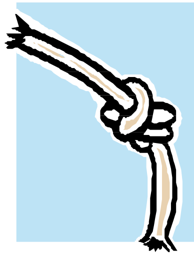
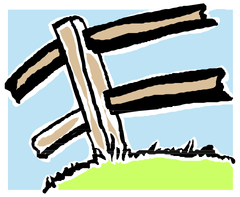
**11. Ropes and Camps**



1. A piece of rope is cut into two equal parts.
   (a) What is each part called?
   (b) What fraction will each part be if:
      i) we halve the two pieces again?
      ii) we cut the two pieces in three equal pieces?
      iii) we cut the two pieces in four equal pieces?
      iv) we cut the two pieces in five equal pieces?
      v) we cut the two pieces in six equal pieces?
      vi) we cut the two pieces in sixteen equal pieces?



2. A farmer decides to divide his farm in camps. He divides the farm into 3 equal sized camps.
   (a) What fraction of the farm will each of these camps be?
   (b) What fraction will each new camp be if:
      i) he halves each of the camps?
      ii) he divides each camp into 3 equal camps?
      iii) he divides each camp into 4 equal camps?
      iv) he divides each camp into 6 equal camps?
      v) he divides each camp into 7 equal camps?

3. Calculate the following:
   (a) $\frac{1}{2}$ of $\frac{1}{2}$
   (b) $\frac{1}{4}$ of $\frac{1}{2}$
   (c) $\frac{1}{5}$ of $\frac{1}{2}$
   (d) $\frac{1}{16}$ of $\frac{1}{2}$
   (e) $\frac{1}{2}$ of $\frac{1}{3}$
   (f) $\frac{1}{3}$ of $\frac{1}{3}$
   (g) $\frac{1}{4}$ of $\frac{1}{3}$
   (h) $\frac{1}{6}$ of $\frac{1}{3}$
   (i) $\frac{1}{7}$ of $\frac{1}{3}$

**Teacher Notes:**

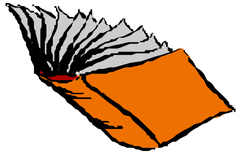
**What learners may do:**

- Learners may need to draw their responses to questions 1 and 2. Different strategies should be shared so that learners can be exposed to more formal strategies as well.
- Learners may calculate their answers to questions 1 and 2 by multiplication or division: The answer to 1) b) (i) can be obtained by calculating $\frac{1}{2}$ of $\frac{1}{2}$ or by calculating $\frac{1}{2} \div 2$. Both of these are acceptable and learners should discuss why they give the same answer.
- Learners may write $\frac{1}{2}$ of $\frac{1}{2}$ (for example) as $\frac{1}{2}$ x $\frac{1}{2}$. This is acceptable – this notation was introduced to them in 'Fractions in All Shapes and Sizes'.

**What learners may learn:**

- Correct naming of fractional parts.
- Calculating a fraction of a fraction.
- Calculating a fraction of a fraction out of context.

## 12. Covering Books



The pupils in Valley Primary have to cover their exercise books with brown paper. The brown paper is sold at the school in rolls. To help the parents decide how many rolls they must buy, the school gives the following information:

A Grade 4 pupil needs about $\frac{2}{3}$ of a roll to cover all his/her books.
A Grade 5 pupil needs about $\frac{3}{4}$ of a roll to cover all his/her books.
A Grade 6 pupil needs about 1 roll to cover all his/her books.
A Grade 7 pupil needs $1\frac{1}{2}$ rolls to cover all his/her books.

1. Mrs Daniels has a child in Grade 4, one in Grade 5 and one in Grade 7. How many rolls must she buy?

2. The number of children in each of the grades in the school is given below:
   130 in Grade 4,
   112 in Grade 5,
   119 in Grade 6
   and 96 in Grade 7.
   How many rolls of paper will be needed for all the children in the school?

**Teacher Notes:**

**What learners may do:**

- Learners may automatically convert the fractions in question 1 to twelfths. They may convert $1\frac{1}{2}$ to $\frac{3}{2}$ or use the $\frac{1}{2}$ in their addition and add the whole number afterwards.
- Some learners may solve question 2 by working out what 130 groups of $\frac{2}{3}$ is, etc.
- Other learners may spontaneously discover that 130 x $\frac{2}{3}$ is the same as $\frac{2}{3}$ x 130 = $\frac{2}{3}$ OF 130. They should be encouraged to share their thinking.

**What learners may learn:**

- Consolidation of addition of fractions and mixed numbers.
- Multiplication of whole numbers by fractions.

**13. Making Large Candles**

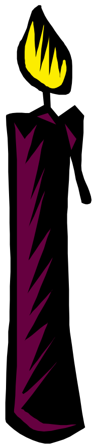
Themba and Xolile are making large candles. They are making

- large round candles (They use exactly $1\frac{1}{4}$ of an ordinary candle to make one of these.)
- large square candles (They use exactly $1\frac{3}{5}$ of an ordinary candle to make one of these.)

1. How many ordinary candles do they have to buy to make 15 large round candles and 15 large square candles?

2.
   (a) How many large round candles can be made out of one packet with 25 ordinary candles?
   (b) How many large square candles can be made out of one packet with 25 ordinary candles?

3. Calculate
   (a) $4 \times 1\frac{1}{4}$
   (b) $15 \times 1\frac{1}{4}$
   (c) $4 \times 1\frac{3}{5}$
   (d) $15 \times 1\frac{3}{5}$
   (e) $25 \div 1\frac{1}{4}$
   (f) $25 \div 1\frac{3}{5}$



**Teacher Notes:**

**What learners may do:**

- Learners may calculate question 1 by carrying out repeated addition (15 groups of $1\frac{1}{4}$ plus 15 groups of $1\frac{3}{5}$).
- Learners may realise that it is not practical to buy $42\frac{3}{4}$ candles, so a more sensible answer to question 1 would be that they should buy 43 candles.
- In order to answer question 2, learners will have to calculate how many $1\frac{1}{4}$'s (and how many $1\frac{3}{5}$'s) are in 25. They may not realise that they are carrying out division -–question 3 will alert them to this. Most learners will probably solve question 2 by carrying out repeated addition or multiplication.
- While completing question 3, learners should become aware that they were carrying out multiplication in question 1 and division in question 2.
- They may use their previous responses while solving questions 3) (b) and 3) (d). For example, having worked out that $4 \times 1\frac{1}{4} = 5$, they may calculate $15 \times 1\frac{1}{4}$ by saying that there are 3 groups of 4 in 12 so $15 \times 1\frac{1}{4} = (3 \text{ x } 5) + (3 \text{ x } 1\frac{1}{4}) = 18\frac{3}{4}$. Other learners will calculate $15 \times 1\frac{1}{4} = 15 + \frac{15}{4} = 18\frac{3}{4}$. Learners should share their methods.

**What learners may learn:**

- Multiplication of mixed numbers by whole numbers.
- Addition of mixed numbers.
- Division by mixed numbers (grouping).
- Multiplication and division with mixed numbers out of context.

**14. Making Estimations II**

| |
|---|
| A number like $9\frac{4}{7}$ is called a *mixed number* because it has a whole number (9) and a fractional part ( $\frac{4}{7}$ ). |

For each of the following, fill in the blank with a mixed number so that the answer meets the conditions given. All work should be done by using your head, rather than pencil and paper.

$9\frac{4}{7}$ + _____ = a number close to but more than 15

$19\frac{4}{5}$ + $21\frac{1}{3}$ + _____ = a number close to but less than 50

$7\frac{9}{10}$ − ______ = a number close to but more than 6

______ − $13\frac{2}{3}$ = a number close to but more than 30

$123\frac{5}{7}$ + $51\frac{1}{2}$ + ______ = a number close to but less than 300

Write down some things which you think are important about estimating fraction sums and differences.

**Teacher Notes:**

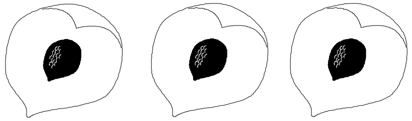
**What learners may do:**

- Learners may offer a variety of estimations. They should be encouraged to evaluate each other's answers and judge whether or not they are reasonable. For example, $5\frac{4}{7}$ may be considered a reasonable estimate for the first question, but $6\frac{1}{2}$ would result in an answer which is bigger than 16, so this would not be a reasonable estimate.
- Learners may be inclined to guess without thinking, but should be encouraged to discuss their reasons.
- Learners should use only mental strategies to complete this activity. They should not work out solutions using pencil and paper.
- Learners should be encouraged to share their conjectures about how to estimate when adding and subtracting mixed numbers.

**What learners may learn:**

- Addition and subtraction of mixed numbers (mental estimations).

## 15. DRIED FRUIT



1. When drying peaches the peaches lose water, because it evaporates. Therefore the mass of the dries peaches is only about a third of the original mass of fresh peaches.
   (a) If you dry $\frac{3}{4}$ kg of fresh peaches, what fraction of a kilogram of dried peaches would you get?
   (b) And from $\frac{3}{6}$ kg of fresh peaches?
   (c) nd from $\frac{8}{10}$ kg of fresh peaches?

2. If you need 3kg of dried peaches and you want to dry the peaches to $\frac{1}{3}$ of the mass of fresh peaches, how many kilograms of fresh peaches do you need?

3. Phillip, a farmer in Citrusdal, likes his peaches fairly dry. He therefore dries the peaches so that the dried peaches' mass is only about $\frac{1}{4}$ of the mass of the fresh peaches.

   Complete the following table:

| Mass of fresh fruit (kg) | $\frac{12}{20}$ | $\frac{6}{10}$ | $\frac{3}{5}$ | $\frac{12}{32}$ | $\frac{5}{8}$ | | | |
|---|---|---|---|---|---|---|---|---|
| Mass of Phillip's dried peaches (kg) | | | | | | $\frac{1}{4}$ | $\frac{1}{3}$ | $\frac{2}{5}$ |

**Teacher Notes:**

**What learners may do:**

- Learners may struggle to understand the context of this problem. They should clarify the problem with each other or, if necessary, the teacher.
- Learners may solve question 1 by finding $\frac{1}{3}$ of each of the given amounts, or by dividing each of the given amounts into three. Both methods are acceptable.
- Learners should be encouraged to draw if they are stuck.
- Learners may not explicitly realise that they are dealing with ratio in question 2, but may reason that if $\frac{1}{3}$ of the peaches is 3, then the mass of fresh peaches must be three times this amount (9). They may reason in a similar fashion for the last section of the table in question 3.

**What learners may learn:**

- Calculating a fraction of a fraction.
- The fraction as a ratio.

## 16. Tenth Eaters

The tenth-eaters are found in Malfrac-land. They come out at night and whenever they see something that they can eat, they eat **one-tenth** of it straight away.

Mrs Piecie made a cake and forgot it on the kitchen table. The tenth-eaters came out, one after the other.

1. The first tenth-eater saw the cake, took one-tenth of it and ran away. How much of the cake was left?

2. The second tenth-eater took one-tenth of what was left and ran away. How much of the cake was now left?

3. A third tenth-eater took one-tenth of what was left and ran away. What was left of the cake?

**Teacher Notes:**

**What learners may do:**

- Learners may struggle to calculate what is left of the cake in questions 2 and 3. It is important that they think systematically:
- Some learners may reason: If the second tenth-eater ate one tenth of what was left after the first tenth-eater ($\frac{9}{10}$), then what was left now was $\frac{9}{10} - (\frac{1}{10} \times \frac{9}{10}) = \frac{90}{100} . - \frac{9}{100} = \frac{81}{100}$ .
- Other learners may reason that the first and second tenth-eaters ate $\frac{1}{10}$ and $\frac{9}{100}$ respectively. Thus together they ate $\frac{19}{100}$ of the cake, so what was left was $\frac{81}{100}$ .
- Similar reasoning can be expected for question 3.

**What learners may learn:**

- Calculating a fraction of a fraction.
- Subtraction of fractions.
- Conversions between tenths, hundredths and thousandths (important for understanding decimal fractions).

**17. Magic Squares with Fractions**

A magic square is a square when the sums of the numbers in each row, each column and each diagonal are equal.

Let us find out if the following is a magic square.

| | | |
|---|---|---|
| 8 | 1 | 6 |
| 3 | 5 | 7 |
| 4 | 9 | 2 |

The sum of each of the rows:

$8 + 1 + 6 = 15$
$3 + 5 + 7 = 15$
$4 + 9 + 2 = 15$

The sum of each of the columns:

$8 + 3 + 4 = 15$
$1 + 5 + 9 = 15$
$6 + 7 + 2 = 15$

The sum of each of the diagonals:

$8 + 5 + 2 = 15$
$4 + 5 + 6 = 15$

Is this a magic square?

Find out whether or not the following are magic squares:

| | | |
|---|---|---|
| $1\frac{3}{4}$ | $\frac{1}{4}$ | $\frac{6}{4}$ |
| $\frac{3}{4}$ | $1\frac{1}{4}$ | $1\frac{1}{2}$ |
| 1 | 2 | $\frac{2}{4}$ |

| | | |
|---|---|---|
| 4 | $\frac{3}{6}$ | 3 |
| 2 | $4\frac{1}{2}$ | 1 |
| $\frac{12}{8}$ | $2\frac{10}{20}$ | $2\frac{18}{12}$ |

| | | |
|---|---|---|
| $1\frac{1}{7}$ | $\frac{1}{7}$ | $\frac{6}{7}$ |
| $\frac{3}{7}$ | $\frac{5}{7}$ | 1 |
| $\frac{4}{7}$ | $1\frac{2}{7}$ | $\frac{2}{7}$ |

**Teacher Notes:**

**What learners may do:**

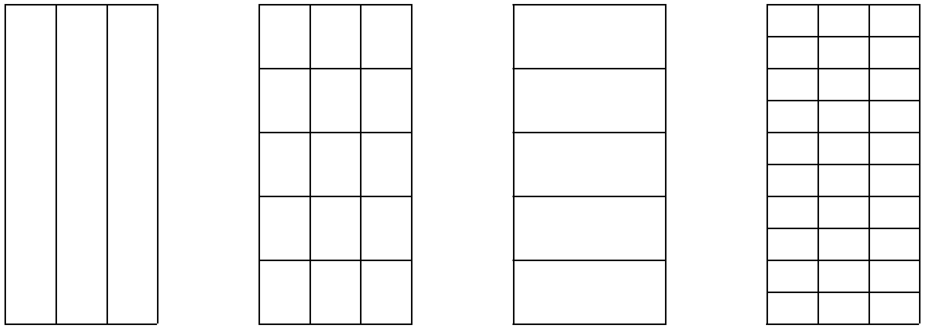
- Learners may not be familiar with magic squares. Teachers should ensure that they understand the whole-number example before proceeding to the examples fractions.

**What learners may learn:**

- Consolidation of addition of fractions.

**18. The Chocolate Factory**

A chocolate factory produces the following slabs of chocolate, all the same size but with different patterns of small blocks:



A B C D

Sometimes the slabs get damaged and the factory cannot sell them in the usual wrappings.

The factory wants to donate these broken 'rejects' to children's charities. They break the damaged slabs into smaller pieces so that each child will get the same amount of chocolate. To make it easier to distribute these gifts, they put each child's share in a small plastic bag.

The management decides to put two blocks of slab A and two blocks of slab C into each bag.

1. In how many different ways can one bag be made up? What are these different ways?
   Compare your answers in your group to make sure that you have found all the possible ways.
2. For each of the possibilities in question 1, write down what fraction of each slab is used.
   How much chocolate is used in total?
3. The number sentence for 'two blocks of slab A and two blocks of slab C' would be $\frac{1}{3} + \frac{1}{3} + \frac{1}{5} + \frac{1}{5}$ = ? Complete this number sentence and write number sentences to show all your different possibilities.

**Teacher Notes:**

**What learners may do:**

- Learners may begin by randomly finding equivalents of two blocks of slab A and two blocks of slab C. This is acceptable – in their discussion in groups, they may see the need for making a systematic list.
- Learners may struggle to write number sentences for their solutions. The teacher should help them understand what is meant by this.

**What learners may learn:**

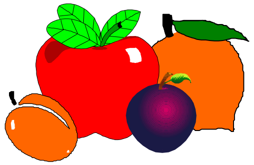
- Consolidation of equivalent fractions.
- Consolidation of addition of fractions.

## 19. Dried Fruit II (Consolidation)

Stephan, a farmer from Clanwilliam, dries the following kinds of fruits:

- Peaches which are dried to $\frac{1}{4}$ of the mass of the fresh fruit.
- Apples which are dried to $\frac{3}{10}$ of the mass of the fresh fruit.
- Apricots which are dried to $\frac{1}{5}$ of the mass of the fresh fruit.
- Plums which are dried to $\frac{3}{8}$ of the mass of the fresh fruit.

Complete the following table:



| Fresh Fruit mass (kg) | $\frac{1}{4}$ | $\frac{2}{4}$ | $\frac{3}{4}$ | 1 | $1\frac{1}{4}$ | $1\frac{2}{4}$ | $1\frac{3}{4}$ | 2 |
|---|---|---|---|---|---|---|---|---|
| Dried peaches (kg) | | | | | | | | |
| Dried apples (kg) | | | | | | | | |
| Dried apricots (kg) | | | | | | | | |
| Dried plums (kg) | | | | | | | | |

**Teacher Notes:**

**What learners may do:**

- Learners may wish to convert the fractions to their simplest equivalents. However, they should be encouraged to also examine the patter which emerges when all the fractions in the first row are expressed as sixteenths, for example. This pattern may help them to complete the table quickly. They should reflect on why the shortcuts which they have discovered work.

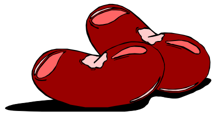
**What learners may learn:**

- Consolidation of calculating a fraction of a fraction.

**20. Nothemba's Experiment**

Nothemba had to do a science experiment. She tested the effect of using a new fertiliser on a bean plant.

At the beginning of the experiment the plant was $1\frac{3}{4}$ cm high. She measured the plant at the end of each week and found the following:



At the end of Week 1, it was $2\frac{1}{4}$ cm high;

at the end of Week 2, it was $3\frac{1}{2}$ cm high;

during Week 3 it grew $\frac{7}{12}$ cm more than during Week 2; and

at the end of Week 4, it was $6\frac{5}{12}$ cm high.

1. Write down three interesting mathematics problems about Nothemba's science experiment. One problem must be easy, one must be of medium difficulty, and one must be difficult.
2. Explain what makes the easy problem in question 1 easy.
3. Explain what makes the difficult problem in question 1 difficult.
4. Solve your problems, and a friend's problems. Check your answers with each other.

**Teacher Notes:**

**What learners may do:**
- Learners will have to reflect on the process of solving problems with fractions in order to determine what is 'easy' and 'difficult'.
- Teachers may gain some understanding of learners' difficulties by examining what they regard as 'difficult'.

**What learners may learn:**
- Consolidation of addition and subtraction with fractions.
- Metacognitive skills: Thinking about thinking processes.

**21. A Game**

Design at least one game that is based on the following arrangement of fractions. State the rules of the game clearly.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $\frac{1}{4}$ | $\frac{4}{8}$ | $\frac{1}{2}$ | $\frac{5}{12}$ | $\frac{1}{3}$ | $\frac{1}{6}$ | $\frac{3}{6}$ | $\frac{2}{4}$ | $\frac{2}{6}$ |
| $\frac{1}{4}$ | $\frac{2}{3}$ | $\frac{2}{6}$ | $\frac{1}{4}$ | $\frac{2}{4}$ | $\frac{4}{8}$ | $\frac{1}{4}$ | $\frac{2}{8}$ | $\frac{1}{6}$ |
| $\frac{6}{12}$ | $\frac{1}{4}$ | $\frac{1}{6}$ | $\frac{1}{5}$ | $\frac{2}{10}$ | $\frac{1}{4}$ | $\frac{1}{6}$ | $\frac{2}{10}$ | $\frac{3}{6}$ |
| $\frac{3}{6}$ | $\frac{3}{8}$ | $\frac{2}{12}$ | $\frac{3}{6}$ | $\frac{2}{6}$ | $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{2}{8}$ | $\frac{1}{4}$ |
| $\frac{1}{4}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | $\frac{1}{4}$ | $\frac{2}{3}$ | $\frac{1}{6}$ | $\frac{2}{6}$ | $\frac{2}{4}$ | $\frac{2}{5}$ |
| $\frac{2}{5}$ | $\frac{1}{5}$ | $\frac{2}{5}$ | $\frac{3}{8}$ | $\frac{1}{3}$ | $\frac{1}{4}$ | $\frac{3}{4}$ | $\frac{1}{2}$ | $\frac{5}{6}$ |
| $\frac{1}{8}$ | $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{3}{8}$ | $\frac{1}{2}$ | $\frac{1}{3}$ | $\frac{1}{3}$ | $\frac{1}{3}$ | $\frac{1}{6}$ |

Now play your game with a friend.

**Teacher Notes:**

**What learners may do:**

- Learners may design games which involve finding equivalent fractions, halving, doubling, adding, subtracting, multiplying or dividing fractions.

**What learners may learn:**

- Consolidation of operations with fractions.
- Consolidation of equivalent fractions.

**TO PREVIOUS**