Quantitative Skills by Strand and Review Sheet

The following skills will be covered by the Diagnostics. They are arranged in four strands (Number, Graphs, Algebra, Measurement). Within each strand the skills are listed according to the Q Skills Review in which they appear. It is recommended that you work through the reviews in the order given here, since some of the later reviews rely on skills examined in the earlier reviews.

Number Strand

Definition of Number: an arithmetical value, expressed by a word, symbol, or figure, representing a particular quantity and used in counting and making calculations; a sum of units.

1-3) Quantity and Calculation

– Estimating value/size of fractions, percentages (incl. >100%), decimals.
– Units: give correct units for all quantities which have units
– Calculation: whole numbers and negative numbers (without a calculator)
– Order of Operations applied correctly to calculations
– Use of formulas: substitute into formula then evaluate

4) Fractions

– equivalent fractions and 'cancelling'
– add, subtract, multiply, and divide fractions (without a calculator)

5) Decimals

– understanding the size of decimal fractions
– add, subtract, multiply, and divide decimal fractions (without a calculator)

6) Percentages

– p% of a quantity = an amount : find any part of this
– understand one quantity is "p% more than" another
– % increase/decrease, distinguish from final value
– find effect of a sequence of % changes (ie compounding)
– understand absolute vs. percentage change

Graphs Strand

Definition of Graphs: diagrams showing the relation between variable quantities, typically of two variables, each measured along one of a pair of axes at right angles.

1) Relationships and Graphs

– Scales: read axis scales correctly (when not 1 square per unit)
choose appropriate axis scales to draw a graph
– Read and interpret info from a graph (including meaning of slope and its units)
– Plot graph points from data or function values
– Identify increasing/decreasing functions from graph

2) Linear Graphs

– Slope: find slope of simple straight line graph, determine positive/negative
find slope from coordinates of two points
relate slope and change in x and y variables
– Equation of a straight line: from graph
understand each symbol in $y = mx + b$
different forms of the equation of a straight line
find axis intercepts from equation
– Draw line given: two points or one point and slope or equation in any form
– Determine if a point is above, on, or below a line
– Read coordinates of point of intersection of two lines from graph and interpret

Algebra Strand

Definition of Algebra: a generalization of arithmetic in which letters representing numbers are combined according to the rules of arithmetic.

1) **Expressions and Equations**
   - – Simplify expressions: collect like terms
   - – Brackets: expand/factor involving one bracket
   - – Distinguish expressions and equations
   - – Solve linear equations involving BEDMAS
   - – Use of formulas: change subject (ie rearrange) or substitute into formula then solve

2) **Systems of Equations**
   - – Pairs of Equations: solve algebraically by substitution or elimination method
   - – Calculate coordinates of points of intersection of graphs

3) **Non-Linear Expressions and Equations**
   - – Algebraic fractions: simplify by cancelling factors in numerator/denominator
   - – Brackets: expand/factor involving two brackets
   - – Solve factored quadratic equation (ie (...)(...) = 0)
   - – Solve equations and rearrange formulas involving roots

4) **Exponents and Roots**
   - – Meaning of exponents (positive, zero, negative)
   - – When to add/subtract/multiply exponents
   - – Fractional exponents and relation to roots
   - – Square roots: combining, simplifying, square rooting

5) **Right Triangles**
   - – Pythagorean theorem
   - – Trigonometry to find a side or angle in a right triangle

Measurement Strand

Definition of Measurement: the size, length, or amount of something; its dimension, magnitude; a unit or system of measuring.

1) Units of Measurement

– Metric units and common traditional units

– Unit conversions: between different metric prefixes

of square and cubic units

cubic units to litres, hours to hrs and mins

of rates (eg g/cm^3 to kg/m^3)

between systems (eg lbs to kg) given conversion fact

2) Length, Area, Volume

Know and use formulas for common geometric shapes:

– Lengths: perimeter, radius/diameter/circumference of circles

– Areas: rectangle, triangle, circle, surface area combining these

– Volumes: prism and cylinder, pyramid and cone, sphere

3) Analysing Dimensions and Formulas

– Analyse dimensions of quantities in a formula

– Understand need for consistency of units (eg all lengths in metres)

– Use formula to find units of a quantity

– Use units to suggest/validate a formula

– Ratios: units the same unless stated otherwise

– Recognise proportional and inverse proportional situations

4) Scientific Notation

– Converting to/from scientific notation

– Multiplying, dividing and adding/subtracting numbers in scientific notation

– Precision: give an appropriate number of significant digits