

## KCSE PREDICTIONS 2020 MATHEMATICS PAPER 2

1. Without using logarithm tables or calculator, solve  $3^{2x+3} - 28(3^x) + 1 = 0$ . (3 mks)

2. Use a mathematical table to evaluate: (3 mks)

$$\left( \frac{4.28 \times 0.01677}{\tan 20} \right)^{\frac{1}{5}}$$

3. Simply and leave answer in surd form. (3 mks)

$$\frac{-9}{\sqrt{13} + \sqrt{3}} - \frac{5}{\sqrt{3} - \sqrt{13}}$$

4. The sides of triangles were measured and recorded as 8.4 cm, 10.5 cm and 15.3. Calculate the percentage error in perimeter correct to 2 d.p. (3 mks)

5. Simplify: (3 mks)

$$\frac{\log 16 + \log 81}{\log 8 + \log 27}$$

6. Simplify the expression: (4 mks)

$$\frac{(-36 + 9x^2) + (-6y + 3xy)}{3x - 6}$$

7. Given that  $\frac{x(x^2-1)}{x+1}$ , find  $\frac{dy}{dx}$  at the point (2,4). (3 mks)

8. (a) Expand and simplify the expression  $\left(10 + \frac{2}{x}\right)^5$  (2 mks)

(b) Use the expression in (a) above to find the value of  $14^5$ . (1 mk)

9. John buys and sells rive in packets. He mixes 30 pockets of rive A costing sh 400 per packet with 50 packets of another kind of rive B costing sh 350 per packet. If he sells the mixture at a gain of 20%, at what price does he sell a pocket? (3 mks)

10. A chord of AB of length 13cm subtends an angle of  $67^\circ$  at the circumference of a circle centre O. find the radius of the circle. (3 mks)

11. Find the coordinates of the image of a point (5, -3) when its rotated through  $180^\circ$  about (3,1). (3 mks)

12. Two points P (-3,-4) and Q (2,5) are the points on a circle such that PQ is the diameter of the circle. Find the equation of the circle in the form  $ax^2 + by^2 + cx + dy + e = 0$  where a, b, c and e are constants. (4 mks)

13. Two metal spheres of radius 2.3 cm and 2.86 cm are melted. The molten material is used to cast equal cylindrical slabs of radius 8 mm and length 70mm. If  $\frac{1}{20}$  of the meal is lost during casting. Calculate the number of complete slabs cast. (3 mks)

14. A right pyramid has a rectangular base of 12 cm by 16cm. its slanting lengths are 26 cm. Determine:

(a) The length of AC (1 mk)

(b) The angle AV makes with the base ABCD. (2 mks)

15. Determine the inverse,  $T^{-1}$  of the matrix  $T \begin{pmatrix} 4 & 6 \\ 6 & -2 \end{pmatrix}$  hence solve : (3 mks)

$$2x + 3y = 30$$

$$3x - y = 10$$

16. Use squares, square roots and tables to evaluate: (3 mks)

$$3.045^2 + (49.24)^{-1/2}$$

## SECTION B

17. The table below shows the frequency distribution of diameter for 40 tins in millimeters.

Diameter (mm)	130 – 139	140 – 149	150 – 159	160 – 169	170 – 179	180 – 180
No of tins	1	3	7	13	10	6

Using a suitable working mean calculate:

(a) The actual mean for the grouped lengths. (4 mks)

(b) The standard deviation of the distribution. (6 mks)

18. A  $\frac{3}{2}$  Bao yearly plan is a school pocket money (SPM) saving scheme requiring 12 months payments of a fixed amount of money on the same date each month. All savings earn interest at a rate of  $p\%$  per complete calendar month.

Lewis Kamau decides to invest K£ 30 per month in this scheme as advised by Gumbo and Oteinde 4Q and 4P class governors a.k.a class secretaries and witnesses by very determined mathematics. Martine Mutua Mukumbu ( $M^3$ ) and makes no withdrawals during the year.

- (a) Show that after 12 complete calendar months, Lewis first payment has increased in value to  $K£ 30 r^{12}$ , where  $r = 1 + \frac{P}{100}$  (4 mks)

- (b) Show that the total value, after 12 complete calendar months, of all 12 payments is  $K£ 30 r = \frac{r(r^{12}-1)}{(r-1)}$  (3 mks)

- (c) Hence calculate the total interest received during the 12 months when the monthly rate of interest is  $\frac{1}{2}$  per cent. (3 mks)

19. A mobile dealer sells phones of two types: Nokia and Motorola. The price of one nokia and one Motorola phone is Ksh 2000 and Ksh 16000 respectively. The dealers wishes to have at least fifty mobile phones. The number of Nokia phones should be atleast the same as those of Motorola phones. He has Ksh 120,000 to spend on phones. If he purchases  $x$  Nokia phones and  $y$  Motorola phones;

(a) Write down all the inequalities to represent the above information. (3 mks)

(b) Represent the inequalities in part (a) above on the grid provided. (4 mks)

(c) The profit on a nokia phone is Ksh 200 and that on a Motorola phone is Ksh 300. Find the number of phones of each type he should stock so as to maximize profit. (3mks)

20. The vertices of parallelogram are O (0,0), A (5,0) B (8,3) and C (3,3). Plot on the same axes:

- (i) Parallelogram O'A'B'C', the image of OABC under reflection in the line  $x = 4$   
(4 mks)
- (ii) Parallelogram O''A''B''C'' the image of O'A'B'C' under a transformation described by the matrix  $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$  Describe the transformation. (4 mks)
- (iii) Parallelogram O'''A'''B'''C''' under the enlargement, centre (0,0) and scale factor  $\frac{1}{2}$   
(2 mks)

21. A particle moving with acceleration  $a = (10 - t) \text{ m/s}^2$ . When  $t = 1$  velocity  $V = 2 \text{ m/s}$  and when  $t = 0$  displacement  $S = 0 \text{ m}$ .

(a) Express displacement and velocity in terms of  $t$ .

(b) Calculate the velocity when  $t = 35$

(c) What is the displacement when  $t = 5$

(d) Calculate maximum velocity.

22. (a) Three quantities  $x$ ,  $y$  and  $t$  were such that the square root of  $y$  varies directly as  $x$  and inversely as  $t$ . find the percentage change in  $t$  if  $x$  decreases in ratio  $4 : 5$  and  $y$  increases by  $44\%$ . (5 mks)

(b) If  $y$  varies as the square root of  $x$  and the sum of the vale of  $y$  when  $x = 4$  and  $y = 100$  is 2:

(i) Find  $y$  in terms of  $x$  (3 mks)

(ii) Find  $x$  correct to one d.p when  $y = 14$  (2 mks)

23. Use a ruler and pair of compasses only in this question. ABC is a fixed triangle in which  $AB = AC = 6$  cm and angle  $BAC = 90^\circ$ . Show clearly on a two dimensional drawing the locus of Q in each case below.

(a) When Q is equidistant from both lines CA and CB. (5 mks)

(b) When the area of triangle ABC = areas of triangle QBC. (5 mks)

24. Two fair dice are tossed once. The event A and B are defined as follows:

A: the score on the two dices are the same

B: at least one die shows a 4.

- (a) Draw a probability space representing the tossing. (2 mks)
- (b) Calculate:
- (i) The probability of even A (1 mk)
  - (ii) The probability of even B (2 mks)
  - (iii) The probability of even A and B (2 mks)
- (c) If the two dice are tossed three time
- (i) Draw a tree diagram showing the event A happening for the three tosses. (1 mk)
  - (ii) Calculate the probability that A occurs:
    - (a) Exactly once (1 mk)
    - (b) At least once (2 mk)
    - (c) At most once (2 mks)