Maths

Higher Level Functions and quadratic graphs

It is not necessary to carry out all the activities contained in this unit. Please see *Teachers' Notes* for explanations, additional activities, and tips and suggestions.

Theme	**Higher Level Functions and quadratic graphs**
Levels	**A1 – B1**
Language focus	Key vocabulary, word identification, sentence structure, extracting information from text, grammar.
Learning focus	Using Maths textbooks and accessing curriculum content and learning activities.
Activity types	Matching, word identification, structuring sentences and text, cloze, multiple choice, reading comprehension, categorising vocabulary, recording learning, developing a learning resource.
Acknowledgement	**Extracts from *Shortcuts to Success. Maths. Junior Certificate Ordinary Level*. Mark Halpin.** Gill & Macmillan. We gratefully acknowledge Gill & Macmillan for the right to reproduce text in some of these activities.
Learning Record	A copy of the Learning Record should be distributed to each student. Students should: 1. Write the subject and topic on the record. 2. Tick off/date the different statements as they complete activities. 3. Keep the record in their files along with the work produced for this unit. 4. Use this material to support mainstream subject learning.

Making the best use of these units

- **At the beginning of the class,** make sure that students understand **what** they are doing and **why**. *'We are doing the exercise on page (12) to help you to remember key words / to help your writing skills / to help with grammar'* etc.

- You can create your **personal teaching resource** by printing these units in full and filing them by subject in a large ring binder.

- **Encourage students** to:

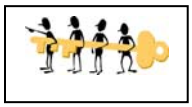
    - Bring the relevant **subject textbooks** to language support class. It does not matter if they have different textbooks as the activities in these units refer to vocabulary and other items that will be found in all subject textbooks. These units are based on curriculum materials.
    - Take some **responsibility for their own learning** programmes by:

Developing a **personal dictionary** for different subjects, topics, and other categories of language, on an on-going basis. This prompt is a reminder.

Recording what they have learnt on the ***Learning Record,*** which should be distributed at the start of each unit.

Keeping their own **files** with good examples of the work produced in language support for different subjects and topics. This file will be an invaluable **learning resource** in supporting mainstream learning.

- Don't forget that many of the activities in these units are suitable as **homework** tasks, for **self-study,** or for use in the **subject classroom** with the agreement of the subject teacher.



Indicates that answers may be found at the end of the unit.

Keywords

The list of keywords for this unit is as follows:

Nouns
answer
axis
domain
equation
formula
function
graph
ground level
height
inequality/inequalities
intersection
kilometre (km)
line
metre (m)
missile
point
problem
quadratic graph
range
seconds
symmetry
time
type
value

Verbs
to amount to
to calculate
to check
to complete
to contain
to correspond
to evaluate
to express
to find
to give
to graph
to represent
to solve
to use

Adjectives
above
below
both
complete
coordinate
corresponding
lowest
maximum
minimum
quadratic

Other
hence = so = therefore
problem-solving = to solve a problem

Symbols
= equals
f(x) function of x
≤ less than or equal to
< less than
≥ greater than or equal to
> greater than
→ goes to

Vocabulary file 1

This activity may be done in language support class or in the mainstream subject classroom.

Word	Meaning	Word in my language
axis		
domain		
equation		
intersection		
range		
symmetry		
type		

Get your teacher to check this and then file it in your folder so you can use it in the future.

Vocabulary file 2

This activity may be done in language support class or in the mainstream subject classroom.

Word	Meaning	Word in my language
corresponding		
maximum		
minimum		
coordinate		
to calculate		
to represent		
to solve		

Get your teacher to check this and then file it in your folder so you can use it in the future.

NAME: _____ DATE:_____

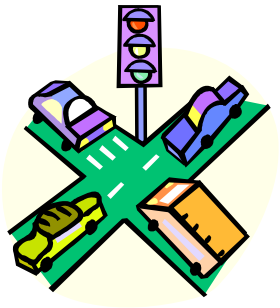
MATHS: Higher Level Functions and quadratic graphs

Level: A1
Type of activity: pairs or individual

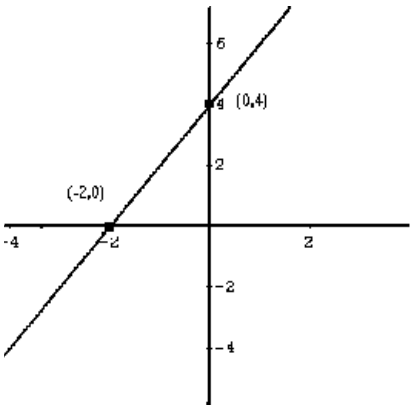
Focus: vocabulary
Suggested time: 10 minutes

Working with words

1. Tick the correct answer



- ☐ a) an intersection
- ☐ b) a road accident
- ☐ c) a bar chart
- ☐ d) a linear graph



a) an intersection

- ☐ b) a road accident
- ☐ c) a bar chart
- ☐ d) a linear graph

2. Select the best meaning of the mathematical word, function

a) a rule that changes one number into another number
b) a collection of objects
c) positive and negative numbers

3. In maths, which letter is used to represent a function?

a) x
b) y
c) f

NAME: _____ DATE:_____

MATHS: Higher Level Functions and quadratic graphs

Level: A1/A2
Type of activity: pairs or individual

Focus: vocabulary, sentence construction
Suggested time: 10 minutes

Sentences

1. Match the meaning and the word.

a) a reference line on a grid (graphs have a horizontal ____ and a vertical ____)

b) from the lowest to the highest point in a graph

c) the set of inputs

range

axis

domain

2. Put these words in the correct order to form sentences about functions and graphs.

called a function is a map also

_____

number is mapped one onto number another

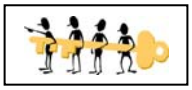
_____

x-axis the is called the horizontal line

y-axis the is called the vertical line

NAME: _____ DATE:_____
MATHS: Higher Level Functions and quadratic graphs

Level: A1 / A2 **Type of activity:** pairs or individual	**Focus:** vocabulary **Suggested time:** 30 minutes



Odd One Out

1. Circle the word which does not fit with the other words in each line.

Example: ***apple*** ***orange*** ***banana*** ***taxi***

minimum value bus maximum

graph car height missile

intersection graph point cold

blue solve find evaluate

2. Find these words in your textbook. Then put them in short sentences in your own words. Use a dictionary if necessary.

to calculate _____

to check _____

to express _____

to graph _____

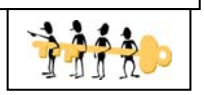
to represent_____

Check that these key words are in your personal dictionary.

NAME: _____ DATE:_____

MATHS: Higher Level Functions and quadratic graphs

Level: A1 / A2 **Type of activity:** individual	**Focus:** key vocabulary **Suggested time:** 10 minutes



Maths Keywords

1. Fill in the missing letters of the keywords listed below.
On the line next to the keywords, write down whether this word is a noun, an adjective or a verb.

rep_ _se_ts _____

sy_ _et_y _____

cor_ _spo_ _ing _____

ma_im_ _ _____

2. Write as many words as possible related to **functions and graphs / this unit**. You have 3 minutes!

_____

_____

_____

_____

_____

_____

Check that these key words are in your personal dictionary.

NAME: _____ DATE:_____
MATHS: Higher Level Functions and quadratic graphs

Level: A1 / A2
Type of activity: pairs or individual

Focus: key vocabulary, spelling
Suggested time: 20 minutes

Unscramble the letters

1. This is the measure of how tall something is TEGIHH

Answer _____

2. When two or more lines meet STRECENITINO

Answer _____

3. The least or smallest amount of something NIMMMUI

Answer _____

4. An equation that includes the second power of X (x^2) DAQICRUAT

Answer _____

Solve the secret code

English	A	D	E	F	G	H	N	O	P	R	S	U
Code	B	X	Y	I	K	Q	R	M	L	E	C	W

ex: XMME = DOOR

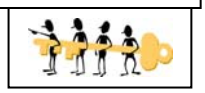
KEBLQC BEY KMMX IWR! =

_____

NAME: _____ DATE:_____
MATHS: Higher Level Functions and quadratic graphs

Level: A2/B1
Type of activity: pairs or individual

Focus: vocabulary, basic sentence structure
Suggested time: 30 minutes



Completing sentences

The sentences on this page are all from your textbooks. Fill in the blanks in these sentences. Use words from the Word Box below.

Notes on drawing the graph

The x-axis

1. The x values are from -2 to +2 so make these values the start and _____ of the x-axis if you can.
2. Use the full_____ of the page for the x-axis.
3. Make sure the x values are _____ out equally.

The y-axis

1. Please ensure that the y values are spaced out _____.
2. The space between the y values does not have to be the same as the space _____ the x values.

Sketching the graph

1. Always use a pencil to sketch the graph (never a _____).
2. The graph must be drawn freehand (not with a _____).

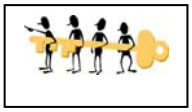
Word Box:

pen	spaced	finish	ruler	between	width	equally

NAME: _____ DATE:_____
MATHS: Higher Level Functions and quadratic graphs

Level: A2 / B1 **Type of activity:** individual	**Focus:** key vocabulary, topic information, reading comprehension **Suggested time:** 30 minutes

Multiple choice



Text: Stories and Problem-Solving Involving the Quadratic Graph

Example
Graph the function f: $x \rightarrow -2x^2 + 2x + 11$ in the domain $-2 \leq x \leq 3$.
Let the graph represent the flight of a missile fired 1 metre below ground level.
The x-axis represents time with x = -2 representing 10a.m., x = -1 representing 11a.m., etc.
The y-axis represents the height of the missile with the gap between each x value being 1 metre.

Use the graph to find:
(i) The height of the missile at 1.30p.m.
(ii) At what times was the missile at ground level?
(iii) At what times was the missile 4 metres above the ground?
(iv) What was the maximum height reached by the missile?
(v) At what time was the maximum height reached?

1. What must you let the graph represent?
   a) ground level b) the flight of a missile
   c) the fight over a missile d) nothing

2. What does the x-axis of the graph represent?
   a) nothing b) a missile
   c) time d) flight

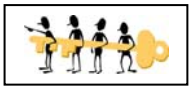
3. What should you use the graph to find at 1.30p.m.?
   a) the height of the missile b) nothing
   c) ground level d) a gap

4. Should you find the times the missile was 2 metres above the ground?
   a) Yes b) No

5. Should you find the maximum height reached by the missile?
   a) Yes b) No

NAME: _____ DATE:_____
MATHS: Higher Level Functions and quadratic graphs

Level: A2/B1 **Type of activity**: individual and pairs	**Focus**: adjectives and verbs **Suggested time**: 30 minutes



Grammar points

1. **Preposition Hunt**

Preposition: a word or group of words that is used before a noun or pronoun to show place, direction, time etc.

Circle the 10 prepositions in these columns. Score 4 points for each correct answer. Who will score the highest? Perhaps you will. Good luck!

between	at
line	symmetry
from	height
lowest	before
maximum	solve
in	by
into	complete
good	for
value	axis
off	to

Score: _____ points

2. Fill in the missing prepositions from the text below.

- Add 5 ___ both sides.
- Divide both sides ____ 3.
- Find the value ___ x.
- Consider the graph ___ the right.
- The graph cuts the axis ___ -1.2 and 3.2
- Draw the graph ___ the function.

Levels A1 and A2

Alphaboxes

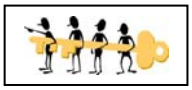
Using your textbook, find **one** word beginning with each of the letters of the alphabet. Write the word in the relevant box. You could also write the word in your own language.

a	b	c
d	e	f
g	h	i
j	k	l
m	n	o
p	q	r
s	t	u
v	w	xyz

Maths Word Search

Level: All levels

Find the words in the box below.



J Y D
M A X I S X I V S
T V Y L O W E S T G S R L
G R A P H T Y P E V A L U A T E V
R P X P X D S O L V E P L Z X N L B S
D U I F I N T E R S E C T I O N C K I Y X
L T G T U B U G Y D E Q U A T I O N O B L
R A N G E W K C O M P L E T E P O I N T F V A
T W S U V L S W C O R R E S P O N D I N G H W
G E T Q U W R E Z S Z X E K M X X E B K X U G E K
Z I O M E W K N Q H A U N X V T S T E M P D K A V
U S P R Q B F C I G C Q E L O A D B S J V V X N C
R M R E O P B Z L B M M M I N I M U M O A U T K P B X
E I O R Y B P J U S Y M M E T R Y U L O Q O T T C Q G
S O T E H E I G H T J O T C O O R D I N A T E W B M V
P N J B R L I K Q Y X L N J M A M I S S I L E B F
R T W B I Q W N B F K U R Z L L T U X A T I S M E
G V C B G J J A F E D P A H B M D K T R V J U F E
L M L D V A L U E S O N X S F U H Z V Y U O L
S Z H N O B P N X F P X G Y L O P Z S U X Z S
C Q M V H K V J W Q U A D R A T I C D L C
D S M A X I M U M E E N M D O M A I N I Z
Y S K N V S J I O G J W R S L P D I L
Y G V P N F I N D X L M T O Y T L
V M N W M S P B I T S R G
N B Q J W S E E L
O G U

AXIS	EVALUATE	MAXIMUM	SOLVE
COMPLETE	FIND	MINIMUM	SYMMETRY
COORDINATE	GRAPH	MISSILE	TYPE
CORRESPONDING	HEIGHT	POINT	VALUES
DOMAIN	INTERSECTION	QUADRATIC	
EQUATION	LOWEST	RANGE	

Play Snap

Make Snap cards with 2 sets of the same keywords. See *Notes for teachers* for ideas about how to use the cards.

equation	**equation**
values	**values**
quadratic	**quadratic**

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MATHS: Higher Level Functions and quadratic graphs

solve	**solve**
symmetry	**symmetry**
intersection	**intersection**

NAME: _____ DATE:_____

MATHS: Higher Level Functions and quadratic graphs

point	point
line	line
find	find

NAME: _____ DATE:_____

MATHS: Higher Level Functions and quadratic graphs

complete	**complete**
represents	**represents**
height	**height**

Answer key

Working with words, page 6
1. a,d
2. a
3. c

Sentences, page 7
1. range= b, axis = a, domain = c
2. A function is also called a map.
One number is mapped onto another number.
The horizontal line is called the x-axis.
The vertical line is called the y-axis.

Odd One Out, page 8
Bus, car, cold, blue

Maths key words, page 9
represents (verb), symmetry (noun), corresponding (verb or adjective), maximum (noun or adjective)

Unscramble the letters, page 10
Height, intersection, minimum, quadratic
Secret Code: graphs are good fun

Completing Sentences, page 11

Notes on drawing the graph

The x-axis

4. The x values are from -2 to +2 so make these values the start and **finish** of the x-axis if you can.
5. Use the full **width** of the page for the x-axis.
6. Make sure the x values are **spaced** out equally.

The y-axis

1. Please ensure that the y values are spaced out **equally**.
2. The space between the y values does not have to be the same as the space **between** the x values.

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Sketching the graph

1. Always use a pencil to sketch the graph (never a **pen**).
2. The graph must be drawn freehand (not with a **ruler**).

Multiple choice, page 12

1b, 2c, 3a, 4b, 5a

Grammar points, page 13

Prepositions: between, from, in, into, off, at, before, by, for, to

- Add 5 **to** both sides.
- Divide both sides **by** 3.
- Find the value **of** x.
- Consider the graph **on** the right.
- The graph cuts the axis **at** -1.2 and 3.2
- Draw the graph **of** the function.

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Word Search, page 15