1.3.2 Mathematics Alt. A Paper 2 (121/2)

SECTION I (50 marks)

*Answer **all** the questions in this section in the spaces provided.*

1 Use logarithms, correct to 4 decimal places, to evaluate

$$\sqrt[3]{\frac{83.46 \times 0.0054}{1.56^2}}$$

(4 marks)

2 Three grades A, B, and C of rice were mixed in the ratio 3:4:5. The cost per kg of each of the grades A, B and C were Ksh 120, Ksh 90 and Ksh 60 respectively.
Calculate:

(a) the cost of one kg of the mixture; (2 marks)

(b) the selling price of 5 kg of the mixture given that the mixture was sold at 8% profit. (2 marks)

3 Make s the subject of the formula.

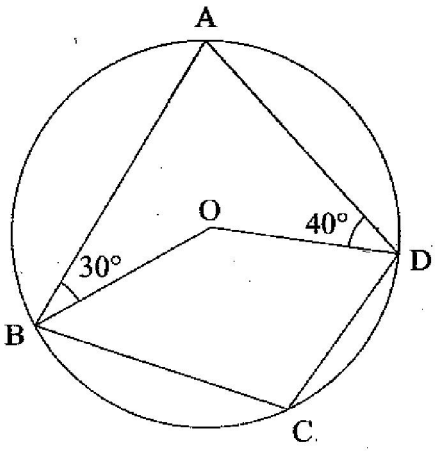
$$w = \sqrt[3]{\frac{s+t}{s}}$$

(3 marks)

4 (a) Solve the inequalities $2x - 5 > -11$ and $3 + 2x \leq 13$, giving the answer as a combined inequality. (3 marks)

(b) List the integral values of x that satisfy the combined inequality in (a) above. (1 mark)

5 In the figure below, ABCD is a cyclic quadrilateral. Point O is the centre of the circle. Angle ABO = 30° and angle ADO = 40°.



Calculate the size of angle BCD. (2 marks)

6 The ages in years of five boys are 7, 8, 9, 10 and 11 while those of five girls are 4, 5, 6, 7 and 8. A boy and a girl are picked at random and the sum of their ages is recorded.

(a) Draw a probability space to show all the possible outcomes. (1 mark)

(b) Find the probability that the sum of their ages is at least 17 years. (1 mark)

7 The vertices of a triangle are A(1,2), B(3,5) and C(4,1). The coordinates of C' the image of C under a translation vector T, are (6,–2).

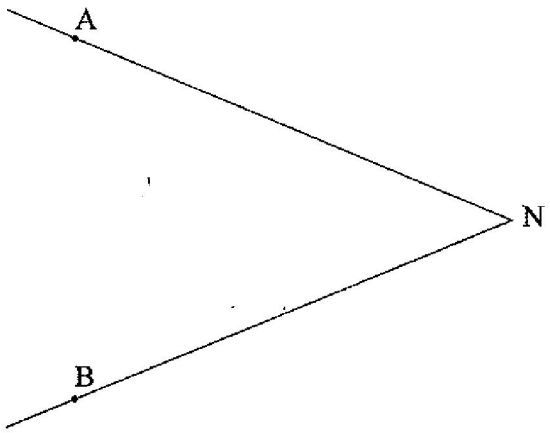
(a) Determine the translation vector T. (1 mark)

(b) Find the coordinates of A' and B' under translation vector T. (2 marks)

8 Write sin 45° in the form $\frac{1}{\sqrt{a}}$ where a is a positive integer. Hence simplify $\frac{\sqrt{8}}{1+\text{Sin } 45°}$, leaving the answer in surd form. (3 marks)

9 The radius of a spherical ball is measured as 7 cm, correct to the nearest centimetre. Determine, to 2 decimal places, the percentage error in calculating the surface area of the ball. (4 marks)

10 (a) In the figure below, lines NA and NB represent tangents to a circle at points A and B. Use a pair of compasses and ruler only to construct the circle. (2 marks)

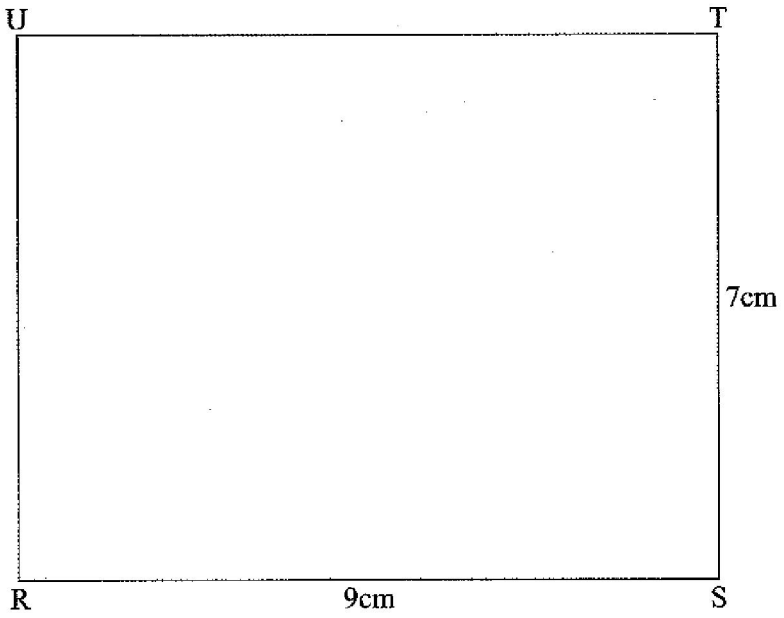


(b) Measure the radius of the circle. (1 mark)

11 Expand and simplify the expression.

$\left(a+\frac{1}{2}\right)^4+\left(a-\frac{1}{2}\right)^4$ (3 marks)

12 The figure below represents a scale drawing of a rectangular piece of land, RSTU. RS = 9 cm and ST = 7 cm.



An electric post P, is to be erected inside the piece of land. On the scale drawing, shade the possible region in which P would lie such that PU > PT and PS ≤ 7 cm. (3 marks)

13 Vector **OP** = 6**i** + **j** and **OQ** = –2**i** + 5**j**. A point N divides **PQ** internally in the ratio 3:1. Find **PN** in terms of **i** and **j**. (3 marks)

14 A point M (60°N, 18°E) is on the surface of the earth. Another point N is situated at a distance of 630 nautical miles east of M.
Find:
(a) the longitude difference between M and N; (2 marks)

(b) the position of N. (1 mark)

15 The equation of a circle centre (a,b) is $x^2 + y^2 - 6x - 10y + 30 = 0$.
Find the values of a and b. (3 marks)

16 The table below shows values of x and y for the function $y = 2 \sin 3x°$ in the range $0° \leq x \leq 150°$.

$x°$	0	15	30	45	60	75	90	105	120	135	150
y	0	1.4	2	1.4	0	-1.4	-2	-1.4	0	1.4	2

(a) On the grid provided, draw the graph of $y = 2 \sin 3x$. (2 marks)

(b) From the graph determine the period. (1 mark)

SECTION II (50 marks)

*Answer only **five** questions in this section in the spaces provided.*

17 The cash price of a laptop was Ksh 60 000. On hire purchase terms, a deposit of Ksh 7 500 was paid followed by 11 monthly installments of Ksh 6 000 each.

(a) Calculate:

(i) the cost of a laptop on hire purchase terms; (2 marks)

(ii) the percentage increase of hire purchase price compared to the cash price. (2 marks)

(b) An institution was offered a 5% discount when purchasing 25 such laptops on cash terms. Calculate the amount of money paid by the institution. (2 marks)

(c) Two other institutions, X and Y, bought 25 such laptops each. Institutions X bought the laptops on hire purchase terms. Institution Y bought the laptops on cash terms with no discount by securing a loan from a bank. The bank charged 12% p.a. compound interest for two years.
Calculate how much more money institution Y paid than institution X. (4 marks)

18 The first, fifth and seventh terms of an Arithmetic Progression (AP) correspond to the first three consecutive terms of a decreasing Geometric Progression (G.P). The first term of each progression is 64, the common difference of the AP is d and the common ratio of the G.P is r.

(a) (i) Write two equations involving d and r. (2 marks)

(ii) Find the values of d and r. (4 marks)

(b) Find the sum of the first 10 terms of:

(i) the Arithmetic Progression (A.P); (2 marks)

(ii) the Geometric Progression (G.P). (2 marks)