

# Springburn Academy : Mathematics Department

## Higher Mathematics : Lesson Starters

Block 1 Without using a calculator :

### Task 6

- 1 Find the equation of the perpendicular bisector of R(2, 10) and S (3,12).
- 2 Vector  $\mathbf{a} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$  and vector  $\mathbf{b} = \begin{pmatrix} -4 \\ 0 \end{pmatrix}$ . Calculate  $|3\mathbf{a} + 4\mathbf{b}|$
- 3 Where does the line  $2x + 3y - 9 = 0$  cut the y-axis?
- 4 Express  $x^2 + 10x + 9$  in the form  $(x + p)^2 + q$ .

### Task 7

- 1 Write down the period of the graph of the equation  $y = \sin 3x$ .
- 2 The line  $2y = x + 1$  crosses the y-axis at (0, a). Find the value of a.
- 3 Determine the nature of the roots of the equation  $3x^2 - 4x + 5 = 0$  using the discriminant.
- 4 E, F and G are the points with coordinates (0, -5), (2, -11) and (8, 1) respectively.  
The equation of the altitude EH of triangle EFG is  $2y = -x + 10$ . (True or False?)

### Task 8

- 1 The line  $3y - 4x = 7$  is parallel to the line  $6y = -8x + 9$ . (True or False?)
- 2 Determine if the points A(-5, -3), B(-1, 0) and C(7, 6) are collinear.
- 3 Find the angle that the line joining K (-8, 8) and L(5, -5) makes with the x- axis.
- 4 Solve the equation  $x^2 + 3x - 5 = 0$  using the quadratic formula.  
(Leave your answer in surd form.)

**Task 9**

- (a) Find the equation of  $L_1$ , the perpendicular bisector of the line joining  $P(3, -3)$  to  $Q(-1, 9)$ .
- (b) Find the equation of  $L_2$  which is parallel to  $PQ$  and passes through  $R(1, -2)$ .
- (c) Find the point of intersection of  $L_1$  and  $L_2$ .
- (d) Hence find the shortest distance between  $PQ$  and  $L_2$ .

**Task 10**

A quadrilateral has vertices  $A(-1, 8)$ ,  $B(7, 12)$ ,  $C(8, 5)$  and  $D(2, -3)$  as shown in the diagram.

- (a) Find the equation of diagonal  $BD$ .
- (b) The equation of diagonal  $AC$  is  $x + 3y = 23$ . Find the coordinates of  $E$ , the point of intersection of the diagonals.
- (d) Find the equation of the perpendicular bisector of  $AB$ .
- (e) Show that this line passes through  $E$ .

