Hillel Academy High School

Grade 10
Accelerated Mathematics
End of Year Study Guide
September 2013 - June 2014

Examination	Duration	Date

The exam consists of *2 papers*:
 	
 <u>Paper 1</u>:   10-15 questions of various lengths
 	
      Calculators Allowed
 	
 <u>Paper 2</u>:   10-15 questions of various lengths
 	
      Calculators Allowed
	1.5 - 2 hours
	
	 1.5 - 2 hours
		June 2014

GRADE 10 (Accelerated) MATHEMATICS

Materials Needed: Pens, Pencils, Erasers, Geometry Set, 30cm Ruler and Scientific Calculator

HOW TO STUDY MATH

- ✓ WITH PAPER & PENCIL! Not your eyes and headphones! You can't study Math by looking at the notes, you MUST PRACTICE!!!!

- ✓ Use your own notebook(s) to help you revise. Makes notes and try the examples to ensure you understand the concepts.

- ✓ Go over your old assignments- homework, classwork & test. Look at the mistakes you made. Do you know how to do all questions correctly now?

- ✓ Practice more questions in your weak areas. Additional questions can be found in your textbook or online. If you are not sure how to do a question, look at the solution. Copy it out carefully, trying to understand the processes involved then try to do it again independently, without the solution in front of you. If you are still having problems ask a friend, parent, tutor, or teacher for help.

- ✓ Plan your study time systematically. Set aside at least 45 minutes every day to revise and practice mathematics.

- ✓ Start now! Do not wait until the week of the exam!

> *Mathematics is a continuous subject and requires that you build on your previous knowledge base. So though the exam will focus on the areas indicated below, it will also require that you remember concepts taught in previous years.*

Note: the numbers refer to topic numbers (1-15) as indicated in Cambridge IGCSE Additional Mathematics 0606 Syllabus for examination in 2015

*1. Set language and notation

- use set language and notation, and Venn diagrams to describe sets and represent relationships between sets as follows:

  $A = \{x: x \text{ is a natural number}\}$

  $B = \{(x, y): y = mx + c\}$

  $C = \{x: a \leqslant x \leqslant b\}$

  $D = \{a, b, c, \ldots\}$

- understand and use the following notation:

Union of A and B	$A \cup B$
Intersection of A and B	$A \cap B$
Number of elements in set A	$n(A)$
"…is an element of…"	$\in$
"…is not an element of…"	$\notin$
Complement of set A	A'
The empty set	$\varnothing$
Universal set	$\mathcal{E}$
A is a subset of B	$A \subseteq B$
A is a proper subset of B	$A \subset B$
A is not a subset of B	$A \nsubseteq B$
A is not a proper subset of B	$A \not\subset B$

2. Functions

- understand the terms: function, domain, range (image set), one-one function, inverse function and composition of functions
- use the notation $f(x) = \sin x$, $f: x \mapsto \lg x \ (x > 0)$, $f^{-1}(x)$ and $f^2(x) \ [= f(f(x))]$

3. Quadratic functions

- find the maximum or minimum value of the quadratic function $f : x \mapsto ax^2 + bx + c$ by any method
- use the maximum or minimum value of $f(x)$ to sketch the graph or determine the range for a given domain
- know the conditions for $f(x) = 0$ to have:

  (i) two real roots, (ii) two equal roots, (iii) no real roots

  and the related conditions for a given line to

  (i) intersect a given curve, (ii) be a tangent to a given curve, (iii) not intersect a given curve
- solve quadratic equations for real roots and find the solution set for quadratic inequalities

4. Indices and surds

- perform simple operations with indices and with surds, including rationalising the denominator
- use the laws of indices to simplify expressions and solve exponential equations
- solve radical equations (equation involving roots) by squaring or identifying the hidden quadratic

5. Factors of polynomials

- know and use the remainder and factor theorems
- find factors of polynomials
- solve cubic equations

6. Simultaneous equations

- solve simultaneous equations in two unknowns with at least one linear equation

7. Logarithmic and exponential functions

- know simple properties and graphs of the logarithmic and exponential functions including $\ln x$ and e^x (series expansions are not required)
- know and use the laws of logarithms (including change of base of logarithms)

  (i) $\log_a (PQ) = \log_a P + \log_a Q$;

  (ii) $\log_a \left(\dfrac{P}{Q} \right) = \log_a P - \log_a Q$;

  (iii) $\log_a P^b = b \log_a P$;

  (iv) $\log_a a = 1$;

  (v) $\log_a 1 = 0$;

- Solve logarithmic equations
- Use logarithms to solve equations of the form $a^x = b$

8. Straight line graphs

- interpret the equation of a straight line graph in the form

  $y = mx + c$
- solve questions involving mid-point and length of a line
- know and use the condition for two lines to be parallel or perpendicular

9. Circular measure

- solve problems involving the arc length and sector area of a circle, including knowledge and use of radian measure

10. Trigonometry

- know the six trigonometric functions of angles of any magnitude (sine, cosine, tangent, secant, cosecant, cotangent)
- use the relationships

  $\dfrac{\sin A}{\cos A} = \tan A$, $\dfrac{\cos A}{\sin A} = \cot A$, $\sin^2 A + \cos^2 A = 1$,

  $\sec^2 A = 1 + \tan^2 A$, $\operatorname{cosec}^2 A = 1 + \cot^2 A$

  and solve simple trigonometric equations involving the six trigonometric functions and the above relationships (not including general solution of trigonometric equations)
- prove simple trigonometric identities

12. Binomial expansions

- use the Binomial Theorem for expansion of $(a + b)^n$ for positive integral n
- use the general term $\binom{n}{r} a^{n-r} b^r$, $0 < r \ n$

  (knowledge of the greatest term and properties of the coefficients is not required)

13. Vectors in 2 dimensions

- use vectors in any form, e.g. $\binom{a}{b}$, $\overrightarrow{AB}$, $\mathbf{p}$, $a\mathbf{i} - b\mathbf{j}$
- know and use position vectors and unit vectors
- find the magnitude of a vector; add and subtract vectors and multiply vectors by scalars

14. Matrices

- display information in the form of a matrix of any order and interpret the data in a given matrix
- solve problems involving the calculation of the sum and product (where appropriate) of two matrices and interpret the results
- calculate the product of a scalar quantity and a matrix
- use the algebra of 2×2 matrices (including the zero and identity matrix)
- calculate the determinant and inverse of a non-singular 2×2 matrix and solve simultaneous linear equations