazaar?

   (b) Now press the following on your calculator: 60 ÷ 5 =. What fraction of 60 have you now worked out?

   (c) Keeping your answer on the screen of the calculator, now press × 2 =. What fraction of 60 have you now worked out? What is your answer?

2. John says: 'I will give $\frac{2}{10}$ of my pocket money to charity'. John gets R50 pocket money.

   (a) How much does he give to charity?

   (b) Now press the following on your calculator: 50 ÷ 10 =. What fraction of R50 have you now worked out?

   (c) Keeping your answer on the screen of the calculator, now press × 2 = . What fraction of R50 have you now worked out? What is your answer?

3. Susan has a bag of 35 sweets. She shares this equally between herself and 4 other friends.

   (a) How many sweets does each one get?

   (b) How many sweets do two of the friends get together?

   (c) How many sweets do three of the friends get together?

   (d) Now press the following on your calculator and write down your answers:
   (i) 35 ÷ 5 = and then × 1 =
   (ii) 35 ÷ 5 = and then × 2 =
   (iii) 35 ÷ 5 = and then × 3 =

   (e) What do you notice about all the calculator answers?

4. (a) What should you press on the calculator to work out how much $\frac{5}{16}$ of 32 sweets are?

   (b) Write down another way that you can work this out on the calculator

Teacher Notes:

In 'Earning Money for Hospital' the children were given the opportunity to see that a fraction can be interpreted as an operator by dividing by the denominator and multiplying by the numerator. This was however not made very explicit. The children were simply given the chance to work this out for themselves.

It is important that the children are given the chance to talk about and reflect on question number 3 specifically. If they haven't seen the relationship yet, this will give them an opportunity to do so.

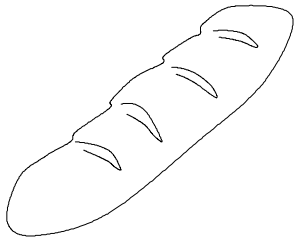
What learners may do:

- Some children might prefer to multiply before they divide. In question 5 they are given the opportunity to think of another way of doing this calculation on the calculator. Instead of pushing $32 \div 16 \times 5$, they can see that $32 \times 5 \div 16$ will give the same answer.

What learners may learn:

- That a fraction can also be interpreted as an operator. (The teacher does not need to mention the word 'operator')
- How to work out fractions of more than one whole.

12. The Gatsby



Every lunchtime, the Williams family buys a Gatsby bread with lots of tasty fillings. Father is the biggest so he takes a half of the bread, while Mother, Jonathan and Catherine share the rest equally.

1. What fraction of the original bread do they each get?

2. Grab-a-Gatsby Shop is selling the 'Bumper Gatsby'. They are so big that the shop cuts them into 12 pieces. Father still wants a half of the bread while Mother, Jonathan and Catherine still want to share the rest equally. How many pieces must Father, Mother, Jonathan and Catherine each get?

Teacher Notes:

This is an introductory exercise on multiplying fractions. The learners should *however* on no account be given the number sentence or be told that this is multiplication. The activity is within the learners' ability, especially if they draw and name the portions. This exercise should be done in class and time should be provided for reflection and discussion. It can lead to sensible interaction as different children have different ways of solving the problem. If the conflict in these situations is successfully resolved, it can also lead to the construction of equivalent fractions.

It is also very important to remember that the fact that a fraction of a fraction can also be interpreted as a fraction times a fraction should not be introduced until **much later**. The concept of a fraction **of** a fraction should be developed first.

What learners may do:

- Divide the half into three and then need discussion with friends to know what to call these 'pieces' OR immediately know to divide the bread into (multiples of) 6
- Immediately see that two twelfths is one sixth, or may need to redraw the bread with 12 divisions.

What learners may learn:

- To work out a fraction of a fraction
- Equivalent fractions

13. New Pirates' Pizza Parlour!

Pirates' Pizza Parlour is opening a new shop in Bellville. The manager wants to sell

- a Single Slice
- a Big Slice ($\frac{1}{4}$ of the whole pizza)
- a Lady's Slice ($\frac{1}{9}$ of the whole pizza)

1. Into how many slices must the new Pirates' Pizza Parlour cut their pizzas? Why?

2. What fraction of a whole pizza would a combination of a Big Slice and a Lady's Slice give you?

3. The ladies are complaining that the Lady's Slice it too small. The manager decides to make it $\frac{2}{9}$ of the whole pizza. What fraction of a whole pizza would a combination of a Big Slice and a Lady's Slice give you now?

4. A customer wants $\frac{5}{36}$ of a pizza for himself and a Lady's Slice for his wife. What fraction of a whole pizza does he buy?

5. Choose your own (any) combination of pizza slices from the new Pirates' Pizza Parlour and work out what fraction of the original pizza you have chosen. Check your friends' answers.

Teacher Notes:

Refer to teacher notes of 'Pirates' Pizza Parlour'

What learners may also learn:

- Choice of appropriate common denominator
- Addition of fractions with different denominators, of which the numerator is not 1 (non-unit fractions)

14. Sharing Chocolate

A big chocolate slab is divided into 36 small blocks.

1. Between how many people can this slab be shared easily? Write your answers in the table below.
   In the table also write - how many blocks each person will get every time
   - and what part (fraction) of the slab each person will then get.

Number of people to share slab						
Number of blocks per person						
Fraction of slab per person						

2. Compare your answers to the others in your group.
3. Did your group find all the possibilities?
4. How do you know that you have found all the possible solutions?

Look at your answers (fractions) in the last row of the table.
Do you all have the same fraction for the same number of blocks?

Teacher Notes:

The table is open-ended, so that there is no suggestion of a number of possibilities.

Pre-knowledge:

Concept of fraction (part of a whole) must be developed and stable by now.

What learners may do:

- Divide slab into various parts
- Count number of small blocks
- Name the various parts
  - by using number of "small blocks"
  - by using the number of parts whole was divided
- Compare answers to others in groups
  - find more possibilities
  - fraction can be expressed in terms of number of "small blocks" or "bigger divisions" (argue?)
- Examine answers in 2nd row
- Try to find more than one name

What learners may learn:

- Notation of fractions
- We learn from one another
  - fractions can be expressed in more than one way
- Recognise divisors as factors of 36
- Fraction can be expressed in multiples of the "unit" - (equivalent fractions)

Possible outcomes of the whole activity:

- Learners realize that if something is equally shared by *n* people, each person will receive $\frac{1}{n}$ of the whole unit
- $\frac{1}{n}$ can be expressed as $\frac{2}{2n}$; $\frac{3}{3n}$; $\frac{4}{4n}$; $\frac{5}{5n}$; . . . For example, $\frac{1}{3}$ can be expressed as $\frac{2}{6}$, $\frac{3}{9}$, $\frac{4}{12}$, $\frac{5}{15}$ . . .

More Possibilities for Questions:

Use your table to answer the following questions:

- Which part of the slab is one small block?
- How many blocks will each get if two people share the slab?
  What fraction of the slab will each person get? Find another way to name that fraction.
- Find other fractions on your table that can be named in more than one way.
- Find as many names as you can for the same fraction.

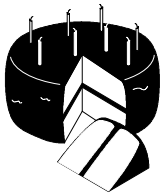
15. After the Party

1. After a party there are three-quarters of a cake left. Jane eats half of what was left over. What fraction of the cake did she eat?

2. Delshe arrives and eats half of the remaining cake. What fraction of the cake did she eat?

3. Piet comes home and eats half of the remaining cake. What fraction of the cake did he eat?

4. What fraction of the cake is left over?



Teacher Notes:

This activity requires that pupils determine a fraction OF a fraction. It should **not** yet be formalized as multiplication of fractions at this point and the number sentence should **not** be given. Pupils may use their own drawings with subdivisions to solve the problems.

What learners may do:

1. Some may, for example, handle the $\frac{3}{4}$ of the apple tart as $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$ and then halve each of these to get $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{3}{8}$
2. Others may divide only $\frac{1}{4}$ in half and take one of the other two quarters. E.g. $\frac{1}{4} + \frac{1}{8}$

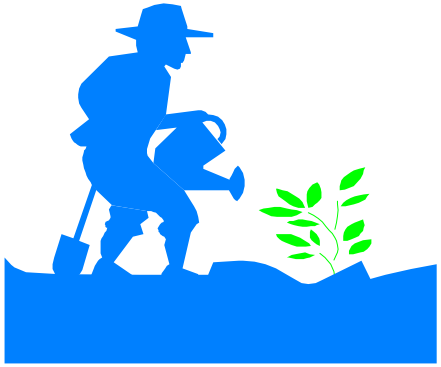
What learners may learn:

1. The idea of equivalent fractions can be constructed. (To be able to solve $\frac{1}{4} + \frac{1}{8}$ the child must realise that $\frac{1}{4} = \frac{2}{8}$).
2. Working out fractions of fractions.
3. Simple addition.

16. Compost for Vegetables

1. A vegetable farmer wants to distribute some bags of compost equally among 5 beds of vegetables.
   (a) How much compost does each bed get if there are 16 bags of compost?
   (b) How much compost does each bed get if there are 17 bags of compost?
   (c) How much compost does each bed get if there are 18 bags of compost?
   (d) How much compost does each bed get if there are 19 bags of compost?
   (e) How much compost does each bed get if there are 20 bags of compost?
   (f) How much compost does each bed get if there are 21 bags of compost?

2. 15 bags of compost are distributed equally among a number of beds of vegetables and nothing is left over.
   (a) How much compost does each bed get if there are 4 beds of vegetables?
   (b) How much compost does each bed get if there are 5 beds of vegetables?
   (c) How much compost does each bed get if there are 6 beds of vegetables?
   (d) How much compost does each bed get if there are 7 beds of vegetables?
   (e) How much compost does each bed get if there are 8 beds of vegetables?
   (f) How much compost does each bed get if there are 9 beds of vegetables?
   (g) How much compost does each bed get if there are 10 beds of vegetables?
   (h) How much compost does each bed get if there are 11 beds of vegetables?



Teacher Notes:

The learners should be encouraged to discuss their answers after each subsection. This will help them to confront each of the problems individually and to create the opportunity for them to reach consensus about equivalent fractions.

What learners may do:

- Most of the learners will probably share out the 'wholes' first and then divide the rest of the compost bags by drawing the bags.

What learners may learn:

- Some of the questions in number 2, for example c (either $\frac{3}{6}$ or $\frac{1}{2}$), provide the opportunity for equivalent fractions to be developed.

17. Making Estimates

For each of the following problems, circle the best estimate and then **explain** how you decided what to circle.

1. Tracey answered 13 out of 16 questions correctly.
   She answered about $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ of the questions correctly
   Explanation:

2. Fatima planted 12 flower bulbs and Salim planted 38 flower bulbs. Together they planted all of the bulbs.
   Fatima planted about $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{2}{3}$ $\frac{3}{4}$ of the bulbs
   and Salim planted about $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{2}{3}$ $\frac{3}{4}$ of the bulbs.
   Explanation:

Teacher Notes:

It is very important that the learners discuss their answers after these questions.

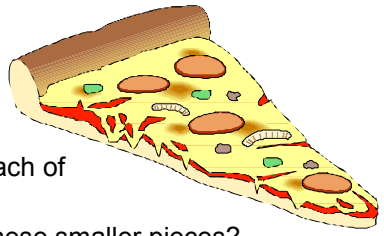
What learners may do:

- Some learners might try to work out what fraction 13 is of 16.
- Some of the learners might round the numbers up or down to make it easier to work with. E.g. change the 13 to either 12 or 14. And then work out the fraction and try to simplify it.
- Other children might start to work out $\frac{1}{2}$, $\frac{2}{3}$ and $\frac{3}{4}$ of 16 and see which one is closest to 13
- Some children might just guess. Asking them to explain can prevent this.

What learners may learn:

- Again the opportunity is created for the children to develop the concept of equivalent fractions.
- They can also develop the feeling of the 'muchness' of a fraction

18. Pieces of Pizza



1. A pizza is cut in three pieces. John cuts each of the three pieces in half.
   (a) What fraction of the pizza is each of these smaller pieces?
   (b) If John cuts each of the smaller pieces in half again, what fraction would each of **these** pieces be?

2. A family size pizza is cut into 5 slices of equal size. We call each slice a fifth ($\frac{1}{5}$). What fraction of the pizza would each slice be if:
   (a) We halve each of the pieces?
   (b) We cut each piece into 3 equal parts?
   (c) We cut each piece into 5 equal parts?
   (d) We cut each piece into 7 equal parts?
   (e) We cut each piece into 10 equal parts?

3. Use a diagram to show the following:
   (a) What is $\frac{1}{2}$ of $\frac{1}{3}$?
   (b) What is $\frac{1}{2}$ of $\frac{1}{6}$?
   (c) What is $\frac{1}{2}$ of $\frac{1}{5}$?
   (d) What is $\frac{1}{3}$ of $\frac{1}{5}$?
   (e) What is $\frac{1}{5}$ of $\frac{1}{5}$?
   (f) What is $\frac{1}{7}$ of $\frac{1}{5}$?
   (g) What is $\frac{1}{10}$ of $\frac{1}{5}$?

Teacher Notes:

This task is aimed at developing multiplication of fractions. The number sentence should however **not** be given to the children!
The fractions in the third problem were chosen especially because they are the same fractions used in the first and second problems. This helps to formalize the concept of what a fraction of a fraction really means. Do **not** split the problems up. Problems 1, 2 and 3 must be given on the same day. Do **not** give problem 3 alone on the next day. This can be done in two consecutive lesson hours.
Problem 2 with problem 3 can be repeated if necessary.

What learners may do:
Once again different strategies could be used to solve the problems (See After the Party).

What learners may learn:
- Working out fractions of fractions.
- Forming the concept of equivalent fractions.
- Working with fractions of fractions in a more formal way (just numbers, without context). It is very important to remember that the same problem should be given in context first!

19. Making Candles

Themba and Xolile buy ordinary candles at the supermarket. They melt the wax and make fancy candles to sell on the market. They make the following fancy candles:

- small round candles (They use exactly $\frac{2}{3}$ of an ordinary candle to make one of these.)
- small square candles (They use exactly $\frac{3}{4}$ of an ordinary candle to make one of these.)

1. How many ordinary candles do they have to buy to make
   (a) 20 small round candles?
   (b) 20 small square candles?

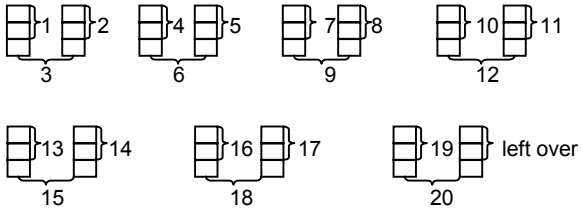
2. The supermarket sells candles in packets of ten.
   (a) How many small round candles can be made out of one packet of ordinary candles?
   (b) How many small square candles can be made out of one packet of ordinary candles?

Teacher Notes:

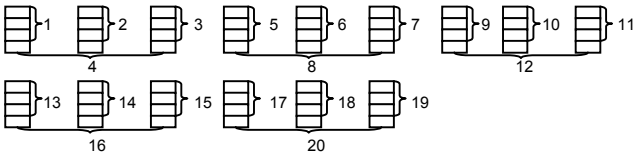
Allow learners to clarify the context (melting 'ordinary' candles and making new candles). The teacher should help them if this is necessary.

What learners may do:

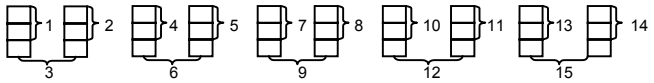
1(a) To find out how many candles will be necessary, learners may add two-thirds 20 times: $\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\ldots$(20 times) = 40 thirds = $\frac{40}{3}$ = $13\frac{1}{3}$
They need 14 candles.
OR: The learners may reason that for every two ordinary candles you can make 3 fancy candles. Therefore 18 fancy candles (3×6) need 12 ordinary candles (2×6). Then you would still need $1\frac{1}{3}$ ordinary candles ($\frac{2}{3}+\frac{2}{3}$) to make 2 more fancy candles. They would need 14 candles.



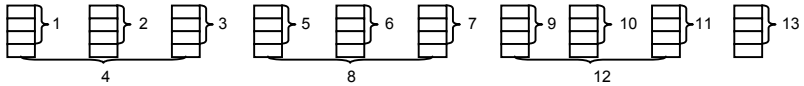
1(b) Again the learners may add. $\frac{3}{4}+\frac{3}{4}+\frac{3}{4}+\frac{3}{4}+\ldots$ (20 times) = 60 quarters = $\frac{60}{4}$ = 15.
They will therefore need 15 candles.
OR: The learners may reason that for every 3 ordinary candles you can make 4 fancy square candles. Therefore 20 fancy candles (4×5) need 15 ordinary candles (3×5). They would need 15 candles.



2(a) The structure is the same as that of Mrs. Daku's Apple Tarts (see teaching notes). In this problem we are revisiting the idea of dividing by a fraction ($10 \div \frac{2}{3}$). Learners may reason: How many two-thirds are there in 10.



2(b) Learners may reason: How many $\frac{3}{4}$'s in 10



What learners may learn:

- Fractions as part of a whole
- The iterative meaning (repeated adding): $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \ldots$
- Multiplying a fraction with a whole number

20. Baking Biscuits

Wendy uses her grandmother's recipes for biscuits. The measurements of all the ingredients are given in cups and teaspoons. Here are two recipes:

SPICY BISCUITS

4 cups of flour	$\frac{1}{4}$ teaspoon salt
1 cup of sugar	$\frac{3}{4}$ teaspoon cream of tartar
$\frac{1}{4}$ cup butter	$\frac{1}{2}$ teaspoon ground cloves
$\frac{1}{4}$ cup soft fat	1 teaspoon ground cinnamon
1 egg	$\frac{2}{5}$ cup water

This recipe is enough for about 120 biscuits

COCONUT BISCUITS

2 cups of flour	$\frac{3}{4}$ cups of coconut
$\frac{2}{5}$ cups butter	1 teaspoon vanilla essence
$\frac{3}{4}$ cups of sugar	$\frac{1}{5}$ cup milk
1 egg	$\frac{1}{4}$ teaspoon salt

2 teaspoons baking powder
This recipe will be enough for about 40 biscuits

1. Wendy wants to make about 60 spicy biscuits and 20 coconut biscuits. Write down the "new" recipe (how much of each ingredient will she need?)

2. Wendy's mother wants to bake 300 spicy biscuits and 200 coconut biscuits. How much of each ingredient will she need?

Teacher Notes:

Make sure that all the learners understand the context. Some of the ingredients (cream of tartar, cloves, and cinnamon) might be unknown to the learners.

All the learners must do the two problems. The number of cookies can however be changed by the teacher. (Just make sure that the fractions in the recipes stay sensible).

A third problem can be introduced as enrichment for fast workers:

3a. Wendy's mother's "baking session" produced 300 spicy biscuits. She wants to put these biscuits in packets for the bazaar. Of how many different ways can you think to do this? (You want to use all the biscuits).

b. If she decides to rather put all 500 biscuits in packets, on how many different ways can she do this? (You want to use all the biscuits).

What learners may do:

- In the first problem they can work out half of each ingredient: E.g. half of $\frac{2}{5}$ of a cup of butter.
- In the second problem some of them will add 120 + 120 + 60 (that they have worked out previously). Others will not see that immediately.
- For the 200 coconut biscuits they may decide to add 40 + 40 + 40 + 40 + 40 = 200. OR they may decide to multiply 40 $\times$ 5 = 200. Do not pressure them to use a method that they do not understand.

What learners may learn:

- In the first problem the idea of a fraction OF a fraction is revisited. (See teacher notes on The Gatsby)
- The iterative meaning is also revisited. This leads the way to the addition of fractions. The idea that $\frac{1}{5}+\frac{1}{5}+\frac{1}{5}=\frac{3}{5}$ is reinforced. When you add fifths your answer is fifths and not fifthteens.

TO PREVIOUS

TO NEXT