



NYANDO MIXED SECONDARY SCHOOL

GRADE 12 MATHEMATICS

End of Term Examination

Total Marks: 100

Name: Adm No: Date:

Section A (36 Marks)

Answer all the questions in this section.

1. Simplify the expression $\sqrt{50} + \sqrt{8} - \sqrt{32}$. [3 marks]
2. Solve for x in the equation $\log_{\blacksquare} x + \log_{\blacksquare} (x - 2) = 1$. [3 marks]
3. Given matrices $A = \begin{bmatrix} 2 & 1 \\ 3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ 0 & 4 \end{bmatrix}$. Find AB. [3 marks]
4. The first term of an arithmetic progression is 4 and the common difference is 3. Find the sum of the first 10 terms. [3 marks]
5. Solve the inequality $2x^2 - 3x - 2 \leq 0$. [3 marks]

6. In a right-angled triangle, the hypotenuse is 13 cm and one leg is 5 cm. Find the length of the other leg.

[3 marks]

7. A sector of a circle has radius 7 cm and angle 60° . Find its area. (Take $\pi = 22/7$) [3 marks]

8. Find the distance between points A(2,3) and B(-1,7). [3 marks]

9. Calculate the volume of a cylinder with radius 3.5 cm and height 10 cm. (Take $\pi = 22/7$) [3 marks]

10. The table below shows the number of books read by 20 students in a month: Number of books: 0,1,2,3,4 Number of students: 3,5,6,4,2 Find the mean number of books read. [3 marks]

11. A bag contains 3 red balls and 5 blue balls. A ball is drawn at random, then replaced, and a second ball is drawn. Find the probability that both balls are red. [3 marks]

12. In how many different ways can 4 different books be arranged on a shelf? [3 marks]

Section B (64 Marks)

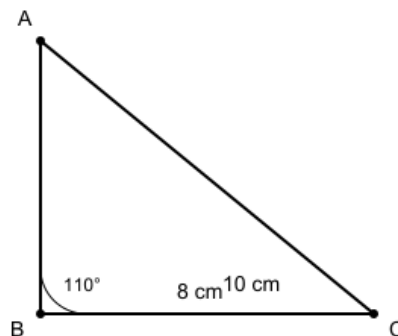
Answer any four questions in this section.

1. The third term of a geometric progression is 18 and the sixth term is 486. (a) Find the common ratio and the first term. (4 marks) (b) Find the sum of the first 8 terms. (4 marks) [8 marks]

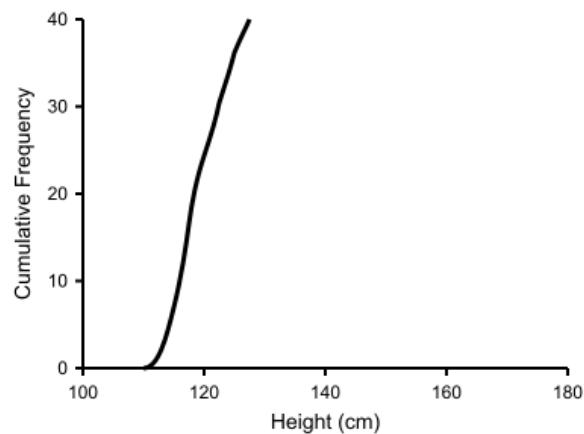
2. A transformation T is represented by matrix $M = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$. (a) Find the image of the point $P(1, -2)$ under T . (3 marks) (b) Find the determinant of M . (2 marks) (c) Find the area of the image of a shape whose area is 5 square units under T . (3 marks) [8 marks]

3. Solve the equation $2\sin^2\theta - \sin\theta - 1 = 0$ for $0^\circ \leq \theta \leq 360^\circ$. [8 marks]

4. The diagram below shows triangle ABC . Use the information provided in the diagram to: (a) Calculate the area of triangle ABC . (4 marks) (b) Calculate the length of AC . (4 marks) [8 marks]



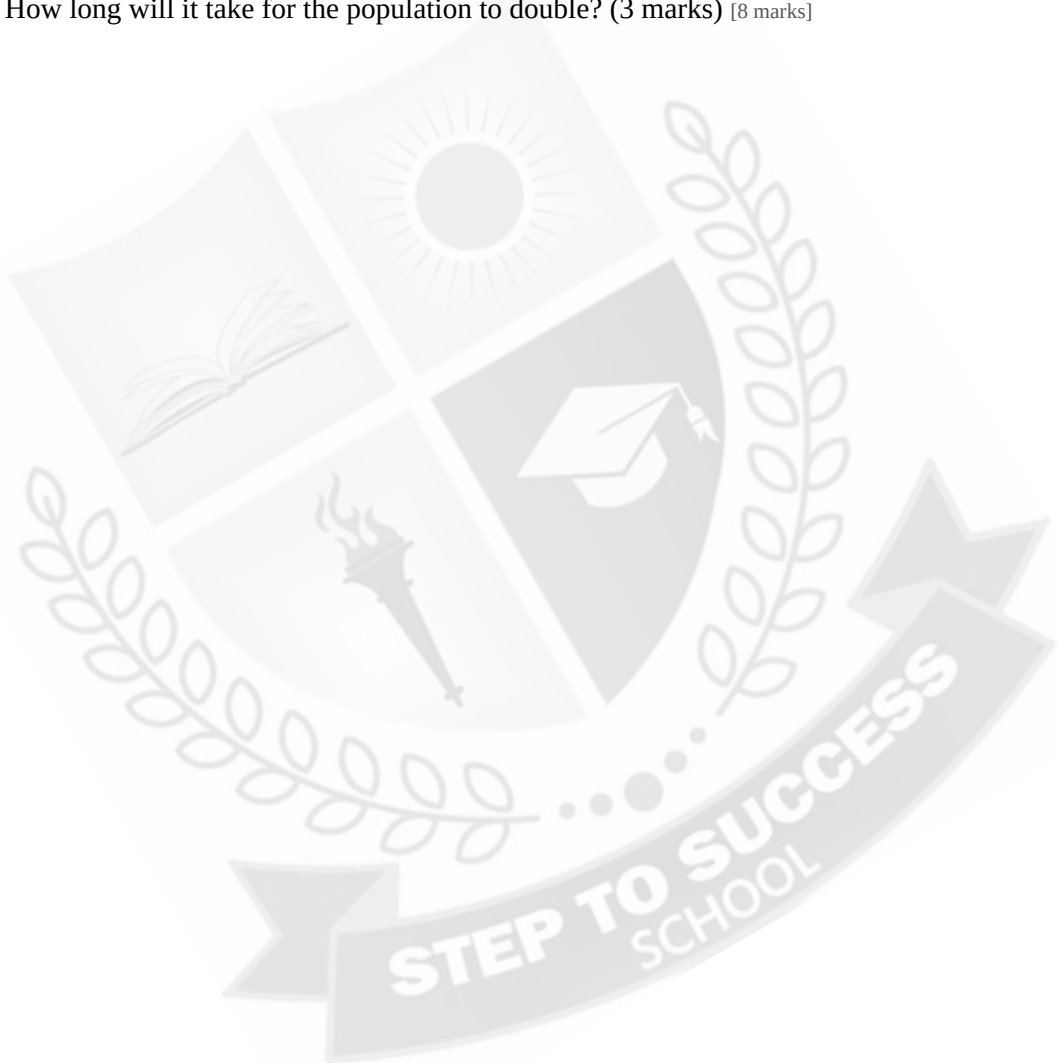
5. The ogive below shows the cumulative frequency distribution of heights of 40 plants. (a) Determine the median height. (2 marks) (b) Determine the interquartile range. (4 marks) (c) Determine the number of plants whose height is greater than 150 cm. (2 marks) [8 marks]



6. Bag A contains 2 white and 3 black balls. Bag B contains 4 white and 2 black balls. One ball is drawn from each bag. (a) Draw a tree diagram to show all possible outcomes and their probabilities. (3 marks) (b) Find the probability that both balls are of the same colour. (3 marks) (c) Find the probability that at least one ball is white. (2 marks) [8 marks]

7. (a) Expand $(2x - y)^3$ up to the term containing y^3 . (4 marks) (b) Find the coefficient of x^3y^2 in the expansion of $(x - 2y)^5$. (4 marks) [8 marks]

8. The population of a town is increasing at a rate of 4% per year. Its current population is 50,000. (a) Write an expression for the population after t years. (2 marks) (b) Find the population after 10 years. (3 marks) (c) How long will it take for the population to double? (3 marks) [8 marks]



MARKING GUIDE

Question	Expected answer / marking points	Marks
q1_01	$\sqrt{50} = 5\sqrt{2}$, $\sqrt{8} = 2\sqrt{2}$, $\sqrt{32} = 4\sqrt{2}$. Therefore $5\sqrt{2} + 2\sqrt{2} - 4\sqrt{2} = 3\sqrt{2}$.	3
q1_02	$\log_{\frac{1}{2}}[x(x-2)] = 1 \Rightarrow x(x-2) = 3 \Rightarrow x^2 - 2x - 3 = 0 \Rightarrow (x-3)(x+1) = 0 \Rightarrow x=3$ or $x=-1$. Since $x > 2$, $x=3$.	3
q1_03	$AB = [[2(1)+1(0), 2(-2)+1(4)], [3(1)+(-1)(0), 3(-2)+(-1)(4)]] = [[2,0], [3,-10]]$.	3
q1_04	$S_n = n/2[2a+(n-1)d]$; $S_{10} = 10/2[2(4)+9(3)] = 5(8+27) = 175$.	3
q1_05	Factor: $(2x+1)(x-2) \leq 0$. Critical values: $x=-1/2$, $x=2$. Test intervals: $x \leq -1/2$ gives positive, $-1/2 < x < 2$ gives negative, $x \geq 2$ gives positive. Hence $-1/2 \leq x \leq 2$.	3
q1_06	Let the other leg be x . $x^2 + 5^2 = 13^2 \Rightarrow x^2 = 169 - 25 = 144 \Rightarrow x = 12$ cm.	3
q1_07	Area = $(\theta/360)\pi r^2 = (60/360) \times 22/7 \times 7^2 = (1/6) \times 22/7 \times 49 = 77/3 \text{ cm}^2 \approx 25.67 \text{ cm}^2$.	3
q1_08	$d = \sqrt{(-1-2)^2 + (7-3)^2} = \sqrt{9+16} = \sqrt{25} = 5$ units.	3
q1_09	$V = \pi r^2 h = 22/7 \times (3.5)^2 \times 10 = 22/7 \times 12.25 \times 10 = 385 \text{ cm}^3$.	3
q1_10	Mean = $(0 \times 3 + 1 \times 5 + 2 \times 6 + 3 \times 4 + 4 \times 2) / 20 = (0+5+12+12+8)/20 = 37/20 = 1.85$.	3
q1_11	$P(\text{red}) = 3/8$; since replacement, $P(RR) = (3/8) \times (3/8) = 9/64$.	3
q1_12	$4! = 4 \times 3 \times 2 \times 1 = 24$ ways.	3
q2_01	(a) $T_n = ar^2 = 18$, $T_{2n} = ar^{2n} = 486$. Dividing: $r^3 = 27 \Rightarrow r = 3$. Then $a(9) = 18 \Rightarrow a = 2$. (b) $S_n = 2(3^n - 1)/(3 - 1) = 2(6561 - 1)/2 = 6560$.	8
q2_02	(a) $MP = [[2,1], [3,2]]$ $[1,-2] \begin{bmatrix} 0 & -1 \end{bmatrix}$, image is $(0,-1)$. (b) $\det M = 2 \times 2 - 1 \times 3 = 4 - 3 = 1$. (c) Area scale factor = $ \det M = 1$, so image area = $5 \times 1 = 5$ square units.	8
q2_03	Factor: $(2\sin\theta + 1)(\sin\theta - 1) = 0$. Thus $\sin\theta = 1 \Rightarrow \theta = 90^\circ$, or $\sin\theta = -1/2 \Rightarrow \theta = 210^\circ, 330^\circ$. Solution set: $\{90^\circ, 210^\circ, 330^\circ\}$.	8
q2_04	(a) Area = $1/2 \times AB \times BC \times \sin(\angle ABC) = 1/2 \times 8 \times 10 \times \sin 110^\circ = 40 \times 0.9397 \approx 37.6 \text{ cm}^2$. (b) $AC^2 = AB^2 + BC^2 - 2(AB)(BC)\cos 110^\circ = 64 + 100 - 160(-0.3420) = 164 + 54.72 = 218.72 \Rightarrow AC \approx 14.79$ cm.	8
q2_05	(a) Median = value at the 20th cumulative frequency. From the ogive, median ≈ 138 cm. (b) $Q_1 \approx 128$ cm (at 10th frequency), $Q_3 \approx 149$ cm (at 30th frequency). IQR = $Q_3 - Q_1 \approx 21$ cm. (c) Cumulative frequency at 150 cm is 32, so number greater than 150 cm = $40 - 32 = 8$ plants.	8
q2_06	(a) Tree diagram: First branch Bag A: $W(2/5)$, $B(3/5)$; second branches Bag B: $W(4/6=2/3)$, $B(2/6=1/3)$. (b) $P(\text{same}) = P(WW) + P(BB) = (2/5 \times 2/3) + (3/5 \times 1/3) = 4/15 + 3/15 = 7/15$. (c) $P(\text{at least one W}) = 1 - P(BB) = 1 - 3/15 = 12/15 = 4/5$.	8
q2_07	(a) $(2x - y)^5 = 32x^5 - 80x^4y + 80x^3y^2 - 40x^2y^3 + \dots$ (b) General term $T_{r+1} = C(5,r)x^{5-r}(-2y)^r$. For x^3y^2 , $r=2$: term = $C(5,2)x^3(-2y)^2 = 10 \times 4 x^3y^2 = 40x^3y^2$. Coefficient = 40.	8
q2_08	(a) $P(t) = 50000(1.04)^t$. (b) $P(10) = 50000(1.04)^{10} \approx 50000 \times 1.480244 = 74012.2 \approx 74,012$. (c) $2 = (1.04)^t \Rightarrow t = \log 2 / \log(1.04) \approx 0.3010 / 0.0170 \approx 17.7$ years.	8