

# Springburn Academy : Mathematics Department

## Higher Mathematics : Lesson Starters

### Block 3 ( Circle 2)

Without using a calculator :

#### Task 1

- 1 Differentiate  $\frac{3x^2 - 4x}{2x^3}$  wrt  $x$ .
- 2 If  $u_{n+1} = 4u_n - 5$ ,  $u_4 = -169$ , find  $u_2$ .
- 3 What is the min. value of  $(2x - 1)^2 + 9$ ?
- 4 Find the distance between the centers of the circles with equations  $x^2 + y^2 - 4x + 6y - 3 = 0$  and  $(x - 5)^2 + (y + 7)^2 = 25$ .

#### Task 2

- 1 Factorise  $3x^2 - 2x - 8$
- 2 Write down max. value of  $5 - 3\sin(2x)$
- 3 For what value(s) of  $p$  does  $2x^2 + 3x - p = 0$  have equal roots?
- 4 Find the distance between the centers of the circles with equations  $x^2 + y^2 + 10x + 8y + 17 = 0$  and  $(x + 3)^2 + (y - 5)^2 = 16$ .

#### Task 3

- 1 Write down the equation of the circle center  $(1, -4)$  with radius double that of the circle with equation  $x^2 + y^2 - 4x + 6y - 3 = 0$
- 2 Write  $x^2 - 10x - 3$  in the form  $(x + a)^2 + b$
- 3 Write down max. value of  $8 - 5\cos(2x)$
- 4 Calculate  $\int_0^2 (3x^2 - 4x + 6)dx$

#### Task 4

- 1 What is the min. value of  $14 + (6 - 11x)^2$ ?
- 2 Solve  $\sin 2x = \frac{\sqrt{3}}{2}$  for  $0 \leq x \leq \pi$ .
- 3 If  $u_{n+1} = 0 \cdot 3u_n + 10$ , find  $l$ .
- 4 Show that  $x^2 + y^2 + 18x + 6y + 41 = 0$  and  $(x - 3)^2 + (y - 2)^2 = 36$  touch.

### Task 5

- 1 Find the equation of the straight line which is parallel to the line with equation  $2x + 3y = 5$  and which passes through the point  $(2, -1)$ .
- 2 Circle P has equation  $x^2 + y^2 - 8x - 10y + 9 = 0$ . Circle Q has centre  $(-2, -1)$  and radius  $2\sqrt{2}$ .
- (a) (i) Show that the radius of circle P is  $4\sqrt{2}$ .  
(ii) Hence show that circles P and Q touch.
- (b) Find the equation of the tangent to circle Q at the point  $(-4, 1)$ .
- (c) The tangent in (b) intersects circle P in two points. Find the  $x$ -coordinates