# TEACHING FRAQCTIONS AND PERCENTAGES: A FOCUS ON INTERMEDIATE PHASE (Grade 4-6)

**Forward**

The purpose of this presentation is to enable teachers to teach fractions and link it to percentages in an easy interactive way. It is important for teachers to understand that teaching makes sense and meaning if learners are taught from everyday experiences. The teaching of fractions can make sense and meaning to learners if learners understand how fractions are used to solve problems in their lives. They share food every day and as they share they should see fractions in action. It is important to introduce fractions practically in situations where learners share things given in wholes. These experiences should be drawn from REAL LIFE activities so that learners will make meaning out of them. The problems should draw from continuous quantities such as money, length, time and volume for the purpose of integration.

Give learners enough time to explore, explain and discover connections on their own by sharing and creating different fractions. Have models and shapes to cut into equal parts and out of these experiments they would understand that a fraction is one or more equal parts of a whole

In this workshop learner involvement is very important and the teacher acts as a facilitator. What is important is that learners are given room to explain what they do and why it makes sense. What I mean is allow learners the opportunity to explain to each other, to the teacher and to the class. Lessons should be interactive. Most successful mathematics lessons are those lessons in which learners share ideas and explain concepts to each other in their own language at their own level. They should even be allowed to verbalize when working out problems.

Teaching should start from simple to complex and from known to unknown. A good lesson is not incidental or accidental. It comes out of thorough planning and preparation. Use resources available to make lessons interactive and meaningful to learners.

Mathematics teachers are encouraged to come together on regular basis to discuss problems, share thoughts and generally help each other to make the teaching of mathematics meaningful and interesting.

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# THE ICONS

|  |  |
| --- | --- |
|  | Text or Reading Material: provides information about the topics objectives that are covered in a manual. Note some units may only have reading information text |
| **cid:image003.png@01D065B2.98047F40** | Introductory Activity: requires you to focus on the content that will be discussed in a unit |
| **cid:image004.png@01D065B2.98047F40** | Self- Assessment: enables you to check your understanding of what you have read and, in some cases, to apply the information presented in the unit to new situations. |
| **cid:image005.png@01D065B2.98047F40** | Practice Activity: encourages you to review and apply what you have learned before taking a unit test. |
|  | Reflection: asks you to relate what you have learned to your work as a teacher or education officer in your community |
|  | Summary: highlights or provides an overview of the most important points covered in a unit. |
|  | Unit Test; concludes each unit |
| **cid:image012.png@01D065B2.98047F40** | Possible Answers: allow you to evaluate your learning by providing sample answers to assessments, activities and the unit test. |
|  | Time allocated to activities |

# INTRODUCTION

Why this workshop?

When God saw Moses in the wilderness he asked one question. What are you holding in your hands? We hold in us talents and potential that God wants us to develop. On the basis of this then this workshop is premised on the following principle derived from the theory by Vygostky 1978. When people share ideas they create knowledge. It is when we come together that we share the same vision and aim to achieve the same goals, create a community of practice among teachers and promote collaboration on the premise that teachers work better when they share experiences and best practices.

# WORKSHOP RULES

* Could we please turn all cell phones onto silent / off?
* During discussions let us respect each other’s opinion and answers.
* Let us adhere as far as possible to the time frames set down.
* Contribute CONSTRUCTIVELY to all discussions.

# OBJECTIVES OF THE WORKSHOP

1. Define what a fraction is
2. Show the concept of fraction is developed through sharing and introduction of the vocabulary related to fractions
3. Demonstrate concrete, representation and symbolic meaning of the concept
4. EXPLAIN AND DEMONSTRATE

* What equivalent fractions are
* How to compare fractions
* How to reduce fractions to lowest terms
* What proper fractions are
* Improper fractions
* What mixed numbers are
* How to add and subtract fractions
* Calculate fractions of amounts
* Multiply and divide fractions
* Number as a fraction of another

1. Demonstrate what a percentage is
2. EXPLAIN AND DEMONSTRATE

* Write a percentage as a fraction
* Convert a fraction to a percentage
* Reduce percentage to simplest form
* Write a percentage as a decimal
* Write a decimal as a percentage
* Finding a percentage of a quantity

1. Provide a platform for debate on how to use problem solving approach when teaching fractions and percentages

**cid:image003.png@01D065B2.98047F40**WHAT IDEAS SHOULD GUIDE THE TEACHER WHEN TEACHING MATHEMATICS IN GENERAL

* Learners understand concepts better if taught from known to unknown
* Prior knowledge is important for concept development
* Cues help learners to process information easily
* Local contexts understood by learners help learners to understand concepts better and use concrete materials where possible
* Examples used in a teaching learning situation should be drawn from learners’ everyday experiences
* Learners should be given the opportunity to interact, share ideas and explain how they get answers
* Provide scaffolding to help learners attain higher levels of mental functioning
* Demonstrations and illustrations should be clear and that emphasis should be given on areas of possible misconceptions through clear questioning and explanations

**cid:image004.png@01D065B2.98047F40**KEY TERMS IN THE PRESENTATION

**1. WHAT IS PRIOR KNOWLEDGE?**

What learners have done before, what learners already know in relation to the concept

**2. WHAT IS SCAFFOLDING?**

Proving clues, guidelines, demonstrate steps or provide questions

**3. WHAT IS A CONTEXT?**

Situation, experience or example from learners’ experiences that will help to provide meaning to abstractions in a lesson

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# WHAT KIND OF KNOWLEDGE IS REQUIRED BY THE TEACHER TO IMPROVE UNDERSTANDING OF THE FRACTIONS?

1. **Conceptual knowledge**

- consists of ideas and relationships that make it possible for a person to ASSIMILATE AND ACCOMMODATE new concepts.

1. **Procedural knowledge**

-consists of rules and steps followed when working out answers to routine mathematical tasks

1. **General misconceptions made by learners**

-addition miscues

-subtraction errors

-multiplication errors

**4. How to eradicate them**

1. Mark and show all errors

2. Ask learners to explain to other learners

3. Providing feedback during and after the lesson by:

* question learners
* seek explanation
* demonstrate
* give clear illustrations
* group discussion
* peer support

**cid:image005.png@01D065B2.98047F40**DISCUSSION QUESTIONS

What is a fraction? Give examples

What is a percentage? Give examples

What misconceptions are made by learners

* drawing and showing a given fraction
* e.g. draw an isosceles triangle and divide it into two halves
* When adding or subtracting fraction
* When multiplying
* When dividing

Why is it important for the teacher to have knowledge of misconceptions before teaching division?

**cid:image005.png@01D065B2.98047F40**CAPS REQUIREMENTS FOR THE TOPIC

|  |  |  |
| --- | --- | --- |
| **Requirements for Fractions Grade 4 to 6** *CAPS pp 71 – 72)* | | |
| **4** | **5** | **6** |
| **1.2 Common Fractions:** Concepts, skills and number range for Term 2:  *The clarification notes for Term 2 emphasize using a range of ‘models’ such as shapes, number lines and collections of objects. Equivalence and addition are only done informally for now.* | | |
| **Describing and ordering fractions:**  • Compare and order common fractions with  different denominators (halves; thirds, quarters;  fifths; sixths; sevenths; eighths)  • Describe and compare common fractions in  diagram form  **Calculations with fractions:**  • Addition of common fractions with the same  Denominators  • Recognize, describe and use the equivalence of  division and fractions  **Solving problems**  • Solve problems in contexts involving fractions,  including grouping and equal sharing  **Equivalent forms:**  • Recognize and use equivalent forms of common  fractions (fractions in which one denominator is a  multiple of another) | **Describing and ordering fractions:**  • Count forwards and backwards in fractions  • Compare and order common fractions to at least  twelfths  **Calculations with fractions:**  • Addition and subtraction of common fractions with  the same denominators  • Addition and subtraction of mixed numbers  • Fractions of whole numbers which result in whole  Numbers  • Recognize, describe and use the equivalence of  division and fractions  **Solving problems**  • Solve problems in contexts involving common  fractions, including grouping and sharing  **Equivalent forms**:  • Recognize and use equivalent forms of common  fractions (fractions in which one denominator is a  multiple of another) | **Describing and ordering fractions:**  • Compare and order common fractions, including  tenths and hundredths  **Calculations with fractions:**  • Addition and subtraction of common fractions in which one denominator is a multiple of another  • Addition and subtraction of mixed numbers  • Fractions of whole numbers  **Solving problems**  • Solve problems in contexts involving common  fractions, including grouping and sharing  **Percentages**  • Find percentages of whole numbers  **Equivalent forms:**  • Recognize and use equivalent forms of common  fractions with 1-digit or 2-digit denominators  (fractions in which one denominator is a multiple  of another)  • Recognize equivalence between common fraction  and decimal fraction forms of the same number  • Recognize equivalence between common  fraction, decimal fraction and percentage forms of the same number |
| **What is new?**   * Introduction to sevenths in Grade 4. * The concept of fractions and ways to think about fractions is expanded. * Solving a wider range of types of problems. | | |

# HOW CAN LEARNERS UNDERSTAND FRACTIONS? PRACTICAL APPLICATION

Learners should understand the concept of a whole.

A whole loaf of bread before you cut it into pieces, a fruit before you take a bite, a packet of sweets before you share with your friends.

You start from known to unknown. Cut the shapes and fruits into two equal parts. Give half of the fruit to your friend. How do we write that as a fraction? If we put the two halves together what do we have? How do we write that as a fraction? and it gives us . is also equivalent to one “1” whole that we started with.

Use a full shape, set, line, packet full of sweets, a fruit to show 1 whole.

Ask learners to draw their own shapes and divide them into quarters, halves, thirds, fifths, sixths, sevens and eights. Each time ask them to show the number of equal parts that make up that whole and write it as a fraction.

Learners should also understand that the whole can be divided into equal parts through folding and cutting off the parts. They should write down the fraction of the shaded parts draw and show them.

**Pictorial representation**

 **pizza sub sets of three**

****

**shapes blocks**



Creating situations for understanding fractions

1. What fraction of the pizza has been removed? What fraction of the pizza is shown?
2. What fraction of the shape is shaded for each of the shapes?
3. What is the difference between the way we write whole and or

Use this opportunity to explain numerator and denominator and proper fraction.

Questions for practice

1. Draw any shape and show the following fractions
2. Which fraction of the whole is shaded?

|  |  |
| --- | --- |
|  |  |
|  |  |

b)

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

c)

# FRACTIONS EQUAL IN VALUE (EQUIVALENT FRACTIONS)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 whole | | | | | | | |
|  | | | |  | | | |
|  | |  | |  | |  | |
|  |  |  |  |  |  |  |  |

The teachers need to emphasizes that 1 whole is equal in value to by using a simple fraction wall.

The learners should show fractions that are equivalent to

a) b) c) d) e)

The learners need to be given practice questions that have different questioning styles. Answers can be obtained by using fraction wall or by calculation

1.a) = b) = c) = d) = e) =

Example 1 x

By calculation: divide 4 by 2 and multiply the numerator by the answer.

Why do we divide and multiply ÷

Example 2

÷

By calculation: divide 4 by 2 and multiply the numerator by the answer =

Why do we divide by highest common denominator? ÷

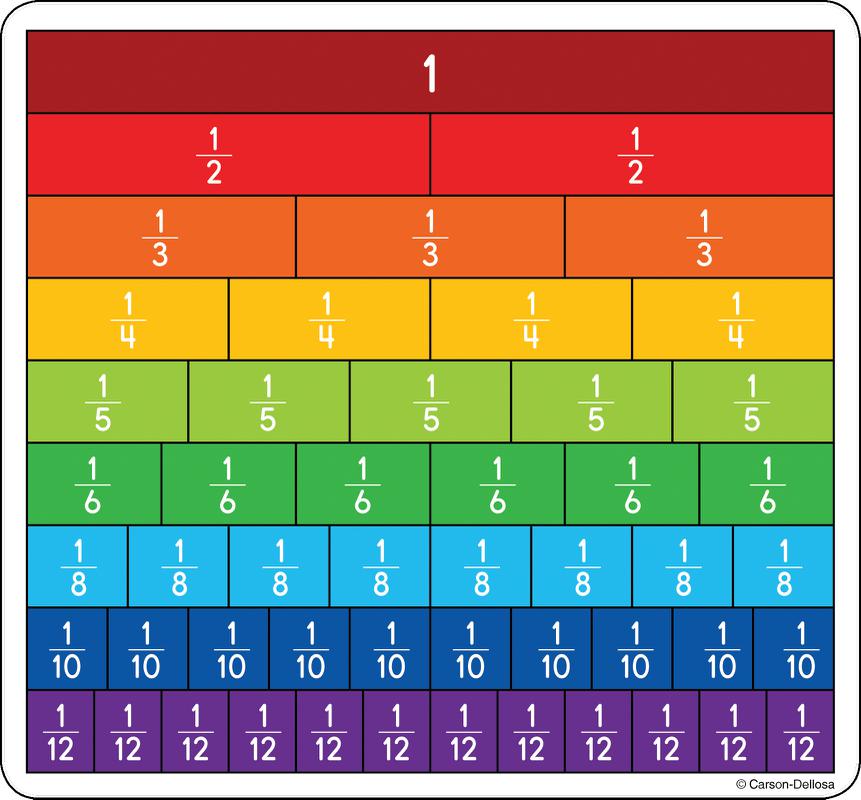
2. a)

b) =

c) =

d) =

e)=

USING THE FRACTION WALL TO COMPARE FRACTION

Give learners a task to compare fractions by asking own question. They would use bigger than smaller than or equals to. Then use the context to introduce < ;> or =

Varied questioning styles are required here for learners to manipulate and understand the fraction chart

1. Which fraction is bigger or smaller?

a)

b) or

c) or

d) or

e) or

2. Arrange the fractions in ascending or descending order

a) ;

b) ; ;

c ; ;

d;

e);;

The learners can get answers by looking at the fraction chart or by calculation

Example 3

By calculation the learners should find the common denominator of the fractions given. The learners divide the denominators into the common denominator

And multiply answers they get by the given numerators

X

; =

÷ 20

From the calculations = ; = and = In descending order; ;

# SIMPLIFYING FRACTIONS TO LOWEST TERMS

The learners should know that when they reduce a fraction to its lowest terms or form they should divide both the numerator and denominator by their highest common factor

Introduce the word “cancellation” – can we use this word?

Example 4

x = which sign “x” or “” explains this clearly to the learners? Use varied styles to ask learners eg.find the simplest form,reduce to their simplest form,reduce the fractions to lowest terms and etc.



# PROPER FRACTIONS, IMPROPER FRACTIONS AND MIXED FRACTIONS

Example 5

The above figure shows that there 6 thirds in 2 wholes number that is If you simplify the fraction line is a division sign and therefore the answer is two whole numbers. In this fraction the denominator is smaller than the numerator and therefore the fraction is called an improper fraction

Example 6

The figure above shows that there are 8 thirds, which is written as By mere looking there 2 whole numbers and,this means that the fraction can be simplified to 2 . This can be simplified by dividing by the denominator and writing the remainder as a fraction of the divisor. The answer is 2

Practice questions

1. Write the following as whole numbers



6. a)

b)

c)

d)

e)

Convert mixed numbers to improper fractions

1. 2
2. 6
3. 3
4. 5
5. 6

How do learners convert?

Example 7

Multiply denominator by whole number and add numerator as shown

+

2 =

X

# A NUMBER AS A FRACTION OF ANOTHER

Fractions are a good way of comparing two quantities. For instance, in real life people use this concept often. We rested for an hour and continued working. A turn is enough to tighten the bolt. An hour has 30 minutes hence to get half is expressing 30 minutes as a fraction of an hour or 90 degrees (900) as a fraction of 360 degrees (3600) because a turn is 360 degrees. Here learners should know that the quantities should be same unit and that they should reduce the fraction to lowest term

Practice questions

1. Express the first quantity as a fraction of the second quantity

a) 8 minutes, 1 hour

b) 70 cm, 2 metres

c) 14 hour, 1 week

d) 45 cents R15

e) 48 seconds ,2 minutes

2. There are 12 boys and 22 girls in grade6.

a) What fraction of the girls are the boys?

b) What fraction of the class are boys?

c) What fraction of the class are girls?

# FRACTIONS ON AMOUNTS

½ of our class has 15 learners. What it means is that of in mathematics means multiply by. At grade 4 level you can also talk about the fraction of amounts as a process of creating sets or sharing equally among given number of people and then looking at number of shares. ¾ of 20 means twenty items shared among four people. How many items do three people get?

This can be written as x

Example 8

(20 4) x 3 =5 x 3 = 15

Ask the learners to show other methods of getting the same answer and they should justify why their methods are correct

Practice questions

1. a) of 40 b) of 36kg c) of km d) of 44 e)2 of 20

2. Thapelo ate of his sweets. If he had 45 sweets, how many sweets were left?

3. of a number is 45 . What is the number?

4. A drum is 225 litres of water when full. If it is ¾ full how many litres of water are in the drum?

5. From10:45 to 11 33 am George spent of the time reading, drawing and writing. How many minutes did he spend?

a) reading

b) drawing

c) writing

# ADDITION AND SUBTRACTION OF FRACTIONS

The caps document spells that addition and subtraction should be taught together as inverse operations

Example 9

Models can be used to introduce addition and subtraction of fractions with the same denominator

+ =

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1/7 | 1/7 | 1/7 | 1/7 | 1/7 |  |  |

One whole has 7 equal parts.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1/7 | 1/7 | 1/7 | 1/7 | 1/7 |  |  |

- =

Ask the learners to give their own answers and explain how they get the answers. What is important here is when we add or subtract fractions of the same denominator we add or subtract numerators only

Practice questions

a) +

b) +

c) -

d) -

e) +

# ADDITION AND SUBTRACTION OF FRACTIONS WITH DIFFERENT DENOMINATORS

The caps document instructs that learners should workout problems involving fractions of which one denominator is a multiple of another. Therefore, to this end, learners should convert one of the fractions so that it is equivalent to the other with equal denominators at grade six level.

Example 10

+ = x + = + =

Example 11

This method is suitable for grade 7 upwards

Lowest common multiple can be obtained by listing multiples of both denominators first,

The lowest common multiple is 20. This strategy is useful for learners who are struggling with their multiplication table

4 = 4, 8, 12, 16, **20**, 24

5 = 5, 10, 15, **20**, 25

- = = =

Or

= = = =

is an Improper fraction, and can be simplified into a mixed number to get 1

Practice questions

1. a) 1-

b) -

c) +

d) +

e) -

1. Palesa used of the day to do homework and sleeping. What fraction of the day did she spend doing homework and sleeping?
2. How many hours did Palesa spend doing homework?
3. How many hours did she spend sleeping?
4. If she spends the rest of the day at school what fraction of the day did she spend at school?
5. How many hours were spent at school?

# ADDITION AND SUBTRACTION OF MIXED NUMBERS

Example 12

To work out 5 + 2

The learners should add whole numbers first, in the example above we add 5 and 2, i.e. 5 + 2.

Then find the common denominator which is 10

Divide the common denominator by the two denominators and multiplying by the numerators

 =

=

Do not forget to emphasize your teaching points. What are teaching points here?

You can also change the mixed numbers to improper fractions and subtract or add numbers. The disadvantage of this method is that the numerators become very big.

Practice questions

a) 1+2

b) 8-

c) 4 +2

d) 8 -

e) 4 - 3

# MULTIPLICATION OF FRACTIONS

Example 13

Multiplying fractions by whole number is the same as repeated addition

x 2 =+ = explain that the learners that it is an error to multiply both the denominator and numerator by 2

Example 14

X use this table to illustrate how to multiply by

you can also say of The shaded area is called the unit region

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

It is like multiplying numerator by numerator and denominator by denominator and reducing the answer to its lowest terms.

= X

=

After this example you can introduce “cancellation” and with mixed numbers change to improper fractions first.

# DIVISION OF FRACTIONS

Example 16 5 means what do you divide by to get 5 There are 2 halves in 1 therefore in 5 you multiply 5 by2 .This gives the justification for inverting the fraction to your right. With mixed numbers change to improper fractions first

Practice questions

1. 2

4. 2 3

# PERCENTAGES

The term per cent means per hundred. The symbol for % is used.19 % means

You can write any percentage as a fraction with 100 as its denominator.

Example 17

7% =

Example 18

7 % and write 7 as a numerator of 100 =

Multiply the denominator and numerator by 2 = x

You will get and reduce it to its lowest terms =

Practice questions

Write as percentages to their simplest form

1. 49%
2. 25%
3. 33%
4. 12%
5. 112%

Example 19

Express fraction as a percentage

Multiply both the denominator and numerator by 4 = X

=

= 28%

Divide numerator and denominator by 5 =

=

= 27%

Practice questions

Write each fraction as a percentage









Example 20

of 18 change 50% to a fraction to simplest form. Then multiply x 18 = 9

Practice Questions

1. a) 30% of 80

b) 27% 60

c) 45% of 345

d) 75% of 900

e) 78% of 580

2. A test was written out of 80. Lerato got 85% of the marks. How many marks did she get?

3. David pays a 15% deposit for a car which costs R82 200.

a) How much did he pay as deposit?

b) What percentage of the cost has he still to pay?

c) What is the current balance?

# PERCENTAGE INCREASE OR DECREASE

Here you calculate percentage of an amount either add it or subtract it from the amount depending on the nature of the question. On these problems ask learners to solve using own method and reinforce what they say because they are several ways that can be followed to get to the same answer. They must apply what was learnt on the topic on fractions

Example

Increase 350 by 6%

Integrate with idea of decimals here.

350 x = 350x0, 06 = 2, the 6% of 350 is 2,

Then add 350 and the 21 to get 371

Example decrease 480 by 5%

Subtract 5% from 100% = 95%

Then 95% x 480 = x 480 .You get the answer straight = 456

Learners should show how they get the answer

Practice questions

1. Increase 65 by 20%

2. Decrease 430 by10%

3. Normal price for a computer is R550.In a sale the price was reduced by15%, Find the sale

price of the computer

4. The price of bread increased from R 10 to R 15. What was the percentage increase?

# APPLICATION OF BLOOM ‘S TAXONOMY

Bloom taxonomy is critical in preparing learners to operate at different levels of mental functioning. The caps document refers to bloom s taxonomy as the cognitive levels. It is important to note that the purpose of this discussion is enabling the teachers to understand cognitive levels and how to apply Blooms taxonomy teaching and learning. When you give your learners classwork borrow from the words below and vary your questioning style. The word problems that form part of the practice questions help your learners to operate at different levels of the taxonomy. Therefore, it is important the learners get used to story problems and practice them often.

ORIGINALLY THE TAXONOMY HAD SIX COGNITVIVE LEVELS: knowledge, comprehension, application, analysis, synthesis and evaluation

Knowledge Questions

* Knowledge of terminology
* Knowledge of specific details and elements
* Recall
* Recognize facts

Comprehension questions (conceptual knowledge) routine procedures

* Interpret
* Classify
* Compare
* Summarize
* Explain
* Give examples

Application questions complex procedures

* Show how parts relate to one another
* Reorganize ideas to make sense
* Knowledge specific skills
* Knowing when to use a particular procedure
* Breaking into constituent parts

Problem solving

* Making judgments, checking and criticizing
* Use of appropriate procedure to solve a problem

# CONCLUSION

All approaches to be used should begin from simple to complex. Those strategies used at grade four or five level can also be used in grade 7 if learners experience problems. Give learners not only an opportunity to work out problems using their own methods but further question and probe them to explain how they get their answers. By listening to the explanations they give and looking at their demonstrations you will be able to pick on misconceptions that must be corrected. Ensure that you integrate the teaching of fractions to other topics so that learners would apply what they know to understand the new concept being taught. It is also important to use learners’ experiences so they can make connections through seeing the relevance of the concept of fractions in solving real life problems.