The de Ferrers Trust

# MATHEMATICS - YEAR 11 HIGHER - PART 1

## A ALGEBRAIC FRACTIONS

| | | |
|---|---|---|
| 1 | Simplify algebraic fractions | Factorise where possible.<br>Cancel common factors. |
| 2 | Adding, subtracting, multiplying and dividing algebraic fractions | Follow the same rules as numeric fractions. Cancel common factors. |
| 3 | Solving equations with algebraic fractions | Simplify the algebraic fraction first.<br>Then solve the equation. |

## B ALGEBRAIC PROOF

| | | |
|---|---|---|
| 1 | Example | One numeric solution required. |
| 2 | Prove/proof | Must work for any number. An **algebraic solution** is required. |
| 3 | Consecutive numbers | $n, n+1, n+2$ ... |
| 4 | Consecutive even numbers | $2n, 2n+2, 2n+4$ ... |
| 5 | Consecutive odd numbers | $2n+1\ 2n+3, 2n+5$ ... |
| 6 | A multiple of $n$ | An expression is a multiple of $n$ if $n$ is a common factor.<br><br>e.g. 6 is a multiple of $18n$ + 30 because it can be written as 6(3n + 5) |

## C DIRECT AND INVERSE PROPORTION

| | | |
|---|---|---|
| 1 | Direct proportion ($y \propto x$) | $y = kx$<br><br>As $x$ increases, $y$ **increases** proportionally |
| 2 | Inverse proportion ($y \propto \frac{1}{x}$) | $y = \frac{k}{x}$<br><br>As $x$ increases, $y$ **decreases** proportionally |

## D COORDINATE GEOMETRY OF A CIRCLE

| | | |
|---|---|---|
| 1 | Equation of a circle | $x^2 + y^2 = r^2$ ($r$ is the radius, centre 0,0) |
| 2 | Identifying if coordinates lie on a circle | On the circle if $x^2 + y^2 = r^2$<br>Inside the circle if $x^2 + y^2 < r^2$<br>Outside the circle if $x^2 + y^2 > r^2$ |
| 3 | Finding the equation of a tangent to a point on a circle | • Find the gradient of the radius<br>• The radius is **perpendicular** to the tangent<br>• Find the gradient of the tangent<br>• Substitute into y = mx + c using the coordinates |

## E FUNCTIONS

| | | |
|---|---|---|
| 1 | Function | A function relates an input into an output. |
| 2 | Composite function | When one the output of one function becomes the input for another. |
| 3 | Inverse function | A function that reverses another function.<br>e.g. For the function:<br>$x \rightarrow \times 5 \rightarrow -3 \rightarrow y$<br>Replace the output with the input ($y$ with $x$) and select inverse operations:<br>$y \leftarrow \div 5 \leftarrow +3 \leftarrow x$<br>The inverse function is $\frac{x+3}{5}$ |

## E VELOCITY-TIME GRAPHS

| | | |
|---|---|---|
| 1 | Velocity-time graphs | Horizontal lines represent constant velocity.<br>Sloping lines represent acceleration (upward) or deceleration (downward). |
| 2 | Finding acceleration from a velocity-time graph | Acceleration is the **gradient** of a straight line, or the gradient of the tangent at a point. |
| 3 | Finding the total distance travelled from a velocity-time graph | Find the **area under the curve**<br>Note: Area of a trapezium: $\frac{1}{2}(a+b)h$ |