MERRYLAND HIGH SCHOOL – ENTEBBE
S6 TERM 2020 HOLIDAY BREAK
MATHEMATICS P2

1. Initially, a particle is at the origin and it is projected with a velocity of $\begin{pmatrix} a \\ o \end{pmatrix}$. After t seconds the particle a is at a point with the position vector $\begin{pmatrix} 30 \\ -10 \end{pmatrix}$m. Find the value of t and a.

2. a) By plotting graphs of y = x and y = 4 sin x on the same axes, show that the root of the equation x –4 sin x = 0 lies between 2 and 3.
   b) Hence use NRM to find the root of the equation correct to 4 s.f.

3. a) For the set of 9 numbers;
   $\sum$(x–x) $\sum(x - \bar{x})^2$ = 60 and $\sum x^2$ = 285.
   Find the mean of the numbers.
   b) If x^2 B in (8, 0.4), determine the value of P(x >6).
   c) The mean weight of 600 male students in college is 85kg with standard deviation of 9kg. The weights are normally distributed.
   (i) Find the number of students whose weights lie in the range of 75kg to 95 kg.
   (ii) If 62% of the students weigh more than P kg, find the value of P.

4. a) A car working with constant power P against a constant resistance has a maximum speed of V when travelling up a slope of 1 in 12, and a maximum speed of 3V on the level.
      (i) Obtain the expression in terms of P, V and g for the resistance and the mass of the car.
      (ii) Show that the acceleration when the car is travelling down the slope at a speed of V is $\frac{g}{6}$.
   b) A 200 tone train can travel up a slope of 1 in 100 at a maximum speed of 10ms^{-1}. It has the same speed when free-wheeling down the slope.
   (i)Find the power of the train and the resistance at this speed.
   (ii) If the resistance is proportional to the square of the speed, find the maximum speed on the level.

5. The heights (in cm) of senior six candidates in college were measured and recorded as in the frequency table below.

Height (cm)	151 - 153	154 - 156	157 - 159	160 - 162	163 - 165	166 - 168
Frequency	2	14	13	13	2	1

   a) Calculate the:
      (i) Mean height
      (ii) Standard deviation
      (iii) Modal height
   b) Draw the cumulative frequency curve and use it to estimate the:
      (i) Median height
      (ii) Range of the height of the middle 60% of the candidates.

6. a) A particle performs a SHM of periods 4s and amplitude 2cm about a centre O. Find the time it takes the particle to travel from O to a point P, a distance $\sqrt{2}\ cm$ from O.
   b) A particle moving with linear simple harmonic motion of magnitude 1.5m. The speed of the particle is $\sqrt{50}\ ms^{-1}$ when its displacement from the end point is 1m. Calculate its maximum acceleration.
   c) A particle moves with SHM about a mean position O. When passing through two points which are 2m and 2.4m from O, the particle has speeds of 3ms^{-1} and 1.4ms^{-1}

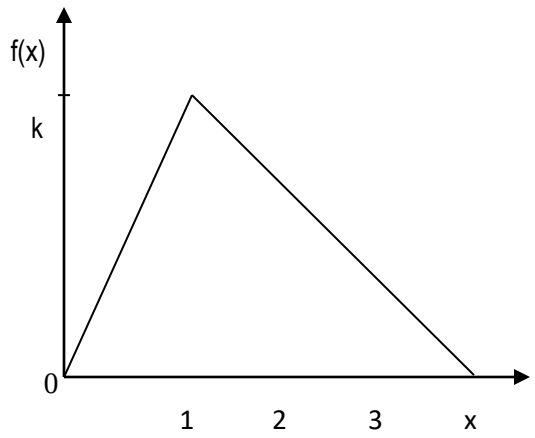
respectively. Find the amplitude of the motion and the greatest speed attained by the particle.

7. A body moving with acceleration $e^{2t}i - 3\sin 2tj + 4\cos 2tk$ is initially located at the point (1, -2, 2)m and has a velocity of 4i – 2j + k ms^{-1}. Find the:
   a) Speed of the body when $t = \frac{\pi}{4}s$.
   b) Distance of the body from the origin at $t = \frac{\pi}{4}$.

8. a) The continuous random variable y is uniformly distributed in the interval **a** < y < **b**. The lower quartile is 5 and the upper quartile is 9. Find:
      (i) The values of **a** and **b**.
      (ii) P(6 < y < 7)

   b) Given that x^2 R[32, 37] find;
      (i) E9x)
      (ii) Standard deviation

9. A random variable x has its p.d.f as shown below:



   (i) Find the value of k.
   (ii) Find the probability density function, f(x)
   (iii) Compute P ($|x - 1| < \frac{1}{2}$).
   (iv) Prepare the c.d.f, F(x) and hence find the median of x.

10. a) A box contains equal number of red counters as yellow counters. A counter is taken from the box, its colour is noted then replaced. This is performed eight times in all. Calculate the probability that:
      (i) Exactly three will be red.
      (ii) At least one will be red.
      (iii) More than four will be yellow.

   b) A random variable x is such that x^2B(10, P) where P > 0.5 and var(x) = 1.875. Find:
      (i) The value of P
      (ii) Ecx)
      (iii) P(x = 2)

END