For the final ten days leading up to the first AS Maths exam paper (8MA0/01 for Edexcel), we will publish four exam questions. Three of the questions will focus on the Pure Mathematics content, and one of the questions will focus on Mechanics content. There will be no questions on Statistics content. The three questions will vary in difficulty, but they will usually increase in difficulty. You may use a calculator for any of the questions and solutions are provided on a separate document.

1 Show that $\dfrac{2+\sqrt{\pi}}{1-\sqrt{\pi}} = \dfrac{a+\pi}{1-\pi} + \dfrac{b\sqrt{\pi}}{1-\pi}$, where a and b are integers to be found.

2 (a) Given that $8^{3y+2x} = 16^y$, express y in terms of x.

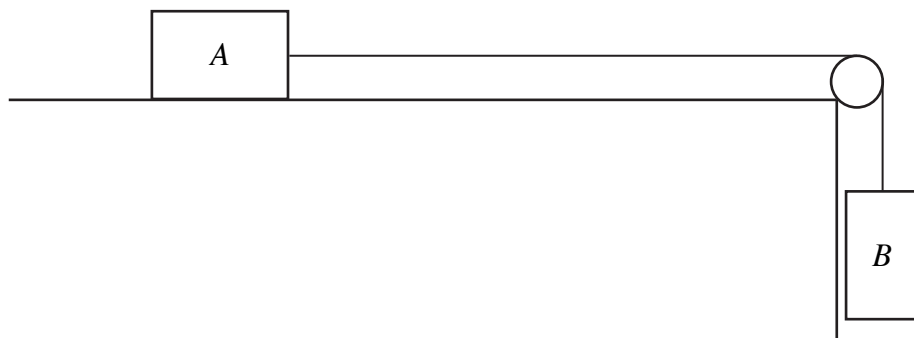(b) Solve the simultaneous equations

$$(x-4)^2 + 3y^2 = 4$$

$$x + y = 4$$

3 (a) Solve, for $0 \le \theta \le 360°$, the equation $\sin^2(2\theta) = 3\cos(2\theta)\sin(2\theta)$.

(b) Prove that $\tan^2 x \sin^2 x \equiv \tan^2 x - \sin^2 x$.

(c) Use a counter-example to show that the claim

$$\tan^2 x \cos^2 x \equiv \tan^2 x - \cos^2 x$$

is false.

4

Blocks A and B are connected by a light inextensible string that passes over a small smooth pulley, which is fixed to the edge of the table. Block A has a mass of 5 kg and the block B has a mass of 8 kg. The magnitude of the frictional force between the table and the block A is kR N, where k is a constant and R is the magnitude of the normal reaction force extered by the table on A.

The system is released from rest.

(a) (i) Show that the magnitude of the acceleration of the blocks A and B, a m s^{-2}, is given by

$$a = \frac{8g - 5kg}{13}, \; k < \frac{8}{5}$$

(ii) Explain the restriction of k.

Given that $k = 0.4$,

(b) find the magnitude of the tension in the string,

(c) calculate the magnitude of the resultant force acting on the pulley.

END OF WORKSHEET