



**2<sup>ND</sup> SEM. 2005/2006**

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**UNIVERSITY OF SWAZILAND**

**FINAL EXAMINATION PAPER**

**PROGRAMME:** DIP. IN AGRICULTURAL EDUCATION I  
DIP. IN AGRICULTURE I  
DIP. IN HOME ECONOMICS I  
DIP. IN HOME ECONOMICS EDUCATION I  
REM. IN AGRICULTURE I  
REM. IN HOME ECONOMICS EDUCATION I

**COURSE CODE:** AEM 100

**TITLE OF PAPER:** MATHEMATICS

**TIME ALLOWED:** TWO HOURS AND THIRTY MINUTES (2H30MIN)

- INSTRUCTIONS:**
1. QUESTION 1 IS COMPULSORY.
  2. ANSWER ANY TWO OTHER QUESTIONS.
  3. NO DOCUMENT IS AUTHORIZED.
  4. SHOW ALL YOUR WORKINGS.
  5. EQUIPMENT AUTHORIZED: CALCULATOR, COMPASS, RULER, ERASER
  6. USE, IF NEEDED, THE GRAPH PAPER WILL BE PROVIDED.

**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE CHIEF INVIGILATOR**

**QUESTION 1**

**SECTION A: MULTIPLE CHOICE:** For each item, circle the one letter of the choice that best completes/answers that item. In this section, consider all numbers exact.

(2 marks each) [20 marks total]

1.  $85 - 25 \div 5 + 2 \times 5$  is equal to: a. 22 b. 90 c. 4 d. 70 e. 1.714...
2. Assuming equal quality, choose one of the following which is the best value:
  - a. 22 kg of chicken for E445.00
  - b. 500 g of chicken for E15.00
  - c. 30 kg of chicken for E605.00
  - d. 32 kg of chicken for E645.00
  - e. 15 kg of chicken for E295.00
3.  $100^{\frac{1}{2}}$  is equal to: a. 50 b. 0.020 c. 10 d. 10,000 e. 0.10 f. 0.00010
4.  $(x^3 \div y^3z) \div (x^5 \div yz)$  fully simplified is: a.  $1 \div x^2y^2$  b.  $x^8 \div y^4z^2$  c.  $x^3yz \div x^5y^3z$  d.  $x^2y^2$
5. A rectangular field is 50m longer than it is wide. If the perimeter is 700m, the width is:
  - a. 50m
  - b. 100m
  - c. 150m
  - d. 200m
  - e. 250m
  - f. 300m
6. The equation  $y = 3x + 8 + 2x^2$  is: a. linear b. quadratic c. cubic d. all of these e. none of these
7.  $x$  is a whole number and  $10 < x < 15$ . The solution for  $x > 11$  and  $x < 13$  is:
  - a. no solution
  - b. 11,12,13
  - c. 10,14,15
  - d. 11,12
  - e. 12,13
  - f. 11
  - g. 12
  - h. 13
8. If 5 men working 8 hours per day can fence a given field in 6 days, then how many days will it take 6 men if they work 5 hours per day? a. 4 b. 4.5 c. 5 d. 6 e. 7 f. 8 g. 9
9. 400 ppm is equal to: a. 40% b. 4% c. 0.4% d. 0.04% e. 0.004% f. 0.0004%
10. When a dealer sells an item for cash she gives a 10% discount. If she earns 26% profit on a cash sale, her profit on a sale at the listed selling price would be:
  - a. 23.4%
  - b. 28.6%
  - c. 30%
  - d. 35%
  - e. 40%
  - f. 45%
  - g. 82.2%

**SECTION B:** Answer all questions in the space provided. Show all of your work!

1. Assume that the yield of maize depends on the amount of fertilizer nitrogen applied and that the relationship is linear. Further assume that the yield is 3.0 t/ha if N is applied at 20 kg/ha, and the yield is 5.0 t/ha if N is applied at 60 kg/ha.

a. Derive algebraically the equation of the relationship. [ 6 marks]

b. Explain the meaning of the slope and the Y-intercept in this problem. [4 marks]

2. If 800.0 kg/ha of 2:3:2 (22) is applied to beans, how much nitrogen is applied to 23.40 ha?

(Assume the numbers in 2:3:2(22) are exact.) [ 5 marks]

3. Assume that a manufacturer of tractors makes two models, ZX and WX. From information about parts needed the inequalities given below arise, where  $Z$  is the number of ZX tractors produced and  $W$  is the number of WX tractors produced. The corresponding equations have been graphed below. Shade the region showing the possible numbers of each model produced.

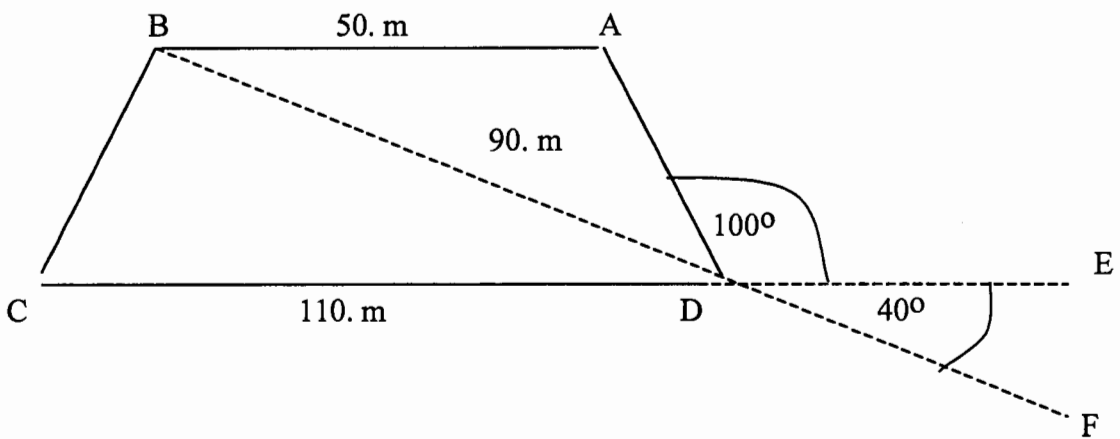
$$5Z + 4W < 300$$

$$2Z + 3W < 150$$

[5 marks]

**QUESTION 2**

Assume the following is a field. (Do not assume it is drawn to scale.)



- a. What is the size of angle BDC and angle BDA? [6 marks]
  
- b. What are the lengths of sides AD and BC? [8 marks]
  
- c. What is the area of the field? [6 marks]

**QUESTION 3**

- a. If the population of a country is  $8.0 \times 10^5$  and its annual growth rate is 1.5% . How long will it take for the population to double? [10 marks]
- b. If the population of a country was 1.0 million at the start of 1999 and its annual population growth rate is 2.5%:
- How long will it take the population to double? [5 marks]
  - What would the population be in the year 2010 A.D.? [5 marks]

**QUESTION 4**

- a. The instantaneous acceleration of an object is constant at  $30.6\text{m/s}^2$ . The instantaneous velocity at 15.0s is 500m/s. Find the equation for instantaneous velocity at any point in time. [10 marks]
- b. Marginal profit in US dollars is given by the equation:  $MP= 870-14X$ , where X is the number of a product sold. If X changes from 20 to 30, what is the change in total profit? Assume all numbers are exact. [10 marks]

**QUESTION 5**

- a. Determine the maximum and/or minimum values of the following functions. If given an interval, remember to evaluate  $f(X)$  at the endpoints to see if these are maximum or minimum values. If no interval is given find the maximum and/or minimum turning points.
- $f(X) = 2X - X^2 + 3$  [5 marks]
  - $f(X) = 2X^3 - 9X^2 + 12X + 5$  for  $0 \leq X \leq 2.5$  [5 marks]
- b. If two oxen hitched to a plough apply a force of 550. N at an angle of  $22.0^\circ$  up from the horizontal, what is the force that does the work of ploughing ? (i.e., what is the horizontal component of this force ?) Also find the vertical component (we will leave the explanation of the importance of the vertical component to the appropriate course.) [10 marks]

**QUESTION 6**

Summarize the following data in:

- a. a grouped frequency distribution. [5 marks]
- b. a histogram. [5 marks]
- c. a frequency polygon. [5 marks]
- d. an ogive. [5 marks]

Grain Yield (g) of 20 Across 7443 Maize Plants

135	124	96	29	187
23	57	50	26	42
44	44	60	140	187
80	96	130	37	105

Source: R.C. Kuhn. 1987 Maize Field Data.