

Name: \_\_\_\_\_

KAMBALA

# MATHEMATICS

YEAR 11

HSC ASSESSMENT TASK 1

NOVEMBER 2003

*Time Allowed: 50 minutes*

## INSTRUCTIONS

- This task contains 3 questions of equal value. Marks for each question are shown.
- Answer all questions on the writing paper provided. Start each question on a new page.
- Calculators may be used.
- Show all necessary working.
- Marks will be deducted for careless or badly arranged work.

**Question 1***(Start a new page)***Marks**

A point  $P(x,y)$  moves such that it is equidistant from the point  $S(-3,1)$  and the line  $y = 3$

- (i) Show that the equation of the locus of  $P$  is a parabola given by the equation  
$$4y = -x^2 - 6x - 1$$
 **3**
- (ii) Show that the equation of this locus can be written in the form  $(x + 3)^2 = -4(y - 2)$  **2**
- (iii) Find the focal length of the parabola. **1**
- (iv) Write down the co-ordinates of the vertex.  
**1**
- (v) Write down the co-ordinates of the focus.  
**1**
- (vi) Write down the length of the latus rectum.  
**1**
- (vii) Write down the equation of the directrix. **1**
- (viii) Find the points of intersection with the  $x$ -axis. **2**

**Question 2***(Start a new page)***Marks**

- (a) For what values of  $k$  does the equation  $x^2 - 2x + 3 = k$  have real roots?  
**3**
- (b) If  $Ax(x - 1) + Bx + C \equiv x^2 + x$ , find the values of  $A$ ,  $B$  and  $C$ . **3**
- (c) Let  $\alpha$  and  $\beta$  be the roots of  $3x^2 - 5x - 4 = 0$ .  
By evaluating  $\alpha + \beta$  and  $\alpha\beta$  find the value of  $\alpha^2 + \beta^2$  **3**
- (d) For what values of  $k$  will the equation  $x^2 + 2x - 2k = 0$  have:
- (i) roots which are reciprocals of each other **2**
- (ii) one root equal to 3 **1**

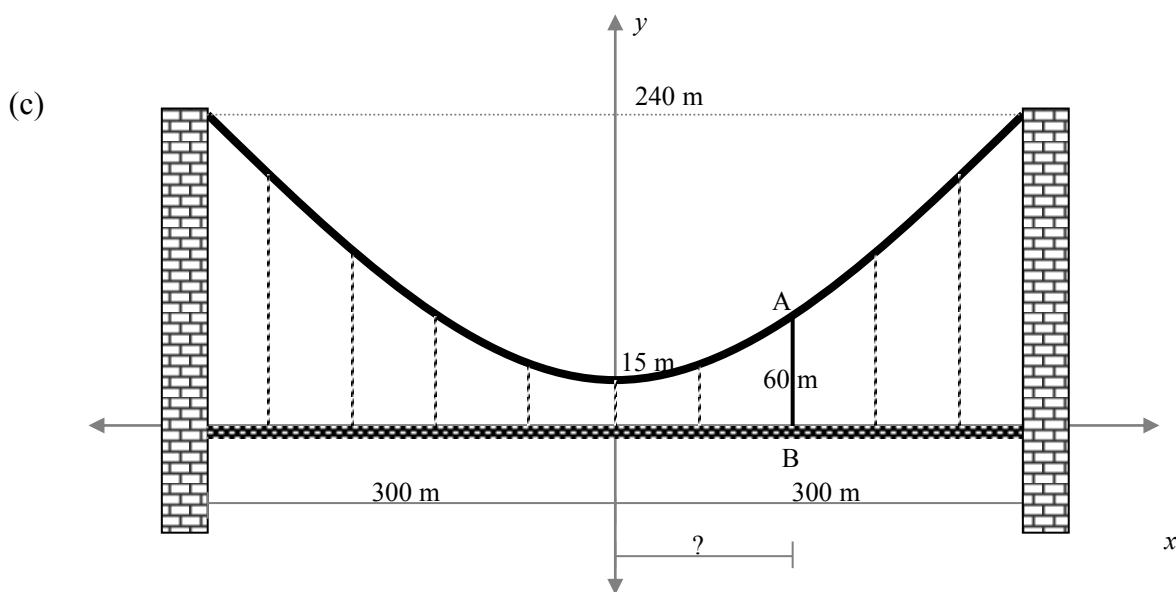
**Question 3***(Start a new page)***Marks**

- (a) Use the substitution  $u = x + \frac{6}{x}$  to solve the following equation for  $x$ :

$$\left(x + \frac{6}{x}\right)^2 - 2\left(x + \frac{6}{x}\right) - 35 = 0$$

**4**

- (b) Find the values of  $m$  for which  $x^2 - (m + 1)x + (2m - 1) = 0$  has no real solutions.

**4**

The diagram above represents a large suspension bridge over a river. The bridge has a span of 600 metres. It is 240 metres above the roadway at its highest point and 15 metres high at its lowest. The curve of the bridge can be represented by a parabola, with the roadway represented by the  $x$  axis, as shown in the diagram.

- (i) Show that the equation of the parabola is given by  $x^2 = 400(y - 15)$

**2**

The roadway is supported by wires from the bridge curve. One of these wires has been labelled AB on the diagram.

- (ii) If AB is found to be 60 metres long, how far is B from the centre of the bridge?  
(leave your answer correct to 2 decimal places)

**2**

**END OF TASK**