

Tutorial letter 201/1/2016

MATHEMATICS AND MATHEMATICS TEACHING PST201F

Semester 1

Department Mathematics Education

IMPORTANT INFORMATION:

This tutorial letter contains the memorandum for Assignment 02

IMPORTANT INFORMATION:

At the end of this letter, you will find exam guidance.

BAR CODE

ASSIGNMENT 02

SOLUTIONS AND COMMENTS

Dear student

This tutorial letter contains solutions to Assignment 02. You will need to compare the solutions to your own attempts. This feedback is very important. Work through the solutions, and use the examples to prepare for the exam.

REMEMBER

NOT every question will be marked. That does not mean that the questions not marked are not important (Interpret the three NOTS in this sentence!!*). Look carefully at the marking schedule and the marks you obtained.

We are committed to help you to pass this module. Please be committed from your side to pass. Success will not come without effort.

*It means everything is important!

The solutions are placed in boxes for your convenience

PART A

Activity 1.1

Write a short paragraph on your experiences as a learner in a Mathematics class when you were at school. Write at least one good experience and one bad experience.

(5)

Own ideas

Activity 1.2

Write a paragraph to describe what you think **each** of the pictures (photos) represent. Do not rush though the activity. Write **as much as you can** about the situation depicted in each picture.

(6)

Own ideas:

Some students' opinions (students give their own impressions)

- 1 Teacher stand behind her table, children all listen passively to the teachers
- 2 Learners are engaged in a problem, where they have manipulatives (concrete apparatus which they can use to solve a problem)
- 3 Looks like a very old classroom set-up. One can almost smell the fear of the children – sitting on their hands!
- 4 Teacher listening attentively to learners

- 5 Learners sitting alone, grappling with mathematics – not a happy picture
- 6 I can feel the enthusiasm with which learners are listening to teachers. Learners actively engaged in the lesson

Activity 1.3

- 2 Look at the verbs related to the “doing” of mathematics in a mathematics classroom as mentioned in the text. Use each of them in a sentence to relate them to the doing of mathematics. (4)

Here are some verbs:

compare	explain	predict	conjecture	explore	represent	construct
formulate	solve	describe	investigate	verify	develop	justify

Own sentences will be marked

- 3 Describe the role of the teacher and the learners in the classroom where they are doing mathematics (4)

Use words in full sentences:

Learners: productive struggle, share, listen, reflect, explain, find connection (vd W page 14)

Teachers: Focus on learners’ prior knowledge, testing ideas, making connections and comparisons, making conjectures

Activity 1.5

Turn to page 18 of your prescribed textbook.

Read the instructions and answer the question:

- 1 *Who has the best chance of getting a red and a blue?*

Now answer the following questions:

- 2 *Was there a rule that you could follow to answer the question?*

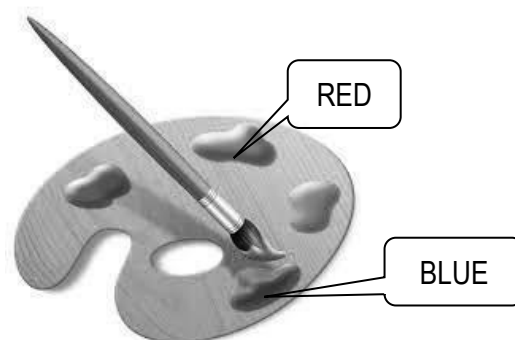
There was no "rule" to be followed

- 3 *Did you make up your own strategy?*

Own answer

- 4 *How do you feel about solving a problem without somebody giving you the “rule” to work with?*

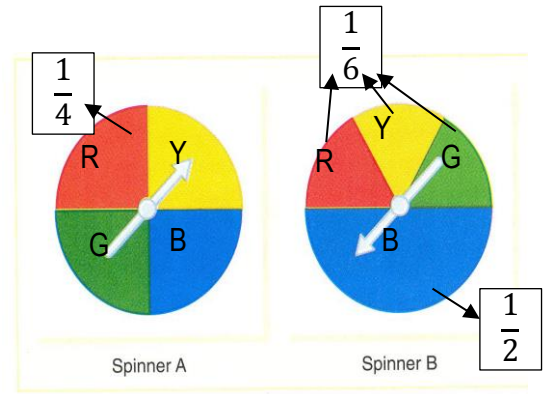
Own answer



If you mix blue paint with red paint, you will have purple.

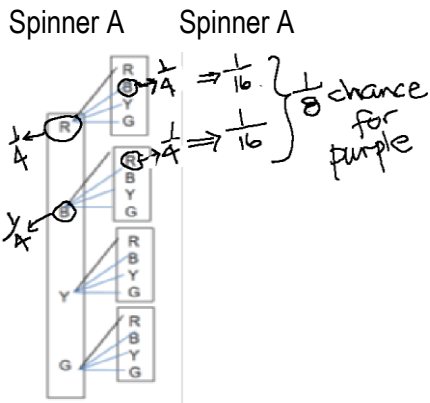
Here is the problem and some solutions

Three students are spinning to get purple with two spinners, either by spinning first red and then blue, or first blue and then red. They may choose to spin each spinner once, or one of the spinners twice. Mary chooses to spin twice on spinner A, John chooses to spin twice on spinner B, and Susan chooses to spin first on spinner A and then on spinner B. Who has the best chance of getting a red and a blue?

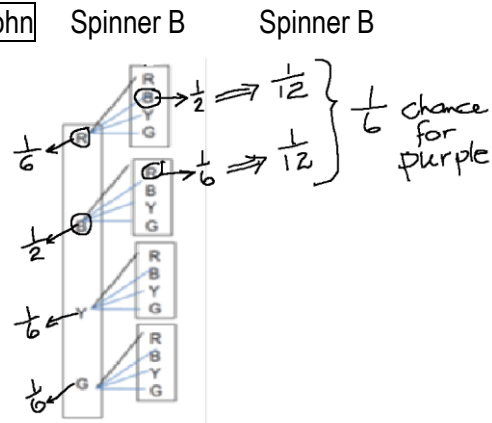


A solution

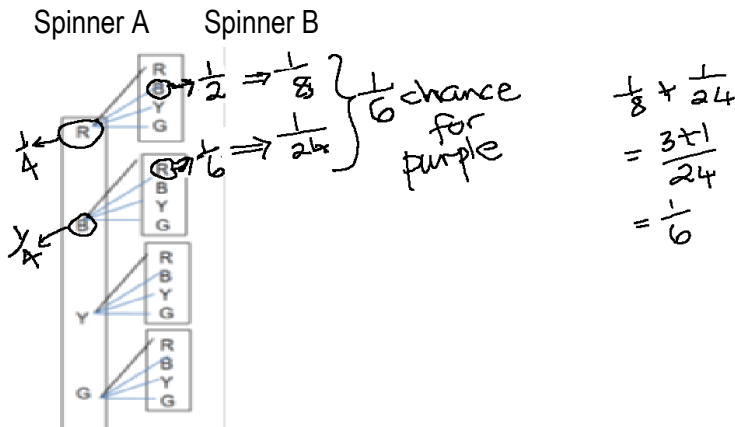
Mary



John



Susan



Another strategy is explained on page 19 of the text book.

If you use a square to indicate each of the possibilities as a fraction part, then it will look as follows:

MARY

SPINNER A

RED	BLUE	GREEN	YELLOW
-----	------	-------	--------

SPINNER A

RED
BLUE
GREEN
YELLOW

SPINNER A overlaps with itself

RR	RB	RG	RY
BR	BB	BG	BY
GR	GB	GG	GY
YR	YB	YG	YY

The square is divided into 16 parts of equal size. Two of the parts are both red and blue.
 $\frac{2}{16} = \frac{1}{8}$
 There is one-eighth chance of getting purple.

If you superimpose the one square (SPINNER A) over itself, you can see which parts overlap. Can you see the parts that are "purple"?

SUSAN

SPINNER A

RED
BLUE
GREEN
YELLOW

SPINNER B

BLUE
BLUE
BLUE
YELLOW
GREEN
RED

SPINNERS A AND B OVERLAPPING

BR	BB	BG	BY
BR	BB	BG	BY
BR	BB	BG	BY
YR	YB	YG	YY
GR	GB	GG	GY
RR	RB	RG	RY

The square is divided into 24 parts of equal size. Four of the parts are both red and blue.

$$\frac{4}{24} = \frac{1}{6}$$

There is one-sixth chance of getting purple.

If you superimpose the one square (SPINNER A) over the other (SPINNER B) you can see which parts overlap. Can You see the overlapping parts?

JOHN

If you superimpose the one square (SPINNER B) over a duplicate of itself you can see which parts overlap. Let us see which parts will be blue as well as red (BR):

SPINNER B

BLUE
BLUE
BLUE
YELLOW
GREEN
RED

SPINNER B

BLUE
BLUE
BLUE
YELLOW
GREEN
RED

SPINNER B overlaps with itself

BB	BB	BB	BY	BG	BR
BB	BB	BB	BY	BG	BR
BB	BB	BB	BY	BG	BR
YB	YB	YB	YY	YG	YR
GB	GB	GB	GY	GG	GR
RB	RB	RB	RY	RG	RR

The square is divided into 36 parts of equal size. Six of the parts are both red and blue.

$$\frac{6}{36} = \frac{1}{6}$$

There is one-sixth chance of getting purple.

(6)

Activity 1.6

Assimilation occurs when a new concepts fits into an existing network of ideas. The new information expands an existing network.

Accommodation takes place when the new concept does not fit into an existing network of ideas. The brain has to revamp or reorganise the network. This takes place through reflective thought or sifting through existing ideas that seem to be related to the new concept.

Disequilibrium – when new knowledge and existing knowledge do not 'match' and the learner needs to modify the re-arrange concepts and connections.

Reflective thought – means to sift through existing ideas to find those that seem related to the new knowledge.

(4)

Activity 1.7

Four children had 3 boxes of Smarties. They decided to open all 3 boxes, to share the Smarties fairly. There were 52 Smarties in each box. How many Smarties did each child get?

Now look at two attempts from Grade 4 learners to solve this problem:

- 1 Explain in your own words how the two learners solved the problem.
- 2 What is an algorithm?

Michael's work:

$$\begin{array}{r} 156 \div 4 = 10 \\ - 40 = \\ \hline 116 \div 4 = 4 \\ - 16 = \\ \hline 100 \div 4 = 25 \\ - 100 = \\ \hline 0 \end{array}$$

39 each

Michael

Romy's work:

1	2	3	4
20	20	20	20
5	5	5	5
10	10	10	10
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1

3 x 52 =

39

Romy

Activity 1.8

1. The learner borrowed a "ten" from the "hundreds" column
2. The learner borrowed 100 from the 600 and carried it over as a 10 to the units
3. No. The learner does not understand the value of the ONE that he/she is borrowing. (3)

Activity 1.9

Weaknesses of rote learning – your own words for the following

- Learners do not always understand what they are learning. They will not enjoy the subject. They may perform poorly.
- They forget what is taught, often because there are too many rules and algorithms to memorise. They are not able to apply their knowledge to a new situation.
- They do not know how this knowledge applies or links to the real world.
- The teacher who uses this method is more concerned about getting through the work than how and if the students are really learning.
- It is an instrumentalist form of learning. Learners are not encouraged to link the new knowledge to existing knowledge.
- It is considered to be 'weak construction'. The learner is not really building a useful network of ideas.

(3)

Activity 1.11

- 2 Explain why **relational understanding** has a far greater potential for promoting reflective thinking than **instrumental understanding**. (2)

Bookwork. See textbook and tut letter 501

Relational understanding is an understanding of what to do AND WHY. All concepts are in a connected network and when a learner wants to recall a concept, all the other related concepts are understood and can easily be recalled. Relational understanding means that the learner integrates the concept into an already constructed network of ideas. The learner will be able to sift through his/her existing ideas and link the new information. The learner will be able to apply this knowledge.

Instrumental understanding is on the opposite continuum of understanding. This is also called "doing without real understanding". The ideas are isolated, and cannot be connected (related) to other ideas. Instrumental understanding is related to the rote learning of concepts. Instrumental understanding means that the learner only knows how to follow a procedure, he/she does not necessarily understand the concept. The learner will not be able to apply the knowledge and will quickly forget.

Give own conclusion why relational understanding promote reflective thought.

- 3 Explain what it means that understanding exists on a continuum from relational to instrumental understanding. Give an example of a mathematical concept and explain how it might be understood at different places along this continuum.

Vd Walle textbook page 23 and 24

Activity 1.13

- 2 A model for a mathematical concept is any object, picture or drawing that presents the concept or onto which the relationship for that concepts can be imposed.
- 3 Blocks, bottle tops, graph, explanation can be examples of models. (2)

Activity 1.14

1. Five strands of mathematics proficiency:
 - Conceptual understanding – understanding mathematical concepts, operations and relations
 - Procedural fluency – being able to carry out mathematical procedures flexibly, accurately and efficiently
 - Productive disposition – to see mathematics as sensible, useful and worthwhile
 - Strategic competence – able to formulate, represent and solve mathematical problems
 - Adaptive reasoning – logical thought, reflection, explanation and justification
2. Learners learn new concepts more effectively

- There is less to remember
- Increased retention and recall
- Enhanced problem solving abilities
- Improved attitudes and beliefs

(5)

Activity 2.1

- Teaching for problem solving – teaching a skill that a student can later solve problems using this skill.
- Teaching about problem solving – teaching students how to solve problems. Giving them general strategies (draw a picture) for solving problems.
- Teaching through problem solving – learners will learn mathematical concepts through solving problems.

(3)

Activity 2.2

The problem on page 56 is copied here:

$$10 + \mathbf{A} = 4 + (3 + \mathbf{B})$$

Answer the following questions:

- 1 Find the numbers for each blank to make the equation true.

Examples: $A = 1, B = 4$ $A = 2, B = 5$ $A = 3, B = 6$

- 2 Find different pairs of numbers that will make the equation true.

- 3 What is the relationship between the two numbers of any correct solution?

B is always three more than A.

Activity 2.6

- 1 What does it mean to say that a task has multiple entry points?

A problem where different strategies can be used to find a solution, is called a problem with multiple entry points

- 2 Write down any mathematical task for intermediate phase learners where you can use at least two entry points.

Example

Joseph has 24 marbles, some red and some blue. He gives all the red marbles to Janet. Janet says she wants to exchange half of her red marbles for blue marbles. They do that, and now Joseph has 18 marbles left. How many red marbles are there?

(5)

Activity 2.7

- 1 Give reasons why there should be a shift in the thinking about mathematics teaching.

There should be a shift away from the traditional approach where teachers **show** students how to follow a procedure and the students practice this skill. This approach has the students as passive learners and students are used to being told what to do – they are reluctant to think for themselves. If you give them a sum that is slightly different or ask them to solve ‘word’ problems they struggle.

There should be a shift towards **problem-based learning**. This means that lessons should begin where the students are, with the ideas that students already have. Students should learn through problem based activities that require thought. They will learn mathematics as a result of solving the problems.

Think about:

Mathematics should not be seen as learning a set of rules and procedures. A variety of methods to solve the same problem should be encouraged. Learners should be given good problems and not just repetitive exercises of the same kind.

- We want to move away from procedural knowledge to conceptual understanding of mathematics.
- Learners should do less rote learning of rules and become more involved in making sense of concepts
- There should be more classroom discussion to enhance understanding
- Learners have to be given the opportunity to voice their opinions about how they understand and solve problems
- Teacher must LISTEN to learners to understand how they think and reason
- Learners should not be criticized for making mistakes.

- 2 Use your own words to describe the teacher's actions in the *before*, *during* and *after* phases of a problem-solving lesson. USE OWN WORDS

(6)

Before ⇒ Getting ready

- Activate prior knowledge
- Be sure the problem is understood
- Establish clear expectations

Begin with a simple version of the task, brainstorm, estimate or use mental computations, be sure the task is understood, establish expectations

During ⇒ Students work

Let go!

- Notice students' mathematical thinking
- Provide appropriate support
- Provide worthwhile extensions

The learners should be working in groups, listen actively to what they are saying, provide hints, suggest a different representation or model

After ⇒ Class discussion

- Promote math community
- Listen actively
- Summarize main ideas

Engage the class in a discussion; list the answers of the groups on the board without comment. Give the learners space to explain their thinking.

PART C

These questions relate to Chapter 11 - 13 of the prescribed books:

- 1 Name the three ways one can count a set of objects, and explain how these methods of counting can be used to combine concepts and written names for numbers. (6)

See pages 191 and 208 van de Walle

- 2 How can learners learn to write two-digit numbers in a way that it is connected to the base 10 meaning of ones and tens? (4)

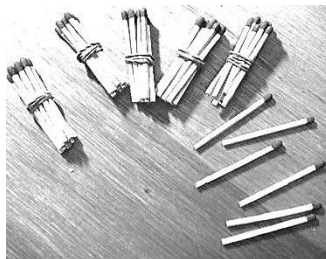
Learners can use a variety of base ten apparatus (manipulatives). They will only need units and tens concrete models. They can use the beans as illustrated in your tutorial letter 501, or matches or Dienes blocks. You can make your own Dienes blocks (see end of tutorial letter 501 for templates to cut out). The idea is that learners understand that ten ones make 10, and then the place value of the digit in the tens place means tens (or ten ones)

See tutorial letter 102 page 7

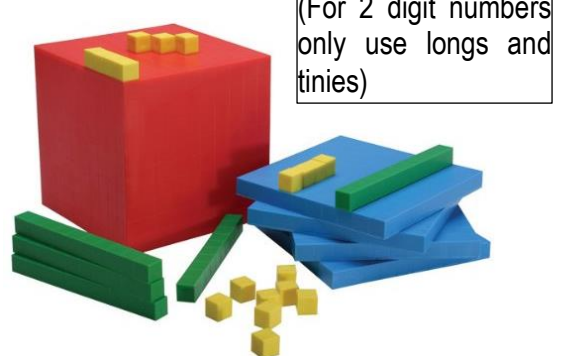
Beans – see packaging



Match sticks – bundles of 10



Dienes blocks



(For 2 digit numbers only use longs and tinies)

You get **groupable** models and **pre-grouped** models. With groupable models, children can arrange the counters to suit their own counting but with pre-grouped models children cannot take pieces apart or group them

Describe in your own words

3 Describe two ways in which the hundred chart can be used to identify place value.

(2)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- In the rows, the unit digits grow by 1 as you move from left to right.
- The last column has all unit digits as zero, but the tens digits increase by one as you move down.
- In the columns, the tens digit grows by one as you go down.
- The last number in the chart is 100

H	T	U
1	0	0

place value chart

Examples

Remember place values:

H T U

MUST refer to place values

The rows show the same face values in the tens place value (except for the last column)

The columns show the same face values in the unit place value

In column 1 All unit digits are 1 – we have always 1 in the unit place value

In column 2, all unit digits are 2, etc.

In row one (except for last block) all the numbers are only one digit, so they are in the ones place

In row two (except for last block) all the place values of the tens digits is 1

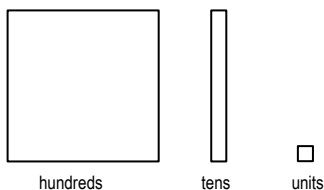
Try to find more patterns in the place values.

4 Draw Dienes block to show how to find the solution to:

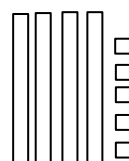
a) $45 + 18$

(3)

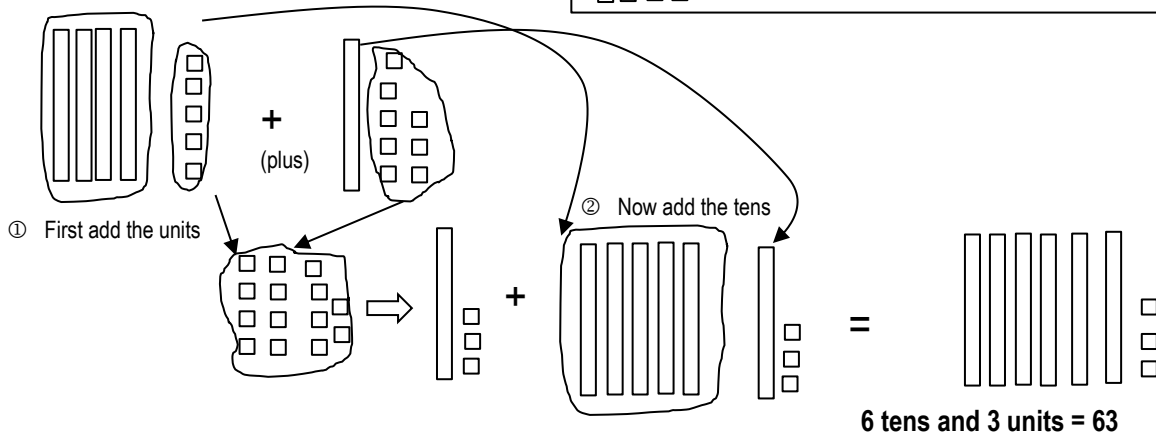
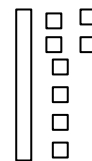
Your key for Dienes block (also called base 10 blocks)



Set out 4 longs and 5 tinies



Set out 1 long and 8 tinies



b) $45 - 18$

Set out 6 longs and 4 tinies

① Break up one long into 10 tinies

② Subtract one long and eight tinies from the 3 longs and 15 tinies

4 tens 5 units

5 Test the following numbers for divisibility by 9, and 11. (Do not factorise – no calculator)

a) 11 183 139

For 9 – we add the digits: $1+1+1+8+3+1+3+9 = 27$. 27 is divisible by 9. This means that the number is 11 183 139 divisible by 9.

For 11

Add every 2nd digit: $1 + 1 + 3 + 3 = 8$

Add the other digits: $1 + 8 + 1 + 9 = 19$

Subtract $19-8=11$

If the result is 11 or 0 – then the number is divisible by 11, so in this case 11 183 139 is divisible by 11

b) 525 607 533

For 9 we add all the digits: $5+2+5+6+0+5+3+3=36$. 36 is divisible by 9, so the number 525 607 533 is divisible by 9.

For 11: $5+5+0+5+3=18$

and $2+6+7+3=18$

Subtracting these two $18 - 18 = 0$.

So the number 525 607 533 is divisible by 11

6. The prime numbers between 1 and 100 are:

(5)

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

7 Use the vertical and horizontal algorithms to find the sum or difference of: (Explain the "borrow" and "carry" concepts)

a) $354 + 268$

② This small 1 here is 1 hundred

① Add the units: $4 + 8 = 12$. This small 1 here is 1 ten

13	5	4
2	6	8
6	2	2

$$\begin{aligned}
 354 + 268 &\Rightarrow 300 + 50 + 4 + 200 + 60 + 8 \\
 &= (300 + 200) + (50 + 60) + (4 + 8) \\
 &= (500) + (110) + (12) \\
 &= 622
 \end{aligned}$$

Some steps may be left out

b) $345 - 268$

① Borrow 1 ten from the 50. Fifty becomes 40 and the 4 becomes 14

② Now borrow 100 from the 300. The 40 now becomes 140

23	14	5	14
2	6	8	
0	7	6	

8 How are standard algorithms different from student-invented strategies? Explain the benefits of invented strategies over standard algorithms (give at least two valid points).

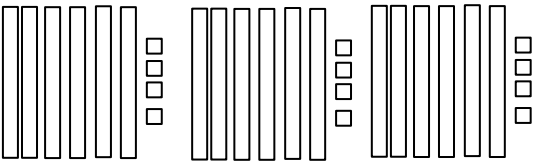
(3)

(2)

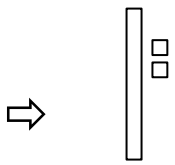
An algorithm is a rule that can be used; a procedure that is carried out which is usually learned by rote, with little understanding. Invented strategies are methods which learners produce themselves. It is usually built on concepts that the learners know already. One often finds that learners invent their own strategies in the way that they understand, and not necessarily the way in which the teacher explains. It is always a good idea to first find out how the learners understand a concept and to build on their understanding. It is never a good idea to simply show them the "method" from the beginning of a lesson and let them repeat it. You need to lead them from their own ideas towards understanding the algorithms.

- 9 Draw pictures showing how 64×3 could be modelled: with counters, with base – ten blocks, or with areas on base 10 grids. (Use at least two of the methods)
Base 10 blocks (4)

Set out 6 longs and 4 tinies (3 times)

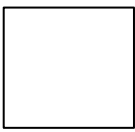


When you group the "tinies" – there are 12 of them this will give you 1 long and 2 tinies

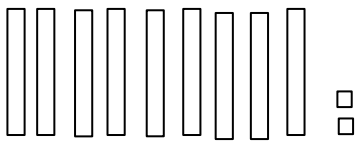


When you group the "longs" – there are now 19 longs.

So 10 longs make one flat.



So we are left with 1 flat, 9 longs and 2 tinies:



- 10 What would you do if your learners persist on using repeated addition for multiplication problems without really doing any multiplication? (3)

Let learners use their preferred method of calculation for as long as they are comfortable with it. It is not wrong to use repeated addition when large numbers are involved. However, when learners use repeated addition to calculate 123×7 (for example), then it becomes tedious, and learners could be guided to use a different strategy.

$$\begin{array}{rcl} 100 \times 7 & \Rightarrow & 700 \\ 20 \times 7 & \Rightarrow & 140 \\ 3 \times 7 & \Rightarrow & \underline{21} \\ & & 861 \end{array}$$

[40]

PART D

These questions relate to Chapter 15 – 17 of the prescribed book:

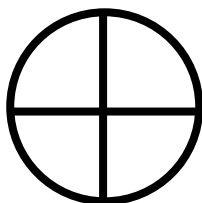
- 1 Sharing and "equal sharing" (fare sharing): what is the difference? (2)

Own work

- 2 Give examples of each of three categories of fractions: [Illustrate with diagrams]

2.1 Area model

Continuous whole (area model)



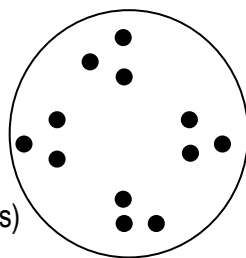
Example" A pizza divided into four equal parts



2.2 Set model

Discrete whole (set model)

- Mary shares 12 sweets between her and 3 friends (4 people)
- Each friend gets one-quarter of the 12 sweets (3 sweets)

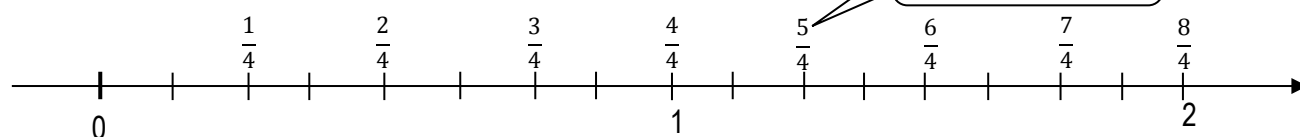


Twelve sweets
divided by four
people – loose
objects

2.3 Length model (number line) Paper strips can also be used as length models

(6)

Example



- 3 In the context of choosing a “whole”, explain when a “third” is not always equal to a “third”.
Give an example.

(3)

When thinking of a fraction as a part of a whole, the part will depend on the size of the whole. For example, one third of an orange is not the same as one third of a watermelon. So when we contextualise fractions as a part of “something”, this “something” has to be exactly the same. In the world of numbers, when we talk about a third, we always mean a third of ONE. (one unit)

- 4 Use the correct language to explain the difference between the expressions:
“it is the third of March”

This means the third day of the month of March (ordinal number).

“you are third in the row”

This means if there is a row of people, you are the third person from the beginning (ordinal number).

“I want a third of the pizza”

This means if you divide a pizza in three equal parts, each part is one third of the whole (fraction).

(4)

Some numbers of note:

- A cardinal number tells “how many.” Cardinal numbers are also known as “counting numbers,” because they show quantity. Cardinal numbers are whole numbers, so fractions are not cardinal numbers.

- Ordinal numbers tell the order of things in a set—first, second, third, etc. Ordinal numbers do not show quantity. They only show rank or position.
- A nominal number names something. Nominal numbers do not show quantity or rank. They are used only to identify something (e.g. a postal code).

5 The exercise is based on “Pause and Reflect” in your textbook, pp 321 – 322

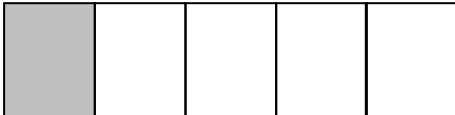
No “free-hand sketches” will be accepted

Use a ruler and sharp pencil to make accurate drawings

You may draw on the computer

5.1 If the given rectangle represents one whole

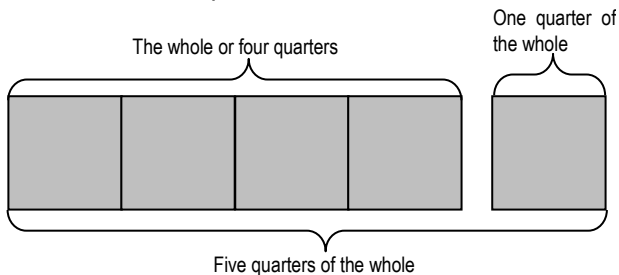
- Show one fifth of the whole



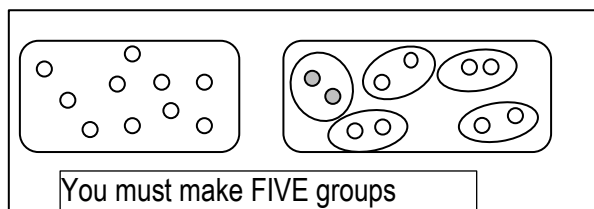
- Show two thirds of the whole



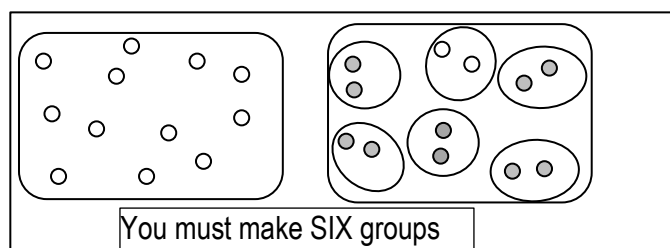
- Show five quarters of the whole



5.2 If ten counters are a whole set, how many are there in one-fifth of the set? Answer: 2



5.3 If 12 counters are a whole set, how many counters would make five-sixths? Answer: 10

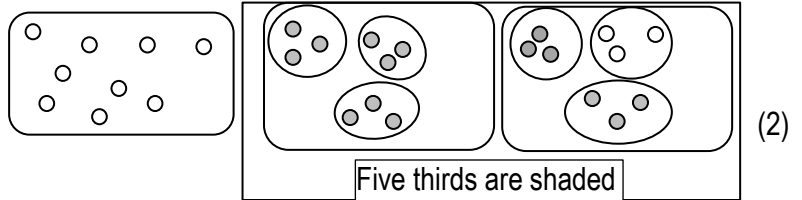


(3)

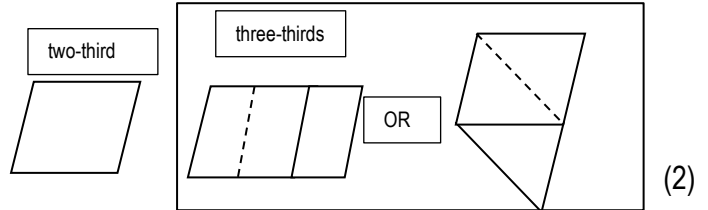
(2)

(2)

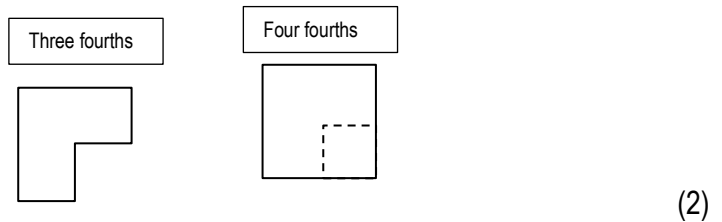
- 5.4 If 9 counters are a whole, how many are in FIVE THIRDS of the set? Answer: $9 + \frac{2}{3}$ of 9 = 15



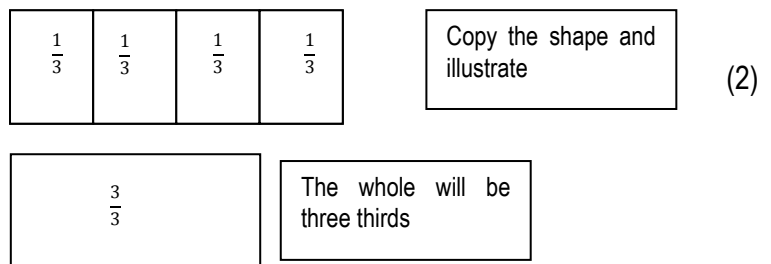
- 5.5 If this rhombus is two-thirds of the whole, what would the whole look like?



- 5.6 If this figure is three-fourths, draw a shape that could be the whole.



- 5.7 If this rectangle is four – thirds, what would the whole look like?



- 6 Use the following models to show the equivalence of the fractions $\frac{2}{3}$ and $\frac{4}{6}$

6.1 A set model

Choose the whole to be 18 marbles (loose objects) Can you choose another whole?

Divide the whole into 3 parts of equal size	Divide the whole into 6 parts of equal size
The 3 in the $\frac{2}{3}$ tells you into how many parts the whole must be divided	The 6 in the $\frac{4}{6}$ tells you into how many parts the whole must be divided
The 2 in the $\frac{2}{3}$ tells you how many parts you must choose: Choose 2 parts of 6 marbles each, which is 12 marbles	The 4 in the $\frac{4}{6}$ tells you how many parts you must choose: Choose 4 parts of 3 marbles each, which is 12 marbles

6.2 Area model

Let us choose a rectangle as the whole



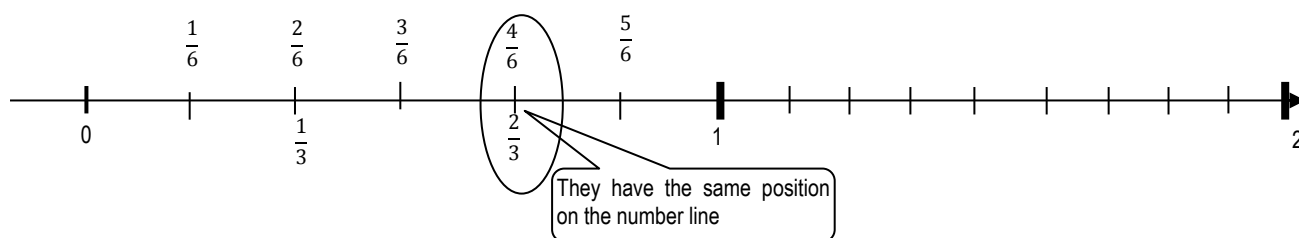
For $\frac{2}{3}$
Divide the whole into 3 equal parts
and shade 2



For $\frac{4}{6}$
Divide the whole into 6 equal parts
and shade 4

6.3 The number line

(3)



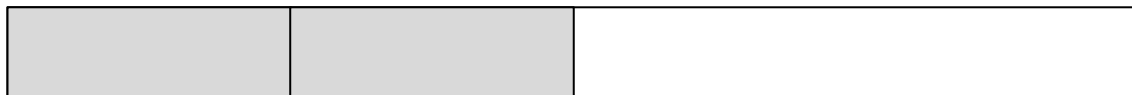
- 7 Compare the fractions $\frac{1}{2}$, $\frac{2}{3}$ and $\frac{2}{5}$ by making use of the area model. (You should be able to arrange the fractions from small to big). Make sure that you choose the whole correctly, and make accurate drawings.

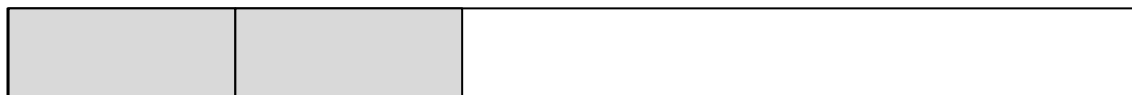
(6)

You will have to choose a whole into which all the denominators can divide, so that you can divide the whole into 2, 3 as well as 5 equal parts.

I am choosing a rectangle with length of 15 cm. (The number that 2, 3 and 5 can divide is 30, but that will be too long for the page, so I choose a length of 15cm. You must use a ruler to divide the parts accurately.

The whole


 $\frac{1}{2}$

 $\frac{2}{3}$

 $\frac{2}{5}$

$$\frac{2}{5} < \frac{1}{2} < \frac{2}{3}$$

- 8 Use a standard algorithm to calculate: $2 - \frac{1}{5} - \frac{1}{10}$ (2)

- ① Make the denominators the same. Choose a number that 5 and 10 can divide into (10)
- ② Now write all the fractions with denominators of 10 $2 = \frac{20}{10}$ $\frac{1}{5} = \frac{2}{10}$ $\frac{1}{10} = \frac{1}{10}$
- ③ $2 - \frac{1}{5} - \frac{1}{10}$
 $= \frac{20}{10} - \frac{2}{10} - \frac{1}{10}$
 $= \frac{20-2-1}{10}$ Put over the same denominator
 $= \frac{17}{10}$ or $1\frac{7}{10}$

- 9 Mama Matebane bought 4 Bar-Ones for her three children to share fairly between them. What fraction of a whole Bar-One will each child get? Illustrate the solution with drawings.. (5)

FOUR Bar-ones must be divided by THREE children

Each child gets one whole Bar one



Divide the remaining Bar one into three equal



So each child will get one and one third of the whole Bar one

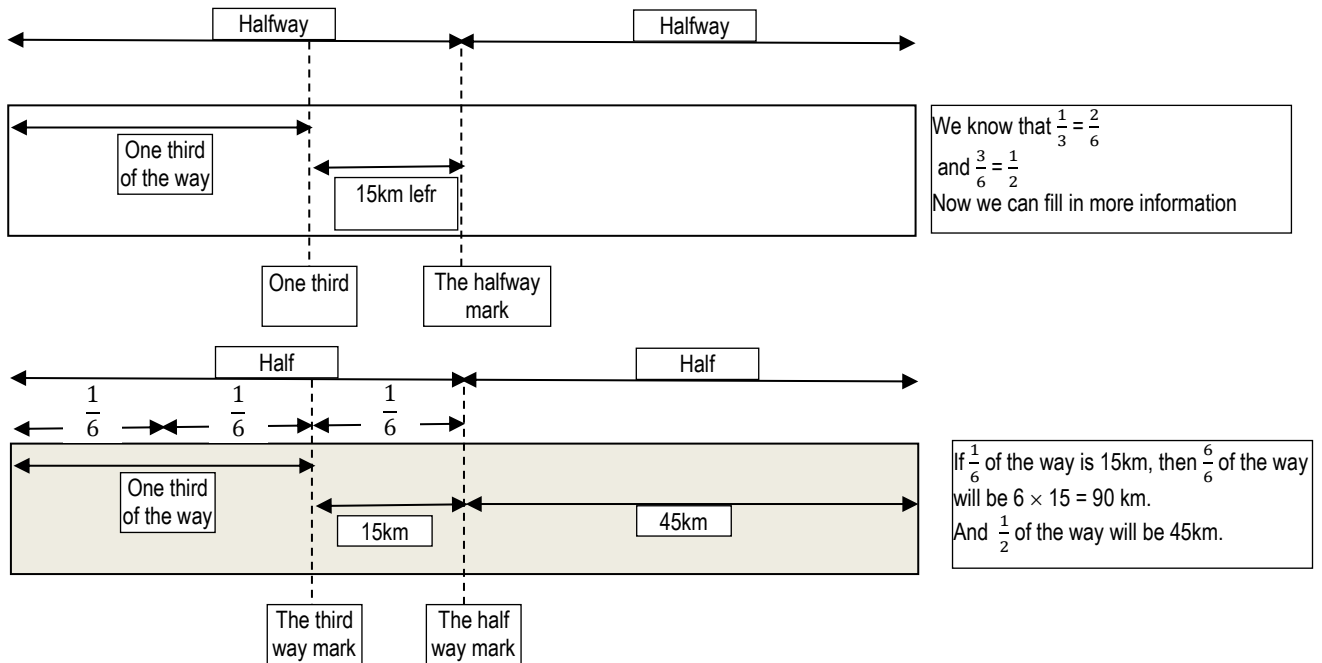


$$\Rightarrow \frac{1}{3} \text{ of } 4 = \frac{4}{3} \text{ or } 1\frac{1}{3}$$

- 10 Amin has completed one-third of his cycling race. He is still has 15km to go to reach the halfway mark. How may kilometres he still has to cycle to finish? [Use a diagram to help you] (6)

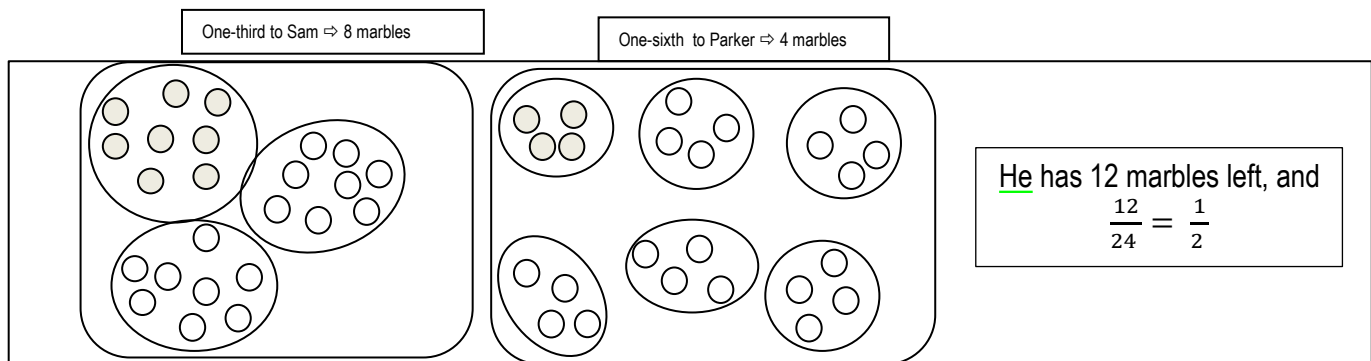
Let us use a rectangle to model the entire race.

We know that:



1 Amin still has to cycle 60km to complete the race

- 11.1 Sally has a bag of 24 marbles. She gave one – quarter of them away to Sam and one-sixth of them to Parker. What fraction of her marbles does she has left? How many marbles it that? (4)



Using an algorithm to find what fraction he has left:

$$1 - \frac{1}{3} - \frac{1}{6}$$

$$= \frac{12 - 4 - 2}{12}$$

$$= \frac{6}{12} = \frac{1}{2}$$

- 11.2 Vuyi got a huge pizza to share with her two brothers. Jamie, the youngest got one-fifth of the pizza, and Mpo, the oldest, got three-tenths. What part of the original pizza is left for herself? (4)

The pizza

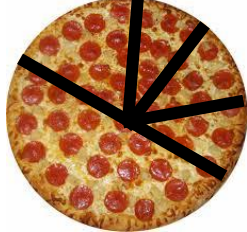


Same pizza in fifths



Pizza in tenths





The algorithm:

$$1 - \frac{1}{5} - \frac{3}{10}$$

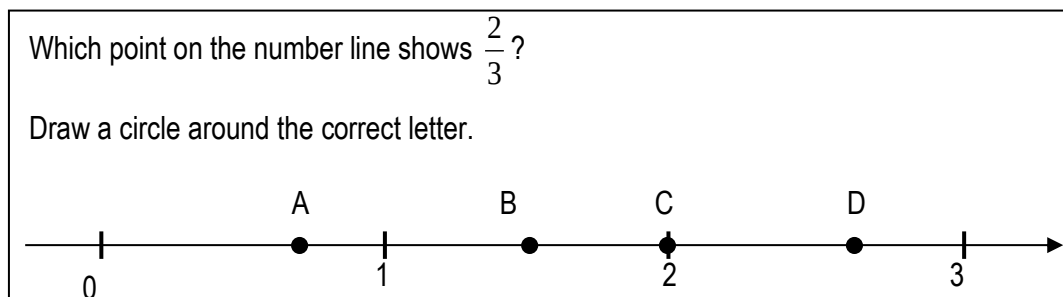
$$= \frac{10 - 2 - 3}{10}$$

$$= \frac{5}{10} = \frac{1}{2}$$

One-fifth and three tenths eaten

Half of the pizza is left for Vuyo

- 12 The following question was given to Grade 6 learners:



Nine percent of the learners chose A as the answer, 14% chose B, 43% chose C and 34% chose D.

- 12.1 What is the correct answer? (1)

Correct position of $\frac{2}{3}$ is at A (only 9% of learners had it correct)

- 12.2 Give an explanation about the misconceptions learners had when they chose the incorrect answers? (3)

Possible misconception if learners chose B

Learner could have thought that the 2 indicated the whole, and saw $\frac{2}{3}$ as a part of that length

Possible misconception if learners chose C

This was the most popular incorrect response. Learners mistakenly took the whole number line (from 1 to 3) as the whole, and then saw $\frac{2}{3}$ as the position of C

Learners who chose D, possibly thought of $\frac{2}{3}$ as a number between 2 and 3.

13 Use the grid to illustrate: $\frac{4}{5}$ of $\frac{3}{4}$

(4)

① Shade $\frac{4}{5}$ of the whole like this:

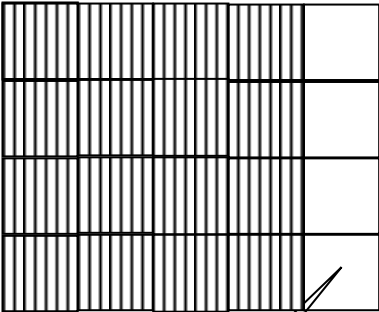
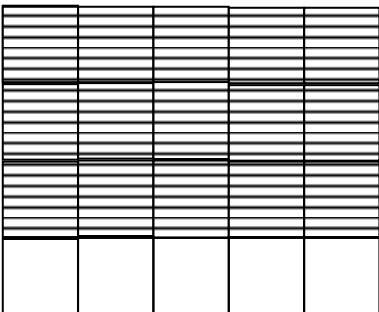
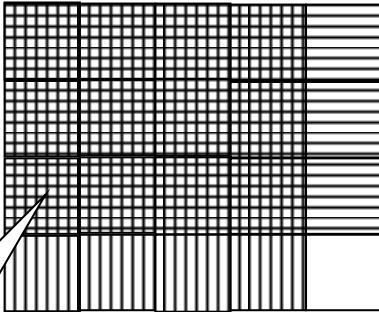


② Shade $\frac{3}{4}$ of the whole like this:



③ The section that overlaps is shaded like this:



Each little block is $\frac{1}{20}$ of the whole

④ $\frac{4}{5}$ of $\frac{3}{4} = \frac{12}{20}$ or $\frac{3}{5}$

$\frac{12}{20}$ of the whole is double shaded

This shows $\frac{4}{5}$ of $\frac{3}{4}$ of the whole

[74]

PART E

These questions relate to Chapter 20 of the prescribed book:

- 1 Describe in your own words the first three *van Hiele* levels of Geometric thought (level 0, 1 and 2). How do the activities that you will give learners on the three levels differ? (6)

Own words See tut letter 201 page 51

LEVEL 0 Visualization

Learners can classify shapes according to what they look like. They will see a rectangle as the same as a "door". They can distinguish between a rectangle and a square, but only by what the shape looks like and not according to their properties.

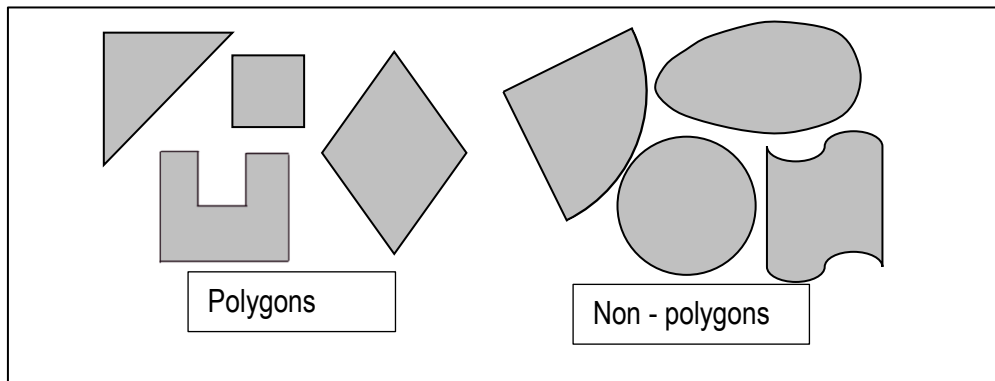
LEVEL 1 Descriptive

Learners can describe shapes according to their properties, for example, a rectangle has equal opposite sides, and all right angles. They can group shapes according to characteristics, but do not yet know how to identify a shape if a set of properties are given. They would usually describe a shape by naming ALL the properties of that shape. For example, they will say a rectangle has equal and parallel opposite sides, equal diagonals, equal angles etc. In other words they do not yet see the minimum requirements for a shape to be identified.

LEVEL 2 Analysis

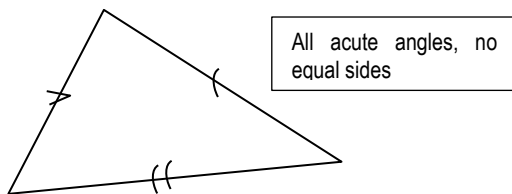
Learners at this level understand the relationships between shapes. They can now identify the minimum requirements for a shape to be identified. So they know that a rectangle is a parallelogram with one right angle, because they understand that all the other properties of a rectangle are included in that definition. They can also identify a square as a kite, because a square has all the properties of a kite.

- 2 Draw an assortment of different types of flat shapes that include polygons and non-polygons (at least three of each kind). Explain your classification. Why is this type of exercise necessary for learners on *van Hiele* level 0? [own explanation] (8)

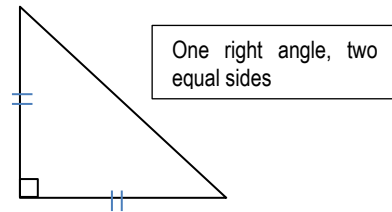


- 3 Draw the following triangles. Your sketches must be done with a ruler and very neatly drawn.

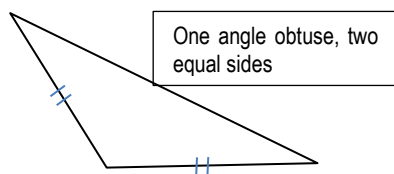
3.1 Scalene, acute angled triangle



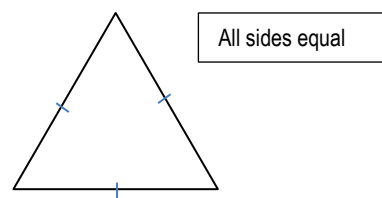
3.2 Isosceles, right angled triangle



3.3 Isosceles, obtuse angled triangle



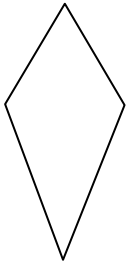
3.4 Equilateral triangle angled triangle



(4)

- 4 Which quadrilaterals are described by the following characteristics? Make a neat drawing of each.

4.1 two pairs of equal adjacent sides



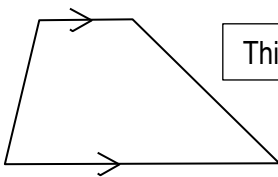
This is a kite

4.2 a parallelogram with all angles equal



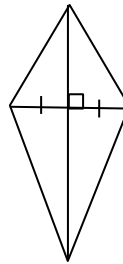
This is a rectangle (all angles 90°)

4.3 one pair of parallel sides



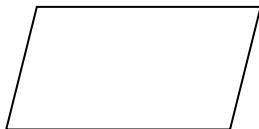
This is a trapezium

4.4 One diagonal bisects the other perpendicularly



This is a kite

4.5 two pairs of opposite angles equal



This is a parallelogram

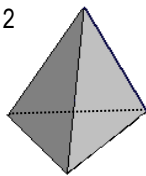
(10)

- 5 Classify the following 3D shapes – polyhedrons or non-polyhedrons. Name each of the objects (a mathematical name).

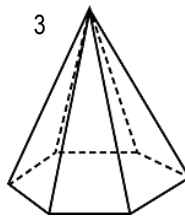
1



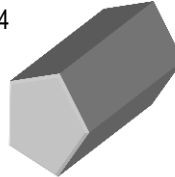
2



3



4



5



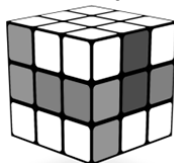
6



7



8



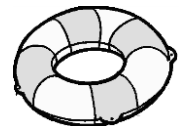
9



10



11



(11)

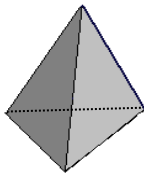
Number	Name	P or NP
1	Right cylinder	NP
2	Triangular pyramid or tetrahedron	P
3	Hexagonal pyramid	P
4	Pentagonal prism	P

5	Cone	NP
6	Right cylinder	NP
7	Ovoid	NP
8	Cube	P
9	Ellipsoid	NP
10	Sphere	NP
11	Torus	NP

6 Draw neat diagrams of the following polyhedra, made up of: (Name the polyhedra)

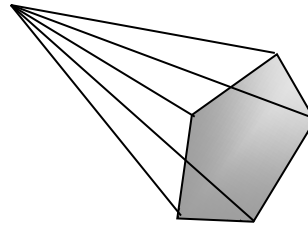
6.1 four triangular faces

Tetrahedron



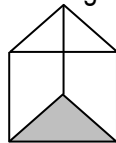
6.2 pentagonal and triangular faces

Pentagonal pyramid



6.3 two triangles and rectangles

Triangular prism

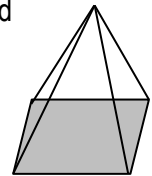


6.4 a pentahedron which is a pyramid

Rectangular/square pyramid

(base must be a quadrilateral)

There must be 5 faces.



(8)

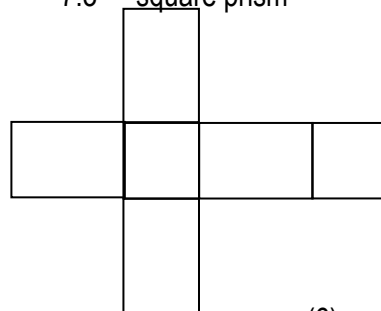
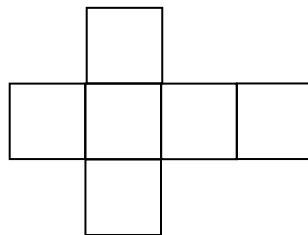
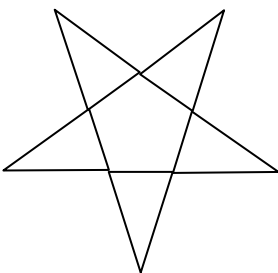
7 Draw the nets of the following polyhedra:

7.1 pentagonal pyramid

7.2 cube

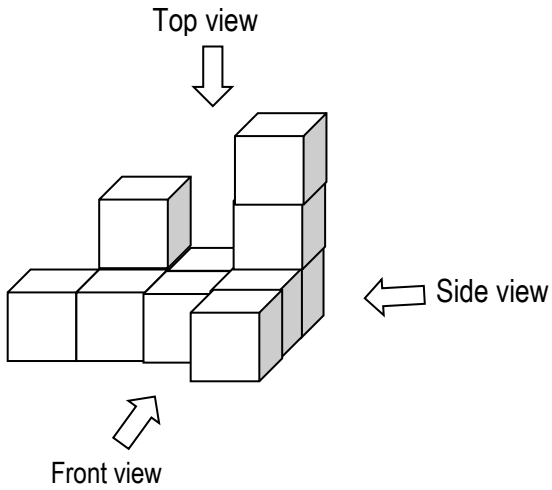
7.3 square prism

S



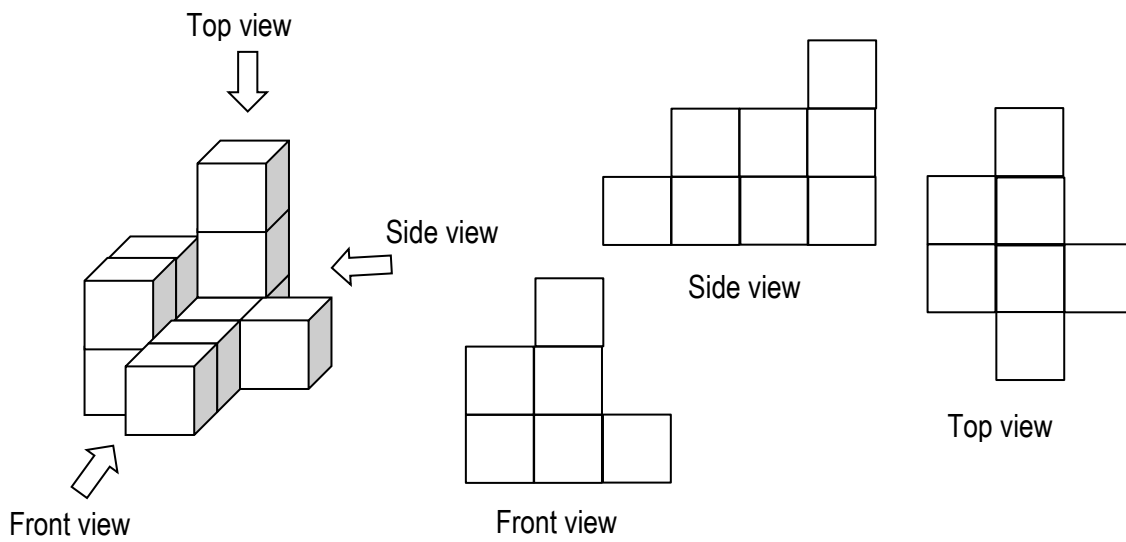
(6)

8 Draw the front, top and side view of the following structure



(3)

8 Draw the front, top and side view of the following structure



(3)

[56]