THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

041 **BASIC MATHEMATICS**

(For Both School and Private Candidates)

TIME: 3 Hours ***Monday morning 08/10/2007***

Instructions

1. This paper consists of sections A and B.
2. Answer **all** questions in sections A and **four (4)** questions from section B.
3. All necessary working and answers for each question done must be shown clearly.
4. Mathematical tables or slides rules may be used unless otherwise stated.
5. Electronic calculators are **not** allowed in the examination room.
6. You are advised to spend not more than 2 hours on section A and the remaining time on section B.
7. Cellular phones are **not** allowed in the examination room.
8. Write your **Examination Number** on every page of your answer booklet(s).
9. Use $\pi = \frac{22}{7}$ and Radius of Earth = 6370 km wherever necessary.

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This paper consists of 7 printed pages.

SECTION A (60 marks)

Answer **all** questions in this section.

1. (a) Given $x = 4.5 \times 10^{-7}$ and $z = 7.2 \times 10^{5}$, find y in standard form if $z = xy$. **(2 marks)**

   (b) Express $2.1\dot{3}\dot{5}\dot{3}$ as a fraction. **(2 marks)**

   (c) Evaluate $\dfrac{\frac{1}{2.5} + 0.28 + 1\frac{17}{25}}{3\frac{1}{5} \div \frac{0.32}{0.15}}$

   Give your answer in fraction form. **(2 marks)**

2. (a) There are 60 people at a meeting. 35 are businesspersons, 32 are employees and 15 are both businesspersons and employees.

   (i) How many are businesspersons or employees?

   (ii) How many are neither businesspersons nor employees? **(3 marks)**

   (b) If $n(A \cap B') = 8$, $n(B \cap A') = 5$ and $n(A \cup B) = 20$.

   (i) Display the information in a Venn diagram,

   (ii) Give the values of $n(A)$ and $n(B)$. **(3 marks)**

3. (a) Let A be the acute angle of a right angled triangle ABC such that $\hat{B} = 90°$ and $\text{Cos } \hat{C} = \frac{5}{13}$. Find the value of $\text{Sin } \hat{A}$. **(2 marks)**

   (b) If $\underline{a} = \underline{i} + 2\underline{j}$, $\underline{b} = \underline{i} - 2\underline{j}$ and $\underline{c} = 5\underline{i} - 14\underline{j}$.
   Find the values of scalars p and q such that $p\underline{a} + 2q\underline{b} = \underline{c}$.
   (4 marks)

4. (a) Use common logarithmic tables to find the value of
   $\dfrac{2.055 \times 20.35 \times 6.325}{100.5 \times 0.045}$
   (4 marks)

   (b) Solve for x if $\sqrt{3^{x+2} - 17} = 8$. **(2 marks)**

5. (a) Prove that the opposite angles of any quadrilateral inscribed in a circle are supplementary. **(2 marks)**

(b) In figure 1 below, 0 is the centre of the circle, $A\hat{O}B = 120°$ and $C\hat{D}B = 15°$.

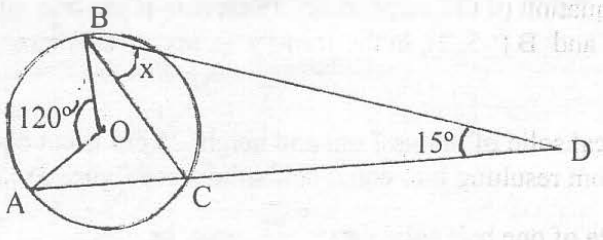


Fig. 1

Find the value of x. **(2 marks)**

(c)

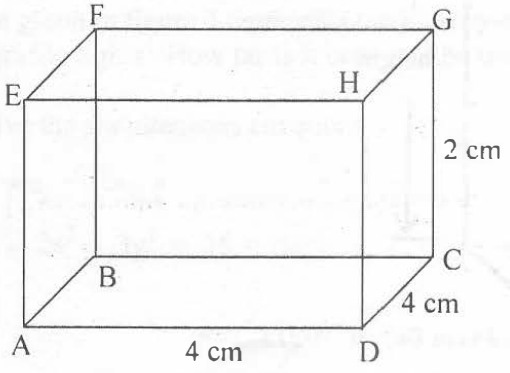


Fig. 2

For a tank given in the figure 2 above, calculate the angle between $\overline{DF}$ and the base ABCD. **(2 marks)**

6. (a) The first four terms of an AP are 2, (a – b), (2a + b + 7) and (a – 3b) respectively where a and b are constants.

(i) Find the values of the constants a and b.

(ii) The sum of the first 10 terms. **(4½ marks)**

(b) For how long should Tshs. 1,200,000/= be invested at simple interest rate of 5 % to get an interest of Tshs. 180,000/=? **(1½ marks)**

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7. (a) Find the equation of a straight line that is parallel to the line $3x + 4y = 1$ and cuts the x - axis where $x = -1$.

Express the answer in the form $ax + by + c = 0$ where a, b and c are constants. **(2½ marks)**

(b) Find the equation of the perpendicular bisector of the line joining the points A (3, - 1) and B (-5, 2), in the form $y = mx + c$ where m and c are constants. **(3½ marks)**

8. (a) A cylindrical solid of radius 7 cm and height 25 cm is cut equally from the top to bottom resulting into equal half solids (see figure 3). Find the total surface area of one half solid. $\pi = \frac{22}{7}$ may be used.

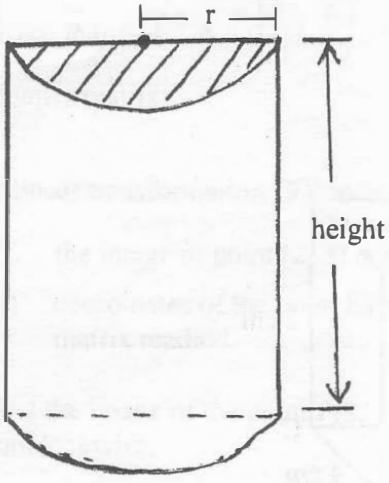


Fig. 3 **(4 marks)**

(b) What is the area of a regular 45 sides polygon inscribed in a circle of radius 6 cm? **(2 marks)**

9. (a) Mary received a certain amount of money from her father to go to school. She spent one third in her journey to school. At school she paid two thirds of the remaining amount as school fees and remained with 24,000/= as her pocket money. Showing the procedure, calculate the total amount of money she received from her father. **(4 marks)**

(b) If $f(x) = x^4 + kx^2 + 4x + 4$ has a remainder 16 when divided by $x - 2$. Find the value of k. **(2 marks)**

10. (a)

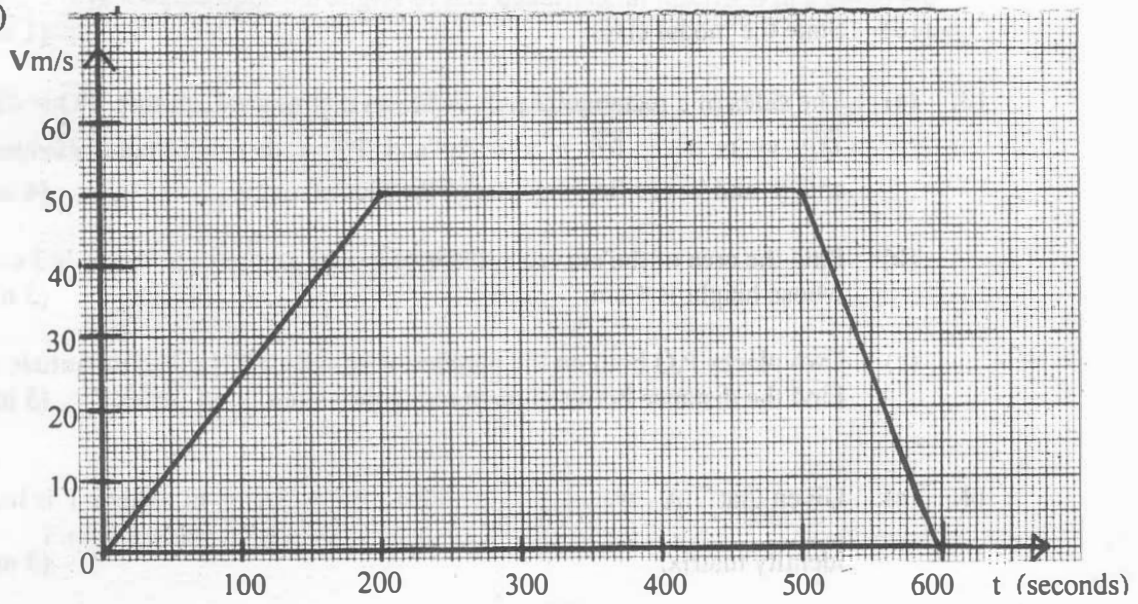


Fig. 4

The graph in figure 4 represents the journey made by a car between two sets of traffic lights. How far is it between the traffic lights? **(3 marks)**

(b) Solve the simultaneous equations

$$\begin{cases} x - y = 2 \\ 2x^2 - 3y^2 = 15 \end{cases}$$ **(3 marks)**

SECTION B (40 marks)

Answer **four (4)** questions from this section.

11. A person requires 15 and 14 units of chemical A and B respectively for his garden. A liquid product contains 5 and 2 units of A and B respectively, per jar; a dry product contains 1 and 4 units of A and B respectively, per carton. If the liquid product costs Tshs 3000/= per jar and the dry product costs Tshs. 2000/= per carton, how many of each should a person purchase to minimize the cost and meet the requirements? **(10 marks)**

12. The frequency distribution of the length of a sample of 100 nails, measured to the nearest mm is shown below.

Length	40 – 42	43 – 45	46 – 48	49 – 51	52 – 54	55 – 57	58 - 60
Frequency	4	9	13	20	34	18	2

(a) How many nails have length less than 51.5 mm? **(1 mark)**

(b) Calculate the mean length. **(4 marks)**

(c) Draw a histogram and use it to estimate the modal length. **(4 marks)**

(d) State the modal class. **(1 mark)**

13. (a) The sides of a rectangular plot PQRS in metres are such that $\overline{PQ} = 4x + 3$, $\overline{QR} = 3x + 1$, $\overline{RS} = x + 6y$ and $\overline{PS} = 4x - y$. Find the values of x and y and hence find the area of the plot in metres. **(4 marks)**

(b) Find the area of the curved surface of a cone whose base radius is 3 cm and whose height is 4 cm. **(3 marks)**

(c) Two places P,Q both on the parallel of latitude 26°N differ in latitude by 40°. Find the distance between them along their parallel of latitude. **(3 marks)**

14. (a) Given that $A = \begin{pmatrix} 1 & 2 \\ -1 & 4 \end{pmatrix}$. Find $A^2 + 5A + 6I$ where I is he identity matrix. **(3 marks)**

(b) A linear transformation T has matrix $\begin{pmatrix} 2 & -1 \\ 1 & 1 \end{pmatrix}$. Find

(i) the image of point (2, 3) under T.

(ii) coordinates of the point having an image of (7, 2) under T by using matrix method. **(5 marks)**

(c) Find the image of the point P(2, 1) under rotation about origin through 90° anticlockwise. **(2 marks)**

15. (a) (i) Draw the graphs of the functions $f(x) = x^2 - 4$ and $g(x) = x + 2$ in the same coordinate system.

(ii) Shade the region enclosed by the graphs in (i) indicating the intercepts for both graphs. **(7 marks)**

(b) From the graphs in (a) write the coordinates of the points where $f(x) = g(x)$. **(2 marks)**

(c) State the domain and range of $f(x)$. **(1 mark)**

16. (a) Box A has 10 light bulbs of which 4 are defective and box B has 6 light bulbs of which 1 is defective, if a box is selected at random and then a bulb is randomly drawn, calculate the probability that the bulb drawn is defective. **(3 marks)**

(b) A pair of fair dice is thrown. Find the probability that the sum is 10 or greater if a 5 appears on the first die. **(3 marks)**

(c) Given that $P(A') = \frac{1}{6}$, $P(B') = \frac{3}{5}$ and $P(A \cap B) = \frac{1}{4}$.

Find $P(A \cup B)$. **(4 marks)**