MARINA INTERNATIONAL SCHOOL

MATHS PAPER 3 SCHEME OF WORK

FORM 7 - TERM 1

WEEK	TOPIC	TOPIC DETAILS
1.1	ALGEBRA	Understand the meaning of |x|, sketch the graph of y =|ax + b| and use relations such as |a| = |b| ⇔ a2 = b2 and |x – a| < b ⇔ a – b < x < a + b when solving equations and inequalities, e.g. |3x – 2| = |2x + 7|, 2x + 5 < |x + 1|; graphs of y = |f(x)| and y =f(|x|) for non-linear functions f are not included;
1.2	ALGEBRA	Divide a polynomial, of degree not exceeding 4, by a linear or quadratic polynomial, and identify the quotient and remainder (which may be zero)
1.3	ALGEBRA	Use the factor theorem and the remainder theorem, e.g. to find factors and remainders, solve polynomial equations or evaluate unknown coefficients, including factors of the form (ax + b) in which the coefficient of x is not unity, and including calculation of remainders
2.1	ALGEBRA	Recall an appropriate form for expressing rational functions in partial fractions, and carry out the decomposition, in cases where the denominator is no more complicated than: - (ax + b)(cx + d)(ex + f) - (ax + b)(cx + d)^2 - (ax + b)(cx2 + d) excluding cases where the degree of the numerator exceeds that of the denominator
2.2	ALGEBRA	Use the expansion of (1 + x)n, where n is a rational number and |x|<1; finding a general term in an expansion is not included; Adapting the standard series to expand and determining the set of values of x for which the expansion is valid in such cases is also included
3.1	LOGARITHM AND EXPONENTIAL FUNCTIONS	Understand the relationship between logarithms and indices, and use the laws of logarithms (excluding change of base)

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3.2	LOGARITHM AND EXPONENTIAL FUNCTIONS	Understand the definition and properties of e^x and lnx, including their relationship as inverse functions and their graphs; including knowledge of the graph of y = e^(kx) for both positive and negative values of k
4.1	LOGARITHM AND EXPONENTIAL FUNCTIONS	use logarithms to solve equations and inequalities in which the unknown appears in indices, e.g. 2^x < 5, 3 x 2^(3x-1) < 5, 3^(x+1) = 4^(2x)
4.2	LOGARITHM AND EXPONENTIAL FUNCTIONS	Use logarithms to transform a given relationship to linear form, and hence determine unknown constants by considering the gradient and/or intercept, e.g. y = kx^n gives ln y = ln k + n ln x which is linear in ln x and ln y;y = k (a^x) gives ln y = ln k + x ln a which is linear in x and ln y
5.1	TRIGONOMETRY	Understand the relationship of the secant, cosecant and cotangent functions to cosine, sine and tangent, and use properties and graphs of all six trigonometric functions for angles of any magnitude
6.1	TRIGONOMETRY	Use trigonometrical identities for the simplification and exact evaluation of expressions, e.g. simplifying cos(x – 30°) – 3sin(x – 60°), and in the course of solving equations, e.g. solving tan θ + cot θ = 4, 2 sec^2 θ – tan θ = 5, 3 cosθ + 2sin θ = 1 and select an identity or identities appropriate to the context, showing familiarity in particular with the use of: - sec^2 θ ≡ 1 + tan^2 θ and cosec^2 θ ≡ 1 + cot^2 θ - the expansions of sin(A ± B), cos(A ± B) and tan(A ± B) - the formulae for sin 2A, cos 2A and tan 2A the expression of a sin θ + b cos θ in the forms R sin(θ ± α) and R cos(θ ± α),
7.1	DIFFERENTIATION	Use the derivatives of ex, ln x, sin x, cos x, tan x, tan^(-1)x, together with constant multiples, sums, differences and composites; derivatives of sin^(-1)x and cos^(-1)x not required
7.2	DIFFERENTIATION	Differentiate products and quotients
8.1	DIFFERENTIATION	Find and use the first derivative of a function which is defined parametrically or implicitly, including use in problems involving tangents and normals
9.1	INTEGRATION	Extend the idea of ‘reverse differentiation

WEEK	TOPIC	TOPIC DETAILS
9.2	INTEGRATION	Use trigonometrical relationships in carrying out integration, e.g. use of double-angle formulae to integrate sin^(2)x or cos^2(2x)
9.3	INTEGRATION	Integrate rational functions by means of decomposition into partial fractions
10.1	INTEGRATION	Recognise an integrand of the form kf'(x)/f(x) and integrate such functions
10.2	INTEGRATION	Recognise when an integrand can usefully be regarded as a product, and use integration by parts
10.3	INTEGRATION	Use a given substitution to simplify and evaluate either a definite or an indefinite integral
11.1	NUMERICAL SOLUTIONS OF EQUATIONS	Locate approximately a root of an equation, by means of graphical considerations and/or searching for a sign change, e.g. finding a pair of consecutive integers between which a root lies
11.2	NUMERICAL SOLUTIONS OF EQUATIONS	Understand the idea of, and use the notation for, a sequence of approximations which converges to a root of an equation
12.1	NUMERICAL SOLUTIONS OF EQUATIONS	Understand how a given simple iterative formula of the form xn + 1 = F(xn) relates to the equation being solved, and use a given iteration, or an iteration based on a given rearrangement of an equation, to determine a root to a prescribed degree of accuracy; knowledge of the condition for convergence is not included, but an understanding that an iteration may fail to converge is expected
13.1	VECTORS	Use standard notations for vectors
13.2	VECTORS	Carry out addition and subtraction of vectors and multiplication of a vector by a scalar, and interpret these operations in geometrical terms. The general form of the ratio theorem is not included, but understanding the mid-point of AB has is expected
13.3	VECTORS	Calculate the magnitude of a vector, and use unit vectors, displacement vectors and position vectors, in 2 or 3 dimensions
14.1	VECTORS	Understand the significance of all the symbols used when the equation of a straight line is expressed in the form r = a + tb, and find the equation of a line, given sufficient information e.g. finding the equation of a line given the position vector of a point on the line and a direction vector, or the position vectors of two points on the line

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14.2	VECTORS	Determine whether two lines are parallel, intersect or are skew, and find the point of intersection of two lines when it exists; calculation of the shortest distance between two skew lines is not required; finding the equation of the common perpendicular to two skew lines is also not required
14.3	VECTORS	Use formulae to calculate the scalar product of two vectors, and use scalar products in problems involving lines and points; e.g. finding the angle between two lines, and finding the foot of the perpendicular from a point to a line; questions may involve 3D objects such as cuboids, tetrahedra (pyramids), etc.; knowledge of the vector not required.
15.1	DIFERENTIAL EQUATIONS	Formulate a simple statement involving a rate of change as a differential equation; the introduction and evaluation of a constant of proportionality, where necessary, is included
15.2	DIFERENTIAL EQUATIONS	Find by integration a general form of solution for a first order differential equation in which the variables are separable; including any of the integration techniques from topic 3.5 above
15.3	DIFERENTIAL EQUATIONS	Use an initial condition to find a particular solution
15.4	DIFERENTIAL EQUATIONS	Interpret the solution of a differential equation in the context of a problem being modelled by the equation; where a differential equation is used to model a ‘real-life’ situation, no specialised knowledge of the context will be required

MATHS PAPER 3 SCHEME OF WORK

FORM 7 - TERM 2

WEEK	TOPIC	TOPIC DETAILS
1.1	C OMPLEX NUMBERS	Understand the idea of a complex number, recall the meaning of the terms real part, imaginary part, modulus, argument, conjugate, and use the fact that two complex numbers are equal if and only if both real and imaginary parts are equal; notations Rez, Imz, $\|z\|$, argz, z* should be known; the argument of a complex number will usually refer to an angle θ such that $-\pi < \theta \leq \pi$, but in some cases the interval $0 \leq \theta < 2\pi$ may be more convenient; answers may use either interval unless the question specifies otherwise
1.2	C OMPLEX NUMBERS	Carry out operations of addition, subtraction, multiplication and division of two complex numbers expressed in Cartesian form x + iy; for calculations involving multiplication or division, full details of the working should be shown
1.3	C OMPLEX NUMBERS	Use the result that, for a polynomial equation with real coefficients, any non-real roots occur in conjugate pairs, e.g. in solving a cubic or quartic equation where one complex root is given represent complex numbers geometrically by means of an Argand diagram
1.4	C OMPLEX NUMBERS	Carry out operations of multiplication and division of two complex numbers expressed in polar form $r(\cos\theta + i\sin\theta) \equiv re^{i\theta}$; including the results $\|z_1z_2\| = \|z_1\|\|z_2\|$ and $\arg(z_1 z_2) = \arg(z_1) + \arg(z_2)$, and corresponding results for division Find the two square roots of a complex number e.g. the square roots of 5 + 12i in exact Cartesian form; full details of the working should be shown Understand in simple terms the geometrical effects of conjugating a complex number and of adding, subtracting, multiplying and dividing two complex numbers illustrate simple equations and inequalities involving complex numbers by means of loci in an Argand diagram, e.g. $\|z - a\| < k$, , $\arg(z - a) = a$
2.1	REPRESENTATION OF DATA	Select a suitable way of presenting raw statistical data, and discuss advantages and/or disadvantages that representations may have

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2.2	REPRESENTATION OF DATA	Draw and interpret stem-and-leaf diagrams, box-and-whisker plots, histograms and cumulative frequency graphs, including back-to-back stem-and-leaf diagrams
3.1	REPRESENTATION OF DATA	Understand and use different measures of central tendency (mean, median, mode) and variation (range, interquartile range, standard deviation), e.g. in comparing and contrasting sets of data
3.2	REPRESENTATION OF DATA	Use a cumulative frequency graph, e.g. to estimate medians, quartiles, percentiles, the proportion of a distribution above (or below) a given value, or between two values
4.1	REPRESENTATION OF DATA	Calculate and use the mean and standard deviation of a set of data (including grouped data) either from the data itself or from given totals ∑x and ∑x^2, or coded totals ∑(x – a) and ∑(x – a)^2 , and use such totals in solving problems which may involve up to two data sets
5.1	PROBABILITY	Evaluate probabilities in simple cases by means of enumeration of equiprobable elementary events or by calculation using permutations or combinations, e.g. the total score when two fair dice are thrown, or drawing balls at random from a bag containing balls of different colours (Knowledge of the following probability notation may also be required: P(A), P(A∪B), P(A∩B), P(A/B) and the use of A' to denote the complement of A)
5.2	PROBABILITY	Use addition and multiplication of probabilities, as appropriate, in simple cases; explicit use of the general formula P(A∪B)=P(A)+P(B) - P(A∩B)is not required
6.1	PROBABILITY	Understand the meaning of exclusive and independent events, including determination of whether events A and B are independent by comparing the values of and P(A∩B) and P(A) × P(B)
6.2	PROBABILITY	Calculate and use conditional probabilities in simple cases, e.g. situations that can be represented by a sample space of equiprobable elementary events, or a tree diagram; the use of may be required in simple cases
7.1	DISCRETE RANDOM VARIABLES	Draw up a probability distribution table relating to a given situation involving a discrete random variable X, and calculate E(X) and Var(X)

WEEK	TOPIC	TOPIC DETAILS
7.2	DISCRETE RANDOM VARIABLES	Use formulae for probabilities for the binomial and geometric distributions, and recognise practical situations where these distributions are suitable models, including the notations B(n, p) and Geo(p) ; Geo(p) denotes the distribution in which pr = p(1 – p)^(r–1) for r = 1, 2, 3, …
8.1	DISCRETE RANDOM VARIABLES	Use formulae for the expectation and variance of the binomial distribution and for the expectation of the geometric distribution; proofs of formulae are not required
9.1	THE NORMAL DISTRIBUTION	Understand the use of a normal distribution to model a continuous random variable, and use normal distribution tables; sketches of normal curves to illustrate distributions or probabilities may be required
9.2	THE NORMAL DISTRIBUTION	Solve problems concerning a variable X, where X ~ N(μ,σ²) including: finding the value of P(X > x1), or a related probability, given the values of x1, μ, σ finding a relationship between x1, μ, and σ given the value of P(X > x1) or a related probability for calculations involving standardisation, full details of the working should be shown, e.g.Z = ((X-μ))/σ
10.1	THE NORMAL DISTRIBUTION	Recall conditions under which the normal distribution can be used as an approximation to the binomial distribution, and use this approximation, with a continuity correction, in solving problems; n sufficiently large to ensure that both np > 5 and nq > 5
11.1	PERMUTATIONS AND COMBINATIONS	Understand the terms permutation and combination, and solve simple problems involving selections
12.1	PERMUTATIONS AND COMBINATIONS	Solve problems about arrangements of objects in a line, including those involving - repetition (e.g. the number of ways of arranging the letters of the word ‘NEEDLESS’) - restriction (e.g. the number of ways several people can stand in a line if two particular people must, or must not, stand next to each other); NOTE:questions may include cases such as people sitting in two (or more) rows; questions about objects arranged in a circle will not be included