INTRODUCTION

The Eastern Cape Department of Education, Curriculum Chief Directorate in collaboration with the District curriculum personnel developed this document to support teachers’ planning, teaching and assessment for effective implementation of the National Curriculum Statement in the GET Band.

The document contains exemplars of lesson plans with activities on each assessment standard in all learning outcomes. It is prepared with the intention to give necessary guidance for lesson planning for Term 4 in accordance with the provincial work schedule.

This document must be used as a guide in collaboration with the following documents: National Curriculum Statement. NCS Teacher’s Guide for the development of Learning Programmes, National Assessment Policy, Provincial Assessment Guidelines, Provincial Planning Document. This can be adapted to suite the teacher’s condition and contextual demands of the school. It is a guide to assist teachers in lesson planning. An exemplar is an illustration of how planning could be done, it is not cast on stone. Critical engagement with the document is encouraged.
NOTE TO THE TEACHER

Ensure that Mathematics is taught daily for 1 Hour as according to policy. Daily classwork and homework should be given, marked and feedback be given to learners in order to ensure effective remedial work is done. Informal assessment tasks that culminate into Formal assessment tasks should be given at regular intervals.

Consult as many text books as possible as well as other support material including internet, where possible when developing lessons. Please do not rely on one textbook only when planning lesson activities. Whenever possible, learners should be encouraged to get messy, in order to formulate their own meaningful concepts. The teacher should assist learners in formalising their crude formulations as meaningful learning is the construction of the learner embedded in his previous experience. Learners' misconceptions should be attended to before they become solidified. The teacher should challenge misconceptions with engaging discourse. Some of the lesson plans encourage investigative approach to learning whenever possible.

Activities in the lesson plan exemplars are a guide that helps to scaffold the teacher in developing other related activities. This guide is not cast on stone as context and other critical factors might have an influence. Critical engagement with the document is encouraged.
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## GRADE 7 MATHEMATICS LESSON PLAN EXEMPLARS

### CONTENT OVERVIEW

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</thead>
<tbody>
<tr>
<td><strong>LO1</strong></td>
<td><strong>LO 1</strong></td>
<td><strong>LO1</strong></td>
<td><strong>LO1</strong></td>
</tr>
<tr>
<td>Counting backwards and forwards in decimal intervals and integers.</td>
<td>Profit &amp; loss, budgets, accounts, loans, simple interest, higher purchase, exchange rates, ratio and rates.</td>
<td>Rounding off numbers to at least 1 decimal place. Multiple operations with integers.</td>
<td>Calculations using a range of techniques involving the commutative, associative and distributive properties with positive rational numbers and zero; also a calculator.</td>
</tr>
<tr>
<td>Description and illustration of historical development of numbers (e.g., integers, common fractions).</td>
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</tr>
<tr>
<td>Recognition, classification and representation of numbers (integers, decimals to at least 3 dec place) fractions and percentages in order to describe and compare them.</td>
<td>Recognition, description and use of: equivalent fractions including common fractions, decimals and percentages.</td>
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<td>Recognition, description and use of: equivalent fractions including common fractions, decimals and percentages.</td>
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<tr>
<td>Factors including prime factors of 3 digit numbers.</td>
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<td>Factors including prime factors of 3 digit numbers.</td>
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<td><strong>LO2</strong></td>
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<tr>
<td>Investigation and extension of numeric and geometric patterns to find relationships and to formulate rules, not limited to sequences involving constant difference or ratio; (In the natural and cultural)</td>
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</tr>
<tr>
<td>Draw tables, flow diagrams to describe relationships, Look for pattern, describe in own words the relationship and make conjectures.</td>
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<tr>
<td>Mathematical Modelling in various context</td>
<td>Mathematical Modelling in various context</td>
<td>Mathematical Modelling in various context</td>
<td>Mathematical Modelling in various context</td>
</tr>
<tr>
<td><strong>LO3</strong></td>
<td><strong>LO3</strong></td>
<td><strong>LO4</strong></td>
<td><strong>LO4</strong></td>
</tr>
<tr>
<td>Transformation (rotation, reflection, and translation) and symmetry to investigate properties of geometric figures.</td>
<td>Transformation (rotation, reflection, and translation) and symmetry to investigate properties of geometric figures.</td>
<td>Classifications of different angles into acute, right, obtuse, straight, reflex and revolution.</td>
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</tr>
<tr>
<td>Recognition and description of and differentiation between congruent and similar figures.</td>
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<tr>
<td><strong>LO4</strong></td>
<td><strong>LO3</strong></td>
<td><strong>LO3</strong></td>
<td><strong>LO3</strong></td>
</tr>
<tr>
<td>Calculations on perimeter, of various polygons. Area of a square and surface area rectangle square.</td>
<td>Drawing and interpretation of sketches of solids in different perspective.</td>
<td>Drawing and interpretation of sketches of solids in different perspective.</td>
<td>Drawing and interpretation of sketches of solids in different perspective.</td>
</tr>
<tr>
<td>Use of algorithms to find equivalent fractions.</td>
<td>Use of algorithms to find equivalent fractions.</td>
<td>Use of algorithms to find equivalent fractions.</td>
<td>Use of algorithms to find equivalent fractions.</td>
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<tr>
<td><strong>LO2</strong></td>
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<tr>
<td>Description of a situation by interpreting graphs.</td>
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<td>Description of a situation by interpreting graphs.</td>
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<tr>
<td><strong>LO3</strong></td>
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<tr>
<td>Consolidation</td>
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<tr>
<td>Drawing and interpretation of sketches of solids in different perspective.</td>
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<td>Drawing and interpretation of sketches of solids in different perspective.</td>
</tr>
<tr>
<td>Location of positions on coordinate systems and maps using compass direction.</td>
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<tr>
<td>LO3</td>
<td>LO4</td>
<td>LO5</td>
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</tr>
<tr>
<td><strong>LO3</strong>&lt;br&gt;Naming and exploring geometric shapes&lt;br&gt;Similarities and differences between different polyhedra, and all quadrilaterals.&lt;br&gt;Classification of geometric figures and solids in terms of properties. Construction of geometric figures and designing of nets to make models.</td>
<td><strong>LO4</strong>&lt;br&gt;Problem solving including: Time, distance, speed, length, perimeter of polygons</td>
<td><strong>LO5</strong>&lt;br&gt;Selection and use of appropriate methods to collect data. Designing and using of questionnaires to collect data, record using tables and stem-and-leaf displays. Samples and populations.</td>
<td></td>
</tr>
<tr>
<td><strong>LO5</strong>&lt;br&gt;Determination and identification of measures of central tendency viz.: Median, mode, range and mean. Drawing of graphs viz.: bar graphs, histograms, pie charts, line and broken line graphs. Critical reading and interpretation of data to draw conclusions and make predictions.</td>
<td><strong>LO4</strong>&lt;br&gt;Interrelationship between perimeter, area, surface area and volume in geometric solids.</td>
<td><strong>LO5</strong>&lt;br&gt;Theory of probability - listing possible outcomes and determine relative frequency.</td>
<td></td>
</tr>
<tr>
<td><strong>LO5</strong>&lt;br&gt;Location of positions on coordinate systems and maps using Cartesian plane and compass directions.</td>
<td>Estimation, comparison, measurement and drawing of angles accurate to one degree using protractors.</td>
<td><strong>LO5</strong>&lt;br&gt;Consolidation:&lt;br&gt;Theory of probability - listing possible outcomes and determine relative frequency.</td>
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<td><strong>LO5</strong>&lt;br&gt;Theory of probability - listing possible outcomes and determine relative frequency.</td>
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</tbody>
</table>
## GRADE 7

### LESSON PLAN EXEMPLARS

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LO’s &amp; AS’s</th>
<th>CONTENT</th>
<th>ACTIVITIES</th>
</tr>
</thead>
</table>
| 1-3  | CLUSTER 5: LO1 | Using a range of techniques to perform calculations. Recognition, description and use of mental calculation using commutative, associative and distributive properties of numbers. Using a calculator. | Activity 1  
Getting to know your calculator.  
Activity 2  
Computing using a calculator  
Activity 3  
Use of Commutative law.  
Activity 4  
Use of Associative law.  
Activity 5  
Use of distributive law.  
Activity 6  
Properties of 0  
Activity 7  
Equivalent fractions |

7.1.9 Uses a range of techniques to perform calculations including:
- using the commutative, associative and distributive properties with positive rational numbers and zero;
- Using a calculator.

7.1.11. Recognizes, describes and uses:
- algorithms for finding equivalent fractions;
- the commutative, associative and distributive properties with rational numbers and zero. *(The expectation is that learners should be able to use these properties and not necessarily to know the names of properties.)*
Activity 1
Functions of the keyboard on the calculator.

Activity 2
Using a calculator, the teacher asks the following questions to the learners (each learner should have his/her own calculator):

- Press the ON button. What happens to the display? What is the function of this button?
- Press the OFF button. What happens? What is the function of this key?
- Press 345 + 327 = … What happens? What are the functions of these buttons?
- Then, press the \( C \) key. What happens to the display? What is the function of this key?

The teacher goes on to ask questions about the functions of the calculator. The following basic functions may be covered in addition to the ones above: CE, %

The above-mentioned basic functions can be supplemented with the following information:

- \( MR \): Use this button to put the contents of the memory onto the display. The default memory is number zero.
- \( \% \): This button displays the result of an arithmetic operation as a percentage.
- \( M+ \): Adding this button adds the number displayed to the contents of the memory.
- \( M- \): Subtracts the number shown on the display from memory.
- \( RM \) or \( MR \): Displays the accumulated total in the memory.
• **RM or MR:** Clears the memory.
• **Backspace:** Clears the display one space at a time from the right.

The following may be used as examples to explain the above:

(i) \(8 \times 41 - 28 - 35 + (27 + 17) ÷ 2\)

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Display</th>
<th>Key</th>
</tr>
</thead>
</table>
| \(27 + 17 = \) | 44 | _M+_
| \(÷ 2 = \) | 22 | _M+_

Step 2

\(8 \times 41 = \)

Step 3

\(= \)

\(- 28 - 35 = \)

(ii) \(12 + \frac{1}{2} \text{ of } 10\)

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Display</th>
<th>Key</th>
</tr>
</thead>
</table>
| \(\frac{1}{2} \times 10 = \) | 5 | _M+_

Step 2

\(12 + \text{ MR} - 6 = \)

11
Note: The teacher should practise the functions of the keyboard before giving this activity to learners.

Use your calculator to work out the following numbers (the teacher may add more, including all the operations):

1. 482 + 216 + 3389
2. 0.23 + 3.44 + 0.712
3. 24.01 + 78.34 + 109.25

Teacher gives more functions

<table>
<thead>
<tr>
<th>key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td></td>
</tr>
<tr>
<td>=</td>
<td></td>
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<tr>
<td>ON</td>
<td></td>
</tr>
<tr>
<td>OFF</td>
<td></td>
</tr>
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<td>.</td>
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<td>CE</td>
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<td>%</td>
<td></td>
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<tr>
<td>÷</td>
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</tbody>
</table>

Note: The Commutative Law means that you can swap numbers over and still get the same answer when you add or multiply:
Activity 3
Do the following activity with your calculator. Calculate from left to right:
12 + 14

What is the answer? Now calculate from right to left. Activity 2 above. What do you notice? Why?

This is the **Commutative Law**.

Do the following calculations in your workbook using the Commutative Law. Use a calculator:

1. 34 + 76
2. 21 + 79
3. 43 + ... = 17 + ...
4. 178 x 145
5. 6.5 x 3.7
6. 543 x 0.2 = 0.2 x ...

The teacher may add more examples that include other operations so that learners can discover that commutative law is closed only under addition and multiplication.

Activity 4
Do the following calculations and check the answer. Note: Work out the brackets first:

(3 + 5) + 6 =
3 + (5 + 6) =

What did you notice? Why?

This is called the **Associative Law**.

Note: In the Associative Law, the order in which we calculate makes no difference to the answer. We use brackets in this case.

(a + b) + c = a + (b + c)
(a x b) x c = a x (b x c)

Sometimes it is easier to add or multiply in a different order, e.g.:
29 + 26 + 4
(26 + 4) + 29
Note: In the Distributive Law, we get the same answer when we:

- Add up some numbers and then do multiplication, or
- Do each multiplication separately and then add them

30 + 29
59 →

Sometimes it is also easier to rearrange the number order a little, e.g.:
2 x 17 x 5
(2 x 5) x 17
10 x 17
170 →

Do the following calculations by using the Associative Law. Add the brackets and work out the answer by using your calculator:

1. 6 + 7 + 8
2. 13 x 4 x 10
3. 135 + 43 + 20 + 17
4. 349 x 10 x 17
5. 4.9 + 5.1 + 8.8
6. 7.0 x 4.5 x 20

The teacher may add more examples.

Activity 5

Look at the following two sums.
(Remember, we work out the brackets first when we calculate :)

(4 + 5) x 7 = 9 x 7 = 63 and 4 x 7 + 5 x 7 = 28 + 35 = 63

What do you notice in the two sums? Explain your answer.

This is called the Distributive Law.

Examples:

a. (3 + 5) x 4 = 8 x 4 = 32 is the same as 3 x 4 + 5 x 4 = 12 + 20 = 32.
In conclusion:

Commutative Law: \( a + b = b + a \)
\( a \times b = b \times a \)

Associative Law: \( (a + b) + c = a + (b + c) \)
\( (a \times b) \times c = a \times (b \times c) \)

Distributive Law: \( (a + b) \times c = a \times c + b \times c \)

Do the following calculations using the Distributive Law with your calculator:

1. \((204 + 6) \times 2\)
2. \((56 - 24) \times 12\)
3. \((24 + 17) \times 8\)
4. \((542 - 167) \times 2\)
5. \((12.8 - 8.7) \times 3\)
6. \((R8.35 + R4.79) \times 4\)

The teacher may add more examples.

Activity 6
The teacher uses a calculator to demonstrate the properties of 0, e.g.

Any number + 0 =
Any number − 0 =
Any number \times 0 =
Any number ÷ 0 =
(The teacher should give learners more examples)
**Activity 7**  
**Equivalent fractions**  
The teacher recaps on finding the equivalent fractions e.g. \( \frac{3}{5} = \frac{6}{10} \) and give related activities.  
Learners do activities on comparison of fractions with different denominators e.g.  
Arrange the following fractions in ascending order:  
\[ \frac{1}{2}, \frac{3}{5}, \frac{2}{3} \]  
More activities of this nature are given.

**RESOURCES:** Fraction diagrams & walls, Calculators, Rulers, Maths set, Wall charts & Number line strips.

**INTEGRATION:** **WITHIN:** LO2- Patterns, Functions and Algebra 7.2.2- Describes, explains and justifies observed relationships or rules in own words

**ASSESSMENT:** Homework, classwork, investigation

**BARRIERS TO LEARNING:** Use smaller numbers before getting to bigger numbers

**EXPANDED OPPORTUNITIES:** Use numbers to include billions as well algebraic expressions

**TEACHER REFLECTIONS:**
<table>
<thead>
<tr>
<th>WEEK</th>
<th>LO’s &amp; AS’s</th>
<th>CONTENT</th>
<th>ACTIVITIES</th>
</tr>
</thead>
</table>
| 4    | CLUSTER 4: LO 2  
7.2.6 Describes the situation by interpreting a graph of the situation, or draws a graph from a description of a situation, (e.g. height of a roller-coaster car over time; the speed of a racing car going around a track. | Description of a situation by interpreting graphs. 
Drawing of graphs. | Activity 1  
Revision and consolidation of grade 6 work. 
Activity 2  
Drawing a graph. 
Activity 3  
Analysing a graph. |
Activity 1

The teacher revises the different types of graphs by displaying pictures of graphs. For example, name the following graphs:

Pie Graph

Bar Graph
Hectograph

Line Graph
Activity 2

The teacher does revision and consolidation of Grade 6 Learning Outcome 5, Assessment standard 6 and 7 i.e. drawing a variety of graphs by hand/technology to display and interpret data (grouped and ungrouped) including pictographs and bar graphs, and also to critically read and interpret data in a variety of ways.

For example:

- Learners are to collect test scores and use them to draw a bar graph and ask questions such as,
  - What was the most common score in the test?
  - How many learners altogether wrote the test? Estimate how many of them got fewer than half marks.
  - The learners who took the test do revision on the work for a week, what do you think a graph will look like if they take the test again in week’s time?
The teacher may also use the picture to present information e.g. if in a certain school a total of twenty learners were absent during the week as follows:

Table:

<table>
<thead>
<tr>
<th>DAYS</th>
<th>NUMBER OF LEARNERS ABSENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONDAY</td>
<td>5</td>
</tr>
<tr>
<td>TUESDAY</td>
<td>2</td>
</tr>
<tr>
<td>WEDNESDAY</td>
<td>0</td>
</tr>
<tr>
<td>THURSDAY</td>
<td>4</td>
</tr>
<tr>
<td>FRIDAY</td>
<td>9</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

Below is a picture graph representing the same information as the previous table:

Key

= 2 learners

= 1 learner
The teacher may ask the following questions:

1. On which day were the most learners absent?
2. On which day were all the learners present?
3. There were fewer learners absent on Thursday than on Friday. How many more learners were absent on Friday than Thursday?
4. What was the total number of learners absent from Monday to Friday?

Activity 2

The lotto winnings, in a period of one year, are illustrated per month below:

<table>
<thead>
<tr>
<th>Months</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of Winnings in thousands</td>
<td>88</td>
<td>70</td>
<td>92</td>
<td>107</td>
<td>121</td>
<td>143</td>
<td>141</td>
<td>152</td>
<td>109</td>
<td>165</td>
<td>160</td>
<td>169</td>
</tr>
</tbody>
</table>

1. Using graph paper learners draw a bar graph to represent the information above (any type of graph can be used e.g. a scatter graph, histogram, line graph etc.). Use the vertical axis to represent the amounts in measures of 50 000 and on the horizontal axis the months.

2. Use your graph to answer the following:
   a) Determine which month has the highest winnings and which one has the lowest? Why do you think this is so?
   b) How much cash was paid out during the twelve months?
   c) Why do you think the winnings were at its lowest during the first three months and its highest during the last three months.
   (The teacher may ask more questions to stimulate learners’ cognitive thinking)
Activity 3

The graph below shows the average temperature for each month of a year. Study the graph and answer the questions below it:

Questions follow...
Questions

1. According to the graph, which month of the year is the hottest?
2. During which month was the average temperature the lowest? Why do you think this is so?
3. During which months would the cool drink sales increase? Why?
4. In which months would you wear warm clothes? Why?
5. Which other month has its average temperature the same as that of January?

The teacher may add more critical questions.

RESOURCES: Graph paper, Maths instrument set.

INTEGRATION: Maths: 7.5.8 Draws a variety of graphs by hand/ Technology to display and interpret data/ NS LO 1 AS : Evaluates data and communicates findings.

ASSESSMENT: home work ,classwork ,mini project, Test

BARRIERS TO LEARNING: More drawing of graphs

EXPANDED OPPORTUNITIES: More intensive interpretation of graphs that involve critical engagement

TEACHER REFLECTIONS:
<table>
<thead>
<tr>
<th>WEEK</th>
<th>LO’s &amp; AS’s</th>
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</thead>
</table>
| 5-6  | CLUSTER 4: LO 4  
7.4.8 Classifies angles into acute, right, obtuse, straight, reflex or revolution  
7.4.9 Estimates, compares, measures and draws angles accurate to one degree using protractors. | Classification, estimation and accurate drawing of different angles. | Activity 1  
Classifying angles  
Activity 2  
Comparing angles  
Activity 3  
Accurate construction and measurement of angles |
Activity 1
Classifying angles

For this activity you will need two strips of paper or cardboard. You can cut out the strips of paper and paste it onto a piece of cardboard, or use it as it is. Take a split pin (paper fastener – see picture) and join the two pieces at one end. Use a piece of string if you do not have split pins.

Split pins

Examples of different angles:
Let the learners turn the strips so that it forms different angles. Draw attention to the different angles as the learners turn the strips. Below are a few examples:

**Right angles**, which is $90^\circ$. These strips are also perpendicular to each other:

This is called a **straight angle**. It has turned $180^\circ$:

A **revolution** is formed when the paper strip is turned $360^\circ$:

An **acute angle** is formed when the angle is less than $90^\circ$. 
An **obtuse angle** turns the paper to more than $90^\circ$ and less than $180^\circ$:

A **reflex angle** is formed when it is greater than $90^\circ$ but smaller than $360^\circ$.

**Activity 2.1**

Learners are asked to compare the following angles under the headings:
- Right angles
- Obtuse angles
- Acute angles
- Straight angles
- Reflex angles
- A Revolution
Example: Right angles - $X \hat{Y} Z$

The teacher may give more examples.

**Activity 3.1**

In your workbook, draw the following angles using your protractor, and write down the type of angle underneath each angle:

(a) $45^\circ$
(b) $121^\circ$
(c) $256^\circ$
(d) $90^\circ$
(e) $360^\circ$
(f) $200^\circ$

The teacher gives more examples.
Activity 3.2

Using a protractor (you may cut out the protractor in Appendix A if you don’t have one) learners measure the actual size of angles (in activity 2) after estimating the size of the angles first. The following table can be used. The first one has been given as an example:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of angle</th>
<th>Type of angle</th>
<th>Estimated size of angle (°)</th>
<th>Actual size of angle (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>PRQ</td>
<td>Acute</td>
<td>45°</td>
<td>(To be measured)</td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(g)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RESOURCES:</td>
<td>Mathematical instrument set; Watch; Wall charts.</td>
<td></td>
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<tr>
<td>---</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTEGRATION:</td>
<td>Maths: 7.1.1 Counts forwards and backwards; TECH LO1 Chooses and uses appropriate tools and materials.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASSESSMENT:</td>
<td>Memorandum, rubric, checklist.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BARRIERS TO LEARNING:</td>
<td>Make use of immediate environment as well as the learners’s arms to demonstrate different angles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXPANDED OPPORTUNITIES:</td>
<td>Give more complicated figures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEACHER REFLECTIONS:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEEK</td>
<td>LO’s &amp; AS’s</td>
<td>CONTENT</td>
<td>ACTIVITIES</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>---------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>7-8</td>
<td>AS7.5.10 – Performs simple experiments where the possible outcomes are equally likely and; Lists the possible outcomes based on the conditions of the activity; Determines the frequency of actual outcomes for a series of trials; Determines the relative frequency using the definition of relative frequency (see Mathematics Learning Area Glossary).</td>
<td>Relative frequency</td>
<td>Activity: Possible outcomes that are equally likely. Determining the relative frequency. 2nd week should concentrate on revision of work done in this term.</td>
<td></td>
</tr>
</tbody>
</table>
Introduction
The teacher demonstrates with a bag of white, grey and black marbles, and asks the following questions:

You have a bag of marbles. There are two white marbles, one grey and one black marble.

a) If you take one marble out the bag without looking, what is the chance that that marble will be:
   - White
   - Grey
   - Black

b) What is the chance (probability) that you will take a grey marble out of the bag on you first draw, and if you do not put the marble back in the bag, on your second draw you take a white marble out of the bag?

c) What is the chance that you will pick a white marble out of the bag that has:
   1.1. One white and one black in it?
   1.2. Two black marbles in it?
   1.3. Three white marbles and one black in it?

Activity 1
Determining the relative frequency
When you flip one coin, you will have one outcome out of a possibility of two outcomes: heads or tails. The relative outcome is therefore one out of two, that is ½ or 50% or 0,5

When you flip two coins, it is logical to say that there are three outcomes: (1) two heads; (2) two tails and (3) one head and one tail. This is not quite correct.
Consider the table below:

<table>
<thead>
<tr>
<th>left coin</th>
<th>H</th>
<th>H</th>
<th>T</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right coin</td>
<td>H</td>
<td>T</td>
<td>H</td>
<td>T</td>
</tr>
</tbody>
</table>

The outcomes can be listed as HH; HT; TH; TT - a total of 4 outcomes.
Make a table like the one above and include the middle coin L M R. List the number of outcomes you will have when you flip three coins.

Activity 2
1. Take any dice marked 1 to 6
   (a) If you throw the dice once, how many outcomes will you have?
   (b) Work in pairs and throw the dice 50 times. Record your findings by using tallies after every throw.
   (c) Draw a frequency graph to present the information in (b).
   (d) Calculate the relative frequency of throwing a 5.

Activity 3
ROLLING A DIE
For this activity you will need two die. Work in groups

a) Look at the table below that shows all possible ways that totals could be made when rolling two dice. Complete the table.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Tally to record outcomes</th>
<th>Frequency</th>
<th>Relative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
b) How many combinations are possible?
c) How many totals are possible?
d) Which is the most frequent total?
e) Which are the least frequent totals? Discuss the reasons for this.
f) Draw a frequency graph to show all the totals
**RESOURCES:** Marbles, dice, coins

**INTEGRATION:** NS LO1 AS: Evaluates data and communicates findings.

**ASSESSMENT:** Homework, classwork, test

**BARRIERS TO LEARNING:** Prolong the use concrete material as much as possible

**EXPANDED OPPORTUNITIES:**

**TEACHER REFLECTIONS:**
APPENDIX A
## TERM 4
GRADE 8 MATHEMATICS LESSON PLAN EXEMPLARS:
CONTENT OVERVIEW

<table>
<thead>
<tr>
<th>TERM 1</th>
<th>TERM 2</th>
<th>TERM 3</th>
<th>TERM 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LO 1</strong></td>
<td><strong>LO2</strong></td>
<td><strong>LO1</strong></td>
<td><strong>LO4</strong></td>
</tr>
<tr>
<td>Description and illustration of the historical development of numbers (e.g. irrational numbers)</td>
<td>Interpretation and use of basic algebraic vocabulary in context: Term, Expression, Coefficient Exponent, Base, Constant Equation, Formula/rule</td>
<td>Profit &amp; loss, budgets, accounts, loans, simple interest, higher purchase, exchange rates, ratio and rates (consolidation)</td>
<td>Ways of measuring in different cultures throughout history (e.g. determining the right-angles using knotted string, leading to the Theorem of Pythagoras).</td>
</tr>
<tr>
<td>Integers, Decimals, fractions and percentages, Numbers written in exponential form including squares and cubes of natural numbers and their square and cube roots; Large numbers in scientific notation; Additive and multiplicative inverses; Multiples and factors; Irrational numbers in the context of measurement e.g. π and square and cube roots of non-perfect squares and cubes</td>
<td>Commutative, associative and distributive laws, Classification of terms, multiplication and division of algebraic expressions, Simplification of algebraic expressions given in bracket notation; Comparing different representations of algebraic expressions, Use simple, equivalent forms of algebraic expressions, formulae and equations</td>
<td>Problem – solving involving finances, ratio &amp; rate,</td>
<td>Problem-solving using the theorem of Pythagoras</td>
</tr>
<tr>
<td></td>
<td>Solving equations by: Inspection, Trial and improvement/algebraically (additive and multiplicative inverses)</td>
<td>Problem – solving involving time, distance and speed.</td>
<td>Calculate a missing length in a right-angled triangle leaving irrational answers in surd form.</td>
</tr>
<tr>
<td></td>
<td>Properties of Geometric Exponents</td>
<td><strong>LO2:</strong> Mathematical Modelling: Problem – solving involving equations</td>
<td><strong>LO3:</strong> Plotting of points on a Cartesian plane.</td>
</tr>
<tr>
<td></td>
<td>Properties of Geometric</td>
<td>Graphical representation of a problem situation Interpretation of Graphs</td>
<td>move between positions using: Horizontal and vertical change; Ordered pairs; Compass direction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interpretation of different descriptions of the same relationship or rule</td>
<td>Transformations (e.g. rotations, reflections and translations enlargements and reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Drawing and interpretation of sketches of geometric solids from different perspectives with</td>
</tr>
<tr>
<td>shapes in natural and cultural forms. regular and irregular polygons and polyhedron: The platonic solids (tetrahedron, cube, octahedron, dodecahedron, icosahedrons) t</td>
<td>LO 3: Vocabulary based on parallel lines cut by a transversal. Different angles emanating from parallel lines cut by a transversal. Angle relationships of triangles made from parallel lines cut by two or more transversals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Designing and of use nets to make models of geometric of solids and Accurate constructions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LO 2: Investigation of numeric and geometric patterns: (natural and cultural contexts) represented in physical and diagrammatic form. not limited to sequences involving constant difference or ratio, learner’s own creation. represented in tables. algebraically</td>
<td>LO 4: Problem – solving involving measurement of geometric figures (perimeter, area &amp; volumes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LO 4: Estimating angles Comparing angles Measuring angles Drawing angles Constructing lines and angles Classification of angles</td>
<td></td>
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<tr>
<td>LO 5: Critical reading and interpretation of the graphs: - Bar graphs and double bar graphs - Histograms with given and own intervals; - Pie charts - Line and broken-line graphs - Scatter plots;</td>
<td></td>
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</tr>
<tr>
<td>attention to the preservation of properties</td>
<td></td>
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<tr>
<td>LO 5 Probability Relative frequency of actual outcomes for a series of trials;</td>
<td></td>
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</tr>
<tr>
<td>WEEK</td>
<td>LO’s &amp; AS’s</td>
<td>CONTENT</td>
<td>ACTIVITIES</td>
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</tr>
</tbody>
</table>
| 1 – 3 | CLUSTER 3 [LO 4]  
LO 4: Measurement  
8.4.10  
Describes and illustrates ways of measuring in different cultures throughout history (e.g. determining the right-angles using knotted string, leading to the Theorem of Pythagoras.  
8.4.8  
Investigates (alone or as a member of a group or team) the relationship between the sides of a right-angled triangle in order to develop the Theorem of Pythagoras.  
8.4.9  
Uses the Theorem of Pythagoras to calculate a missing length in a right-angled triangle leaving irrational answers in surd form (√) | Description and illustration of Pythagoras’s Theorem as it was used in the Ancient history.  
Investigations on the relationship between the sides of a right-angled triangle in order to develop the Theorem of Pythagoras  
Problem – solving using the theorem of Pythagoras. | ACTIVITY 1  
The teacher tells a story on how the ancient Egyptians measured their land using knotted ropes. S/he illustrates how these ropes were used to mark out triangles.  
ACTIVITY 2  
The teacher affords learners opportunities to investigate the relationship between the sides of a right-angled triangle in order to develop the theorem of Pythagoras.  
ACTIVITY 3  
The teacher consolidates findings, and then allows learners do applications on Pythagoras’s theorem. |
**ACTIVITY 1**

1.1 Example: The teacher illustrates to the learners how ancient Egyptians measured their land using the knotted ropes as in figures 1 & 2 below:

![Figure 1](image1)

![Figure 2](image2)

1.2 Learners may be requested to visit libraries or use internet to find more about rope stretchers and write a paragraph explaining how they work. Their description should include a discussion of how their work was related to what we today call the Theorem of Pythagoras. *Note an Assessment Task like this can be given after performing Activity 2 & 3*

**Comment:** The teacher can let the learners research further the other ways of measuring or Pythagoras application in different Cultures such as Babylonians, Chinese and throughout history.

**ACTIVITY 2**

The teacher performs practical investigations with the learners;

**INVESTIGATION 1**

**AIM:** to discover the relationship between the sides of a right-angled triangle in order to develop the Theorem of Pythagoras and its application.
Procedure:

Step 1: The teacher supplies learners with square grids sheets or draw 100 square centimetres on graph paper. Then cut out precisely each square so that they can have 100 little squares to work with;

100 such squares

Step 2: On another graph page learners draw as accurately as possible the following right angled triangle with the dimensions below;

---

\[ \begin{align*}
A & \quad 3 \text{ cm} \\
B & \quad 4 \text{ cm} \\
C & \\
\end{align*} \]

Step 3: Using their squares, they must build a square on the sides AB and CD, as illustrated in the diagram below;
Step 4: They can now say $AB^2$ since they have squares on $AB$ and say $BC^2$ since they have squares on $BC$.

Step 5: Allow learners take the cm squares used, to build the 2 squares on $AB$ and $BC$, to build another square on $AC$. Then, observe and communicate their findings.

Step 6: Now they must draw another right angled triangle with the following dimensions;-

![Diagram](image_url)

Step 7: Let them repeat steps 3 & 4 above and observe. They must discuss their findings.

Observations:-
- The sum of the squares of $AB$ and $BC$ equals to the number of squares on $AC$ which is 5cm long.
Repeat the investigation using any other triangle e.g. \( \Delta \) PQR with \( PQ = 6 \text{cm} \); \( QR = 8 \text{cm} \)

The teacher has to consolidate findings and stress on the theorem discovered in steps 5 & 7 in both \( \Delta \)'s ABC and PQR.

**Conclusions:**
- In any right angled triangle the square on the hypotenuse is equal to the sum of the squares on the other two sides.

**INVESTIGATION 2**

**Step 1:** The teacher allows the learners to explore and investigate Pythagoras Theorem using the following method:
- Use a piece of squared grid paper and draw a number of different squares as shown below;
In each case cut out the two copies of each of the squares and cut one of them into the four triangles and smaller square along the lines shown. Next re-arrange the cut out pieces as shown below:

**Step 2:** The teacher must probe the learners and help them discover the theorem:-

- What can you say about the area of the square and total area of the hexagon?
- Consider the dotted line drawn across the hexagon. It divides the hexagon into two squares. What can you say about the area of these two squares and area of the original square?
- By using the names of the sides of one of the triangles write the relationship that you have observed above in words.

**ACTIVITY 3**

**APPLICATIONS**
3.1 Determine the value of the unknown length $x$ on the triangles below:

a) \[ \triangle XYZ \]
\[ \begin{align*}
X & = 20m \\
Y & = 12m \\
Z & = x
\end{align*} \]

b) \[ \triangle KLM \]
\[ \begin{align*}
K & = 15cm \\
L & = 12cm \\
M & = x
\end{align*} \]

c) \[ \triangle PRQ \]
\[ \begin{align*}
P & = 2cm \\
R & = 27mm \\
Q & = x
\end{align*} \]

The teacher gives more activities of this nature for further practice including those in surd form.

3.2 Using Pythagoras's theorem solve problems sighted on the scenario's below:

a) How high up a wall, does a 8m ladder reach if the ladder is 3m from the wall? Draw a picture of a situation as such and answer the question posed.

b) Mr van Aard wants to nail a plank diagonally across a piece of a wooden fencing for reinforcement. The fence is 0.8m high and 1.5m long. Calculate the length of the diagonal plank in figure 1 below.

\[ \text{Figure 1} \]

\[ \begin{align*}
\text{Length} & = \sqrt{0.8^2 + 1.5^2} \\
& = \sqrt{0.64 + 2.25} \\
& = \sqrt{2.89} \\
& = 1.7m
\end{align*} \]

c) A plumber is laying water pipes on a plot of land in figure 2 below. How much piping does he save by laying the pipes across the plot instead of round the boundary? Which answer is most accurate? Give a reason for your answer.
d) Sindi decides to visit her friend who lives on the other side of the park in figure 3 above.
   i. If she walks around the park how far does she walk?
   ii. If she takes the short cut through the park how far will she walk?

e) James planned to measure the width of the river. He fastened one end of a rope to the shore, took the other end in the boat and crossed the river as in figure 4 below. The current dragged him downstream but at least he reached the opposite shore. He realised that the 18m on his marked rope was not the width of the river. He got stuck! Suddenly he remembered the theorem of Pythagoras. He fastened the rope to his boat and …

Figure 4

Suggest a strategy on how there was a happy ending or the story and how the width of the river was calculated.
RESOURCES: pair of scissors; squared grid paper; sharp pencil and ruler.

INTEGRATION: LO 3 Space and shape; Natural Sciences and Technology

ASSESSMENT: Assignment (Activity 1 above); Investigations (Act. 2) or Test.

BARRIERS TO LEARNING: Learners might find difficulties in manipulation of this formula give more activities and assist them in that regard.

EXPANDED OPPORTUNITIES: Include more real life scenarios where learners will use Pythagoras for problem solving.

TEACHER REFLECTION: The teacher must give more activities to consolidate this concept.
<table>
<thead>
<tr>
<th>WEEK</th>
<th>LO’s &amp; AS’s</th>
<th>CONTENT</th>
<th>ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 – 5</td>
<td><strong>CLUSTER 3 [LO 3]</strong>&lt;br&gt;LO 3 : Space and Shape&lt;br&gt;8.3.9 Locates positions on co-ordinate system (ordered grids), Cartesian plane(first quadrant) and maps, and describes how to move between positions using:&lt;br&gt;• horizontal and vertical change;&lt;br&gt;• ordered pairs;&lt;br&gt;• compass direction.&lt;br&gt;8.3.8 Draws and interprets sketches of geometric solids from different perspectives with attention to the preservation of properties.</td>
<td>Plotting of points on ordered grids; Cartesian planes and map and the descriptions of movements between located positions.&lt;br&gt;Drawing and interpretation of geometric solids sketches having preservations of their properties in tact.</td>
<td><strong>ACTIVITY 1</strong>&lt;br&gt;The teacher recaps on locating points in different setting as dealt with in previous grades.&lt;br&gt;<strong>ACTIVITY 2</strong>&lt;br&gt;The teacher provides learners with multiple opportunities to draw and interpret geometric solids with the preservation of their properties.</td>
</tr>
</tbody>
</table>

**ACTIVITY 1**<br>The teacher recaps with the learners on locating points in different setting as dealt with in previous grades.<br>**Example 1**<br>The learners do the following activities as instructed and supervised by the teacher:-<br>1.1 Locates positions on Cartesian plane(first quadrant) and describes how to move between positions using horizontal and vertical change and/or ordered pairs;<br>Learners must consider the image on figure 1 below and answer the following questions;-<br>i) Label PQRS on the top shape in figure. In what quadrant of the Cartesian plane is this shape PQRS?<br>ii) Write the co-ordinated of shape PQRS.<br>iii) What kind of image is P’Q’R’S’ (shape below in figure 1)?<br>iv) Describe the horizontal and vertical movement of the vertices to the image.<br>1.2 Do Reflections (flip) on grid paper which were dealt with on previous grades to address the expectations of locating position" on a grid using motions that involve "horizontal and vertical change";
a) On the grid paper on figure 2 below, plot the following points and join them with a line: A (3; 1) and B (7; 9).
b) On the grid paper plot /draw triangle DEF with co-ordinates D (1; 7), E (6; 7) and F (5; 5).
c) Draw \( \triangle D'E'F' \) the reflection of \( \triangle DEF \) about the line AB.
d) Draw \( \triangle D'E'D' \) the reflection of \( \triangle DED' \) about the line DD'.
e) What kind of quadrilateral is DED'E'? Justify your answer.
f) What is the **horizontal change** as you move from D to E' and from E to D'?
g) What is the **vertical change** as you move from D to E' and from E to D'?
h) Calculate the ratio: \( \frac{\text{vertical change}}{\text{horizontal change}} \), for the movement from D to E' and from E to D'?

Do you think the same will be true for any pair of parallel lines? Justify your answer.
i) What is the horizontal change as you move from D to F and from F to E?
j) What is the vertical change as you move from D to F and from F to E?
k) Calculate the ratio: \( \frac{\text{vertical change}}{\text{horizontal change}} \) for the movement from D to F and from F to E?
What do you notice about these ratios? Do you think the same will be true for any pair of perpendicular lines? Justify your answer.

1.3 Locate and describe positions using compass directions;

Use the compass on figure 4 below to describe the direction of these places from the bridge in figure 3 below:
i) Pine forest
ii) Forest
iii) Town
iv) At what feature or place would you end up if you travelled west from the village to the next feature, north – west to the next feature then north – east to the next feature?

v) Point to the place you would be standing if all of these apply:
- the mealie field is south – east of you.
- the factory is west – south – west of you.
- the mountain is north – west of you.

1.4 Locate positions on maps and describe how to find places or move between positions using compass or ordered pairs;
Refer to the map on figure 5 below answer the following questions;

i) What place do you see, if you put a ruler in the position where dotted lines cross (±25.23S 27.03E)?

ii) Find the following places on the map and write down the degrees and minutes reference from each place. Check you answer in the index of an Atlas. a) Maun(Okavango Swamps) b) Gaberone c) Johannesburg

iii) Name the places in the map that have the following grid references;
   a) 25.46S 25.37E
   b) 23.54S 29.27E
   c) 26.06S 29.04E
The teacher must give more activities to consolidate this concept.