# Dawood Public School
# Course Outline 2017-18
# Mathematics
# Class XI

**Books:**

Seng, T.et al, 2006, New Syllabus Mathematics 1(6th Edition), Singapore; Oxford University Press
Seng, T.et al, 2006, New Syllabus Mathematics 2(6th Edition), Singapore; Oxford University Press
Seng, T.et al, 2006, New Syllabus Mathematics 3(6th Edition), Singapore; Oxford University Press
Seng, T.et al, 2006, New Syllabus Mathematics 4(6th Edition), Singapore; Oxford University Press
Addendum

**Introduction:**

This syllabus provides a comprehensive set of progressive learning objectives for mathematics. The objectives detail what the learner should know or what they should be able to do in each year of education. The learning objectives provide a structure for teaching and learning and a reference against which learners' ability and understanding can be checked.
This syllabus designed to promote continuity, coherence and progression within the study of Mathematics. The syllabus builds on the knowledge, understanding and skills developed within the Key Stage of Study for Mathematics.
This syllabus has been designed to meet the requirements of the GCSE regulations.

**Cambridge O level Mathematics (Syllabus D)**

**Syllabus Code 4024 Assessment:**

All candidates take two papers.
Each paper may contain questions on any part of the syllabus and questions will not necessarily be restricted to a single topic.

| **Paper 1** | **2 hours** |
|---|---|
| Paper 1 has approximately 25 short answer questions. Candidates should show all working in the spaces provided on the question paper. Essential working must be shown for full marks to be awarded. No calculators are allowed for this paper.<br>80 marks<br>This paper will be weighted at 50% of the total qualifi cation. | |

| **Paper 2** | **2 hours 30 minutes** |
|---|---|
| Paper 2 has approximately 11 structured questions. Candidates should answer all questions. Electronic calculators may be used and candidates should have access to a calculator for this paper. Candidates should show all working in the spaces provided on the question paper. Essential working must be shown for full marks to be awarded.<br>100 marks<br>This paper will be weighted at 50% of the total qualifi cation | |

**Assessment at a Glance**

**Calculating aids:**

| |
|---|
| **Paper 1** – the use of all calculating aids is prohibited. |
| **Paper 2** – all candidates should have a **silent** electronic calculator. A scientific calculator with trigonometric functions is strongly recommended. |
| Unless stated otherwise within an individual question, three figure accuracy will be required. This means that four figure accuracy should be shown throughout the working, including cases where answers are used in subsequent parts of the question. Premature approximation will be penalised, where appropriate. |
| In Paper 2, candidates with suitable calculators are encouraged to use the value of π from their calculators. |
| The value of π will be given as 3.142 to 3 decimal places for use by other candidates. This value will be given on the front page of the question paper only. |

**Units**

SI units will be used in questions involving mass and measures: the use of the centimetre will continue. Both the 12-hour clock and the 24-hour clock may be used for quoting times of the day. In the 24-hour clock, for example, 3.15 a.m. will be denoted by 03 15; 3.15 p.m. by 15 15, noon by 12 00 and midnight by 24 00.
Candidates will be expected to be familiar with the solidus notation for the expression of compound units, e.g. 5 cm/s for 5 centimetres per second, 13.6 g/cm$^3$ for 13.6 grams per cubic centimetre.

**Mathematical Instruments**

Apart from the usual mathematical instruments, candidates may use flexi curves in this examination.

**Syllabus Aims and Assessment:**

The syllabus demands understanding of basic mathematical concepts and their applications, together with an ability to show this by clear expression and careful reasoning.
In the examination, importance will be attached to skills in algebraic manipulation and to numerical accuracy in calculations.

**Aims**
The course should enable students to:

- develop their mathematical knowledge and oral, written and practical skills in a manner which encourages confidence;
- read mathematics, and write and talk about the subject in a variety of ways;
- develop a feel for number, carry out calculations and understand the significance of the results obtained;
- apply mathematics in everyday situations and develop an understanding of the part which mathematics plays in the world around them;
- solve problems, present the solutions clearly, check and interpret the results;
- develop an understanding of mathematical principles;

- recognise when and how a situation may be represented mathematically, identify and interpret relevant factors and, where necessary, select an appropriate mathematical method to solve problems;
- use mathematics as a means of communication with emphasis on the use of clear expression;
- develop the abilities to reason logically, to classify, to generalise and to prove;

**Assessment objectives:**

The examination tests the ability of candidates to:

- recall, apply and interpret mathematical knowledge in the context of everyday situations;
- set out mathematical work, including the solution of problems, in a logical and clear form using appropriate symbols and terminology;
- organise, interpret and present information accurately in written, tabular, graphical and diagrammatic forms;
- perform calculations by suitable methods;
- use an electronic calculator;
- understand systems of measurement in everyday use and make use of them in the solution of problems;
- estimate, approximate and work to degrees of accuracy appropriate to the context;
- use mathematical and other instruments to measure and to draw to an acceptable degree of accuracy;
- recognise patterns and structures in a variety of situations and form generalisations;
- interpret, transform and make appropriate use of mathematical statements expressed in words or symbols;
- Interpret, use and present information in written, graphical, diagrammatic and tabular forms;
- Apply and interpret Mathematics in a variety of situations, including daily life;
- Formulate problems into mathematical terms, select, apply and communicate appropriate techniques of solution and interpret the solutions in terms of the problems.

## Monthly Syllabus

| MONTH | CHAPTERS | DURATION |
|---|---|---|
| **AUGUST** | • Sets<br>• Application of Sets to Problems | 1 Week<br>2 Weeks |
| **SEPTEMBER** | • Vectors<br>• Loci and Construction | 2 Weeks<br>2 Weeks |
| **OCTOBER** | • Cumulative Frequency Distribution<br>• Geometrical Transformation | 2 Weeks<br>2 Weeks |
| **NOVEMBER** | • Geometrical Transformation<br>• REVISION | 1 Week |
| **DECEMBER** | **MID TERM EXAMS** | |
| **JANUARY** | • Revision Exercises<br>• Past Papers | 2 Weeks<br>2 Weeks |
| **FEBRUARY** | • Past Papers | 2 Weeks<br>2 Weeks |
| **MARCH** | • Past Papers<br>• **Mock Exams** | |

## Syllabus Content

| Theme or Topic | Subject Content |
|---|---|
| **Sets**<br>**Application of Sets to Problems**<br>**Addendum, Chap No. 1, 2** | Students should be able to:<br>• use set language and set notation, and Venn diagrams, to describe sets and represent relationships between sets as follows:<br>Definition of sets, e.g.<br>A = {x : x is a natural number}<br>B = {(x, y): y = mx + c}<br>C = {x : a ≤ x ≤ b}<br>D = {a, b, c...}<br>Notation:<br>Union of A and B — A U B<br>Intersection of A and B — A ⋂ B<br>Number of elements in set A — n(A)<br>" . . . is an element of . . . " — €<br>Complement of set A — A'<br>The empty set — Ø<br>Universal set — ε<br>A is a subset of B — A ⊆ B<br>A is a proper subset of B — A ⊂ B<br>A is not a subset of B — A ⊄ B<br>A is not a proper subset of B — A ⊄ B |

**Learning Resources:**

**Textbook:**
Cambridge O level Mathematics: Volume 2 has notes and practice questions on pages 2–12 and 387–391

**Online:**
Math is fun has an introduction to sets and Venn diagrams:
www.mathsisfun.com/sets/venn-diagrams.html
Please note – this page uses the symbol U to denote the universal set. This is a widely used alternative to ξ, but is not required for this syllabus.

Work on set notation in chapter 1:
http://assets.cambridge.org/0521539021/sample/0521539021WS.pdf

**Other:**
Large hoops can be marked with string or chalk to create human Venn diagrams.

**4024 past examination papers:**
- Jun 12 Paper 21 Q1
- Jun 12 Paper 22 Q6
- Nov 12 Paper 11Q21
- Nov 12 Paper 12 Q14
- Jun 13 Paper 11 Q24
- Jun 13 Paper 12 Q10
- Nov 13 Paper 11 Q14
- Nov 13 Paper 22 Q5

| Theme or Topic | Subject Content |
|---|---|
| **Vectors**<br>**Book 4, Chap No. 3**<br>**Pg No. (73- 128)** | Students should be able to:<br><br>• describe a translation by using a vector represented by AB or **a**;<br>• add vectors and multiply a vector by a scalar;<br>• calculate the magnitude of a vector as $\sqrt{x^2+y^2}$ . (Vectors will be printed as AB or **a** and their magnitudes denoted by modulus signs, e.g. I ABI or I**a**I. In all their answers to questions candidates are expected to indicate **a** in some definite way, e.g. by an arrow or by underlining, thus AB or a);<br>• represent vectors by directed line segments; use the sum and difference of two vectors to express given vectors in terms of two coplanar vectors; use position vectors. |

**Learning Resources:**

**Textbook:**
Cambridge O level Mathematics: Volume 1 has notes and practice questions on pages 329–364

**Online:**
Work on loci and transformations:
www.cimt.plymouth.ac.uk/projects/mepres/allgcse/bkc14.pdf

BBC Bitesize has work on transformations:
www.bbc.co.uk/schools/gcsebitesize/maths/geometry/

Vector snakes and ladders provides an introduction to column vectors and practice in their use:
www.tes.co.uk/teaching-resource/Vector-snakes-and-ladders-Vector-game-6030422/

An online version of LOGO is available at:
http://turtleacademy.com/playground/en

Scratch software can be downloaded from:
http://scratch.mit.edu/

Math is Fun have some interactive resources for transformations:
www.mathsisfun.com/geometry/transformations.html

**Other:**
Tracing paper is very useful when teaching reflections, rotations and translations.

**4024 past examination papers:**
- Jun 12 Paper 12 Q13
- Nov 12 Paper 21 Q11b
- Nov 12 Paper 22 Q11b
- Jun 13 Paper 12 Q5
- Nov 12 Paper 12 Q22

Cambridge O level Mathematics: Volume 2 has notes and practice questions on pages 286–300

**Online:**
Work on vectors:
www.cimt.plymouth.ac.uk/projects/mepres/allgcse/bkc19.pdf

BBC Bite size has work on simple vectors:
www.bbc.co.uk/schools/gcsebitesize/maths/geometry/

Don Steward has a starter activity based on a tangram to develop use of vector notation:
http://donsteward.blogspot.co.uk/2010/01/vectors.html

**4024 past examination papers:**
- Jun 12 Paper 12 Q12
- Jun 12 Paper 21 Q7
- Jun 12 Paper 22 Q7
- Nov 12 Paper 11Q24

- Nov 12 Paper 21 Q11
- Nov 12 Paper 22 Q11
- Jun 13 Paper 22 Q9a
- Nov 13 Paper 11 Q21
- Nov 13 Paper 21 Q3
- Nov 13 Paper 22 Q12

| Theme or Topic | Subject Content |
|---|---|
| **Loci and Construction**<br>**Addendum Book 4, Chap No. 4**<br>**Pg No. (38 – 58)** | Students should be able to:<br><br>• use the following loci and the method of intersecting loci:<br>a) sets of points in two or three dimensions<br>i. which are at a given distance from a given point,<br>ii. which are at a given distance from a given straight line,<br>iii. which are equidistant from two given points;<br>b) sets of points in two dimensions which are equidistant from two given intersecting straight lines. |

**Learning Resources:**
Cambridge O level Mathematics: Volume 1 has notes and practice questions on pages 187–196

**Online:**
Work on loci and transformations:
www.cimt.plymouth.ac.uk/projects/mepres/allgcse/bkc14.pdf

BBC Bite size has work on loci:
www.bbc.co.uk/schools/gcsebitesize/maths/geometry/

**Other:**
Chalk, string and a metre ruler could be used to mark out a locus.

**4024 past examination papers:**
- Jun 21 Paper 12 Q8biii and 8biv
- Jun 12 Paper 22 Q11b
- Nov 12 Paper 11 Q26
- Nov 12 Paper 12 Q27
- Jun 13 Paper 11 Q15
- Jun 13 Paper 12 Q12
- Nov 13 Paper 12 Q24
- Nov 13 Paper 21 Q2

| Theme or Topic | Subject Content |
|---|---|
| **Cumulative Frequency Distribution**<br>**Book 4, Chap No. 5**<br>**Pg No. (155 -198)** | Students should be able to:<br>• calculate the mean, median and mode for individual data and distinguish between the purposes for which they are used;<br>• construct and use cumulative frequency diagrams; estimate the median, percentiles, quartiles and interquartile range;<br>• calculate the mean for grouped data; identify the modal class from a grouped frequency distribution. |

**Learning Resources:**
Cambridge O level Mathematics: Volume 2 has notes and practice questions on pages 356–366

**Online:**
Work on cumulative frequency at section 9.5:
www.cimt.plymouth.ac.uk/projects/mepres/allgcse/bkb9.pdf

BBC Bite size has work on cumulative frequency:
www.bbc.co.uk/schools/gcsebitesize/maths/statistics

Mathematics teacher K Pitchford describes an unusual (but effective) method for teaching quartiles:
http://mathssandpit.co.uk/blog/?p=1145

Olympic weights – a handling data rich task from mathematics teacher Adam Briggs that involves cumulative frequency and also box and whisker diagrams:
www.ncetm.org.uk/public/files/411886/Olympic+Weights+-+A+Handling+Data+Rich+Task.doc

**Other:**
Learners own data from previous statistics work could be used.

**4024 past examination papers:**
- Jun 12 Paper 12 Q9
- Jun 12 Paper 22 Q5
- Jun 13 Paper 11 Q18
- Jun 13 Paper 12 Q21
- Nov 13 Paper 12 Q14
- Nov 13 Paper 21 Q4

| Theme or Topic | Subject Content |
|---|---|
| **Geometrical Transformation**<br>**Book 4, Chap No. 4, 5** | Students should be able to:<br>• use the following transformations of the plane: reflection (M),rotation (R), translation (T), enlargement (E), shear (H), stretching (S) and their combinations (If M(a) = b and R(b) = c the notation RM(a) = c will be used; invariants under these transformations may be assumed.);<br>• identify and give precise descriptions of transformations |

| | |
|---|---|
| | connecting given figures; describe transformations using coordinates and matrices. (Singular matrices are excluded.)<br><br>All The Chapters of four books are included in the CIE Syllabus. |

**Learning Resources:**
Cambridge O level Mathematics: Volume 2 has notes and practice questions on pages 301–324

**Online:**
'Mathplanet 'has an introduction to transformations using matrices:
www.mathplanet.com/education/geometry/transformations/transformation-using-matrices

Work on transformations is included in (aimed at A Level learners, but the early sections are suitable for learners studying at this level):
www.cimt.plymouth.ac.uk/projects/mepres/alevel/fpure_ch9.pdf

**Other:**
Matrix transformations are often used in computer animations. If any of your learners are enthusiastic coders or animators, they may be able to share their experiences of using transformations.

**4024 past examination papers:**
- Jun 12 Paper 21 Q6
- Jun 12 Paper 22 Q9
- Nov 12 Paper 11 Q16
- Nov 12 Paper 12 Q21
- Jun 13 Paper 11 Q22
- Jun 13 Paper 21 Q8
- Nov 13 Paper 12 Q20
- Nov 13 Paper 21 Q11

**Assessment and Home Work:**

Students will be assessed by taking test of each and every chapter. Home Work shall be given on a daily basis.

**Mathematical Notations:**

The list which follows summarises the notation used

**Set Notation**

| | |
|---|---|
| $\in$ | is an element of |
| $\notin$ | is not an element of |
| $\{x_1, x_2, \ldots\}$ | the set with elements $x_1$, $x_2$,… |
| {x: …} | the set of all x such that… |
| n ( A) | the number of elements in set A |
| $\emptyset$ | the empty set |
| $\varepsilon$ | universal set |
| A´ | the complement of the set A |

| | |
|---|---|
| N | the set of positive integers, {1, 2, 3, …} |
| z | the set of integers {0, ± 1, ± 2, ± 3, …} |
| Z+ | the set of positive integers {1, 2, 3, …} |
| Q | the set of rational numbers |
| Q+ | the set of positive rational numbers, {x ∈ n: x > 0} |
| R | the set of real numbers |
| R+ | the set of positive real numbers {x ∈ o: x > 0} |
| ⊆ | is a subset of |
| ⊂ | is a proper subset of |
| ⊈ | is not a subset of |
| ⊄ | is not a proper subset of |
| ∪ | union |
| ∩ | intersection |
| [a, b] | the closed interval {x ∈ R: a ≤ x ≤ b} |
| [a, b) | the interval {x ∈ R: a ≤ x < b} |

**Mathematical Symbols**

| | |
|---|---|
| = | is equal to |
| ≠ | is not equal to |
| ≡ | is identical to or is congruent to |
| ≈ | is approximately equal to |
| <; << | is less than, is much less than |
| < | is less than or equal to |
| >; >> | is greater than, is much greater than |
| > | is greater than or equal to |
| ∞ | infinity |

**Operations**

| | |
|---|---|
| a + b | a plus b |
| a – b | a minus b |
| a × b, ab, a.b | a multiplied by b |
| a ÷ b, a / b, a/b | a divided by b |

**Functions**

| | |
|---|---|
| f | function f |
| f (x) | the value of the function f at x |

f is a function under which each element of set A has an image in set B

| | |
|---|---|
| f : x→a | y the function f maps the element x to the element y |
| $f^{-1}$ | the inverse of the function f |

| | |
|---|---|
| sin, cos, tan, cosec, sec, cot } | the circular functions |
| $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, $\text{cosec}^{-1}$, $\sec^{-1}$, $\cot^{-1}$ } | the inverse circular relations |

**Matrices**

| | |
|---|---|
| **M** | a matrix **M** |
| $\mathbf{M}^{-1}$ | the inverse of the square matrix **M** |
| det **M** | the determinant of the square matrix **M** |

**Vectors**

| | |
|---|---|
| **a** | the vector **a** |
| AB | the vector represented in magnitude and direction by the directed line segment AB |
| \| **a** \| | the magnitude of **a** |
| \| AB \| | the magnitude of AB |

**Probability and Statistics**

| | |
|---|---|
| A, B, C etc. | events |
| A U B | union of events A and B |
| A ∩ B | intersection of the events A and B |
| P(A) | probability of the event A |
| A′ | complement of the event A, the event 'not A' |
| P(A\|B) | probability of the event A given the event B |
| X, Y, R, etc. | random variables |
| x, y, r, etc. | values of the random variables X, Y, R, etc. |
| $x_1, x_2, \ldots$ | observations |
| $f_1, f_2, \ldots$ | frequencies with which the observations $x_1, x_2, \ldots$ occur |

**Resource List:**

**Books:**

Sang, T.et al, 2008, New Syllabus Mathematics Work book 1, 2, 3 & 4 (6th Edition), Singapore; Oxford University Press

GCE O Level past papers

Bostock, L, S Chandler, A Shepherd, E Smith ST(P) Mathematics Books 1A to 5A
(Stanley Thornes)

| | | | | |
|---|---|---|---|---|
| Book 1A | Book 2A | Book 3A | Book 4A | Book 5A |
| Book 1B | Book 2B | Book 3B | Book 4 B | Book 5B |

Buckwell, Geoff Mastering Mathematics (Macmillan Education Ltd) 0 333 62049 6
Collins, J, Warren, T and C J Cox Steps in Understanding Mathematics (John Murray)
Book 1, 2, 3, 4, 5

National Mathematics Project (NMP) Mathematics for Secondary Schools Red Track Books 1 to 5 (Longman Singapore Publishers Pte Ltd)
Book 1, 2, 3, 4, 5

Cox, C J and D Bell Understanding Mathematics Books 1–5 (John Murray)
Book 1 , 2, 3, 4, 5

MSM Mathematics Group MSM Mathematics Books 1, 2, 3Y, 4Y, 5Y (Nelson) Murray, Les
Progress in Mathematics Books 1E to 5E (Stanley Thornes)
Book 1E, 2E, 3E, 4E, 5E

**Websites:**

- www.nrich.com
- www.hoddereducation.com
- www.collinseducation.com
- www.pearsonschoolsandfecolleges.co.uk
- www.hoddereducation.com
- www.lettsandlonsdale.com
- www.counton.org
- www.math.com
- www.maths-help.co.uk
- www.mathsnet.net