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*, October 10, 2005 a.m.

Instructions

1.   This paper consists of sections A and B.

2.   Answer **all** questions in section 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 and graph papers may be used unless otherwise stated.

5.   You are advised to spend **not** more than **two (2)** hours on section A.

6.   Electronic calculators are **not** allowed in the examination room.

7.   Cellular phones are nct allowed in the examination room.

8.   Write your **Examination Number** on every page of your answer booklet(s).

SECTION A (60 marks)

Answer all questions in this section showing all necessary workings and answers.

1. (a) Simplify $\dfrac{0.3754 \times 17.85}{0.00042 \times 9.33}$ and give your answer in four significant figures. (4 marks)

   (b) Change $0.0\dot{1}$ into a fraction. (2 marks)

2.
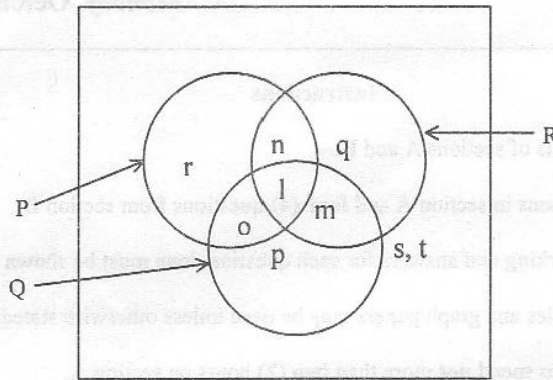

Figure 1

From the above figure, answer the following questions.

   (a) List down numbers of $(P \cup Q)'$ (2 marks)

   (b) Find $n(P \cup Q \cup R)'$ (2 marks)

   (c) Find $n(Q \cup R) - n(P \cap R)$ (2 marks)

3. If $\underline{u} = 4\underline{i} + 6\underline{j}$ and $\underline{v} = \frac{1}{2}\underline{i} - 3\underline{j}$; find:

   (a) $\underline{w}$ for which $\underline{w} = \frac{1}{2}\underline{u} - 2\underline{v}$. (2 marks)

   (b) $|\underline{w}|$ correct to two decimal places. (2 marks)

   (c) the angle that $\underline{w}$ makes with the positive direction of x - axis to the nearest degree. (2 marks)

4. (a) Solve for x if $\left(4^{(x+3)}\right)\left(16^{x}\right) = 8^{3x}$ (3 marks)

   (b) If $\log a = 1.3010$; $\log b = 1.4771$ and $\log C = 1.7782$,

   Calculate $\log\sqrt{\dfrac{a^2 b}{c^2}}$ (3 marks)

CPB

2

5. (a) AOP is the diameter of a circle with centre O.

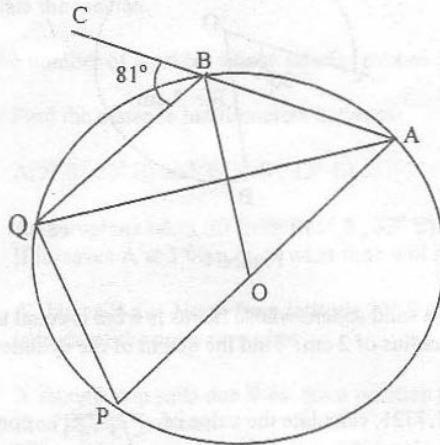Given that ABC is a straight line and angle $Q\hat{B}C = 81°$. Calculate the value of angle $P\hat{A}Q$. **(3 marks)**

Figure 2

(b) With reference to figure 3 below, calculate the length of segment $\overline{CE}$. **(3 marks)**
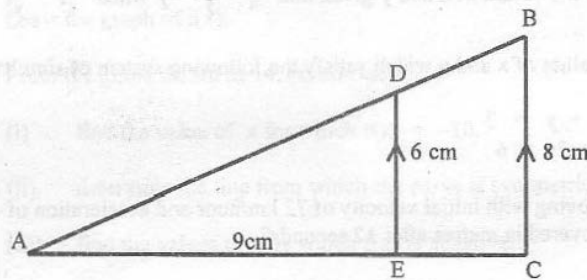

Figure 3

6. The 4th, 6th and 9th terms of an arithmetical progression (A.P.) forms the first three terms of a geometric progression. If the first term of the A.P. is 3, determine the **(3 marks)**

(a) common difference of the arithmetical progression.

(b) common ratio of the geometrical progression. **(3 marks)**

7. Both lines "r" and "s" pass through the point $(k, 9)$. Line "r" has a slope of $-\frac{2}{3}$ and passes through the point $(5, -3)$. Determine the:

(a) value of k. **(2 marks)**

(b) equation of "s" in standard form of $ax + by + c = 0$, if its x - intercept is -14 **(2 marks)**

(c) equation of line "t" perpendicular to line "r" which passes through the point $(k, 9)$ in form of $y = mx + c$. **(2 marks)**

CPB

3

8. (a) Figure 4 shows that AO = OB = 7 cm, < AOB = 36° and O is the centre of the circle. Calculate the perimeter of the figure. (3 marks)

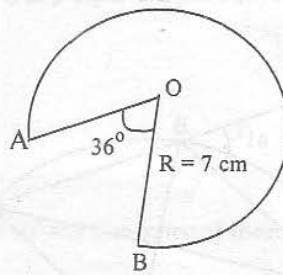
Figure 4

(b) The surface area of a solid sphere whose radius is 6 cm is equal to the surface area of a solid right cylinder with radius of 2 cm. Find the height of the cylinder. (3 marks)

9. (a) Given that $\sqrt{3}$ = 1.7321, calculate the value of $\dfrac{2}{\sqrt{3}-1}$ correct to 4 decimal places. (2 marks)

(b) Determine the values of x and y given that $\dfrac{1}{x}+\dfrac{1}{y}=\dfrac{3}{2}$ when $\dfrac{1}{x^2}+\dfrac{1}{y^2}=\dfrac{5}{4}$. (4 marks)

10. (a) Find the values of x and y which satisfy the following system of simultaneous equations

$$\begin{cases} 2x + y = 3 \\ x^2 - 2y = 6 \end{cases}$$ (3 marks)

(b) A car is moving with initial velocity of 72 km/hour and acceleration of 4 m/s². What is the distance covered in metres after 12 seconds? (3 marks)

SECTION B (40 marks)

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

11. A certain secondary school intends to buy two types of Basic Mathematics reference books. The school wants between 10 and 15 books (inclusive) of author A which cost 8,000/= each. Books from author B cost 10,000/= each. If the school has 240,000/=, what is the maximum number of books can the school buy? (10 marks)

12. The following frequency distribution table shows the monthly salaries for 33 workers in a certain company.

Salary (Tsh.)	20000 - 29000	30000 - 39000	40000 - 49000	50000 - 59000	60000 - 69000
Number of workers	1	4	6	10	8

Salary (Tsh.)	70000 - 79,000	80000 - 89000
Number of workers	2	2

CPB

4

(a) By taking the class mark of the class interval 50000 - 59000 as the assumed mean, calculate the mean salary. **(4 marks)**

(b) What is the mode for this distribution? **(2 marks)**

(c) Calculate the median. **(2 marks)**

(d) Find the number of workers whose salaries exceed Tsh. 69,500/=. **(2 marks)**

13. (a) (i) Find the distance in kilometers between

A($9°$ S , $33°$ E) and B($5°$ S , $33°$ E). **($2^{1}/_{2}$ marks)**

(ii) An aeroplane takes off from B($5°$ S , $33°$ E) to C($5°$ S , $39°$ E) at a speed of 332 km/h. If it leaves A at 3:00 p.m. at what time will it arrive at C airport? **($2^{1}/_{2}$ marks)**

(b) (i) A ship sails due North from latitude $20°$ S for a distance of 1440 km. Find the latitude of the point it reaches. **($2^{1}/_{2}$ marks)**

(ii) A second ship sails due West from position ($60°$N , $5°$ W) for a distance of 1200 km. Find its new position. **($2^{1}/_{2}$ marks)**
(Circumference of Earth = 4×10^{4} km).

14. It has been specified that $f(x) = 2x^2 - 5x - 3$ ranges from $x = -2$ to $x = 4$.

(a) Draw the graph of $f(x)$. **(6 marks)**

(b) From the graph drawn in 14. (a) above;

(i) find the value of x for which $f(x) = -10$.

(ii) determine the line from which the curve is symmetrical.

(iii) find the values of x by which $f(x)$ is negative.

(iv) solve the equation $2x^2 - 5x - 3 = 0$. **(4 marks)**

15. (a) A two digit number is written using the numbers 2, 3 and 4 without repetition.

Find the probability that the number is:

(i) even.

(ii) less than 30. **(4 marks)**

(b) A family has four children. By using a tree diagram, find the probability that the family has:

(i) all boys.

(ii) two boys and two girls. **(4 marks)**

(c) Find the probability that a number selected at random from the numbers −3, −2, 0, 3, 4 and 6 will be a solution set of the equation $x^2 - x - 6 = 0$. **(2 marks)**

16. (a) Given that $A = \begin{pmatrix} 4 & -3 \\ 1 & -2 \end{pmatrix}$, $B = \begin{pmatrix} 3 & 2 \\ -4 & 0 \end{pmatrix}$ and $C = \begin{pmatrix} -1 & 3 \\ 5 & -2 \end{pmatrix}$;

find $\left| 3A - 2B + C \right|$. **(3 marks)**

(b) Solve for x and y in:

$$\begin{pmatrix} x \\ 3 \end{pmatrix} = \begin{pmatrix} 2 \\ x+y \end{pmatrix}.$$ **(2 marks)**

(c) A point (x, y) is rotated through 90° and then reflected about the line y = x. Find:

(i) a single matrix for this double transformation.

(ii) the image of the point (3, 6) under this double transformation. **(5 marks)**