An tSraith Shóisearach do Mhúinteoirí
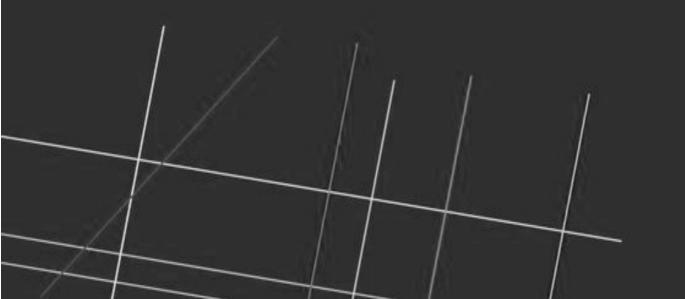
Junior**CYCLE**

for teachers

A Quick Reference Guide to the

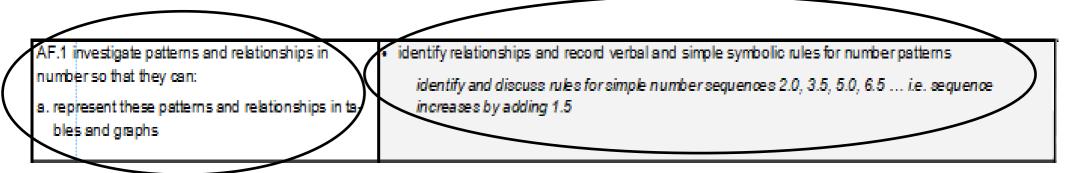Links Between the Primary and Post Primary

Mathematics

How to use this guide:

This quick reference guide is intended for use by teachers when planning for learning, teaching and assessment using the learning outcomes in the Mathematics specification. It gives an overview of the links between the learning outcomes in the Junior Cycle Mathematics specification and the 5th/6th class content objectives in the Primary School Mathematics curriculum. As such only the pertinent learning outcomes in the Mathematics specification have been included. Learning outcomes from the Junior Cycle Mathematics specification are listed in the column on the left. Possible links to the Primary School Mathematics curriculum content objectives are listed in the column on the right. (5th/6th class content objectives are repeated across some strands where some other possible links can be made)

AF.1 investigate patterns and relationships in number so that they can: a. represent these patterns and relationships in tables and graphs	• identify relationships and record verbal and simple symbolic rules for number patterns *identify and discuss rules for simple number sequences 2.0, 3.5, 5.0, 6.5 … i.e. sequence increases by adding 1.5*

This document is not intended to replace the Primary School Curriculum (1999) documents or the Mathematics specification at Junior Cycle. It is important that post primary teachers of Mathematics also refer to the Mathematics specification and the Framework for Junior Cycle (2015) when planning for learning, teaching and assessment.

Contents

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:
N.1 investigate the representation and arithmetic operations so that they can: a. represent the operations of addition, subtraction, multiplication and division in N, Z and Q using models including the number line, decomposition and accumulating groups of equal size	• read, write and order whole numbers and decimals • solve problems involving operations with whole numbers, fractions, decimals and simple percentages *(use diagrams)* • explore and discuss simple properties and rules about brackets and priority of operation • identify positive and negative numbers on the number line • add simple positive and negative numbers on the number line • express improper fractions as mixed numbers and vice versa and place them on the number line

N.1 investigate the representation and arithmetic operations so that they can:
 	
b. perform the order of operations of addition, subtraction, multiplication and division and understand the relationship between these operations and the properties commutative, associative and distributive in N, Z and Q **and in R/Q, including operating on surds**
	• add and subtract whole numbers and decimals (to three decimal places) with and without a calculator
	
	• multiply a decimal by a decimal, without and with a calculator
	    understand that multiplication does not always make bigger
	
	• divide a four-digit number by a two-digit number, without and with a calculator
	
	• divide a decimal number by a decimal, without and with a calculator
	    understand that division does not always make smaller
	
	• add and subtract simple fractions and simple mixed numbers
	    use equivalent fractions to simplify calculations
	    common denominator should be found by listing multiples
	
	• multiply a fraction by a fraction
	
	• multiply a fraction by a whole number
	
	• divide a whole number by a unit fraction
	
	• add simple positive and negative numbers on the number line
	
	• explore and discuss simple properties and rules about brackets and the priority of operations
	
	• know simple properties and rules about brackets and the priority of operation

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:
N.1 investigate the representation and arithmetic operations so that they can: c. explore numbers written in the form a^b so that they can I. flexibly translate between whole numbers and index representation of numbers II. use and apply generalisations such as $a^p\, a^q = a^{p+q}$; $(a^p)/(a^q) = a^{p-q}$; $(a^p)^q = a^{pq}$; and $n^{1/2} = \sqrt{n}$, for $a \in Z$, and $p, q, p-q, \sqrt{n} \in N$ **and for a, b, $\sqrt{n} \in R$, and p, q $\in$ Q** **III. use and apply generalisations such as $a^0 = 1$; $a^{p/q} = \sqrt[q]{a^p} = (\sqrt[q]{a})^p$; $a^{-r} = 1/(a^r)$; $(ab)^r = a^r b^r$; and $(a/b)^r = (a^r)/(b^r)$, for a, b $\in$ R; p, q $\in$ Z; and r $\in$ Q** IV. generalise numerical relationships involving operations involving numbers written in index form V. correctly use the order of arithmetic and index operations including the use of brackets	• identify and explore square numbers • explore and identify simple square roots construct diagrams record and relate to square numbers • write whole numbers in exponential form

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:
N.1 investigate the representation and arithmetic operations so that they can: d. calculate and interpret factors (including the highest common factor), multiples (including the lowest common factor) and prime numbers	• identify simple prime and composite numbers *define a prime number, i.e. a number greater than 1 with exactly two divisors, itself and 1; identify simple prime numbers by trial and error, e.g. 2, 5, 7, 11; identify and record primes with Sieve of Eratosthenes; define a composite number, i.e. a number that has more than two divisors, e.g. 4, 6, 9; identify and record composite numbers using number facts and/or a calculator; investigate relationship with odd and even numbers* • identify factors and multiples • identify common factors and multiples explore and record factors and multiples to identify common factors and multiples
N.1 investigate the representation and arithmetic operations so that they can: e. present numerical answers to the degree of accuracy specified, for example, correct to the nearest hundred, to two decimal places or to three significant places	• identify place value in whole numbers and decimals • round whole numbers to the nearest to the nearest ten, hundred, thousand • round decimals to one, two or three decimal places • estimate sums, differences, products and quotients of whole numbers use strategies for estimation, *e.g. front-end estimation, rounding, clustering, special numbers estimate calculations and compute answers with a calculator e.g. 450 x 9 = 4500 (estimation based on 450 x 10); estimate first, then use calculator to get actual result*

Junior Cycle Mathematics Specification	5th/6th Class Primary School Mathematics Curriculum
The student should be able to:	The pupil should be able to:

N.2 investigate equivalent representations of rational numbers so that they can:
 	
a. flexibly convert between fractions, decimals and percentages
	• compare and order fractions and identify equivalent forms of fractions
	    order equivalent fractions on the number line and on fraction charts
	• express improper fractions as mixed numbers and vice versa and position them on the number line
	• multiply a fraction by a whole number
	• add and subtract simple fractions and simple mixed numbers
	• multiply a fraction by a fraction explore and develop concept by using concrete materials and the number line and by drawing diagrams to illustrate examples, leading to the development of an algorithm
	• compare and order fractions and decimals
	    explore, compare and record using concrete materials and money
	order diagrammatically or on the number line
	• express tenths, hundredths and thousandths in both fractional and decimal form
	• divide a whole number by a unit fraction
	• solve problems involving operations with whole numbers, fractions, decimals and simple percentages
	• develop an understanding of simple percentages and relate them to fractions and decimals
	    express percentages as fractions and as decimals, and vice versa calculate simple percentages, e.g. 50%, 25%, 10%
	• use percentages and relate them to fractions and decimals
	• compare and order percentages of numbers

N.2 investigate equivalent representations of rational numbers so that they can: b. use and understand ratio	• understand and use simple ratios *explore and record the relationship between the natural numbers and their multiples*

Junior Cycle Mathematics Specification	5th/6th Class Primary School Mathematics Curriculum
The student should be able to:	The pupil should be able to:
N.2 investigate equivalent representations of rational numbers so that they can: c. solve money related problems including those involving bills, VAT, profit or loss, % profit or loss (on the cost price), cost price, selling price, compound interest for not more then 3 years, income tax (standard rate only), net pay (including other deductions of specified amounts), value for money calculations and judgements, **mark up (profit as a % of the cost price) margin (profit as a % of selling price), compound interest, income tax and net pay (including other deduc-**	• multiply a fraction by a whole number • solve problems relating to profit and loss, discount, VAT, interest, increases, decreases. • compare value for money using the unitary method • explore value for money *calculate sale prices, e.g. 10% discount, 20% VAT added*

N.3 investigate situations involving proportionality so that they can:
 	
b. solve problems involving proportionality including those involving currency conversion and those involving speed, distance and time
	• multiply a fraction by a whole number
	
	• explore the relationship between time, distance and average speed
	
	    measure, using a stop-watch, the time taken for short journeys to be completed or short distances to be covered and compile database to examine averages
	
	• convert other currencies to euro and vice versa
	
	    identify and discuss exchange rates from newspaper calculate major currency equivalents for basic sums of euro, convert sums of money in other currencies to euro equivalents.

N.4 analyse numerical patterns in different ways, including making out tables and graphs, and continue such patterns	• identify relationships and record verbal and simple symbolic rules for number patterns
	
	    identify and discuss rules for simple number sequences 2.0, 3.5, 5.0, 6.5
	
	• explore the concept of a variable in the context of simple patterns, tables and simple formulae and substitute values for variables
	
	    identify and discuss simple formulae from other strands e.g $d = 2 \times r$; $a = l \times w$
	    substitute values into formulae and into symbolic rules developed from number patterns.

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:
GT.1 calculate, interpret and apply units of measure and time	• select and use appropriate instruments of measurement for length, weight and capacity • estimate and measure length, weight and capacity using appropriate metric units • rename measures of length, weight and capacity *rename measurements of appropriate metric units, express results as fractions and decimal fractions of appropriate metric units* $$750 \ g \ = \ \tfrac{3}{4} \ kg \ = \ 0.75 \ kg$$ $$4 \ kg \ 45 \ g = 4\tfrac{45}{1000} \ kg \ = \ 4.045 \ kg.$$ • read and interpret timetables and the 24-hour clock (digital and analogue) • explore international time zones • interpret and convert between times in 12-hour and 24-hour format • explore the relationship between time, distance and average speed.
GT.2 investigate 2D shapes so that they can: a. draw and interpret scaled diagrams	• find the area of a room from a scale plan • use and interpret scales on maps and plans *identify given scale on a map or plan and draw items to a larger or smaller scale*

GT.2 investigate 2D shapes and 3D solids so that they can:
 	
b. draw and interpret nets of rectangular solids, **prisms (polygonal bases), cylinders**
	• identify and examine 3-D shapes and explore relationships including octahedron (faces, edges and vertices)
	
	• measure the surface area of specified 3-D shapes
	
	   measure 3-D surfaces by measuring individual 2-D faces or by extending into nets
	
	• draw the nets of simple 3-D shapes and construct the shapes
	
	   discuss and draw simple net including flaps where necessary
	
	   construct 3-D shapes from nets

Junior Cycle Mathematics Specification	5th/6th Class Primary School Mathematics Curriculum
The student should be able to:	The pupil should be able to:

GT.2 investigate 2D shapes and 3D solids so that they can:
 	
c. find the perimeter and area of plane figures made from combinations of discs, triangles and rectangles including relevant operations involving pi
	• estimate and measure the perimeter of regular and irregular shape
	
	• rename measures of length
	
	   rename measurements of appropriate metric units, express results as fractions and decimal fractions of appropriate metric units
	
	   $233 \ m = \frac{233}{1000} \ km = 0.233 \ km$
	
	   $1 \ m \ 11 \ cm = 1\frac{11}{100} \ m = 1.11 \ m$
	
	• discover that the area of a rectangle is length by breadth
	
	   determine by repeated experiments using rectangles with sides measured in whole centimetres and square units of one square centimetre
	
	• estimate and measure the area of regular and irregular 2-D shapes
	
	• calculate area using square centimetres and square metres
	
	   choose appropriate measuring units: square centimetres (smaller objects) square metres (large objects or rooms)
	
	• compare visually square metres and square centimetres.
	
	• recognise that the length of the perimeter of a rectangular shape does not determine the area of the shape
	
	• calculate the area of regular and irregular 2-D shapes
	
	• calculate area using acres and hectares
	
	• identify the relationship between square metres and square centimetres
	
	• tessellate combinations of 2D shapes

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:

GT.2 investigate 2D shapes and 3D solids so that they can
 	
d. find the volume of rectangular solids, cylinders, **triangular - based prisms, spheres** and combinations of these, including relevant operations involving pie
	• select and use appropriate instruments of measurement
	
	• estimate and measure capacity using appropriate metric units
	
	• rename measures of capacity
	
	  rename measurements of appropriate metric units
	
	  express results as fractions or decimals of appropriate metric units
	
	$625 \ ml \ = \ \frac{5}{8} \, l \ = \ 0.625 \ l$
	
	$8 \ l \ 253 \ ml \ = \ 8 \, \frac{253}{1000} \, l \ = \ 8.253 \ l$
	
	• find the volume of a cuboid experimentally
	
	  fill a cuboid container with water and measure capacity in litres ,
	
	  fill a cuboid container with unit cubes and count

GT.2 investigate 2D shapes and 3D solids so that they can: e. find the surface area and **curved surface area (as appropriate)** of rectangular solids , **cylinders, triangular - based prisms, spheres,** and combinations of these	• measure the surface area of specified 3D shapes *measure 3D surfaces by measuring individual 2D faces or by extending into nets*

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:
GT.3 investigate the concept of proof through their engagement with geometry so that they can: a. perform constructions 1 - 15 in *Geometry for Post Primary School Mathematics* **(constructions 3 and 7 at HL only)**	• estimate, measure and construct angles in degrees • construct a circle of given radius or diameter draw using a compass • construct triangles from given sides or angles *complete the construction of triangles, given two sides and the angle between them or given two angles and the line between them*

GT.3 investigate the concept of proof through their engagement with geometry so that they can:
 	
b.   recall and use the concepts, axioms, theorems, corollaries and converses, specified in *Geometry for Post-Primary School Mathematics* (section 9 for OL and **section 10 for HL**)
 	
   I. axioms 1, 2, 3, 4 and 5
 	
  II. theorems 1, 2, 3, 4, 5, 6, 9, 10, 13, 14, 15 **and 11, 12, 19,** and appropriate converses including relevant operations involving square roots
 	
 III. corollaries 3, 4 **and 1, 2, 5** and appropriate converses
	• make informal deductions about 2-D shapes and their properties
	
	• recognise angles in terms of a rotation
	
	• recognise, classify and describe angles and relate angles to shape
	
	• use angle and line properties to classify and describe triangles and quadrilaterals name, explore and compare a wide variety of three and four-sided figures in terms of size and number of angles, type and number of sides e.g. trapezium, scalene triangle, regular hexagon
	
	• identify the properties of the circle
	
	    explore and compare circles of various unit diameters measure and identify the relationship of diameter to radius
	
	    examine area by counting square units
	
	• explore the sum of the angles in a triangle cut off the three corners of a paper triangle and put them together to make 180° measure the angles in a variety of triangles using a protractor
	
	    cut off the three corners of a paper triangle and put them together to make 180°
	
	• explore the sum of the angles in a quadrilateral
	
	    cut off the four corners of a paper quadrilateral and put them together to make 360° measure the angles in a variety of quadrilaterals and calculate their sums

Geometry and Trigonometry Strand

Links to the primary school Mathematics curriculum

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:

GT. 3 investigate the concept of proof through their engagement with geometry so that they can:
 	
e. display understanding of the proofs of theorems 1, 2, 3, 4, 5, 6, 9, 10, 14, 15, **and 13, 19**; and of corollaries 3, 4, **and 1, 2, 5** (full formal proofs are not examinable)
	• explore the sum of the angles in a triangle cut off the three corners of a paper triangle and put them together to make 180° measure the angles in a variety of triangles using a protractor
	
	    cut off the three corners of a paper triangle and put them together to make 180°
	
	• explore the sum of the angles in a quadrilateral cut off the four corners of a paper quadrilateral and put them together to make 360° measure the angles in a variety of quadrilaterals and calculate their sums
	
	    cut off the four corners of a paper quadrilateral and put them together to make 360°
	
	    measure the angles in a variety of quadrilaterals and calculate their sums

GT.5 investigate properties of points, lines and line segments in the co-ordinate plane so that they can: a. find and interpret: distance, midpoint, slope, point of intersection, and slopes of parallel **and perpendicular** lines	• plot simple co-ordinates and apply where appropriate, use geoboards and squared paper *use geoboards and squared paper* • use 2D shapes and properties to solve problems
GT.6 investigate transformations of simple objects so that they can: a. recognise and draw the image of points and objects under translation, central symmetry, axial symmetry and rotation	• recognise angles in terms of a rotation *examine, measure and record the angles (including the reflex angle) formed by the hands of a clock at a variety of different times; extend by using manipulatives, e.g. straws, lollipop sticks, Meccano, string, 360° protractor, LOGO computer language if available*
GT.6 investigate transformations of simple objects so that they can: b. draw the axes of symmetry in shapes	• classify 2-D shapes according to their lines of symmetry

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:
AF.1 investigate patterns and relationships in number so that they can: a. represent these patterns and relationships in tables and graphs	• identify relationships and record verbal and simple symbolic rules for number patterns *identify and discuss rules for simple number sequences 2.0, 3.5, 5.0, 6.5 … i.e. sequence increases by adding 1.5*
AF.1 investigate patterns and relationships in number so that they can: b. generate a generalised expression for linear **and quadratic** patterns in words and algebraic expressions and fluently convert between each representation.	• translate number sentences with a frame into word problems and vice versa • translate word problems with a variable into number sentences
AF.2 investigate situations in which letters stand for quantities that are variable so that they can: a. interpret expressions in which letters stand for numbers	• explore the concept of a variable in the context of simple patterns, tables and simple formulae and substitute values for variables *identify and discuss simple formulae from other strands e.g. d = 2 x r; a = l x w* *substitute values into formulae and into symbolic rules developed from number patterns.*
AF.4 select and use suitable strategies (graphic, numeric, algebraic, trial and improvement, working backwards) for finding solutions to: a. linear equations in one variable with coefficients in Q and solutions in Z **or in Q**	• solve one-step number sentences and equations

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:
SP.1 investigate the outcomes of experiments so that they can: a. generate a sample space for an experiment in a systematic way, including tree diagrams for successive events and two way tables for independent events	• identify and list all possible outcomes of simple random processes *discuss and list all possible outcomes of:* *rolling a die (1,2,3,4,5,6)* *rolling two die and calculating total* *tossing two coins* *drawing a cube from a bag containing blue, red and green cubes* *selecting any two numbers at random from the numbers 1,2,3,4,5*
SP.2 investigate random events so that they can: a. demonstrate understanding that probability is a measure on a scale of 0 –1 of how likely an event (including an everyday) event is to occur.	• estimate the likelihood of occurrence of events on a scale from 0 - 100%, 0 to 1
SP. 2 investigate random events so that they can: c. use relative frequency as an estimate of the probabilty of an event, given experimental data, and recognise that increasing the number of times an experiment is repeated generally leads to progressively better estimates of its theoretical probability	• construct and use frequency charts and table

Statistics and Probability Strand

Links to the primary school Mathematics curriculum

Junior Cycle Mathematics Specification The student should be able to:	5th/6th Class Primary School Mathematics Curriculum The pupil should be able to:
SP.3 carry out a statistical investigation which includes the ability to: b. plan and implement a method to generate and/or source unbiased,representative data, and present this data in a frequency table	• collect, organise and represent data using pictograms, single and multiple bar charts and simple pie charts collect data from the environment in tabular form and represent in appropriate format discuss and explore modes of representation • construct and use frequency charts and tables
SP.3 carry out a statistical investigation which includes the ability to: d. select, draw and interpret appropriate graphical displays of univariate data, including pie charts, bar charts, line plots, histograms (equal intervals), ordered stem and leaf plots, **and ordered back-to-back stem and leaf plots**	• collect, organise and represent data using pictograms, single and multiple bar charts and simple pie charts collect data from the environment in tabular form and represent in appropriate format discuss and explore modes of representation • read and interpret pictograms, single and multiple bar charts, and pie charts • collect, organise and represent data using pie charts and trend graphs sales or rainfall per month • read and interpret trend graphs and pie charts

SP.3 carry out a statistical investigation which includes the ability to:
 	
e. select, calculate and interpret appropriate summary statistics to describe aspects of univariate data. Central tendency: mean **(including of a grouped frequency distribution),** median, mode. Variability: range
	• explore and calculate averages of simple data sets
	
	    calculate the average by adding all the values and dividing by the number of items (use a calculator)
	
	    identify the most frequently occurring item in a data set
	
	    calculate average by adding all the values and dividing by the number of items (use a calculator)