KICUKIRO DISTRICT

ES KANOMBE/ EFOTEC

CLASS S5 MCB, PCM, MPC & MEG

MATHEMATICS

1) Discuss and state which of the following are propositions. Give reasons for your answer.
   i. $27 + 35 = 62$
   ii. Nyanza is a chief city of Rwanda
   iii. The population of Rwanda is less than 2 million.
   iv. What a beautiful evening!
   v. m is greater than n.

2) The operation * is defined in set of real numbers $\mathbb{R}$ by
   x*y = x +y -3 and a∆ b = a+b-ab show $(\mathbb{R}, *, \Delta)$ is a commutative ring

3) Calculate the numerical values of the following expressions without using a calculator.
   a) $2\cos 0^0 \sin 45^0 \cos 45^0 \tan 45^0$
   b) $\dfrac{\tan 60^0 + \tan 30^0}{\tan 60^0 - \tan 30^0}$

4) Prove the following identity
   a) $(\sin x + \cos x)^2 + (\sin x - \cos x)^2 = 2$
   b) $\sin^4 x + \cos^4 x + 2\sin^2 x \cos^2 x = 1$
   c) $\dfrac{1}{1+\sin x} + \dfrac{1}{1-\sin x} = 2\sec^2 x$

5) Calculate the following limits
   a) $\lim\limits_{x \to +\infty} \left(\sqrt{x^2 + 1} - \sqrt{x^2 - 1}\right)$
   b) $\lim\limits_{x \to -2} \dfrac{2x^2 + 7x + 6}{4x^3 + 8x^2 + 9x - 18}$

6) The numbers 1, 2, 4, 6, 10, 12, 13, 16, 17, and 20 are written on ten pieces of cards and one is drawn at random. Find the probability that the number on the cards will be either an odd number or multiple of 3.

7) A card is picked at random from a pack of 20 cards numbered 1, 2, 3, ..., 20. Given that card shows an even number, find the probability that it is a multiple of 4.

8) In set $A = \{-1, 1\}$ the law * and $\perp$ are defined the following tables.

*	-1	1
-1	-1	1
1	1	-1

$\perp$	-1	1
-1	1	-1
1	-1	1

Show that $(A, *, \perp)$ is a commutative ring.

9) Two numbers are selected at random, one from each set {1,3, 5,7} and {2, 4, 6, 8}. The numbers obtained are added together.
   a) Draw a possibility- space diagram and find the probability that the sum obtained is

   a) Less than eight.   (b) Even.   (c) More than ten.

10)   a) the roots of the equation $3x^2 + 4x - 5 = 0$ are α and β find the equation whose root are,
   (i) $\frac{1}{\alpha}$ and $\frac{1}{\beta}$ (ii) α^2 and β^2
       a) Prove that $2b^2 = 9ac$ if the root of equation
          $ax^2 + bx + c = 0$ are α and 2α

11)   In a group of 60 students, 20 study Geography, 24 study English and 8 study both Geography and English. Are the events' a student studies Geography 'and 'a student studies English 'independent?

12)   From a pack of 52 playing cards two cards are drawn without replacement. Calculate, as a fraction in its lowest terms, the probability that.   (6 marks)
   a) Both are hearts,
   b) Both are red,
   c) Neither is a club.

13) Three people in an office decide to enter a marathon race. The respective probabilities that they will complete the marathon are 0.9, 0.7and 0.6.
Assuming that their performances are independent, find the probability that.
   a) They all complete the marathon,
   b) At least two complete the marathon.
14) A team needs to win at least two of its remaining three remaining games to secure the championship. The probability that the team will win the games are assessed to be 0.6, 0.7 and 0.8, respectively. Calculate the probability, based on these assessed values, that the team will secure the championship.
15) In a particular experiment, the two variables x and y were noted and the results are tabulated.

x	1	1.5	2	3	4	6	8	10
y	6	5.2	4.8	4.4	4.2	4	3.9	3.48

By plotting a suitable graph, show that a relationship of the form $y = \frac{a}{x} + b$ exist and find the values of the constants a and b.

END