121/2
MATHEMATICS
Paper 2
JULY/AUG. 2006
Time: $2^1/_2$ Hours

SECTION I (50 marks)
(Answer all questions in this section)

1. Find the percentage error in the value of x + y if x=2.8cm and y=3.6cm measured to the nearest 0.1cm. (3mks) *Nrk*

2. If $P = \begin{pmatrix} -5 & -8 \\ 3 & 5 \end{pmatrix}$

   Evaluate p^2, hence use the matrix method to solve the simultaneous equations.(3mks) *Nrk*

   $-5x = 8y + 2$
   $3x = -5y + 1$

3. P varies partly as the square of V and partly as the cube of V. When V=2, P=-20 and when v=-3, P = 135. Find the relationship between P and V. (3mks) *Nrk*

4. Make x the subject of the formula. (3mks) *Nrk*

$$P = \sqrt{\frac{x + 2w}{4x + 3R}}$$

5. Without using logarithm tables, solve the equation log (5x – 4) = log (x+ 2) + $^1/_3$ log 27. (3mks) *Nrk*

6. A bag contains 2 green balls, 3 red and one blue ball. Another bag contains 4 green, 5 red and 3 blue balls. A ball is chosen at random from the bag. Find the probability that the chosen ball is blue (3mks) *Nrk*

7. The second term of a G.P is 6, and the fifth term is 48, find the common ratio and the 3rd term of the G.P. (3mks) *Nrk*

8. The velocity v of a body moving in a straight line at any time t is given by v=3t – 2. Its distance at time t=0 is equal to 4. Calculate the distance when t=4. (3mks) *Nrk*

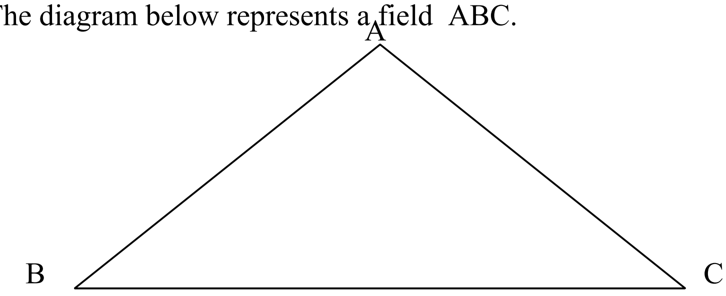
9. A lorry starts from rest and after t seconds, its speed, vm/s is given by the following table

t	0	1	2	3	4	5	6
Vm/s	0	2.4	4.2	5.6	6.6	7.2	7.6

   Use the trapezoidal rule to estimate the distance the lorry travels in the six seconds. (3mks) *Nrk*

10. Solve the equation $8 \cos^2 \theta + 2 \cos \theta - 3 = 0$, for $0^0 \leq \theta \leq 360^0$ (3mks) *Nrk*

11. The diagram below represents a field ABC.



   a) Draw the locus of points equidistant from sides AB and AC (1mk) *Nrk*
   b) Draw the locus of points equidistant from points A and C. (1mk) *Nrk*
   c) A coin is lost within a region which is nearer to point A than to point C and closer to side AC than to side AB. Shade the region where the coin can be located. (1mk) *Nrk*

12. The average rate of depreciation in value of a new generator is 8% per year. After use for four years its value was found to be sh.107,457. Find its value at the beginning of the four year period. (4mks) *Nrk*

13. Expand and simplify $(1-3x)^5$, Hence use your expansion up to the term x^3 to estimate $(0.94)^5$ correct to 4 significant figures. (4mks) *Nrk*

14. Simplify the following by rationalizing the denominator. (3mks) *Nrk*

$$\frac{\sqrt{2}\ -\ 1}{4\sqrt{2}\ -\ 3}$$

15. The equation of a circle is given by $x^2 + y^2 + 4x - 5=0$. Find the radius and the centre of the circle. (3mks) *Nrk*

16. Two towns are such that $A(68^0N, 73^0W)$and $B(68^0N, 107^oW)$. Find the shortest distance between them if radius of the earth is 6370km. (3mks) *Nrk*

SECTION II

17. Triangle PQR whose vertices are p(2,2), Q(5,3) and R(4,1) is mapped onto triangle P′Q′R′ by a transformation whose matrix is $\begin{pmatrix} 1 & -1 \\ -2 & 1 \end{pmatrix}$

a) On the grid draw PQR and $P^1Q^1R^1$. (4mks) *Nrk*

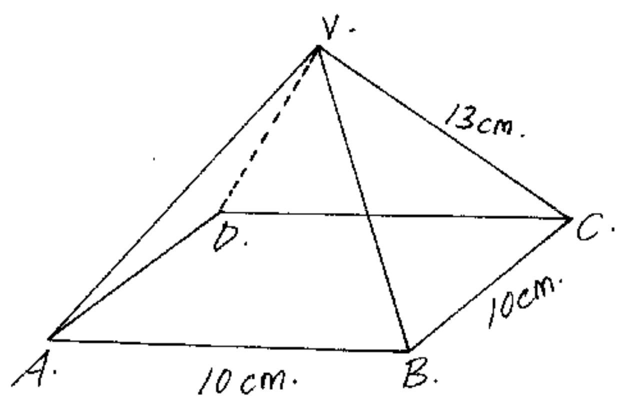
b) The triangle $P^1Q^1R^1$ is mapped onto triangle $P^{11}Q^{11}R^{11}$ whose vertices are $P^{11}(-2,-2)$, $Q^{11}(-5,-3)$ and R^{11} (-4,-1)

(i) Find the matrix of transformation which maps triangle $P^1Q^1R^1$ onto $P^{11}Q^{11}R^{11}$. (2mks) *Nrk*

(ii) Draw the image $P^{11}Q^{11}R^{11}$ on the same grid and describe the transformation that maps PQR onto $P^{11}Q^{11}R^{11}$. (2mks) *Nrk*

c) Find a single matrix of transformation which will map PQR on to $P^{11}Q^{11}R^{11}$.(2mks) *Nrk*

18. The figure below shows a square ABCD point V is vertically above middle of the base ABCD.



AB = 10cm and VC = 13cm.

Find;

(a) the length of diagonal AC (2mks) *Nrk*

(b) the height of the pyramid (2mks) *Nrk*

(c) the acute angle between VB and base ABCD. (2mks) *Nrk*

d) the acute angle between BVA and ABCD. (2mks) *Nrk*

e) the angle between AVB and DVC. (2mks) *Nrk*

19. The following table shows the distribution of marks obtained by 50 students.

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

a) By using a suitable assumed mean, calculate

(i) the mean (5mks) *Nrk*

(b) the variance (3mks) *Nrk*

(c) the standard deviation (2mks) *Nrk*

20. The displacement s metres of a particle moving along a straight line after t seconds is given by

$$S = 4 - 4t - 3t^2 - t^3$$

a) Find

(i) Its speed when $t = \frac{1}{2}$ (3mks) *Nrk*
(ii) its initial acceleration (2mks) *Nrk*
b) Calculate
(i) the time when the particle was momentarily at rest. (3mks) *Nrk*
ii) its displacement by the time it comes to rest. (2mks) *Nrk*21
Copy and complete the table below for the function $y = 5 + 3x - 2x^2$.
(2mks)

x	-3	-2	-1	0	1	2	3	4
$-2x^2$	-18		-2	0	-2			-32
5 + 3x	-4		2	5		11	14	
y	-22			5		3		-15

(a) Use the values from the table to draw the graph of $y = 5 + 3x - 2x^2$ on the grid provided. (3mks) *Nrk*

b) Use your graph to solve the quadratic equation
(i) $5 + 3x - 2x^2 = 0$ (1mk) *Nrk*
(ii) $2x^2 - 2x - 3 = 0$ (2mks) *Nrk*
c) Determine the range of values of x which satisfy the inequality, $5 + 3x - 2x^2 \geq -2$.(2mks) *Nrk*

22. Water flows through a cylindrical pipe of diameter 3.5cm at a speed of 45m/minute.
a) Calculate the volume of water delivered by the pipe in one minute in litres.(3mks) *Nrk*
b) A cylindrical storage tank of height 4 metres is filled by water from this pipe at the same rate of flow. Water started flowing at 8.00a.m. and was filled up at 2.50p.m. Calculate the area of the cross-section of this tank. (4mks) *Nrk*
c) Water costs sh. 3.50 per thousand litres plus a fixed standing charge of sh.18.50. Calculate the cost of a family which consumes the capacity of this tank in one month.(3mks) *Nrk*

23. a) Complete the following table.

X^0	0	15	30	45	60	75	90	105	120	135
Sin $(2x)^0$	0	0.50			0.87					-1.00

(2mks) *Nrk*

b) Using a horizontal scale for x of 1cm to 15 units and vertical scale for sin $(2x)^0$ of 5cm to 1 unit, draw the graph of y=sin 2x for $0^0 \leq x \leq 135^0$. (3mks) *Nrk*
c) By adding a suitable straight line to your graph, estimate values of x for which (5mks) *Nrk*

$$5 \sin (2x)^0 + \frac{x}{30} - 2 = 0.$$

24. A transport company required to transport 800 passengers and 60 tonnes of luggage. It has two kinds of vehicles, Buses which carry 60 passengers and 8 tonnes of luggage each, and lorries which can carry 90 passengers and 40 tonnes of luggage each. Only 10 buses and 8 lorries are available.
a) Write down the inequalities that satisfy the facts given above. Let x be the number of buses and y be the number of lorries. (4mks) *Nrk*
b) (i) represent the inequalities formed graphically. (5mks) *Nrk*
(ii) What is the least number of vehicles that can be used. (1mk) *Nrk*