OMTC26 Syllabus and Format

Last updated: 4th January, 2026

At a Glance

The *Oxford Mathematics Team Challenge* is a competition between teams composed of four students, which consists of three rounds: the *Lock-in*, *Maps* and *Scenes* round. The rounds occur after a warm-up session with a variety of puzzles, which do not count towards the competition, and the event is rounded up by a guest talk and the results ceremony.

The syllabus consists of most of the pure AS Level Mathematics, with the omission of all calculus, and with the addition of various topics from the GCSE and A-Level Mathematics curricula, among others. The following document details the specifics of the syllabus and format of the rounds. For more information for the overall competition and specimen papers, please visit

https://www.omtc.co.uk/prepare

In terms of *changes* from OMTC25:

- **Syllabus.** Added: the modulus function, function compositions, inverse functions (including inverse trig functions); simplifying rational expressions; subsets and supersets. Removed: linear Diophantine equations, the number of distinct factors of a number.
- **Format.** Removed the Individual round from the competition scoring; Lock-in now has 3 questions (from 4), takes 2 answers (from 4), and lasts 60 minutes (from 45); reworked the Maps board and scoring of it, and it now lasts 75 minutes (from 60); 'Guts' renamed to 'Scenes'; split the Scenes round into two sections (the "acts") which each last 30 minutes (from 80 minutes total). All rounds have been appropriately adjusted in difficulty.

Syllabus

The OMTC will assume *comfort* with the topics that follow. Any rows containing content not part of the AS Level Syllabus is marked with a red asterisk (*). You will not be penalised for using any techniques omitted by the syllabus.

N.B. This is *not* a list of what may come up in the OMTC – rather, this is a list of what we will expect you to be familiar with!

Geometry

Content	Conventions	Omitted
Pythagoras' Theorem.		
2D geometry: similarity and congruence of shapes. Internal angles, angles of polygons. Parallelograms. Perimeter and area.		Circumcentre, orthocentre, incentre, centroid. Heron's formula.
Circumference and area of circles; length of chords and arcs, area of circles, sectors and segments.		Radians.
3D geometry: prisms, tetrahedra, cones, spheres; their surface areas and volumes. Vectors.		A more thorough usage of vectors, e.g. the dot product.
Coordinate geometry: equations of lines and circles in the plane; constructions and loci.		
Circle Theorems: Central Angle Theorem, Same Segment Theorem, Thales' Theorem, cyclic quadrilaterals, Alternate Segment Theorem, chords and tangents.		
Trigonometry: the sine, cosine and tangent of an angle; $\tan x = \sin x \,/\, \cos x$, $\sin^2 x + \cos^2 x = 1$, $\sin(90^\circ - x) = \cos x$. Periodicity of sine, cosine and tangent; sine and cosine rules. The inverse functions arcsin, arccos and arctan.	arcsin instead of $\sin^{-1}$ (and similar for cosine and tangent).	sec, cosec, cot. Compound angle formulae.
Rotations, reflections, enlargements and translations of shapes. Tessellation (e.g. of the plane).		

Algebra

Content	Conventions	Omitted
Solving linear equations in up to two variables.		
Value and quantity. Distance as the product of constant speed and time. GBP.		
Mean, median and mode.		
Logarithms and exponents: their laws, solutions of x in $a^x = b$.	$\log x = \log_{10} x$, $\ln x = \log_e x$	
Rationalising surds. Decimal expansions, including recurring decimal expansions.		
Sequences and series: arithmetic, geometric, periodic, iterative formulae. Convergence of infinite geometric series.*		
Inequalities: sums of squares are non-negative. Bounds of standard functions (e.g. sine, cosine).		Cauchy-Schwarz inequality, HM-AM-GM-QM inequality.
The modulus function.*	$\lvert x \rvert$	
Graphical interpretations of formulae and equations; determining equations and inequalities via graphs.		
Graph transformations: $f(x) \mapsto f(ax)$, $f(x) \mapsto af(x)$, $f(x) \mapsto f(x-a)$, $f(x) \mapsto f(x)+a$ for any number a.		
Functions, including piece-wise, exponential and reciprocal. Compositions of functions; inverse functions. Recursively-defined functions.*	$f\colon X \to Y$ is a function from X to Y.	
Curve sketches; interpreting graphs of functions.		Use of calculus.

Polynomials

Content	Conventions	Omitted
Solving linear equations in up to two variables.		
Quadratics: completing the square, the discriminant.		Complex numbers.
Polynomial factorisations; use of the Factor Theorem and Remainder Theorem. Simplifying rational expressions.*		
The Binomial Theorem for positive whole exponents, combinations and binomial probabilities. The factorial function.	${}^nC_r$ means 'n choose r'	
Polynomial facts: an nth degree polynomial has at most n distinct roots.*		

Miscellaneous

Content	Conventions	Omitted
Combinatorics. Choices and permutations. Use of the Binomial Theorem in combinatorics. Probability: sample spaces, complementary events, mutually exclusive events, independent events. Conditional probability; Bayes' Law.	Probability of an event A is $P(A)$.	Expected value.
Number theory. Primes, basic rules for divisibility. The Fundamental Theorem of Arithmetic. Lowest common multiples, highest common factors.*		A more thorough usage of modular arithmetic. Fermat's Little Theorem.
Sets. Use of the terms *natural numbers* ($\mathbb{N}$), *integers* ($\mathbb{Z}$), *rational numbers* ($\mathbb{Q}$) and *real numbers* ($\mathbb{R}$). The fact that $\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R}$. Unions, intersections, complements, subsets and supersets. Intervals.*	$\mathbb{N}$ does not include 0.	
Logic. Implications, statements and their converses; *if and only if* statements. Proofs by deduction, exhaustion and contradiction, and disproof by counterexample.*		Mathematical induction.

Format

The OMTC consists of three rounds, which are below in order of occurrence. You are allowed to use pencils, erasers, sharpeners and pens to preference. Calculators, measuring instruments and squared paper are strictly forbidden.

The score breakdown per round is as follows:

Round	Lock-in	Maps	Scenes
Raw score	60	240	120
Scaled score	240	240	240

At the end of the competition, three highest-scoring teams are declared the winning teams (in first, second and third). In the event of a tie for any of these positions, a tiebreaker is ran between any tying teams (the exact rules of a tiebreaker will feature in a later version).

Warmup

The competition starts with a collection of ten multiple choice questions whilst people are arriving. These don't count towards the final scores in the competition. Participants are

Lock-in

Lock-in is the first round of the competition, consisting of three questions, which explore unfamiliar territories of mathematics in greater depth. Each question focusses on a specific concept: part of this round's difficulty comes from understanding a new concept and engaging with it. Teams can only answer two of the three questions, so should try and scope out the questions before committing.

The questions are split up into multiple parts which require teams to produce mathematical reasoning, mathematical explanation, or mathematical working. The parts will indicate what kind of answer and level of depth is expected, but the team will need to exercise their own judgement in determining the level of depth required.

There are **3 problems** and **60 points** in total; the round lasts **60 minutes**.

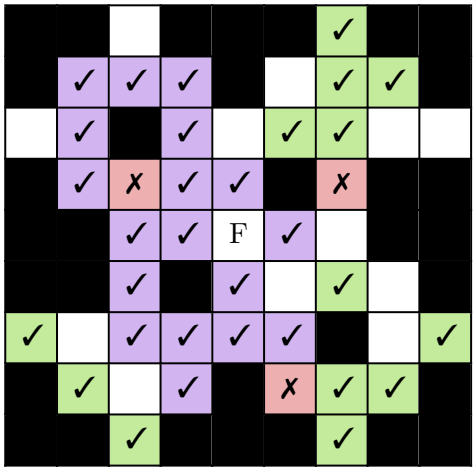
Maps

Maps is the second round which teams solve problems in a 9×9 grid, called the *map*. The centremost cell is the *free cell* (labelled 'F' in the examples); black cells do not have questions.

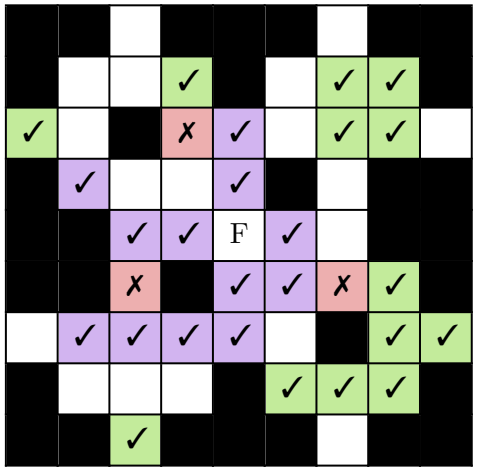
Teams submit *non-negative integer answers* to all questions. Any correctly-answered question awards its points as indicated by the question paper or the map. If a correctly-answered question is connected to the free cell by a series of horizontal and vertical paths of correct answers, it scores twice as many points!

In the examples below, cells are labelled with a checkmark (✓) if they were correctly answered, with a cross (✗) if incorrectly answered; (F) is the free cell, and other cells had no submission. The cells shaded in green scored full points for the teams; purple cells scored double.

Diagonal paths don't count



Paths must use (✓) cells



There are **44 problems** and **200 points** (including double points) in total; the round lasts **75 minutes**.

Scenes

Scenes is the last round of the competition, which requires competitors to be economical with their time. The round is split into two sections (the "acts"), which each have 12 questions grouped in triplets (the "scenes").

Teams submit *integer answers* to all 24 questions. The triplets progressively increase in difficulty, and their point value increases accordingly. The breakdown of points is as follows:

Act	I				II			
Scene	1	2	3	4	5	6	7	8
Score per question	3	4	5	6	3	4	6	9

Each team sends one of their members to a problem station to pick up copies of the first set of problems. Teams can only begin the next problem set after having submitted their current one, and are **not** able to resubmit solutions.

The last triplet is an *estimathon* in which contestants offer an estimate to the actual answer – teams whose answer is closer to the actual value score higher. The exact formula of your score in each estimathon question is

$$9 \times \frac{\min\{A, E\}}{\max\{1, A, E\}}$$

rounded to the nearest integer, where A is the actual solution and E is the team's estimated guess.

Lastly, the top scores on this round are displayed live at the front, and are hidden in the last 20 minutes. No pressure!

There are **24 problems** and **120 points**; the round lasts **60 minutes**, with a short break in between the sections.

Tiebreaker

Ties will be resolved in the following way. Teams are given a category of object and are asked to list a certain number of examples of this category within 5 minutes. They get 1 point for each correct submission, and lose $\frac{1}{2}$ a point for each incorrect submission; teams in the tiebreaker are then placed accordingly (this does not affect any team placings outside of the tiebreaker).