Teacher Development Workshop

Senior Phase

Mathematics
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INTRODUCTION TO CAPS

This section is an introductory section to the Senior Phase CAPS. Use your Survival Guide to the Senior Phase CAPS as a resource.

Activity A:

Topics to be covered:
• Generic CAPS information
• Assessment
• Generic planning

Instructions:
• Participants should complete this activity in groups of 3.
• Use the Survival Guide to the Senior Phase CAPS as a resource to look up the answers.
• Read the statement / question and discuss the answer in your group.
• Write down the answer in the space that has been left for discussion notes.

The questions have been developed to stimulate discussion. The facilitator will discuss the questions at the end and clarify any uncertainties.

<table>
<thead>
<tr>
<th>Answer and Discussion Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What does CAPS stand for?</td>
</tr>
<tr>
<td>2. CAPS is not a new curriculum.</td>
</tr>
<tr>
<td>State whether the above statement is true or false.</td>
</tr>
<tr>
<td>3. The Senior Phase CAPS will be implemented in 2014.</td>
</tr>
<tr>
<td>State whether the above statement is true or false.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
</tbody>
</table>
| 4. | *There are no more Learning Areas in the Senior Phase.*  
State whether the above statement is true or false. |
| 5. | *The number of subjects in Senior Phase has decreased.*  
State whether the above statement is true or false. |
| 6. | *The number of assessments in the Senior Phase has increased.*  
State whether the above statement is true or false. |
| 7. | Which changes in the Senior Phase will have the greatest impact on planning?  
Hint: Look at the time allocation in the Survival Guide. |
MATHEMATICS INTRODUCTION TO CAPS

This section of the workshop focuses on Mathematics Grades 7-9. It provides a taste of what to expect in the Spot on, Platinum and Today Mathematics textbooks and how they support teaching CAPS.

Activity B: Mathematics textbooks

Topics to be covered:
- Generic CAPS information
- Criteria for choosing a textbook
- Timetabling and planning in Mathematics
- Assessment in Mathematics

Instructions:
- Study the list provided. The list consists of 9 criteria that are considered important to most teachers when choosing a textbook.
- Rank the importance of the criteria by placing numbers 1 to 9 in the spaces provided.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequencing of content according to the CAPS</td>
<td></td>
</tr>
<tr>
<td>Relevant and up to date content</td>
<td></td>
</tr>
<tr>
<td>Specific tasks required for Programme of Assessment e.g. tests,</td>
<td></td>
</tr>
<tr>
<td>projects etc.</td>
<td></td>
</tr>
<tr>
<td>Annual teaching plan according to the CAPS with term by term</td>
<td></td>
</tr>
<tr>
<td>overview</td>
<td></td>
</tr>
<tr>
<td>Teacher’s Guide which provides guidance and answers for Programme</td>
<td></td>
</tr>
<tr>
<td>of Assessment</td>
<td></td>
</tr>
<tr>
<td>Variety of revision activities</td>
<td></td>
</tr>
<tr>
<td>Diagrams and pictures to explain content</td>
<td></td>
</tr>
<tr>
<td>Remedial activities to support those learners that may need extra</td>
<td></td>
</tr>
<tr>
<td>support</td>
<td></td>
</tr>
<tr>
<td>Extension activities to support those learners that need expanded</td>
<td></td>
</tr>
<tr>
<td>opportunities</td>
<td></td>
</tr>
</tbody>
</table>
Activity C: Mathematics Senior Phase (Grade 7)

This activity is taken from a Grade 7 Topic in Mathematics. The examples are from Spot on Mathematics Grade 7, Platinum Mathematics Grade 7 and Mathematics Today Grade 7.

Topics to be covered:
• Grade 7 Mathematics
• Relevance and contextualization of examples and activities

Instructions:
• Participants should complete this activity in pairs.
• Study the activity taken from Spot on Mathematics Grade 7, Platinum Mathematics Grade 7 and Mathematics Today Grade 7.
• Answer the questions that follow.

Questions:
1. Mathematics should be relevant and understandable for all learners. Discuss the importance of using examples and activities that all Grade 7 learners can relate to.

2. Which Mathematics topic do these activities cover?

Annual Teaching Plan Grade 7 Mathematics

<table>
<thead>
<tr>
<th>Grade 7 Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Number, Operations and Relations</td>
</tr>
<tr>
<td>• Patterns, Functions and Algebra</td>
</tr>
<tr>
<td>• Space and Shape (Geometry)</td>
</tr>
<tr>
<td>• Measurement</td>
</tr>
<tr>
<td>• Data Handling</td>
</tr>
</tbody>
</table>
Solve problems

You need to be able to solve problems in contexts involving square numbers, cube numbers and numbers in exponential form.

Example
A box of eggs contains 6 eggs in each row and there are 6 rows. How many eggs are there in the box?

Answers
$6 \times 6 = 36$ eggs

EXERCISE 2.4

1. a) Write down all the square numbers from this list:
   $1 ; 33 ; 100 ; 64 ; 900 ; 46 ; 25 ; 63 ; 36$
   b) Write down all the cube numbers from this list:
   $1 ; 32 ; 100 ; 64 ; 46 ; 27 ; 8 ; 36$

2. Find the square root of 169 by trial and improvement.

3. Between which two natural numbers is the square root of 40?

4. On a chessboard there are eight rows of squares and eight columns of squares. Calculate how many squares there are on the board.

5. a) Thembiso places three boxes next to each other in three rows. How many boxes are there altogether?
   b) Val places four boxes next to each other in four rows. How many boxes are there altogether?
   c) Shariefa places five boxes next to each other in five rows. How many boxes are there altogether?

6. Joe has $2^4$ soccer cards and Sam has $2^5$ soccer cards. How many cards do they have altogether?

7. A number is the square root of 16 and also the square of 2. What is the number?

8. Which is greater: $4^2$ or $\sqrt{121}$?

Taken from Platinum Mathematics Grade 7 (page 23)
Square roots
Finding the square root of a number is the inverse operation of squaring a number. To find the square root ask yourself which number multiplied by itself will give you this number. For example, 4 is the square root of 16 because \(4 \times 4 = 16\). We use the square root sign to write “the square root of” like this: \(\sqrt{16} = 4\). In the same way, 10 is the square root of 100 because \(10 \times 10 = 100\). Therefore \(\sqrt{100} = 10\).

**Worked example**
What is the square root of 16?
**Answer**
\[
\sqrt{16} = \sqrt{4 \times 4} = \sqrt{4^2} = 4
\]

**Exercise 2**
Copy this table into your workbook and complete it without using a calculator:

<table>
<thead>
<tr>
<th>(\sqrt{1})</th>
<th>(\sqrt{1} \times 1)</th>
<th>(\sqrt{1^2})</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\sqrt{4})</td>
<td>(\sqrt{2} \times \sqrt{2})</td>
<td>(\sqrt{4^2})</td>
<td>2</td>
</tr>
<tr>
<td>(\sqrt{9})</td>
<td>(\sqrt{3} \times \sqrt{3})</td>
<td>(\sqrt{9^2})</td>
<td>3</td>
</tr>
<tr>
<td>(\sqrt{25})</td>
<td>(\sqrt{5} \times \sqrt{5})</td>
<td>(\sqrt{25^2})</td>
<td>5</td>
</tr>
<tr>
<td>(\sqrt{49})</td>
<td>(\sqrt{7} \times \sqrt{7})</td>
<td>(\sqrt{49^2})</td>
<td>7</td>
</tr>
<tr>
<td>(\sqrt{100})</td>
<td>(\sqrt{10} \times \sqrt{10})</td>
<td>(\sqrt{100^2})</td>
<td>10</td>
</tr>
</tbody>
</table>

**Cubes**
A cube is the number you get by multiplying a number by itself and then by itself again. For example: \(2 \times 2 \times 2 = 8\). We write \(2^3 = 8\). We say “2 cubed equals 8”.

**Did you know?**
A cube is a 3D (solid) shape with 6 square faces of sides and 12 edges. All the edges are the same length (s). Some numbers are also called cubes.

**Remember**
\[a^3 = a \times a \times a\]
Solving problems with exponents

Exponents are used in our daily lives to solve problems involving area and volume.

Area is the size of a flat surface. Area is measured in squares. A square metre (m\(^2\)) is the size of a square surface whose sides are 1 m long.

This surface has a length of 4 m and a breadth of 4 m.

We could add all the squares together, but a quick way of finding the area would be to multiply the length by the breadth: \(4 \times 4\) or \(4^2 = 16\) m\(^2\).

There are 16 squares metres.

Volume is the amount of space occupied by a solid, a liquid or a gas. Volume is measured in cubes. 1 cubic cm (1 cm\(^3\)) has a length of 1 cm, a breadth of 1 cm and a height of 1 cm.

This shape has a length of 3 cm, a breadth of 3 cm and a height of 3 cm. We could add up all the cubes, but a quick way to get the volume would be to multiply the length by the breadth by the height: \(3 \times 3 \times 3\) or \(3^3 = 27\) cm\(^3\).

There are 27 cubic cm.

Example 1

Phumi is buying instant lawn in squares with an area of 1 m\(^2\) each to cover her garden. If the garden measures 6 m by 6 m, how many squares of instant lawn does Phumi need to buy?

Solution

Area = \(length^2\)

= (6)\(^2\)

= 36 m\(^2\)

So Phumi needs to buy 36 squares of instant lawn, with a total area of 36 m\(^2\).

Activity 2.4b Solving problems with exponents

1. a) Mrs Lehola wants to put a carpet in her son’s bedroom which is a square room with a length of 5 m. How many m\(^2\) of carpeting does she need to buy? How much will it cost if 1 m\(^2\) of carpeting costs R70?
   b) Mrs Lehola’s farmyard in Mpumalanga is 600 m long and 600 m wide. Work out the area of her farm in square metres.

2. a) A box of biscuits has a length of 10cm, a breadth of 10 cm and a height of 10 cm. Work out the volume of the box.
   b) Mr Radebe has a cube bathroom with a height of 3 m. What is the volume of his bathroom?
   c) A large toy dice has a volume of 216 cm\(^3\). Work out the length of the side of the die.
Activity D: Mathematics Senior Phase (Grade 8)

This activity is taken from a Grade 8 topic in Mathematics. These examples are from Spot on Mathematics Grade 8, Platinum Mathematics Grade 8 and Mathematics Today Grade 8.

Topics to be covered:

- Grade 8 Mathematics
- Repetition and practicing of calculations

Instructions:

- Study the extracts taken from Spot on Mathematics Grade 8, Platinum Mathematics Grade 8 and Mathematics Today Grade 8.
- Discuss and answer the questions that follow.

Questions:

The practical activities in this topic require certain skills from the teachers.

1. Discuss the importance of repetition and practice of calculations by learners.

2. Discuss how much homework is necessary and how much of the work should be completed in the classroom.

3. Which Mathematics topic does this activity cover?

Annual Teaching Plan Grade 8 Mathematics

<table>
<thead>
<tr>
<th>Grade 8 Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number, Operations and Relations</td>
</tr>
<tr>
<td>Patterns, Functions and Algebra</td>
</tr>
<tr>
<td>Space and Shape (Geometry)</td>
</tr>
<tr>
<td>Measurement</td>
</tr>
<tr>
<td>Data Handling</td>
</tr>
</tbody>
</table>
1. Write an equation for each of the following problems and solve for the unknown number.
   a) When I divide a number by 9, the answer is 4. (2)
   b) If I add 48 to a certain number, I get 87. (2)
   c) When I multiply a certain number by 15, the answer is 75. (2)
   d) When I subtract 63 from a certain number, the answer is 27. (2)

2. Thandi is 6 years older than Maleni. Maleni is 11 years old. How old is Thandi? (2)

3. What number am I thinking of? Write an equation and solve for the required number.
   a) When I add 4 and then divide by 2, the answer is 10. (2)
   b) If you subtract 5 and divide by 4, you get 3. (2)
   c) If you double the number and then add 15, you get 21. (2)

4. Find three consecutive integers that add up to 45. (2)

5. Yusuf has a piece of wood that is 126 cm long. He wants to make four shelves with lengths that are consecutive integers. How long will the shelves be? (2)

6. Two litres of juice are poured into 6 litres of water. What fraction of the drink is juice? (2)

7. Mandla promised to give his mother \( \frac{2}{9} \) of his salary to help with the monthly costs. If he earns R\(3240\) per month, how much does he give her? (2)

8. Ben needs to pack 7 680 apples into boxes that each contain 24 apples. How many boxes will he need? (2)

9. In a scalene triangle ABC, AB = 21.3 cm; BC = 19.2 cm and AC = 20.4 cm.

<table>
<thead>
<tr>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

Write down an equation for and calculate the perimeter of the triangle. (2)

10. Write down an equation to calculate the area of a triangle with base = 10 cm and perpendicular height = 5 cm. Then find the area of the triangle. (2)

<table>
<thead>
<tr>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
</tr>
<tr>
<td>5 cm</td>
</tr>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

Total marks: 30

Taken from Platinum Mathematics Grade 8 (page 67)
EXERCISE 22.1

1. a) Write the pairs of coordinates from the tables below in the form (x;y).

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>y</td>
<td>x</td>
<td>y</td>
<td>x</td>
</tr>
<tr>
<td>-4</td>
<td>8</td>
<td>-3</td>
<td>9</td>
<td>-8</td>
</tr>
<tr>
<td>-2</td>
<td>4</td>
<td>-2</td>
<td>4</td>
<td>-4</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>-4</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

b)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>y</td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td>-3</td>
<td>9</td>
<td>-3</td>
<td>9</td>
</tr>
<tr>
<td>-2</td>
<td>4</td>
<td>-1</td>
<td>8</td>
</tr>
<tr>
<td>0</td>
<td>14</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

2. a) Complete this table by filling in the x and y values for the equation \( y = -3x + 2 \)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>y</td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td>-4</td>
<td>14</td>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>2</td>
<td>14</td>
</tr>
</tbody>
</table>

b) Complete this table by filling in the x and y values for the equation \( y = x^2 - 1 \)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>y</td>
<td>x</td>
<td>y</td>
</tr>
<tr>
<td>-3</td>
<td>8</td>
<td>-3</td>
<td>8</td>
</tr>
<tr>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

3. Solve these equations by inspection.
   a) \( m + 5 = 9 \)  b) \( 15 - x = 7 \)  c) \( 4y = 32 \)  d) \( x - 6 = -2 \)

4. Solve these equations for x and check your solutions.
   a) \( 5x + 8 = 28 \)  b) \( 24 - 3x = 9 \)
   c) \( 48 - 8x = 16 \)  d) \( 6x + 22 = 64 \)

5. Themba and Mpho together have 127 stamps. Themba has four more than twice as many stamps as Mpho. If Mpho has x stamps, then Themba has \( 2x + 4 \) stamps. How many stamps do they each have?

6. In right-angled triangle GHI, GI = 15 cm and GH = 2 cm.
   a) Calculate length HI.
   b) Determine the perimeter of triangle GHI.
   c) Calculate the area of the triangle.

7. A right-angled triangle has sides 5 cm, 13 cm and x cm.
   a) Solve for x.
   b) Calculate the perimeter of the triangle.
   c) Work out the area of the triangle.

Challenge

If \( \frac{1}{a} + \frac{3}{2} = \frac{5}{6} \), find the value of a.
Revision Test  Topic 7

Know your basics

1. Solve the following equations by inspection and then check your answers:
   1.1 \( 2 - a = 10 \)
   1.2 \( 5 - b = -11 \)
   1.3 \( c + 7 = -3 \)
   1.4 \( 2a + 7 = 13 \)
   1.5 \( 2x + 7 = 3 \)
   1.6 \( 3x^3 = 24 \)
   1.7 \( \frac{1}{3}(x + 7) = 15 \)
   1.8 \( 3^x = 81 \)
   1.9 \( 2^x + 1 = 9 \) (18)

2. Solve the following equations by inspection:
   2.1 \( -\frac{3}{5}x = 15 \)
   2.2 \( 6 - 3x = 10 \)
   2.3 \( 3x + 4 = 5x + 8 \)
   2.4 \( 5x - 7 = 7x - 13 \)
   2.5 \( a^3 = 3a^2 \)
   2.6 \( a^2 = -6a \) (12)

Check your understanding

3. Calculate the value of \( y \) in the following. Substitute the given values of the variables:
   3.1 \( y = 2x^2 + 3 \) if \( x = -2 \)
   3.2 \( y = 2^x + 2x + x^2 \) if \( x = 3 \) (4)

4. The sequence 2; 9; 28; ... is given. Claudia looks at the sequence and writes down the equation \( n^3 + 1 = 126 \).
   4.1 What does \( n^3 + 1 \) mean in this context?
   4.2 What does the number 126 represent?
   4.3 Solve the equation and explain what your answer means. (4)

5. The sum of the volumes of two containers is equal to \( v + v + 10 \). Zenobia measures the containers and writes down the equation \( 2v + 10 = 120 \).
   5.1 How much bigger is the volume of the bigger container than that of the smaller container?
   5.2 What is the sum of the volumes of the two containers?
   5.3 Solve the equation and explain what your answer means. (4)

Challenge yourself

6. The length of a rectangle is 4 times its width. The rectangle has a width of \( x \) cm.
   6.1 Write an algebraic expression for the length of the rectangle.
   6.2 The area of the rectangle is 64 cm\(^2\). Write an equation for the area and solve it.
   6.3 Write down the measurements of the rectangle. (6)

7. Lerato decides to save a fixed amount of R900 each month. The bank uses the following formula to determine the value of her investment (\( F \)) after \( n \) months: \( F = \frac{900(1,015^n - 1)}{0,015} \). Calculate the value of her investment after 6 months. (4)

**TOTAL: [52]**

Taken from Mathematics  Today Grade 8 (page 87)
Activity 7.1  Writing and interpreting equations and formulae

20 minutes

1. Write an equation to represent each of these sentences:
   a) Three less than a number is twelve.
   b) A number divided by eight is seven.
   c) Twice a number is increased by the number and the answer is ninety.
   d) If four is subtracted from twice a number, the result is fourteen.
   e) When six is added to four times a number the answer is fifty.
   f) Twelve decreased by double a number is ten.
   g) The sum of a number and nine is multiplied by negative two to give negative eight.

2. A can of Coke costs Rx. You buy three cans of Coke and receive R2,20 change from R10. Write an equation to describe this situation.

3. Tickets to the movies for four adults cost R148. Write an equation to show how to find the cost for one adult.

4. One metre of material costs Rx. Write an equation to show that 8 metres cost R116.

5. If you visit Malawi, you will get m Malawian kwacha for each rand you take. Write an equation to show that if you have R550, you will get 11 550 kwacha.

6. A piece of rope 8 m long is cut up into x equal pieces. If each piece is 1/2 m long, write an equation which you could use to find the number of pieces.

7. Nthabeleng received R2 100 after a week’s work during the holidays. Write an equation to represent how much she earned each day (d), if she worked every day in the week.

8. The formula $C = 5t$ can be used to find the cost of a certain number of train tickets, where $C$ represents total cost, in rands, and $t$ represents the number of tickets. What does the 5 represent?

9. The formula used to show the relationship between force, mass and acceleration in physics is $F = ma$. For a falling object, acceleration is 10 m$^2$/s. Write an equation you could use to find the mass of the object if the force acting on it is 80 newtons.

10. The formula which connects speed, distance and time is $S = \frac{D}{T}$. If a car is travelling at a speed of 120 km/h, and travels for 3 hours, write an equation you could use to find the distance travelled.

11. To calculate cardiac output (CO), doctors multiply the stroke volume (SV) of the patient by their heart rate (HR).
   a) Write a formula for cardiac output.
   b) If a patient has a cardiac output of 5.3 litres and a heart rate of 70 beats per minute, write an equation which you could use to find their stroke volume.
Activity 9.2  Solving equations using additive and multiplicative inverses

20 minutes

1. Solve these equations using additive and multiplicative inverses:
   a) $5x = -45$
   b) $x - 4 = 19$
   c) $x + 5 = 22$
   d) $-3x = 36$
   e) $32 - x = 5$
   f) $-6x = -72$
   g) $x - 14 = -3$
   h) $x + 9 = -15$
   i) $-9x = 54$

2. Solve these equations and show your working out:
   a) $2x + 1 = 11$
   b) $3x - 12 = 15$
   c) $4x - 3 = 5$
   d) $5x + 9 = 19$
   e) $7x + 3 = -25$
   f) $2x - 5 = 23$
   g) $9x - 7 = 38$
   h) $8x + 1 = -71$
   i) $-5x - 12 = 18$
   j) $11x - 2 = -35$
   k) $-9x - 4 = -40$
   l) $38 - 7x = -11$

3. Solve these equations with variables on both sides:
   a) $3x - 2 = x + 8$
   b) $7x + 9 = 3x - 7$
   c) $2x - 5 = x - 11$
   d) $8x - 6 = -2x + 14$
   e) $3 + 2x = 24 - 5x$
   f) $-3x + 12 = -8x - 3$
   g) $-9x - 4 = -3x + 20$
   h) $2x + 18 = 5x - 9$
   i) $-10x - 7 = -6x - 35$

4. Solve these equations by first applying the distributive law:
   a) $3(2x + 5) = 27$
   b) $4(x - 1) = 16$
   c) $10(y + 9) = 20$
   d) $2(3x + 1) = -10$
   e) $3(b - 11) = -15$
   f) $6(x - 5) = 18$
   g) $4(2a - 1) = 36$
   h) $7(2x + 5) = -7$
   i) $4(2b - 1) = -28$

5. How old am I if 300 reduced by 3 times my age is 72?

6. The sum of a number and 9 is multiplied by $-2$ and the answer is $-8$. Find the number.

7. Seven times a number is equal to 12 more than 3 times the number. Find the number.

8. When exercising, your pulse rate should not exceed a certain limit, depending on your age. This maximum rate is represented by the equation $0.8(220 - a)$, where $a$ represents your age.
   a) What is the maximum pulse rate for a 13-year-old?
   b) Thabiso's maximum pulse rate is 160 beats per minute. How old is he?

9. In a magic square, the rows, columns and diagonals add to the same number. Work out the values of $a$, $b$ and $c$ in this magic square:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>$a$</td>
<td>$b$</td>
</tr>
<tr>
<td>5</td>
<td>$c$</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>4</td>
</tr>
</tbody>
</table>

Taken from Spot on Mathematics Grade 8 (page 113)
**Activity E: Mathematics Senior Phase (Grade 9)**

This activity is taken from a Grade 9 Mathematics topic. These examples are from Spot on Mathematics Grade 9, Platinum Mathematics Grade 9 and Mathematics Today Grade 9.

**Topics to be covered:**
- Grade 9 Mathematics
- Formal Assessment Tasks / Annual National Assessments

**Instructions:**
- Study the assessment tasks taken from Spot on Mathematics Grade 9, Platinum Mathematics Grade 9 and Mathematics Today Grade 9.
- Discuss and answer the questions that follow.

**Questions:**

Spot on Mathematics, Platinum Mathematics and Mathematics Today Grade 9 provide the Formal Assessment Tasks for the learners. There are certain areas that the learners struggle with more than others.

1. Discuss teaching strategies that could be used in the classroom to assist learners to answer the questions taken from the Annual National Assessments.

2. Discuss how the exercises taken from Spot on Mathematics, Platinum Mathematics and Mathematics Today Grade 9 will assist the learners in achieving a better Annual National Assessment Result.

---

**Annual Teaching Plan Grade 9 Mathematics**

<table>
<thead>
<tr>
<th>Grade 9 Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number, Operations and Relations</td>
</tr>
<tr>
<td>Patterns, Functions and Algebra</td>
</tr>
<tr>
<td>Space and Shape (Geometry)</td>
</tr>
<tr>
<td>Measurement</td>
</tr>
<tr>
<td>Data Handling</td>
</tr>
</tbody>
</table>
Taken from the Annual National Assessment Grade 9 Mathematics Exemplar Test 2012 (page 15)

**Example**

Determine the \(x\)- and \(y\)-intercepts of the equation \(y = 2x + 4\) by completing the following table:

<table>
<thead>
<tr>
<th>(x)-intercept</th>
<th>(y)-intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x)</td>
<td>0</td>
</tr>
<tr>
<td>(y)</td>
<td>0</td>
</tr>
</tbody>
</table>

Now, using the coordinates from the table, plot the graph on a Cartesian plane.

**Answers**

1. We use the same method as in the previous example:

   For \(y = 0\):
   
   \[
   0 = 2x + 4 \\
   -4 = 2x \\
   \therefore x = -2
   \]

   For \(x = 0\):
   
   \[
   y = 2(0) + 4 \\
   \therefore y = 4
   \]

   The completed table will then be:

<table>
<thead>
<tr>
<th>(x)-intercept</th>
<th>(y)-intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x)</td>
<td>-2</td>
</tr>
<tr>
<td>(y)</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(x)-intercept</th>
<th>(y)-intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>0</td>
</tr>
<tr>
<td>(y)</td>
<td>4</td>
</tr>
</tbody>
</table>

2. Notice that on the axes we only write the one coordinate. For example, \(-2\) on the \(x\)-axis is the coordinate \((-2; 0)\) and 4 on the \(y\)-axis is the coordinate \((0; 4)\).

Taken from Platinum Mathematics Grade 9 (page 199)
Unit 7 Interpreting graphs: the gradient of a linear graph

The gradient or slope of a line is a measure of the steepness of the line. The word gradient comes from the French word for mountain. The gradient of a straight line is expressed as \( M \).

When the \( m \) value for a function is positive, the graph is an increasing function. However, if the \( m \) value is negative the result is a decreasing function.

Determining the gradient between two points:
coordinates \((x_1; y_1)\) and \((x_2; y_2)\). Use the formula: \( m = \frac{y_2 - y_1}{x_2 - x_1} \) for

The gradient between two points A and B is \( M_{AB} \).

Example

Determine the gradient of the line CD where the coordinates of C are \((4; -9)\) and the coordinates of D are \((2; -5)\).

Solution

Substitute the coordinates of C and D into the equation:

\[
m = \frac{y_2 - y_1}{x_2 - x_1}
\]

\[
m = \frac{-5 - (-9)}{2 - 4}
\]

\[
m = -\frac{5 + 9}{2 - 4}
\]

In all linear graphs, the rate of change, or gradient, is constant.

Looking at the graph \( y = -2x + 1 \), you can see that \( y \) changes by \(-2\) for every increase of 1 unit in \( x \).

AB is change in \( y \) that is 2 units down.

BC is change in \( x \) that is 1 unit across.

\[
\therefore m = \frac{AB}{BC}
\]

\[
m = \frac{-2}{1}
\]

\[
m = -2
\]

This means that the slope or gradient of the graph \( y = -2x + 1 \) is \(-2\).

The negative sign tells us that as \( x \) increases \( y \) decreases. This is known as a decreasing function.

When the gradient is positive, then as \( x \) increases, \( y \) increases. This is known as an increasing function.

All linear graphs can be written in the form \( y = mx + c \).

It is useful to write linear graphs in this way because the \( m \) value represents the gradient of the line and the \( c \) value represents the \( y \)-intercept. The higher the value of \( m \), the steeper the graph is.
If an equation is not in the form \( y = mx + c \), rewrite the equation in the form \( y = mx + c \), then determine the \( y \)-intercept and gradient.

**Example**

Determine the gradient and \( y \)-intercept of the graph

\[ y = -2x - 5. \]

**Solution**

Gradient, \( m = -2 \)

\( y \)-intercept, \( c = -5. \)

**Example**

Determine the gradient and \( y \)-intercept of \( 3y = 6x + 3 \)

**Solution**

\[ 3y = 6x + 3 \]

\[ y = 2x + 1 \]

Gradient \( m = 2 \)

\( y \)-intercept \( c = +1 \)

**Example**

Determine the gradient and \( y \)-intercept of the graph \( y + 4x = 3 \).

**Solution**

Rewrite \( y + 4x = 3 \) in the form \( y = mx + c \).

\[ y + 4x = 3 \] (subtract \( 2x \) from both sides of the equation)

\[ y = -4x + 3 \]

Gradient is \(-4\)

\( y \)-intercept \( c = +3 \).

**Activity 5.7 The gradient of a linear graph**

1. Find the gradient of the graphs.
   a) ![Graph A](image1)
   b) ![Graph B](image2)

Taken from Spot on Mathematics Grade 9 (page 177)
QUESTION 9

9. Answer the following questions.

9.1 The data set contains the heights of a class of grade 9 learners.

<table>
<thead>
<tr>
<th>140</th>
<th>149</th>
<th>152</th>
<th>159</th>
<th>153</th>
<th>143</th>
<th>161</th>
<th>152</th>
<th>145</th>
<th>162</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>158</td>
<td>154</td>
<td>160</td>
<td>164</td>
<td>165</td>
<td>165</td>
<td>155</td>
<td>167</td>
<td>153</td>
</tr>
<tr>
<td>148</td>
<td>166</td>
<td>144</td>
<td>160</td>
<td>150</td>
<td>155</td>
<td>141</td>
<td>162</td>
<td>161</td>
<td>151</td>
</tr>
<tr>
<td>159</td>
<td>163</td>
<td>170</td>
<td>153</td>
<td>172</td>
<td>158</td>
<td>174</td>
<td>166</td>
<td>164</td>
<td>163</td>
</tr>
</tbody>
</table>

9.1.1 Complete the table.

<table>
<thead>
<tr>
<th>Class-interval</th>
<th>Tally marks</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>140—144</td>
<td></td>
<td></td>
</tr>
<tr>
<td>145—149</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150—154</td>
<td></td>
<td></td>
</tr>
<tr>
<td>155—159</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160—164</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165—169</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170—174</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(14)

9.2 Determine:

9.2.1 the range of the heights.

(2)

Taken from the Annual National Assessment Grade 9 Mathematics Exemplar Test 2012 (page 24)
Organising and summarising data
Once your questionnaires have been filled in, you need a way in which to organise the data you have obtained.

Frequency tables
Frequency tables divide big data sets into groups so that they can be understood more readily. Such groups are called intervals. The total number in each group is called the frequency for that group.

Worked example
The table gives a list of the percentages that 40 learners scored in a test. Use tally marks to create a frequency table to display the data. Use the intervals 0–9, 10–19, 20–29 and so on.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Tally</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 &lt; x ≤ 10</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>10 &lt; x ≤ 20</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>20 &lt; x ≤ 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 &lt; x ≤ 40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 &lt; x ≤ 50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 &lt; x ≤ 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 &lt; x ≤ 70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 &lt; x ≤ 80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 &lt; x ≤ 90</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>90 &lt; x ≤ 100</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

"Marks in the 70s" is the group with the highest frequency.
Stem-and-leaf graphs
Another method of representing data is stem-and-leaf graphs. Unlike frequency tally tables, this type of graph shows every value in the data set. In a tally table the individual values are hidden.

Worked example
The following answers were given when Grade 9 learners were asked how many hours of studying they planned to do in the week before final exams: 17; 51; 25; 37; 35; 45; 19; 22; 38; 44; 32; 26; 16; 19; 24; 53; 46; 27; 42; 23; 21; 33; 25; 19. Display this data in a stem-and-leaf diagram.

Solution

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6 7 9 9 9</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>1 2 3 4 5 5 6 7</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>2 3 5 7 8</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>2 4 5 6</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>1 3</td>
<td>2</td>
</tr>
</tbody>
</table>

Key: 1 | 6 = 16 hours

You could also have organised this data into a frequency table as shown above. (As with the tally table, you lose information on individual data items.)

Remember
You learnt about stem-and-leaf graphs in Grades 7 and 8. The first digits are listed vertically from smallest to highest in a “stem” on the left. The last digits are written horizontally next to their first digits, to form the “leaves” of the diagram.
How Platinum, Spot On and Today Mathematics books can help your teaching

At the beginning of the workshop, you were required to rank the importance of the criteria that are considered important to most teachers when choosing a textbook.

The Platinum, Spot On and Today Mathematics books cover all of these criteria.

**Sequencing of content according to the CAPS**

The books follow the exact sequence of the CAPS. Teachers are able to follow the sequence of the textbook and be confident that they have covered everything required by CAPS and in the correct order.

**Relevant and up to date content**

The authors have ensured that the latest CAPS requirements are covered as well as the latest content required by the subject. Assessment tasks are all relevant to the ages of the learners.

**Specific tasks required for Programme of Assessment e.g. tests, projects etc.**

The books include all the required tasks for the Programme of Assessment and the Teacher’s Guide includes all of the guidelines and answers. These can also be used for revision, extension and expanded opportunities.

**Annual teaching plan according to the CAPS with term-by-term overview**

The books follow the exact sequence of the CAPS. They also provide a term planning tool which assists in annual and quarterly planning.

**Teacher’s Guide which provides guidance and answers for Programme of Assessment**

The books have a Teacher’s Guide that provides guidelines on how to use the assessments and how to mark them. Rubrics, memoranda and checklists are also provided where appropriate.
**Variety of revision activities**

The books provide many different activities, which test knowledge and understanding on a variety of levels. Teachers are able to see the learners’ understanding of the content matter straight away. These activities are very practical and assess the content in the CAPS.

**Diagrams and pictures to explain content**

The books have many supporting diagrams and pictures to support the content. They are colourful with eye-catching photographs.

**Remedial activities to support those learners that may need extra support**

The books have many activities in the chapters as well as revision sections at the end of every topic. The Platinum Mathematics also has remedial worksheets, which accompany the Teacher’s Guide.

**Extension activities to support those learners that need expanded opportunities**

The books have many activities in the chapters as well as revision sections at the end of every topic. The Platinum Mathematics also has extension worksheets, which accompany the Teacher’s Guide.

<table>
<thead>
<tr>
<th><strong>Spot On components</strong></th>
<th><strong>Platinum components</strong></th>
<th><strong>Today components</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Learner’s Book</td>
<td>• Learner’s Book</td>
<td>• Learner’s Book</td>
</tr>
<tr>
<td>• Teacher’s Guide with</td>
<td>• Teacher’s Guide with</td>
<td>• Teacher’s Guide</td>
</tr>
<tr>
<td>16 free full-colour</td>
<td>free book of</td>
<td>with free book of</td>
</tr>
<tr>
<td>posters</td>
<td>photocopiable</td>
<td>photocopiable</td>
</tr>
<tr>
<td></td>
<td>worksheets for</td>
<td>worksheets</td>
</tr>
<tr>
<td></td>
<td>remediation and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>extension</td>
<td></td>
</tr>
</tbody>
</table>