Mathematics

Grade 9

Workbooks, ANA Exemplars and ANA Papers Alignment to the 2013 Work Schedules
TABLE OF CONTENTS

1. Notes for the teacher.................................................................2

Section 1
2. Table of contents for Grade 9 Workbook 1: Term 1 & 2.......................3
3. Table of contents for Grade 9 Workbook 2: Term 3 & 4.............................4

Section 2
4. Alignment of Workbook Activities to the Work Schedule .....................6

Section 3
5. Alignment of Exemplars and Previous ANA Papers to the Work Schedule...10
6. Exemplar 1...............................................................................14
7. Exemplar 2...............................................................................29
8. 2011 Exemplar............................................................................45

Section 4
• Annexure 1: 2012 Exemplar Paper
• Annexure 2: 2012 ANA Paper
NOTES FOR THE TEACHER

Purpose of the document
This document aims to enhance the use of the CAPS and workbooks in the teaching, learning and assessment of Grade 9 Mathematics. The document in no way prescribes how teaching should be carried out, but suggests pacing that would ensure curriculum coverage.

Since Workbooks do not have a table of contents, Section 1 provides the table of contents for the workbooks that will make it easy for you to use the alignment of workbooks to the work schedule provided in Section 2.

- Workbook activities may be used for both teaching and assessment.
- Exemplars should be used for revision (NOT FOR TEACHING).
- 2012 Exemplar and 2012 ANA paper are appended to the document as annexures.

Workbooks
A general observation is that teachers encounter challenges with the use of workbooks. The document thus suggests activities in the workbook that could be done for each topic. The teacher should decide whether the activities should be used for teaching or they should be used for consolidation of work done. In some activities, learners may do selected questions. Activities not done during learning and teaching may be used for revision.

It is highly recommended that work done in the workbooks should indicate dates on which it was done. There should also be evidence that the teacher concerned monitors the use of workbooks.
##SECTION 1

<table>
<thead>
<tr>
<th>Activity</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Whole numbers and properties of numbers</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Multiples and factors</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Exponents</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Integers and patterns</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Common fractions</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Percentages and decimal fractions</td>
<td>16</td>
</tr>
<tr>
<td>7</td>
<td>Input and output</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>Algebra</td>
<td>24</td>
</tr>
<tr>
<td>9</td>
<td>Graphs</td>
<td>28</td>
</tr>
<tr>
<td>10</td>
<td>Financial mathematics</td>
<td>30</td>
</tr>
<tr>
<td>11</td>
<td>Types of angles, pairs of angles and sum of angles of a polygon</td>
<td>34</td>
</tr>
<tr>
<td>12</td>
<td>Transformations</td>
<td>38</td>
</tr>
<tr>
<td>13</td>
<td>Geometric objects</td>
<td>40</td>
</tr>
<tr>
<td>14</td>
<td>Perimeter and area</td>
<td>42</td>
</tr>
<tr>
<td>15</td>
<td>Volume and surface area</td>
<td>44</td>
</tr>
<tr>
<td>16</td>
<td>Data</td>
<td>48</td>
</tr>
<tr>
<td>17</td>
<td>Real numbers, rational numbers and irrational numbers</td>
<td>52</td>
</tr>
<tr>
<td>18</td>
<td>Factorization</td>
<td>56</td>
</tr>
<tr>
<td>19</td>
<td>Ratio, proportion and speed (rate)</td>
<td>58</td>
</tr>
<tr>
<td>20</td>
<td>What is direct proportion</td>
<td>60</td>
</tr>
<tr>
<td>21</td>
<td>Inverse proportion</td>
<td>62</td>
</tr>
<tr>
<td>22</td>
<td>Properties of numbers</td>
<td>64</td>
</tr>
<tr>
<td>23</td>
<td>Addition and subtraction of fractions</td>
<td>68</td>
</tr>
<tr>
<td>24</td>
<td>Addition and subtraction of fractions that include squares, cubes, square roots &amp; cube roots</td>
<td>70</td>
</tr>
<tr>
<td>25</td>
<td>Multiplication of fractions</td>
<td>72</td>
</tr>
<tr>
<td>26</td>
<td>Division of fractions</td>
<td>76</td>
</tr>
<tr>
<td>27</td>
<td>Percentages</td>
<td>78</td>
</tr>
<tr>
<td>28</td>
<td>Common fractions, decimal fractions and percentages</td>
<td>82</td>
</tr>
<tr>
<td>29</td>
<td>Addition, subtraction and rounding off of decimal fractions</td>
<td>84</td>
</tr>
<tr>
<td>30</td>
<td>Multiple operations with decimals</td>
<td>86</td>
</tr>
<tr>
<td>31</td>
<td>Calculate squares, square roots, cubes and cube roots</td>
<td>88</td>
</tr>
<tr>
<td>32</td>
<td>Calculate more squares, square roots, cubes and cube roots</td>
<td>92</td>
</tr>
<tr>
<td>33</td>
<td>Exponential form</td>
<td>96</td>
</tr>
<tr>
<td>34</td>
<td>Laws of exponents – Multiplication</td>
<td>98</td>
</tr>
<tr>
<td>35</td>
<td>Laws of exponents – Division</td>
<td>100</td>
</tr>
<tr>
<td>36</td>
<td>Laws of exponents – Division</td>
<td>102</td>
</tr>
<tr>
<td>37</td>
<td>Laws of exponents – raising a product to an exponent</td>
<td>104</td>
</tr>
<tr>
<td>38</td>
<td>Application of the law of exponent</td>
<td>106</td>
</tr>
<tr>
<td>39</td>
<td>Sequences</td>
<td>110</td>
</tr>
<tr>
<td>40</td>
<td>Geometric and number patterns</td>
<td>112</td>
</tr>
<tr>
<td>41</td>
<td>Addition and subtraction of like terms</td>
<td>114</td>
</tr>
<tr>
<td>42</td>
<td>The product of a monomial and binomial or trinomial</td>
<td>116</td>
</tr>
<tr>
<td>43</td>
<td>The product of two binomials</td>
<td>120</td>
</tr>
<tr>
<td>44</td>
<td>The product of two binomials</td>
<td>124</td>
</tr>
<tr>
<td>45</td>
<td>Divide monomial and binomials</td>
<td>126</td>
</tr>
<tr>
<td>46</td>
<td>Substitution</td>
<td>128</td>
</tr>
<tr>
<td>47</td>
<td>Factorise algebraic expression</td>
<td>130</td>
</tr>
<tr>
<td>48</td>
<td>Divide a trinomial and polynomial by a monomial</td>
<td>134</td>
</tr>
<tr>
<td>49</td>
<td>Linear equations that contain fractions</td>
<td>136</td>
</tr>
<tr>
<td>50</td>
<td>Solve equations of the form: a product of factors equals zero</td>
<td>140</td>
</tr>
<tr>
<td>51</td>
<td>Construct angles and polygons using a protractor</td>
<td>142</td>
</tr>
<tr>
<td>52</td>
<td>Using a pair of compasses</td>
<td>144</td>
</tr>
<tr>
<td>53</td>
<td>Constructing triangles</td>
<td>148</td>
</tr>
<tr>
<td>54</td>
<td>Constructing quadrilaterals</td>
<td>152</td>
</tr>
<tr>
<td>55</td>
<td>Regular and irregular polygons</td>
<td>156</td>
</tr>
<tr>
<td>56</td>
<td>Construct a hexagon</td>
<td>158</td>
</tr>
<tr>
<td>57</td>
<td>Constructing a pentagon</td>
<td>160</td>
</tr>
<tr>
<td>58</td>
<td>Constructing an octagon</td>
<td>162</td>
</tr>
<tr>
<td>59</td>
<td>Interior angles of a triangle</td>
<td>164</td>
</tr>
<tr>
<td>60</td>
<td>Triangles</td>
<td>166</td>
</tr>
<tr>
<td>61</td>
<td>Polygons</td>
<td>170</td>
</tr>
<tr>
<td>62</td>
<td>Polygons</td>
<td>172</td>
</tr>
<tr>
<td>63</td>
<td>Similar triangles</td>
<td>176</td>
</tr>
<tr>
<td>64</td>
<td>Congruent triangles</td>
<td>180</td>
</tr>
<tr>
<td>65</td>
<td>Lines and angles</td>
<td>184</td>
</tr>
<tr>
<td>66</td>
<td>Complementary and supplementary angles</td>
<td>186</td>
</tr>
<tr>
<td>67</td>
<td>Transversals</td>
<td>188</td>
</tr>
<tr>
<td>68</td>
<td>Pairs of angles</td>
<td>192</td>
</tr>
<tr>
<td>69</td>
<td>Application of geometric figures and lines</td>
<td>194</td>
</tr>
<tr>
<td>70</td>
<td>Pythagorean theorem</td>
<td>198</td>
</tr>
<tr>
<td>71</td>
<td>More on the theorem of Pythagoras</td>
<td>202</td>
</tr>
<tr>
<td>72</td>
<td>Perimeter of a square and rectangle, area of a square and rectangle</td>
<td>206</td>
</tr>
<tr>
<td>73</td>
<td>Area of a triangle</td>
<td>208</td>
</tr>
<tr>
<td>74</td>
<td>Area of parallelograms and trapeziums</td>
<td>210</td>
</tr>
<tr>
<td>75</td>
<td>Area of a rhombus and a kite</td>
<td>212</td>
</tr>
<tr>
<td>76</td>
<td>Area of a circle</td>
<td>214</td>
</tr>
<tr>
<td>77</td>
<td>Finances – budgets, loans and interest</td>
<td>216</td>
</tr>
<tr>
<td>78</td>
<td>Finances – hire purchase</td>
<td>218</td>
</tr>
<tr>
<td>79</td>
<td>Finances – exchange rates</td>
<td>220</td>
</tr>
<tr>
<td>80</td>
<td>Finances – commissions and rentals</td>
<td>222</td>
</tr>
</tbody>
</table>

**Table of contents for Grade 9 Workbook 2**

| 81 | Number patterns | 2 |
| 82 | Number sequences | 4 |
| 83 | More number sequences | 6 |
| 84 | Geometric patterns | 8 |
| 85 | Number sequences and equations | 10 |
| 86 | Algebraic expressions | 12 |
| 87 | Operations of algebraic expressions | 14 |
| 88 | The product of a monomial and polynomial | 16 |
| 89 | The product of two binomials | 20 |
| 90 | Divide a trinomial and polynomial by a monomial | 28 |
| 91 | Algebraic expressions and substitution | 30 |
| 92 | Factorise algebraic expressions | 34 |
| 93 | Factorise algebraic expressions | 36 |
| 94 | Factorise more algebraic expressions | 38 |
| 95 | Factorise more algebraic expressions | 40 |
| 96 | Factorise even more algebraic expressions | 42 |
| 97 | More algebraic equations | 44 |
| 98 | Even more algebraic equations | 46 |
| 99 | More and more algebraic equations | 48 |
| 100 | Algebraic equations and volume | 50 |
| 101 | Algebraic equations: Substitution | 52 |
| 102 | Algebraic expressions | 54 |
| 103 | Some more algebraic expressions | 58 |
| 104 | Interpreting graphs | 60 |
| 105 | x-intercept and y-intercept | 64 |
106 Interpreting graphs: Gradient
107 Use tables of ordered pairs
108 More graphs
109 Yet more graphs
110 Yet more graphs
111 Sketch and compare graphs
112 Compare and sketch graphs
113 Graphs
114 More graphs
115 Graphs
116 Surface area, volume and capacity of a cube
117 Surface area, volume and capacity of a rectangular prism
118 Surface area, volume and capacity of a hexagonal prism
119 Surface area, volume and capacity of a triangular prism
120 Surface area, volume and capacity of a cylinder
121 Reflecting over axes
122 More about reflecting over axes
123 Reflecting over any time
124 Rotations
125 Translation
126 Transformation
127 More transformations
128 Enlargement and reduction
129 More enlargement and reduction
130 Polyhedra
131 Polyhedra and non-polyhedra
132 Regular and non-regular polyhedra and non-polyhedra
133 Polyhedra and non-polyhedra all around us
134 Visualize geometric objects
135 Geometric solid game
136 Perspective
137 Constructing nets
138 More constructing nets
## SECTION 2
### Alignment of Workbook Activities to the Work Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Content (Knowledge and Skills)</th>
<th>Suggested workbook activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number system</td>
<td>17; 2; 18; 4 See Grade 8 workbook 30</td>
</tr>
<tr>
<td></td>
<td>• Historical development of numbers (Number Theory)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rational numbers (recognition, use and representation; including writing very big/small rational numbers in the scientific notations)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3D Geometry:</td>
<td>13; 130 – 138</td>
</tr>
<tr>
<td></td>
<td>• Properties of geometric solids (Polyhedra, spheres and cylinders)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Nets (sketches) and models of geometric solids</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Perspective drawings of geometric solids (not drawn to scale)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2D Geometry and Measurement:</td>
<td>11; 51 -53; 59; 60; 65 - 68</td>
</tr>
<tr>
<td></td>
<td>• Line geometry (construction and measurement of intersecting lines, parallel lines and angles formed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Triangle geometry (Types and properties including exterior angle theorem)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2D Geometry and Measurement</td>
<td>54 – 58; 61; 62</td>
</tr>
<tr>
<td></td>
<td>• Types of quadrilaterals and other polygons.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Using measurement, straight line and triangle geometry to justify properties and relationships of polygons</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Measurement</td>
<td>14; 15; 72 – 76; 116 - 120</td>
</tr>
<tr>
<td></td>
<td>• Units of measurement and conversions from one unit to the other</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Calculating perimeter, area and volume (use of formulae)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Measurement</td>
<td>19 – 21; 70; 71</td>
</tr>
<tr>
<td></td>
<td>• Theorem of Pythagoras and its applications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Solving problems on ratio and rate (time, distance, speed problems)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Data Handling</td>
<td>16 See Grade 8 workbook 108</td>
</tr>
<tr>
<td></td>
<td>• Data collection techniques</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Data collection instruments (e.g. questionnaires)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Data sources</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Data Handling</td>
<td>16 See Grade 8 workbook 109 - 110</td>
</tr>
<tr>
<td></td>
<td>• Organisation of collected data (Tally and frequency tables)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Central tendency (mode, median and mean)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Measures of dispersion (range)</td>
<td></td>
</tr>
<tr>
<td>Week</td>
<td>Content (Knowledge and Skills)</td>
<td>Suggested workbook activities</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Rational numbers</td>
<td>1; 22; 23; 25 - 30</td>
</tr>
<tr>
<td></td>
<td>• Properties</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Calculations</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Financial mathematics</td>
<td>10; 77; 78</td>
</tr>
<tr>
<td></td>
<td>• Profit and loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Budgets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Loans</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Simple and compound interests</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hire purchase</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Financial mathematics</td>
<td>79; 80</td>
</tr>
<tr>
<td></td>
<td>• Exchange rates</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Commission</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solving financial problems on rate, ratio and proportion</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Exponents</td>
<td>3; 24, 31 – 38 Also look at Grade 8 workbook 32 - 37</td>
</tr>
<tr>
<td></td>
<td>• Laws of exponents</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Calculations involving exponents</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Algebra</td>
<td>7; 39; 40; 81 – 84;</td>
</tr>
<tr>
<td></td>
<td>• Number patterns</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tables</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Flow diagrams</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Algebra</td>
<td>41 -46; 8; 86 – 88; 90; 91</td>
</tr>
<tr>
<td></td>
<td>• Formula and substitution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Products of monomials and polynomials</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Simplify expressions</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Algebra</td>
<td>47 – 50; 85; 92</td>
</tr>
<tr>
<td></td>
<td>• Factorisation of expressions by removing HCF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Solve simple equations</td>
<td></td>
</tr>
</tbody>
</table>
## Term 3

<table>
<thead>
<tr>
<th>Week</th>
<th>Content (Knowledge and Skills)</th>
<th>Suggested workbook activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Position</strong>&lt;br&gt;  - Ordered grids and Cartesian plane&lt;br&gt;  - Compass directions&lt;br&gt;  - Angles of elevation and depression</td>
<td>104&lt;br&gt;See Grade 8 workbook&lt;br&gt;130 - 135</td>
</tr>
<tr>
<td>2</td>
<td><strong>Use transformations to investigate properties of geometric figures:</strong>&lt;br&gt;  (Symmetry, rotations, reflections, translations, enlargements and reductions)</td>
<td>12; 121 - 129</td>
</tr>
<tr>
<td>3</td>
<td><strong>Geometry</strong>&lt;br&gt;  - Similarity and congruence</td>
<td>63; 64; 69</td>
</tr>
<tr>
<td>4</td>
<td><strong>Data Handling</strong>&lt;br&gt;  Draw and critically interpret:&lt;br&gt;  - Bar graphs&lt;br&gt;  - Histograms&lt;br&gt;  - Pie charts&lt;br&gt;  Use the above graphs to make predictions and draw conclusions</td>
<td>Grade 8 workbook&lt;br&gt;16; 111- 114</td>
</tr>
<tr>
<td>5</td>
<td><strong>Data Handling</strong>&lt;br&gt;  Draw and critically interpret:&lt;br&gt;  - Pie charts&lt;br&gt;  - Scatter plots&lt;br&gt;  - Line graphs&lt;br&gt;  Use the above graphs to make predictions and draw conclusions</td>
<td>Grade 8 workbook&lt;br&gt;9; 115 - 120</td>
</tr>
<tr>
<td>6</td>
<td><strong>Algebra</strong>&lt;br&gt;  - Plot graphs of equations&lt;br&gt;  - Determines formula from given graphs</td>
<td>9; 104 – 115;</td>
</tr>
<tr>
<td>7</td>
<td><strong>Probability</strong>&lt;br&gt;  - Do experiments to determine relative frequency&lt;br&gt;  - Determines probability for compound events&lt;br&gt;  - Draw and interpret Tree Diagrams&lt;br&gt;  - Predict probability of outcomes</td>
<td></td>
</tr>
</tbody>
</table>
## Term 4

<table>
<thead>
<tr>
<th>Week</th>
<th>Content (Knowledge and Skills)</th>
<th>Suggested workbook activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Algebraic products.</td>
<td>89; 100 - 103</td>
</tr>
<tr>
<td></td>
<td>• Products of binomials</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Simplifying expressions</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Algebra</td>
<td>97; 98</td>
</tr>
<tr>
<td></td>
<td>• Equivalent expressions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Deriving equations from Flow Diagrams</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Equations</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Algebra</td>
<td>93 – 96; 98; 99</td>
</tr>
<tr>
<td></td>
<td>• Factorise the difference of two squares</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Solve equations that involve factorising difference of two squares</td>
<td></td>
</tr>
</tbody>
</table>

**NB**
To prepare for Grade 9 ANA, incorporate Term 4 work in Term 3 and Term 4 Algebra. Term 4 will thus be used for revision and consolidation using selected activities in the workbook. Special focus in Term 4 could be on basics required for Grade 10 Mathematics.
## SECTION 3
### Alignment of Exemplars & Previous ANA Papers to the Work Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Content (Knowledge and Skills)</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Number system</td>
<td>2.1.3; 2.4</td>
<td>1.8; 2.4</td>
<td>1.1; 1.4; 2.1.4; 2.3</td>
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<tr>
<td></td>
<td>- Historical development of numbers (Number Theory)</td>
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<tr>
<td></td>
<td>- Rational numbers (recognition, use and representation; including writing very big/small rational numbers in the scientific notations)</td>
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<tr>
<td>2</td>
<td>3D Geometry:</td>
<td>1.7; 1.8</td>
<td>1.7</td>
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<tr>
<td></td>
<td>- Properties of geometric solids (Polyhedra, spheres and cylinders)</td>
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<tr>
<td></td>
<td>- Nets (sketches) and models of geometric solids</td>
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<tr>
<td></td>
<td>- Perspective drawings of geometric solids (not drawn to scale)</td>
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<tr>
<td>3</td>
<td>2D Geometry and Measurement:</td>
<td>6.2</td>
<td>6.2</td>
<td>1.9</td>
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<tr>
<td></td>
<td>- Line geometry (construction and measurement of intersecting lines, parallel lines and angles formed)</td>
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<td></td>
<td>- Triangle geometry (Types and properties including exterior angle theorem)</td>
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<tr>
<td>4</td>
<td>2D Geometry and Measurement</td>
<td>6.1.1</td>
<td>6.1.1; 6.1.3</td>
<td>1.8; 6.1.1</td>
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<tr>
<td></td>
<td>- Types of quadrilaterals and other polygons.</td>
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<tr>
<td></td>
<td>- Using measurement, straight line and triangle geometry to justify properties and relationships of polygons</td>
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<tr>
<td>5</td>
<td>Measurement</td>
<td>1.4; 6.1.3; 6.1.5; 6.4.1; 6.4.2; 6.4.4</td>
<td>1.4; 6.1.2; 6.4</td>
<td>6.1.3 – 6.1.5; 8.2</td>
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<tr>
<td></td>
<td>- Units of measurement and conversions from one unit to the other</td>
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<tr>
<td></td>
<td>- Calculating perimeter, area and volume (use of formulae)</td>
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<tr>
<td>6</td>
<td>Measurement</td>
<td>1.3; 3.2; 6.1.2; 6.4.3</td>
<td>1.3; 3.3</td>
<td>1.8; 6.1.2; 8.1</td>
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<tr>
<td></td>
<td>- Theorem of Pythagoras and its applications</td>
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<td></td>
<td>- Solving problems on ratio and rate (time, distance, speed problems)</td>
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<tr>
<td>7</td>
<td>Data Handling</td>
<td>8</td>
<td>7</td>
<td>9.2</td>
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<td></td>
<td>- Data collection techniques</td>
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<td></td>
<td>- Data collection instruments (e.g. questionnaires)</td>
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<td>- Data sources</td>
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<td>8</td>
<td>Data Handling</td>
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<td>7</td>
<td>9.2</td>
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<td></td>
<td>- Organisation of collected data (Tally and frequency tables)</td>
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<td></td>
<td>- Central tendency (mode, median and mean)</td>
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<td></td>
<td>- Measures of dispersion (range)</td>
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## Term 2

<table>
<thead>
<tr>
<th>Week</th>
<th>Content (Knowledge and Skills)</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Exemplar_1</td>
<td>Exemplar_2</td>
<td>Exemplar_3</td>
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<tr>
<td>1</td>
<td>Rational numbers</td>
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<td></td>
<td>- Properties</td>
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<td></td>
<td>- Calculations</td>
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<td></td>
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<tr>
<td>2</td>
<td>Financial mathematics</td>
<td>3.1</td>
<td>3.1; 3.2</td>
<td>3; 3.3; 3.4</td>
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<tr>
<td></td>
<td>- Profit and loss</td>
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<td></td>
<td>- Budgets</td>
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<td>- Loans</td>
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<td>- Simple and compound interests</td>
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<td>- Hire purchase</td>
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<td>3</td>
<td>Financial mathematics</td>
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<td>3.4</td>
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<td>- Exchange rates</td>
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<td>- Commission</td>
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<td>Solving financial problems on rate, ratio and proportion</td>
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<tr>
<td>4</td>
<td>Exponents</td>
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<td></td>
<td>- Laws of exponents</td>
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<td>- Calculations involving exponents</td>
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<tr>
<td>5</td>
<td>Algebra</td>
<td></td>
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<tr>
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<td>- Number patterns</td>
<td>1.9; 4</td>
<td>1.9; 4</td>
<td>1.2; 4</td>
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<tr>
<td></td>
<td>- Tables</td>
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<tr>
<td></td>
<td>- Flow diagrams</td>
<td></td>
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<tr>
<td>6</td>
<td>Algebra</td>
<td>1.2; 2.1.2; 2.1.2; 2.2.1</td>
<td>1.2; 1.6; 2.1.2; 2.1.3; 2.2.1</td>
<td>2.1.2; 2.1.5</td>
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<td></td>
<td>- Formula and substitution</td>
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<td>- Products of monomials and polynomials</td>
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<tr>
<td></td>
<td>- Simplify expressions</td>
<td></td>
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<td>7</td>
<td>Algebra</td>
<td>2.3.1*; 2.5.1; 6.2.1</td>
<td>2.3.1; 2.5.1; 2.4.1</td>
<td>1.7; 2.6.1</td>
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## Term 3

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<thead>
<tr>
<th>Week</th>
<th>Content (Knowledge and Skills)</th>
<th>2010</th>
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<th>2012</th>
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<tr>
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<td>Exemplar_1</td>
<td>Exemplar_2</td>
<td>Exemplar_3</td>
</tr>
<tr>
<td>1</td>
<td><strong>Position</strong>&lt;br&gt; - Ordered grids and Cartesian plane&lt;br&gt; - Compass directions&lt;br&gt; - Angles of elevation and depression</td>
<td>1.10</td>
<td>1.10</td>
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</tr>
<tr>
<td>2</td>
<td><strong>Use transformations to investigate properties of geometric figures:</strong>&lt;br&gt; (Symmetry, rotations, reflections, translations, enlargements and reductions)</td>
<td>1.6</td>
<td>7</td>
<td>8</td>
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<tr>
<td>3</td>
<td><strong>Geometry</strong>&lt;br&gt; - Similarity and congruence</td>
<td>1.5; 6.1.4; 6.3</td>
<td>1.5; 6.1.4; 6.3</td>
<td>6.2; 6.3</td>
</tr>
<tr>
<td>4</td>
<td><strong>Data Handling</strong>&lt;br&gt; Draw and critically interpret:&lt;br&gt; - Bar graphs&lt;br&gt; - Histograms&lt;br&gt; - Pie charts&lt;br&gt; Use the above graphs to make predictions and draw conclusions</td>
<td></td>
<td>9.1</td>
<td>9.1</td>
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<tr>
<td>5</td>
<td><strong>Data Handling</strong>&lt;br&gt; Draw and critically interpret:&lt;br&gt; - Pie charts&lt;br&gt; - Scatter plots&lt;br&gt; - Line graphs&lt;br&gt; Use the above graphs to make predictions and draw conclusions</td>
<td>5.1</td>
<td>5.1</td>
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<tr>
<td>6</td>
<td><strong>Algebra</strong>&lt;br&gt; - Plot graphs of equations&lt;br&gt; - Determines formula from given graphs</td>
<td>5.2</td>
<td>5.2</td>
<td>1.5; 5</td>
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<tr>
<td>7</td>
<td><strong>Probability</strong>&lt;br&gt; - Do experiments to determine relative frequency&lt;br&gt; - Determines probability for compound events&lt;br&gt; - Draw and interpret Tree Diagrams&lt;br&gt; - Predict probability of outcomes</td>
<td>7</td>
<td>8</td>
<td>1.10</td>
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</table>
Term 4

<table>
<thead>
<tr>
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<th>2012</th>
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<td>Exemplar_1</td>
<td>Exemplar_2</td>
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<tr>
<td>1</td>
<td>Algebraic products.</td>
<td>2.2.2</td>
<td></td>
<td>2.1.1;</td>
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<tr>
<td></td>
<td>• Products of binomials</td>
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<td></td>
<td>2.2.2**;</td>
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<tr>
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<td>• Simplifying expressions</td>
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<tr>
<td>2</td>
<td>Algebra</td>
<td>2.5.2; 2.5.3</td>
<td>1.1;</td>
<td>1.6; 1.7;</td>
</tr>
<tr>
<td></td>
<td>• Equivalent expressions</td>
<td></td>
<td></td>
<td>2.4.2; 2.4.3</td>
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<td></td>
<td>• Deriving equations from Flow Diagrams</td>
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<tr>
<td></td>
<td>• Equations</td>
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<tr>
<td>3</td>
<td>Algebra</td>
<td>1.2; 2.3.2; 2.3.3</td>
<td>2.3.2; 2.3.3; 2.5.2; 2.5.3</td>
<td>2.2.1*; 2.2.2; 2.4.6; 2.5.1*; 2.5.2</td>
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<tr>
<td></td>
<td>• Factorise the difference of two squares</td>
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<tr>
<td></td>
<td>• Solve equations that involve factorising difference of two squares</td>
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</tbody>
</table>

* Factorising quadratic trinomials not done in Grade 9
** Process the same as for binomials.
2010 ANNUAL NATIONAL ASSESSMENTS
GRADE 9 MATHEMATICS - ENGLISH
EXEMPLARY 1

SURNAME

______________________________

NAME(S)

______________________________

DATE OF BIRTH

______________________________

SCHOOL NAME

______________________________

EMIS NO.

______________________________

DISTRICT /
REGION

______________________________

Instructions to learners:
1. Question 1 consists of 10 multiple choice questions. Learners must circle the letter of the correct answer (see example below).
2. Learners must provide answers to questions 2 to 8 in the spaces provided.
3. Approved scientific calculators (non-programmable and non-graphical) may be used.
4. The test duration is $2 \frac{1}{2}$ hours.

Example

Circle the letter of the correct answer.

Which number comes next in the pattern?

2 ; 4 ; 6 ; 8 ; _____

a. 9
b. 10
c. 12
d. 20

You have done it correctly if you have circled b as above.
QUESTION 1

1.1 If \((x - 1)(x + 2) = 0\) then \(x =\)

A. \(-1\) or 2
B. 1 or \(-2\)
C. 1
D. \(-2\)

1.2 \(\left(\frac{x^2}{3}\right)^3 \left(\frac{x^3}{2}\right)^2 = \)

A. \(x\)
B. \(x^3\)
C. \(x^6\)
D. \(x^4\)

1.3 In the figure below, the rectangle within the circle, with centre O, is 8 centimetres long and 6 centimetres wide.

What is the length of the diameter QA in \(cm\)?

A. 10
B. 5
C. 14
D. 8

1.4 In the sketch the circle has a radius of 4 cm. What is the area in \(cm^2\) of the shaded part of this circle?

A. \(16\pi\)
B. \(8\pi\)
C. \(\frac{4\pi}{3}\)
D. \(\frac{8\pi}{3}\)
1.5 Why is $\triangle ABC \equiv \triangle DCB$?

A. S S S
B. $90^\circ$ H S
C. S < S
D. < < S

1.6 The geometric shape on the left side of the solid line can be made to fit onto the geometric shape on the right side of the solid line by

A. translation
B. enlargement
C. rotation
D. reflection

1.7 A net of a polyhedron is given below. This is a net of a/an:

A. tetrahedron
B. octahedron
C. dodecahedron
D. icosahedron

1.8 Which of the drawings below represents a perspective view of a rectangular box with one face viewed straight on?

A

B

C

D
1.9 Study this growing pattern.

If you grow this pattern further the next diagram will be:

![Pattern Diagram]

1.10 Which angle in rectangle ABCD is the angle of depression of D from B?

![Rectangle Diagram]

A. $\hat{B}_1$
B. $\hat{B}_2$
C. $\hat{D}_1$
D. $\hat{D}_2$
QUESTION 2

2.1 Simplify:

2.1.1 \( (2x^2 + 3x - 4) - (x^2 - 2x - 6) \)

________________________________________________________________
________________________________________________________________
________________________________________________________________
______________________
______________________

(3)

2.1.2 \( \frac{-4m^3n \times 10mn^2}{5m^3n^3} \)

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

(3)

2.1.3 \( \frac{1.6 \times 10^{-3} + 4.0 \times 10^{-4}}{4.0 \times 10^{-3} - 0.2 \times 10^{-2}} \)  
(Do NOT Use a calculator)

________________________________________________________________
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(4)

2.2 Multiply and simplify:

2.2.1 \( \frac{2}{3} (12a^2 - 3a - 6) \)

________________________________________________________________
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________________________________________________________________

(3)

2.2.2 \( (a - 4b)(a - 2b) \)

________________________________________________________________

(3)
2.3 Factorise fully:

2.3.1 \( 6k + 12k^2 - 3k^3 \)

________________________________________________________________
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(2)

2.3.2 \( 16y^2 - 49 \)

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(2)

2.3.3 \( 3x^2 - 12 \)

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(3)

2.4 Use prime factors to determine the value of \( \sqrt{784} \)

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(4)

2.5 Solve for \( x \):

2.5.1 \( 2x - 3 = 17 + x \)

________________________________________________________________
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(2)
2.5.2 \[ \frac{3x + 4}{2} = 2 \]

________________________________________________________________________

________________________________________________________________________

(3)

2.5.3 \[ \frac{2(x + 5)}{3} = 1 - \frac{3(x - 5)}{4} \]

________________________________________________________________________

________________________________________________________________________

(5)

QUESTION 3

3.1 Show by calculation which is the better investment?
R8 000 invested at 3,5% compound interest per annum for 3 years or
R8 000 invested at 7,5% simple interest per annum for 3 years.

________________________________________________________________________

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(5)
3.2 Mark travels between two towns A and B at an average speed of 70 kilometres per hour for \( 4 \frac{1}{2} \) hours. On his return from town B to A, he travelled at an average speed of 90 kilometres per hour. How long did he take on his return trip?

________________________________________________________________________
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(4)

QUESTION 4

4.1 Write down the next two terms in the given sequence:
-1; 1; 3; ....; ....

________________________________________________________________________
________________________________________________________________________

-----------------------------------------------------------------------------

(2)

4.2 Describe the pattern in QUESTION 4.1 in your own words.

________________________________________________________________________
________________________________________________________________________

-----------------------------------------------------------------------------

(1)

4.3 Write down the general term of the given sequence in the form

\[ T_n = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \]

(2)

4.4 Which term in the sequence is equal to 37?

________________________________________________________________________
________________________________________________________________________

-----------------------------------------------------------------------------

(2)
QUESTION 5

5.1 Use the graphs below to answer the questions that follow.

Which of the above graphs represents:

5.1.1 A discrete, increasing, linear function?  
5.1.2 A continuous, decreasing, linear function?  
5.1.3 An indirect proportion?  

5.2 Use the grid below. On the same system of axes draw and label the graphs defined by:

\[ y = x + 4, \quad \text{if} \quad x \in \{-1, 0, 1, 2\} \quad \text{and} \quad y = -2x + 4, \quad \text{if} \quad x \in \mathbb{R} \]
QUESTION 6

In QUESTION 6 give reasons for each of your statements.

6.1 In rectangle ABCD:
Points J, K, L and M are the mid-points of sides AB, BC, CD and DA respectively;
AB = 24 cm and AD = 10 cm

6.1.1 What kind of quadrilateral is JKLM?

_________________________________________________________________
_________________________________________________________________
(1)

6.1.2 Calculate the length of line-segment KL.

_________________________________________________________________
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(5)

6.1.3 Calculate the perimeter of quadrilateral JKLM.

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(1)
6.1.4 Prove that \( \triangle JBK \equiv \triangle LDM \)
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(7)

6.1.5 Determine the value of \( t \) if the area of \( JKLM = t \times (\text{the area of } ABCD) \).
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_________________________________________________________________
(5)

6.2 In the diagram below, line FK intersects line AD at point E and Line GH intersects line AD at point C.

\[
\begin{align*}
\hat{AEF} &= 3\alpha \\
\hat{FEC} &= 2\alpha + 20^\circ \\
\hat{GCE} &= 4\alpha - 32^\circ
\end{align*}
\]

6.2.1 Calculate the value of \( \alpha \).
_________________________________________________________________
_________________________________________________________________
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_________________________________________________________________
(5)
6.2.3 What can you deduce about line FK and line GH? Give one reason for your deduction.

_____________________________________

_____________________________________

6.3 In the figure below AC = AE and AB = AG

6.3.1 Show that \( \hat{C}_2 = \hat{E}_2 \)

_____________________________________

_____________________________________

6.3.2 Show with reasons that \( \triangle ABC \) and \( \triangle AGE \) are similar.

_____________________________________

_____________________________________

6.4 The dimensions of the Olympic swimming pool are shown in the following diagram. The pool has a uniform depth.
6.4.1 The total capacity of the Olympic pool is 2 500 000 litres. What is the volume of the pool in cubic metres?

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)

6.4.2 Calculate the depth of the Olympic pool. Write the answer in metres.

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___________________________________________________________________

(4)

6.4.3 In 1996, Penny Heyns of South Africa broke the world record by completing the 100 metre breaststroke in 1 minute and 7.02 seconds. Calculate her average swimming speed in metres per second. (Round off your answer to two decimal places).

___________________________________________________________________
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(4)

6.4.4 The space around the pool is paved. The uniform width of the paving is 2.5 metres. Calculate the area of the paving in square metres.

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(6)
QUESTION 7

7.1 Lucy has **two** R50 notes, **one** R20 note, and **three** R10 notes in her pocket.

7.1.1 She randomly takes out one of the notes from her pocket to buy sweets. What is the probability of her taking out a R50 note?

7.1.2 She takes out a note, and then takes out another note. Draw a tree diagram to illustrate the sequence of events.

7.2 The spinner below is spun twice in succession.

7.2.1 What is the probability that the arrow will point to yellow after the first spin and to black after the second spin?
7.2.2 Suppose the spinner was spun 50 times and the frequencies of the outcomes are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Purple</th>
<th>Yellow</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>10</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

Calculate the relative frequency of purple as an outcome?

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

(2)

QUESTION 8

8. The following scores are arranged in an ascending order, where y and z are variables.

1; 3; 5; 5; y; 6; 6; z

8.1 If the median of the scores is $\frac{5\frac{1}{2}}{2}$ calculate the value of y.

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

(2)

8.2 If the mean of the scores is 5 calculate the value of z.

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

(3)

8.3 What is the mode of the scores?

__________________________________________________________________

__________________________________________________________________

__________________________________________________________________

(1)

[6]

Total [140]
### Instructions to learners:

5. Question 1 consists of 10 multiple choice questions. Learners must circle the letter of the correct answer (see example below).

6. Learners must provide answers to questions 2 to 8 in the spaces provided.

7. Approved scientific calculators (non-programmable and non-graphical) may be used.

8. The test duration is $2\frac{1}{2}$ hours.

---

### Example

**Circle the letter of the correct answer.**

Which number comes next in the pattern?

<table>
<thead>
<tr>
<th>2 ; 4 ; 6 ; 8 ;</th>
</tr>
</thead>
<tbody>
<tr>
<td>e. 9</td>
</tr>
<tr>
<td>f. 10</td>
</tr>
<tr>
<td>g. 12</td>
</tr>
<tr>
<td>h. 20</td>
</tr>
</tbody>
</table>

You have done it correctly if you have circled b as above.
QUESTION 1

1.1 If \( 4(x + 3)(2x - 1) = 0 \) then \( x = \)

A. -3 or \( \frac{1}{2} \)

B. 4 or \( \frac{1}{2} \)

C. 0 or 3

D. 4 or -3

1.2 \( \frac{(x^4)(x^2)^3}{(x^{-3})^2} = \)

E. \( x^3 \)

F. \( x^4 \)

G. \( x^8 \)

H. \( x^{16} \)

1.3 In rectangle ABCD, DC =12 cm and diagonal BD=15 cm.

What is the length of BC in cm?

E. 3

F. 27

G. \( \sqrt{369} \)

H. 9

1.4 A circle has a diameter of 6 cm. What is the area in \( cm^2 \) of one quarter of the circle?

E. \( 36\pi \)

F. \( 9\pi \)

G. \( \frac{9}{4}\pi \)

H. \( \frac{9}{2}\pi \)
1.5 In the adjacent figure, AB = AC and AE = AD. Why is \( \triangle ABE \equiv \triangle ACD \)?

A. \( S \ S \ S \)
E. \( 90^\circ \ H \ S \)
F. \( S < S \)
G. \( < < S \)

1.6 If \( x = -2 \) then the value of \(-x^2 + 3x - 4 = \)

E. \(-6\)
F. \(6\)
G. \(-14\)
H. \(-8\)

1.7 The 3-D figure which has 5 faces, 5 vertices and 8 edges is a:

E. cylinder
F. triangular prism
G. square-based pyramid
H. triangular pyramid

1.8 In scientific notation \( 4 \times 10^{-12} \times 7 \times 10^{-7} = \)

A. \(28 \times 10^{-20}\)
B. \(2.8 \times 10^{-18}\)
C. \(2.8 \times 10^{-20}\)
D. \(0.28 \times 10^{-18}\)
1.9  **Study this growing pattern.**

How many dots will there be in the sixth dot array if this dot array is continued?

A. 56  
B. 36  
C. 42  
D. 30  

1.10  **Which angle in rectangle PQRS is the angle of elevation of P from R?**

E. RQS  
F. PQR  
G. PQR  
H. SPR
QUESTION 2

2.1 Simplify:

2.1.1 \((x + 2)^2 - (x + 1)(x - 3)\)

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

(3)

2.1.2 \(\frac{6x^2y \times 8y^3}{12x^4y^2}\)

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

(3)

2.1.3 \(\frac{-16x^3 - 8x^2 + 2x}{-2x} \times (4x - 1)\)

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

(5)
2.2 Multiply and simplify:

2.2.1 \[ \frac{3}{4}(12a^2 - 8a - 4) \]

\[ \text{(3)} \]

2.2.2 \((a + 2)(a^2 - 2a + 4)\)

\[ \text{(3)} \]

2.3 Factorise fully:

2.3.1 \[ 2x^2y^2 - 4x^2y + 10xy^2 \]

\[ \text{(2)} \]

2.3.2 \[ 9x^2 - y^2 \]

\[ \text{(2)} \]

2.3.3 \[ 2x^3 - 8x \]

\[ \text{(3)} \]
24 Use prime factors to determine the value of $\sqrt{108}$

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_____________________________ ____________________________

_______________________________________________________

_______________________________________________________

(4)

2.5 Solve for $x$:

2.5.1 $3(x - 1) - 4x = 5 - 2(x + 1)$

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

(3)

2.5.2 $\frac{2}{3}x - 1 = x$

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

(3)

2.5.3 $\frac{x - 2}{4} - \frac{x + 1}{3} = \frac{x - 2}{12}$

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

(5)

QUESTION 3
3.1 Calculate the simple interest on R5 400 at 6% per annum for 4 years?

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

(4)

3.2 Mark borrowed R8 000 from the bank at 5% per annum compound interest for 3 years. How much must he repay to the bank at the end of 3 years?

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

(5)

3.3 The time taken by the different sets of pumps to empty a water tank is given in the table below.

<table>
<thead>
<tr>
<th>Number of pumps</th>
<th>20</th>
<th>10</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in hours</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

3.3.1 Is this an example of direct or inverse proportion?

________________________________________________________

(1)

3.3.2 Calculate how long it will take 16 pumps to empty the water tank.

________________________________________________________

________________________________________________________

________________________________________________________

(2)
3.4 If 4,5 kg of sugar costs R36, what will 2,5 kg of sugar cost?

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

(3)

4.1 Write down the next two terms in the given sequence:
5; 9; 13; ... ; ...

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

(2)

4.2 Describe the pattern in QUESTION 4.1 in your own words.

_______________________________________________________

_______________________________________________________

_______________________________________________________

(1)

4.3 Write down the general term of the given sequence in the form

\[ T_n = \]________.

(2)

4.4 Which term in the sequence is equal to 101?

_______________________________________________________

_______________________________________________________

_______________________________________________________

_______________________________________________________

(4)

[9]
QUESTION 5

5.1 Use the graphs below to answer the questions that follow.

Which of the above graphs represents:

5.1.1 A decreasing, continuous, non-linear function?
_________________________________________________ (1)

5.1.2 A discrete, increasing, linear function?
_________________________________________________ (1)
5.2 Use the grid below. On the same system of axes draw and label the graphs defined by:

\[ y = 2 - x, \quad \text{for } x \in \{-2; -1; 0; 1\} \quad \text{and} \]
\[ y = 2x - 3, \quad \text{for } x \in \mathbb{R} \]

(7)
QUESTION 6

In QUESTION 6 give reasons for each of your statements.

6.1 In the given diagram $AD = BC$, $AB = CD$, $AP \perp BC$, $AD \perp TC$, $AP \parallel TC$, $AD = 24\, \text{cm}$, $BP = 8\, \text{cm}$ and $AP = 12\, \text{cm}$.

6.1.1 What kind of quadrilateral is $ABCD$? Give a reason for your answer.

__________________________________________________________________________
__________________________________________________________________________  (2)

6.1.2 Calculate the area of quadrilateral $APCD$.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________  (4)

6.1.3 State why is $AP = TC$?

__________________________________________________________________________  (1)

6.1.4 Prove that $\triangle ABP \equiv \triangle CDT$

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________  (4)
6.2 In the figure below, ABCD is a parallelogram. AC = BC and \( \hat{C}_1 = 40^\circ \).

Calculate the size of B\( \hat{A} \)D

(9)

6.3

6.3.1 Which triangle is similar to \( \triangle ACD \)?

(1)

6.3.2 If \( AE : AD = 3 : 8 \) and \( AB = 9 \text{ cm} \), determine the length of BC.

(6)
6.4 The base of a given triangular prism is a right-angled triangle with $AB = 5\ m$, $AC = 12\ m$ and the height of the prism = 20 m.

6.4.1 Calculate the volume of the prism.

\[
\text{Volume} = \frac{1}{2} \times AB \times AC \times \text{height}
\]

\[
= \frac{1}{2} \times 5 \times 12 \times 20
\]

\[
= 600\ m^3
\]

(3)

6.4.2 Calculate the surface area of the prism.

\[
\text{Surface Area} = 2 \times \left( \frac{1}{2} \times AB \times AC \right) + \text{Perimeter of base} \times \text{height}
\]

\[
= 2 \times \left( \frac{1}{2} \times 5 \times 12 \right) + (5 + 12 + 12) \times 20
\]

\[
= 60 + 370 = 430\ m^2
\]

(8)
QUESTION 6

The following marks were obtained by a group of grade 9 learners in a Mathematics test out of 100.

<table>
<thead>
<tr>
<th>38</th>
<th>52</th>
<th>68</th>
<th>81</th>
<th>72</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>45</td>
<td>55</td>
<td>74</td>
<td>49</td>
</tr>
<tr>
<td>52</td>
<td>47</td>
<td>64</td>
<td>58</td>
<td>84</td>
</tr>
</tbody>
</table>

6.1 Draw a stem-and-leaf plot to display the data.

6.2 From the data set determine each of the following:

6.2.1 The range.

6.2.2 The mode.

6.2.3 The median.

6.2.4 The mean.

6.3 How many learners obtained more than 55% for the test?
QUESTION 8

8. If the spinner below is rotated, determine the probability that the arrow will point to:

8.1 a number greater than 

8.2 A prime number. 

8.3 A factor of 8. 

[6]

Total [140]
SURNAME:__________________________  GENDER (TICK □)  BOY  GIRL

NAME (S):________________________________________________________________

PROVINCE:______________________________________________________________

DATE OF BIRTH:__________________________________________________________

I.D NUMBER: ____________________________________________________________________

SCHOOL NAME:_____________________________________________________________

EMIS NUMBER: __________________________________________________________________

DISTRICT /REGION: ___________________________________________________________________

Instructions to learners:
1. Question 1 consists of 10 multiple questions. Learners must circle the letter of the correct answer (see example below)
2. Learners must provide answers to questions 2 and 9 in the spaces provided.
3. Approved scientific calculators (non-programmable and non-graphical) may be used.
4. The test duration is $2\frac{1}{2}$ hours.

Example
Write only the letter of the correct answer e.g. 1A
QUESTION 1

1.1 The next number in the sequence 1; 9; 25;.....is
   A. 33
   B. 36
   C. 49
   D. 50

1.2 Which of the following numbers is a rational number?
   A. \( \sqrt{3} \)
   B. \( \sqrt{16} \)
   C. \( \sqrt{-9} \)
   D. \( \sqrt{13} \)

1.3 \( 12 \times \frac{3}{4} - 6 \times 2 - 2 = \)
   A. \(-5\)
   B. \(9\)
   C. \(-1\)
   D. \(3\)

1.4 The sum of a square root and the cube root of a certain number is 12. The number is
   A. 64
   B. 144
   C. 728
   D. 8

1.5 The equation defining the graph is
   A. \( y = \frac{3}{2}x + 1 \)
   B. \( y = -\frac{3}{2}x + 1 \)
   C. \( y = -\frac{2}{3}x + 1 \)
   D. \( 3y = -2x + 1 \)
1.6 If \( x^2 = 36 \), then \( x = \)
A. 6
B. −6
C. 1
D. ±6

1.7 \( \frac{2^{n+1}}{2^n-2} = \)
A. \( \frac{n+1}{n-2} \)
B. \( \frac{1}{8} \)
C. \( -\frac{1}{2} \)
D. 8

1.8 DEFG is a rhombus. DG = 17cm and EG = 30cm. Calculate the length of DF.

AAXM
A. 8 cm
B. 2 cm
C. 16 cm
D. 4 cm

1.9 If \( \angle AC = \angle B, \angle = 40^\circ \) and \( \angle_2 = 30^\circ \) in the figure, then \( \angle_1 = \)
A. 70°
B. 140°
C. 110°
D. 120°
1.10 The probability of picking an odd number from numbers 1 to 13 is

A. \( \frac{6}{13} \)
B. \( \frac{7}{13} \)
C. \( \frac{1}{13} \)
D. \( \frac{1}{2} \)

QUESTION 2

2.1 Simplify:

2.1.1 \((x + 3)^2 - (x + 1)(x - 4)\)

2.1.2 \(\frac{-4a^2b \times 6ab^4}{12a^4b^3}\)

2.1.3 \(\frac{6x^2a - 3bx^2}{bx - 2ax} + \frac{3x^2}{x}\)

2.1.4 \(\frac{1.4 \times 10^{-3} + 4.0 \times 10^{-4}}{3.0 \times 10^{-3} - 0.2 \times 10^{-2}}\) without using a calculator

2.1.5 \(2^n, 3^{-5}, 2^3 - n, 3^3\)

2.2 Factorise completely:

2.2.1 \(2a^3 - 8a^2 + 4a\)

2.2.2 \(3a^3 - 27a\)

2.2.3 \(3^3\)

2.3 Use prime numbers to determine the value of \(\sqrt[3]{3375}\).

2.4 Solve for \(x\):

2.4.1 \(2(2x - 4) = 4(4 - 2x) - 36\)

2.4.2 \(\frac{3(x+4) - (x-4)}{5^{2x}.5^x} = 2\)

2.4.3 \(5^{2x}.5^x = 1\)
QUESTION 3
3.1 Calculate the simple interest on R3 750 at 11% per annum for 3 years.

3.2 Irma invests R5 500 in a bank at 8,2% per annum compound interest for 4 years.

Calculate the total amount in Irma’s account after 4 years.

QUESTION 4
4.1 Write down the next two terms in the sequence
3; 8; 13; _______; _______;

4.2 Describe the pattern in QUESTION 4.1 in your own words.

4.3 Write down the general term of the given sequence in the form

\[ T_n = \]

4.4 Which term in the sequence is equal to 38?

QUESTION 5
5.1 Underline the word, number or equation in the bracket so that the statement
is correct in each of the following:

5.1.1 The \( x = 4 \) and \( x = -4 \) lines are (parallel/ perpendicular) to one another.

5.1.2 The equation of the horizontal line through the point \( P(3; -2) \) is
\( x = 3 / y = -2 \)

5.1.3 The gradient of the line defined by \( y - 4x + 5 = 0 \) is equal to \( -4 / 4 \).

5.1.4 This graphs of \( f \) represents a (linear/ non-linear) function.
5.2.1 On the same set of axes, draw and label the graphs defined by
\( y = -2x + 1 \) and \( y = x - 2 \). Use the given grid and clearly indicate points
Where the lines cut the axes and label your graphs. (8)

5.2.2 Show by calculation that \( T(1; -1) \) is the point of intersection of the drawn
graphs.

_________________________________________________________

_________________________________________________________

_________________________________________________________

(2)

QUESTION 6

GIVE A REASON for each of your statements in question 6.

6.1 In the given diagram:

\( \text{PQ} = \text{QR} = \text{RS} = \text{SP}, \text{QT} \perp \text{RT}, \text{QT} = RT = 6 \) cm and \( \text{P} = 90^\circ. \)

![Diagram of quadrilateral PQRS with points P, Q, R, S and triangle QRT]

6.1.1 What kind of a quadrilateral is PQRS? (1)

6.1.2 Calculate the length of QR. Leave your in the simplest surd form.

6.1.3 Calculate the area of PQRS. (1)

6.1.4 Calculate the area of \( \triangle QRT \). (3)

6.1.5 Hence, determine the area of PQTRS.
6.2 In the figure VW = 12 cm, XY = 4 cm, UV = 8 cm and XY \parallel UV.

6.2.1 Prove that \triangle XYW ||| \triangle UVW.

6.2.2 Calculate the length of YW.

6.3.1 State which triangle is congruent to \triangle ABC.

6.3.2

A and B are points on a circle with centre O. T is the mid-point of chord AB.

6.3.2 a) Prove that \triangle ATO \equiv \triangle BTO

6.3.2 b) Hence, prove that OT is perpendicular to AB.
QUESTION 7

7.1 A, B, C, D, E and F are the vertices of figure P.

7.1 Write down the co-ordinates of the image of D and E if figure P is translated 3 units to the right and 2 units down.

7.2 Write down the co-ordinates of the image of A’ and B’ if figure P is reflected in the Y-axis.

7.3 Figure P is reduced by a scale factor of 2. Calculate the perimeter of the new figure.

7.4 Complete: Area of figure P: Area of reduced figure =

QUESTION 8

8.1 A rectangular volleyball court DEFG is 9m wide and 18m long. Calculate the length of the diagonal FD correct to 2 decimal places.

8.2 The diameter of a cylinder is 6cm and its height is 20cm. Calculate:
8.2.1 The volume correct to 2 decimal places. 

8.2.2 The surface area of the cylinder correct to 2 decimal places. 

[9]

QUESTION 9

9.1 The following marks were obtained by a Grade 9 class for a Mathematics test Out of 50.

14 21 29 32 36 43
41 17 43 31 38 35
32 29 27 23 36 25
22 26 40 28 47 30
24 46 25 44 42 39

9.1.1 Complete the frequency table.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Tally marks</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 – 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21 – 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 – 40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 – 50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(4)

9.1.2 Draw a histogram to illustrate the data. 

(4)
9.2 Vuu collected the following data from her class about their shoe sizes.

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th></th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

9.2.1 Write down the range and the median for the boys.

9.2.2 Write down the mode (modal size) for the girls.

9.2.3 Calculate the mean for the girls.

Total [140]