SUBJECT and GRADE	Physical Sciences Grade 12
TERM 1	*Week 4*
TOPIC	Vertical Projectile Motion
AIMS OF LESSON	**Vertical Projectile Motion in One Dimension (1D)** • Explain what is meant by a projectile, i.e. an object upon which the only force acting is the force of gravity. • Use equations of motion to determine the position, velocity and displacement of a projectile at any given time. • Sketch position versus time (x vs. t), velocity versus time (v vs. t) and acceleration versus time (a vs. t) graphs for: ➢ A free-falling object ➢ An object thrown vertically upwards ➢ An object thrown vertically downwards ➢ Bouncing objects (restricted to balls) ➢ For a given x vs. t, v vs. t or a vs. t graph, determine: o Position o Displacement o Velocity or acceleration at any time t • For a given x vs. t, v vs. t or a vs. t graph, describe the motion of the object: ➢ Bouncing ➢ Thrown vertically upwards ➢ Thrown vertically downward

RESOURCES	***Paper based resources***	***Digital resources***
	• *Your text books* • *Mind the Gap (p. 50-67)*	*WCED ePortal – Revision of grade 10 & 11:* • Revise the content on Vectors and Scalars done in grade 10, Term 3 via the following link: https://wcedeportal.co.za/eresource/150506 • Revise the content on Motion in one dimension done in grade 10, Term 3 via the following link: • *https://wcedeportal.co.za/eresource/156951* • Revise the content on Instantaneous speed and velocity and the equations of motion done in grade 10, Term 3 via the following link: • *https://wcedeportal.co.za/eresource/160511* • Revise the content on Vectors in two dimensions done in grade 11, Term 1 via the following links: *https://wcedeportal.co.za/eresource/184511* *https://wcedeportal.co.za/eresource/180976* *Mind The Gap Textbook – Vertical Projectile Motion (p. 50 – 67):* *https://drive.google.com/file/d/1umhFy4qgE2b-HUmu3GyeEyidJWHQ12F7/view?usp=sharing* *Gr 12 Physics workbook: (p. 48 – 71)* *https://drive.google.com/file/d/1--q43rYHR2XxTfNVSkV8C-6xm1XiQbfZ/view?usp=sharing* *Grade 12 Physics Teacher's Guide (p. 48 – 90).* *https://drive.google.com/file/d/1xpgfUcJO94JqMi6wPhY5CLZSWDlpAlnJ/view?usp=sharing* *Science Clinic textbook (p. 6 – 8)* *https://drive.google.com/file/d/0B4GLHicOS92UUHlQVk5yZWRqbDQ/view?usp=sharing*

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<tr><td></td><td></td><td>• www.wcedeportal.co.za
• Hey Science App for Physical Sciences
https://wcedeportal.co.za/eresource/28171
• Previous NSC Examination Papers
https://wcedonline.westerncape.gov.za/documents/NSC-results/Papers-memos.html
• You Tube videos</td></tr>
<tr><td>INTRODUCTION</td><td colspan="2">In order to grasp the new content on Vertical Projectile Movement, you must be able to apply the following concepts taught in grades 10 & 11:

• Revise the content on Vectors and Scalars done in grade 10, Term 3 via the following link: https://wcedeportal.co.za/eresource/150506
• Revise the content on Motion in one dimension done in grade 10, Term 3 via the following link: https://wcedeportal.co.za/eresource/156951
• Revise the content on instantaneous speed and velocity and the equations of motion done in grade 10, Term 3 via the following link: https://wcedeportal.co.za/eresource/160511
• Ensure that you know what each symbol in the following equation of motion represents, know the measuring units of each and ensure that you will be able to apply these equations of motion in free fall problem.

MOTION/BEWEGING
<table><tr><td>$v_f = v_i + a\Delta t$</td><td>$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$ or/of $\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$</td></tr><tr><td>$v_f^2 = v_i^2 + 2a\Delta x$ or/of $v_f^2 = v_i^2 + 2a\Delta y$</td><td>$\Delta x = \left(\frac{v_i + v_f}{2}\right)\Delta t$ or/of $\Delta y = \left(\frac{v_i + v_f}{2}\right)\Delta t$</td></tr></table>• Revise the content on Vectors in Two Dimensions done in grade 11, Term 1 via the following links: https://wcedeportal.co.za/eresource/184511 https://wcedeportal.co.za/eresource/180976</td></tr>
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CONCEPTS AND SKILLS

Vertical Projectile Motion in One Dimension (1D)

Work through the following worked examples of free fall (Activities 1 to 6) that you should be able to solve on p. 50 – 67 in the Mind the Gap textbook. An object:

- dropped from a certain height i.e. an object falling freely from rest;
- projected (thrown) upwards and then falls back to the same level as the original level;
- projected upwards and then falls back to a level below the original level;
- a falling object that bounces on a surface.

LINK - Mind the gap textbook: (p. 50-67)
https://drive.google.com/file/d/1umhFy4qgE2b-HUmu3GyeEyidJWHQ12F7/view?usp=sharing

Ensure that you know and understand the following terms, definitions and laws:

MECHANICS: VERTICAL PROJECTILE MOTION	
1-D motion	One-dimensional motion/Linear motion/Motion in one line.
Acceleration	The rate of change of velocity. Symbol: a Unit: meters per second squared ($m \cdot s^{-2}$)
Gravitational acceleration (g)	The acceleration of a body due to the force of attraction of the earth.
Displacement	Change in position. Symbol: Δx (horizontal displacement) or Δy (vertical displacement) Unit: meters (m)
Free fall	The type of motion in which the only significant vertical force acting on the body is the body's weight.
Gravitational force	A force of attraction of one body on another due to their masses.
Position	Where an object is relative to a reference point. Symbol: x (horizontal position) or y (vertical position) Unit: meters (m)
Projectile	An object in free fall.
Velocity	The rate of change of position. Symbol: v Unit: meters per second ($m \cdot s^{-1}$)

ACTIVITIES/ ASSESSMENT	*Work through the examination questions in the Gr 12 Physics workbook: (p. 48 – 71)* *https://drive.google.com/file/d/1--q43rYHR2XxTfNVSkV8C-6xm1XiQbfZ/view?usp=sharing* *The answer to the questions above is in the teacher's guide (p. 48 – 90). Attempt to solve the problems before you have a look at the answers:* *https://drive.google.com/file/d/1xpgfUcJO94JqMi6wPhY5CLZSWDlpAlnJ/view?usp=sharing*
CONSOLI-DATION	*Work through the summarized worked examples on p. 6 - 8 of the Science Clinic textbook via the following link:* *https://drive.google.com/file/d/0B4GLHicOS92UUHlQVk5yZWRqbDQ/view?usp=sharing*
VALUES	The kinematic equations form the base for all calculations involving movement of bodies. It is applied to moving objects in space (like spacecraft, satellites), also to aircraft, firearms etc. Another application is in the design of machine components. It is common to use **kinematics** analysis to determine the (unknown) speed of an object, that is connected to another object moving at a known speed.