

NAMILYANGO COLLEGE
BEGINNING OF TERM 1 EXAMS
S.6 MATHEMATICS PAPER 2

TIME: 2 HOURS

STATISTICS

1. (a) Define the conditional probability of event A given that B has occurred. Use the above definition to find the condition for events A and B to be independent.
- (b) The events A and B are mutually exclusive events and $P(A \cup B) = \frac{3}{4}$, $P(B) = \frac{1}{4}$, find
(i) $P(A)$ (ii) $P(A \cap B)$ (iii) $P(A \cap B)$
2. (a) The events C and D are independent and $3P(C \cup D) = 5P(D) = 4P(C)$
Determine the values of $P(C)$ and $P(D)$
- (b) Find the probability that a 3 digit number formed at random and not starting with zero has exactly two different digits.
3. The Probability that a certain beginner at a shooting exercise gets a good shoot if he uses the right gun is $\frac{1}{3}$ and the probability of a good shoot with an incorrect gun is $\frac{1}{4}$,
- (i) Given that he has five guns to choose from and only one is the correct one for the target in question, calculate the probability that the target will be hit.
- (ii) Given that the target is hit, calculate the probability that the right gun was used.
4. (a) Three bags A, B, C contain respectively 3 white and 2 red ball 4 white, 4 red, 5 white and 2 red balls. A ball is drawn unseen from A and put into B; a ball is then drawn from B and put into C. Find the probability that if a ball is now drawn from C it will be red.
- (b) Three candidates have been nominated for the post of Headmaster in a certain school. The probability that candidate A will be selected is 0.1, the probability that candidate B will be selected is 0.2 and the probability that candidate C will be selected is 0.3.
- It is expected that school fees will be increased if any one of these is elected as Headmaster. The probability of an increase in school fees if A is elected is 0.5, the corresponding probabilities for candidates B and C are 0.6 and 0.4 respectively.
- (i) Find the probability that there will be an increase in school fees
- (ii) A student delayed to report to school only to find that there was an increase in school fees, calculate the probability that candidate A was elected.

5. The ages of the population in Kampala city in a certain year were as follows

Age in years	0 – 9	10 – 19	20 – 39	40 – 59	60 – 69	70 – 89
Numbers (in thousand)	270	150	240	200	80	60

- (a) Draw a histogram for the data
- (b) State the modal class
- (c) Estimate
 - (i) the average age
 - (ii) number of population below 42 years
 - (iii) median age

MECHANICS

1. A particle with position vector $40\mathbf{i} + 10\mathbf{j} + 20\mathbf{k}$ moves with constant speed 5 ms^{-1} in the direction of the vector $4\mathbf{i} + 7\mathbf{j} + 4\mathbf{k}$.

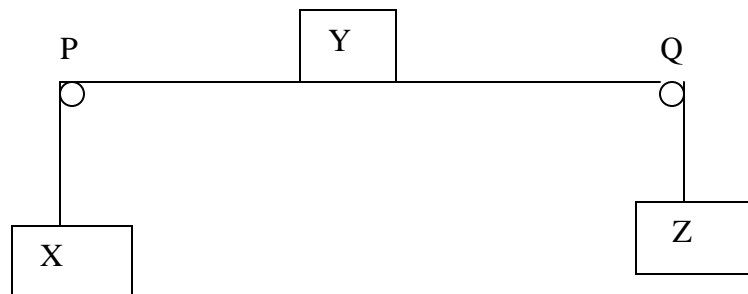
Find its distance from the origin after 9 seconds.

2. A cyclist travels 1.25km as he accelerates uniformly at a rate of $Q \text{ ms}^{-1}$ from a speed of 15 kmh^{-1} . Find the value of Q

3. A car of mass 1500kg is pulling a trailer of mass 600kg up a road inclined at angle $\alpha = \sin^{-1}(0.1)$. The resistance to motion for both the car and trailer is 0.15N per kg. If they are retarding at 0.5 ms^{-2} , find

- (i) the tractive force exerted by the engine
- (ii) the tension in the coupling between the car and the trailer

4.



The diagram above shows masses X, Y and Z of masses 3, 5 and 8kg respectively, connected by light inextensible strings that pass over smooth pulleys P and Q.

The mass Y rests on a rough horizontal table; the coefficient of friction between the table and the mass Y being $\frac{1}{2}$. The system is released from rest.

- (i) Determine the acceleration of the masses
- (ii) The tension in the strings
- (iii) After Z has moved by a distance of 2m, the string connecting it to Y snaps. Find the time and velocity on which this happens.
- (iv) How much further distance will Y move before changing the direction of movement?
- (v) 5. (a) A knife of mass 50g is thrown horizontally at a stationary block of wood of mass 500g lying on a table. The knife gets embedded into the wood and the two move together at a speed of 2 ms^{-1} . Calculate the,

- (i) initial speed of the knife
- (ii) loss in kinetic energy

(b) A motor fires shells at different angles of projection from point O. If the speed of projection is $\sqrt{50g}$ where g is the acceleration due to gravity, and the shell is projected so as to pass through the point B(10, 20)

- (i) Find the possible angles of projection.
- (ii) Deduce that the difference between the corresponding times taken to travel from O to B is $(10 - 2\sqrt{5})/\sqrt{g}$