



**1 ALGEBRA****Quadratic Equation**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**2 SERIES****Geometric Progression**

$$S_n = \frac{a(1-r^n)}{1-r}, (r < 1)$$

$$S_n = \frac{a(r^n - 1)}{r - 1}, (r > 1)$$

$$S_\infty = \frac{a}{1-r} \text{ for } |r| < 1$$

**3 TRIGONOMETRY**Formula for  $\Delta$  ABC

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A.$$

$$\Delta = \frac{1}{2} bc \sin A$$

**4 STATISTICS**

Mean and standard deviation

Ungrouped data

$$\text{Mean } (\bar{x}) = \frac{\sum x}{n}, \text{SD} = \sqrt{\left\{ \frac{\sum (x - \bar{x})^2}{n} \right\}} = \sqrt{\left\{ \frac{\sum x^2}{n} - (\bar{x})^2 \right\}}$$

Grouped data

$$\text{Mean } (\bar{x}) = \frac{\sum fx}{\sum f}, \text{SD} = \sqrt{\left\{ \frac{\sum f(x - \bar{x})^2}{\sum f} \right\}} = \sqrt{\left\{ \frac{\sum fx^2}{\sum f} - (\bar{x})^2 \right\}}$$

## Section A (52 Marks)

Answer all questions in this section

1 (a) Express  $\frac{6}{x-2} - \frac{2}{x-4}$  as a single fraction in its lowest terms. [3]

(b) Evaluate  $\int_{-3}^2 (4 - 3x^2) dx$ . [3]

2 (a) Simplify  $\frac{4p}{3q} \div \frac{p^2q}{6} \times \frac{pq}{2}$ . [2]

(b) The first three terms of a geometric progression are 3, 6 and 12 respectively. Find the

(i)  $n$ th term, [2]

(ii) geometric mean of 96 and 384, [2]

(iii) sum of the first 8 terms of the progression. [3]

3 (a) In a particular locality, 25 people like walking, 22 people like running and 15 people like cycling during their morning routine exercises. 11 people like both walking and running, 9 people like both running and cycling, 7 people like both walking and cycling, 3 people like all the three activities while 7 people do not like any of the activities.

(i) Draw a Venn diagram to illustrate this information. [2]

(ii) How many people

(a) are in this locality, [1]

(b) like walking only, [1]

(c) like two different activities only? [1]

(b) The position vectors of the points A, B and C are  $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ ,  $\begin{pmatrix} 3 \\ 6 \end{pmatrix}$  and  $\begin{pmatrix} 9 \\ 18 \end{pmatrix}$  respectively.

Show that the points A, B and C are collinear. [5]

- 4 (a) Given that matrix  $N = \begin{pmatrix} x & 2 \\ 2x & 6 \end{pmatrix}$ ,
- (i) find the value of  $x$  for which the determinant of  $N$  is 8, [2]
- (ii) hence or otherwise, write  $N^{-1}$ . [2]
- (b) Solve the equation  $5x^2 - 9x - 4 = 0$ , giving your answers correct to 2 decimal places. [5]

5 Answer the whole of this question on a sheet of plain paper.

- (a) (i) Construct triangle  $KLM$  in which  $KL = 11\text{cm}$ , angle  $LKM = 70^\circ$  and angle  $KLM = 50^\circ$ . [1]
- (ii) Measure and write the length of  $LM$ . [1]
- (b) On your diagram, within triangle  $KLM$ , construct the locus of points that are
- (i) equidistant from  $K$  and  $L$ , [1]
- (ii)  $3\text{cm}$  from  $KL$ , [1]
- (iii)  $8\text{cm}$  from  $K$ . [1]
- (c) A point  $X$  within triangle  $KLM$  is such that it is  $3\text{cm}$  from  $KL$  and  $8\text{cm}$  from  $K$ . Label the point  $X$ . [1]
- (d) Another point  $Y$  is such that it is nearer to  $L$  than  $K$ , greater than or equal to  $3\text{cm}$  from  $KL$  and less than or equal to  $8\text{cm}$  from  $K$ . Indicate clearly, by shading, the region in which  $Y$  must lie. [2]

- 6 (a) A bag contains 9 identical cards, 4 of which are Kujanjika (K) cards, 3 Landa (L) cards and the rest are Bulela (B) cards. Two cards are selected at random from the bag one after the other and not replaced.
- (i) Draw a tree diagram to show all the possible outcomes. [2]
- (ii) What is the probability that both cards selected are of the same type? [3]

(b) Study the following pseudocode.

Start

Enter  $R, r, l$

IF  $r > R$  THEN

Print "Error the value of  $r$  is not valid"

ELSE  $S = \pi * (R + r) * l$

END IF

Print  $S$

Stop

Construct a flowchart corresponding to the pseudocode above.

[5]

## Section B [ 48 marks]

Answer any four questions in this section.

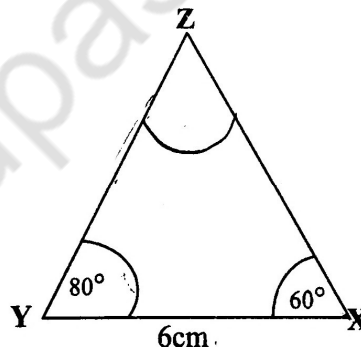
Each question in this section carries 12 marks.

7 Answer the whole of this question on a sheet of graph paper.

Mapulanga plans to buy planks of type A and type B for sale at his hardware shop. He has to buy up to 80 planks altogether. The number of type B planks should not be more than 3 times that of type A. He decides to buy at least 10 planks of type A and at least 20 planks of type B.

- (a) Given that  $x$  represents the number of planks of type A and  $y$  the number of type B, write four inequalities which represent the above conditions. [4]
- (b) Using a scale of 2cm to represent 10 units on both axes from 0 to 80, shade the unwanted region to indicate clearly the region where  $(x, y)$  must lie. [4]
- (c) The profit on each of type A plank is K30.00 and on each of type B plank profit is K20.00.
- (i) Find the number of each type that he can buy to make maximum profit. [2]
- (ii) Calculate this maximum profit. [2]

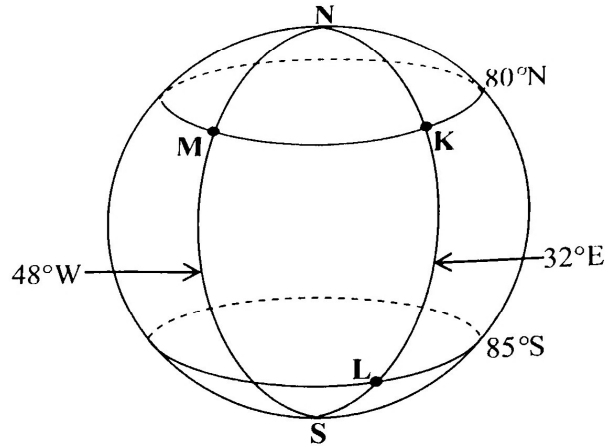
- 8 (a) In the diagram,  $XY = 6\text{cm}$ , angle  $YXZ = 60^\circ$  and angle  $XYZ = 80^\circ$ .



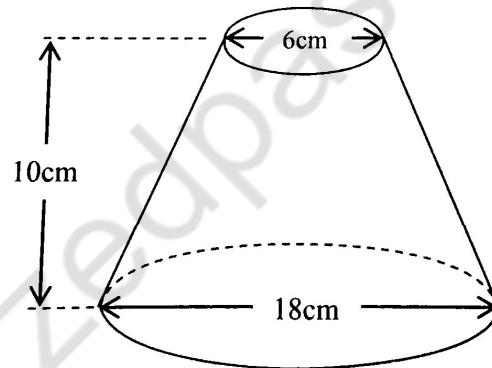
Calculate the

- (i) length of  $YZ$ , [4]
- (ii) area of triangle  $XYZ$ , [2]
- (iii) shortest distance from  $X$  to  $YZ$ . [2]
- (b) Solve the equation  $\tan \theta = 2.75$  for  $0^\circ \leq \theta \leq 360^\circ$ . [2]
- (c) Simplify  $\frac{1-4x^2}{1+2x}$ . [2]

- 9 (a) In the diagram below, M, L and K are points on the surface of the earth.  
 [ $\pi = 3.142$  and  $R = 3437\text{nm}$ ].



- (i) Determine the difference in longitudes between points M and K. [2]  
 (ii) Calculate, in nautical miles, the distance between  
 (a) M and K along latitude  $80^\circ\text{N}$ , [2]  
 (b) K and L along longitude  $32^\circ\text{E}$ . [2]
- (b) The following diagram shows the frustum of a cone. The top and bottom diameters are 6cm and 18cm respectively. [Take  $\pi$  as 3.142]



Given that its perpendicular height is 10cm, calculate the volume of the frustum.

[6]

- 10 The frequency distribution table shows the number of hours students studied on a particular day at a college.

Number of hours	1	2	3	4	5	6	7
Number of students	0	3	3	5	6	2	1

- (a) Calculate the standard deviation. [6]
- (b) Answer this part of the question on a sheet of graph paper.
- (i) Using the table above, copy and complete the relative cumulative frequency table below.

Number of hours	$\leq 1$	$\leq 2$	$\leq 3$	$\leq 4$	$\leq 5$	$\leq 6$	$\leq 7$
Cumulative frequency	0	3	6	11	17	19	20
Relative cumulative frequency	0	0.15	0.3	0.55			

- [1]
- (ii) Using a scale of 2cm to represent 1 unit on the x-axis for  $0 \leq x \leq 7$  and 2cm to represent 0.1 units on the y-axis for  $0 \leq y \leq 1$ , draw a smooth relative cumulative frequency curve. [3]
- (iii) Showing your method clearly, use your graph to estimate the 40<sup>th</sup> percentile. [2]

- 11 Answer the whole of this question on a sheet of graph paper.

The vertices of triangle ABC are  $A(-3, -3)$ ,  $B(-1, -3)$  and  $C(-3, -1)$ .

- (a) Using a scale of 1cm to represent 1 unit on both axes, draw x and y axes for  $-6 \leq x \leq 8$  and  $-4 \leq y \leq 8$ . Draw and label triangle ABC. [1]
- (b) An enlargement with centre  $(0, 0)$  and scale factor  $-2$  maps triangle ABC onto triangle  $A_1B_1C_1$ . Draw and label triangle  $A_1B_1C_1$ . [2]
- (c) Triangle ABC is mapped onto triangle  $A_2B_2C_2$  with vertices  $A_2(3, -3)$ ,  $B_2(3, -1)$  and  $C_2(1, -3)$ .
- (i) Draw and label triangle  $A_2B_2C_2$ . [1]
- (ii) Describe fully this single transformation. [3]
- (d) The matrix  $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$  maps triangle ABC onto triangle  $A_3B_3C_3$ .  
Find the coordinates of  $A_3$ ,  $B_3$  and  $C_3$ . [3]
- (e) A stretch with x-axis as the invariant line and scale factor  $-1$  maps triangle ABC onto triangle  $A_4B_4C_4$  with vertices  $A_4(-3, 3)$ ,  $B_4(-1, 3)$  and  $C_4(-3, 1)$ . Find the matrix of this transformation.