Name .... Index No. ....

FORM 4 END OF TERM 2 EXAM

MATHEMATICS
Paper 2
July 2018
Time: 2½ Hours

INSTRUCTIONS TO CANDIDATES

1. Write your name and index number in spaces provided above.
2. This paper consists of two sections; Section I and Section II
3. Answer **all** the questions in section I and only **Five** questions in section II
4. All answers and working must be written on the question paper in the spaces provided below each question.
5. Show all the steps in your calculations giving your answers at each stage in the spaces below each question.
6. Marks may be given for correct working even if the answer is wrong.
7. Non-programmable electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

SECTION I

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Marks																	

SECTION II

Question	17	18	19	20	21	22	23	24	Total
Marks									

GRAND TOTAL

1. Given that $y = \dfrac{2p - r}{p + 3r}$ express p in terms of y and r

    (3 marks)

2. A quantity v is partly constant and partly varies as u. If u = 1 when v = 12 and u = 12 when v = 23. Find the value of v when u = 5. (3 marks)

3. Solve for x in the equation
    $\log_{10}(3x + 2) - 1 = \log_{10}(x - 4)$ (3 marks)

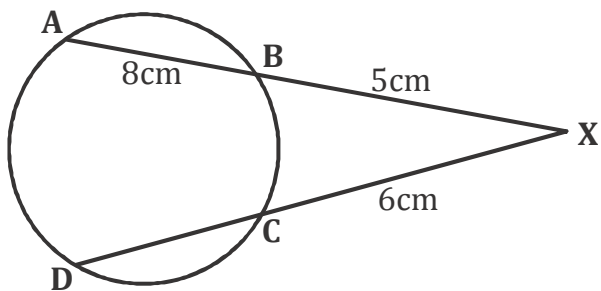**4.** Solve the following ineaquality and state the integral values (3 marks)

2x - 1 < 7 + x ≤ 3x + 2

5. The circle whose are length is 2.2m subtends an angle of 60° at the centre. Calculate the area of the minor segment of the circle. Take $\pi = \frac{22}{7}$ (4 marks)

6. The base and perpendicular height of a triangle are measured as 8.2cm and 6.3cm respectively. Calculate the percentage error in calculating the area correct to 3d.p. (3 marks)

7. Two taps A and B can fill a water bath in 8 minutes and 10 minutes respectively. Tap A is opened for 2 minutes then closed. Tap B is later opened for one minute then closed. How long will the two taps take running together to fill the remaining part of the water bath ?   (3 marks)

8. Chords AB and CD of a circle meet at X as shown in the figure below. If AB = 8cm, BX = 5cm and CX = 6cm, calculate the length of chord CD correct to 1d.p.   (2 marks)

9. Express the following in surd form and simplify by rationalizing the denominator giving your answer in the form of $a + b\sqrt{c}$ (3 marks)

$$\frac{1}{\cos 60^\circ - \sin 45^0}$$

10. i) Expand and simplify $(1-3x)^5$ upto the term in x^3 (2 marks)

ii) Hence use your expansion to estimate $(0.97)^5$ correct to 4d.p. (2 marks)

11. In a transformation, an object with an area of $10cm^2$ is mapped onto an image whose area is $60cm^2$. Given that the matrix of transformation is $\begin{pmatrix} y & y-1 \\ 2 & 4 \end{pmatrix}$ find the value of y. (3 marks)

12. Given that OA = 3i + 2j - 4k and OB = 4i + 5j - 2k. P divides AB in the ratio 1 : 2. Determine the position vector of p in terms of i, j and k. (3 marks)

13. Solve the equation :

2 cos 4x = -1 for $0 \leq x \leq 180^\circ$ (3 marks)

14. The numbers 8, x and 2 are the first three terms of a G.P

i) Find two possible values of x (2 marks)

ii) Find the sum of the first five terms of the G.P if the common ratio is negative. (2 marks)

15. Wanjiku pays for a car on hire purchase in 15 monthly instalments. The cash price of the car is Ksh.300,000 and the interest rate is 15%p.a. A deposit of Ksh.75,000 is made. Calculate her monthly repayments. (3 marks)

16. Points A and B have coordinates as (1, 5) and (-3, 7) respectively. If AB is the diameter of the circle, find the equation of this circle. (3 marks)

17. Joshua has two children whose age difference is 5 years. Twice the sum of their ages is equal to the age of the parent.

a) Taking Y to be the age of the elder child, write an expression for

i) the age of the younger child   (1 mark)

ii) age of the parent   (1 mark)

b) In 20 years time, the product of the children's ages will be 15 times the age of their parent.

i) Form an equation in y and hence determine the present possible ages of the elder child.   (4 marks)

ii) Find the present possible ages of the parent.   (2 marks)

iii)Determine the possible ages of the young child in 20 years time.   (2 marks)

18. The following table shows the distribution of marks obtained by 50 students in a test.

Marks	45 - 49	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79
No. of students	3	9	13	15	5	4	1

By using an assumed mean of 62, calculate :

a) the mean (5 marks)

b) the variance (3 marks)

c) the standard deviation (2 marks)

19. In a Mathematics test, the probability of 3 students Kamau, Otieno and Mwala passing are $^2/_3$, $^3/_4$ and $^5/_6$ respectively.

a) Draw a tree diagram to represent this information. (3 marks)

b) Use the tree diagram to find the probability that :

i) all the three students will fail (2 marks)

ii) at least two students will pass (3 marks)

iii) only one student will pass (2 marks)

20. A particle moves in a straight line such that its displacement s metres from a given point is
$s = t^3 - 6t^2 + 2t + 3$ where t is time in seconds. Find :

a) The displacement of the particle at t = 3 (2 marks)

b) The velocity of the particle where t = 4 (2 marks)

c) The value of t when the particle is momentarily at rest (3 marks)

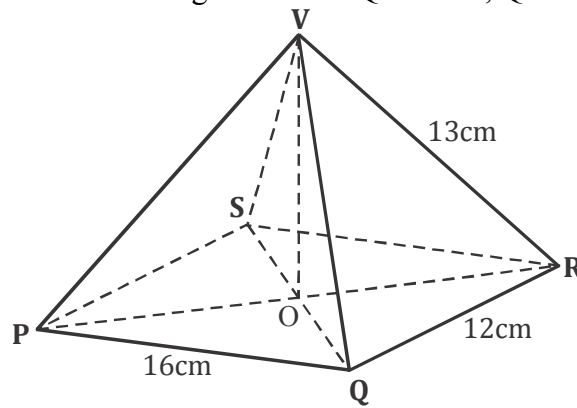**d)** The acceleration of the particle when t = 4 (3 marks)

21. a) A plane leaves airport A(40°S, 36°W) at 1400hrs on Monday and flies due North to airport B(50°N, 36°W). Calculate the distance the plane covers in kilometres. (Take $\pi = {}^{22}/_7$ and R = 6370km) (3 marks)

b) After 45 minutes stoppage at B, the plane flies due East to airport C, distance of 2550 nautical miles from B. Find :

i) the position of C (4 marks)

ii) the local time the plane lands at C if its average speed for the whole journey is 1200km/hr. (Take 1 nautical mile = 1.854km) (3 marks)

22. Figure below is a pyramid on a rectangular base. PQ = 16cm, QR = 12cm and VP = 13cm.

Find :

a) the length of QS   (2 marks)

b) the height of the pyramid   (2 marks)

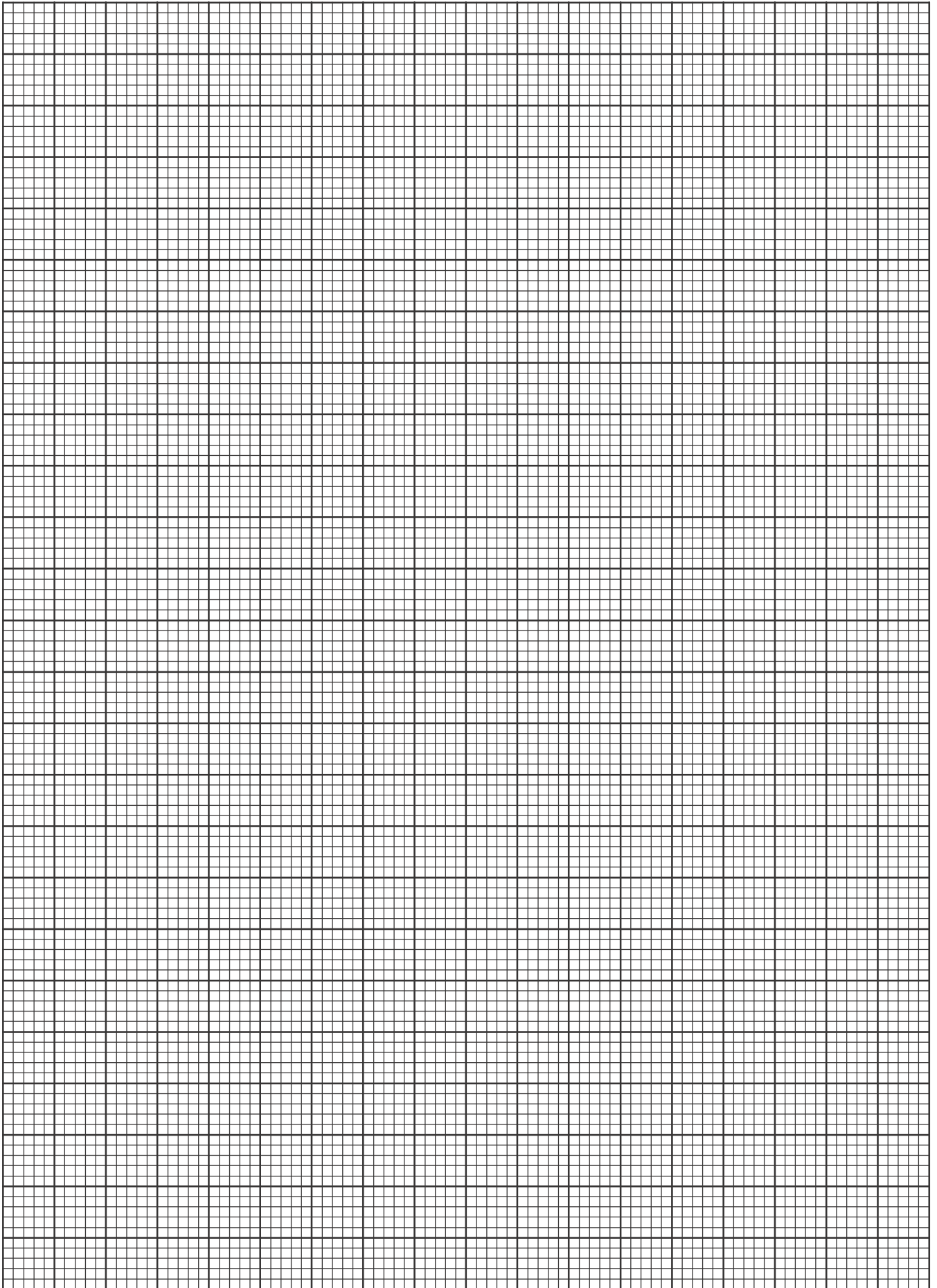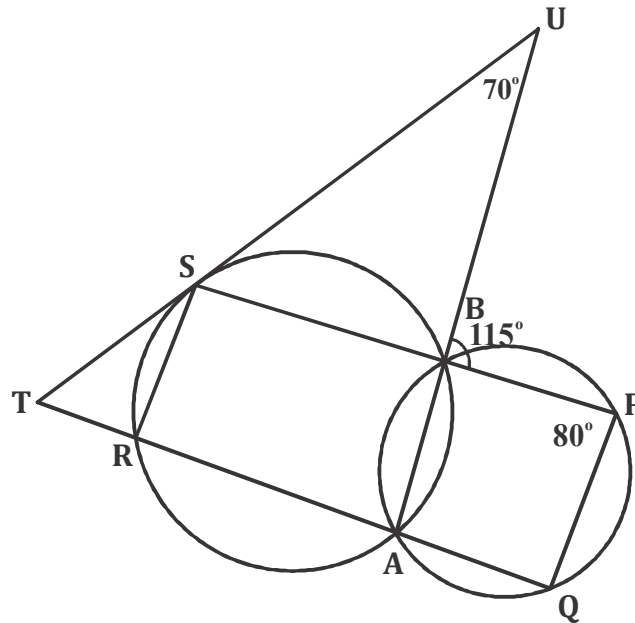**c)** the angle between VQ and the base   (2 marks)

d) the angle between plane VQR and the base   (4 marks)

23. a) Using a ruler and a pair of compasses only, construct triangle ABC in which AB = 9cm, AC = 8cm and angle BAC = 60° (2 marks)

b) On the same side of AB as C, draw the locus of a point P such that angle APB = 60° (3 marks)

c) A region is within the triangle ABC such that AT > 4cm and angle ACT > angle BCT.
Show the region T by shading it. (5 marks)

24.

The figure above shows two circles ABPQ and ABSR intersecting at A and B. QART, PBS and ABU are straight lines. The line TSU is a tangent to the circle ABSR at S. Given that $\angle BPQ = 80^\circ$, $\angle PBU = 115^\circ$ and $\angle BUS = 70^\circ$. Find state reasons the following angles

a) $\angle BRS$ (2 marks)

b) $\angle BSU$ (2 marks)

c) $\angle STR$ (2 marks)

d) $\angle BAR$ (2 marks)

e) $\angle ARB$ (2 marks)