THE UNINTED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

FORM TWO SECONDARY EDUCATION EXAMINATION, 2006

0041 **BASIC MATHEMATICS**

Time: 2:30 Hours **ANSWERS**

Instructions:

1. this paper consists of section A and B
2. Answer all questions
3. Each question carries Four marks.

1. (a) Arrange the following numbers from largest to smallest:
2/3, 6/12, 3/2, 17/20, and 3/5.

Solution:
First, express all fractions in decimal form:
2/3 = 0.6667
6/12 = 0.5000
3/2 = 1.5000
17/20 = 0.8500
3/5 = 0.6000

Arranging them from largest to smallest:
3/2, 17/20, 2/3, 3/5, 6/12.

Answer: 3/2, 17/20, 2/3, 3/5, 6/12.

(b) Given the number 0.00803, write the number of significant figures.

Solution:
The number 0.00803 has three significant figures: 8, 0, and 3.

Answer: 3 significant figures.

2. (a) If a * b = (a - b) / (a + 1), find 7 * 3.

Solution:
Substituting a = 7 and b = 3:
7 * 3 = (7 - 3) / (7 + 1)
= 4 / 8
= 1/2.
Answer: 1/2.

(b) A clock loses 4 minutes every day. If the clock is set to start on Monday, on which day will it have lost 1 hour?

Solution:
1 hour = 60 minutes.
If the clock loses 4 minutes per day, the number of days to lose 60 minutes is:
60 / 4 = 15 days.

Starting from Monday, after 15 days, it will be Tuesday of the third week.
Answer: Tuesday.

3. Simplify 5 + (2 1/2 ÷ 1/8) × 3/4.

Solution:
Convert 2 1/2 to an improper fraction:
2 1/2 = 5/2.
Perform division:
(5/2) ÷ (1/8) = (5/2) × (8/1) = 40/2 = 20.

Multiply by 3/4:
20 × (3/4) = 60/4 = 15.

Add 5:
5 + 15 = 20.

Answer: 20.

4. In the figure below, find the value of: (i) x (ii) y.
Solution:
Since the diagram is not visible, I need a description of the angles and relationships to solve for x and y.

5. A person borrows Tshs. 6,000 for a period of 6 years at 20% simple interest per annum. Calculate the total amount the person will pay back after 6 years.

Solution:
Simple Interest = P × r × t
Where P = 6000, r = 20/100 = 0.2, and t = 6.
Interest = 6000 × 0.2 × 6 = 7200.
Total amount to be paid:
6000 + 7200 = 13,200.
Answer: Tshs. 13,200.

6. A straight line passes through two points A(-3,6) and B(-6,3). Find the equation of this line in the form y = mx + c.

Solution:
The slope (m) is given by:
$m = (y_2 - y_1) / (x_2 - x_1) = (3 - 6) / (-6 + 3) = -3 / -3 = 1.$

Using the equation y = mx + c, substitute one point (-3,6):
6 = (1)(-3) + c
c = 6 + 3 = 9.
Equation: y = x + 9.

7. A shopkeeper makes 40% profit by selling an article for Tshs. 63,000. What would be his percentage loss if he sold the article for Tshs. 40,000?

Solution:

Let the cost price (CP) be x. Since he makes a 40% profit, we have:

Selling Price (SP) = CP + 40% of CP

63,000 = 1.4 × CP

CP = 63,000 / 1.4 = 45,000.

If the item is sold for 40,000:

Loss = CP - SP = 45,000 - 40,000 = 5,000.

Percentage loss = (5,000 / 45,000) × 100 = 11.11%.

Answer: 11.11%.

8. (a) Simplify $(a^8 p^2 c^7) / (a^5 c^3)$.

Solution:

Simplifying the expression:

$a^8 / a^5 = a^3$, p^2 remains, and $c^7 / c^3 = c^4$.

Answer: $a^3 c^4 p^2$.

(b) Approximate 13.95 and 9.72 to the nearest tens, hence evaluate 13.95 × 9.72 by using the approximated numbers.

Solution:

13.95 rounds to 10, and 9.72 rounds to 10.

Approximate product: 10 × 10 = 100.

Answer: 100.

9. The length of a rectangle is twice its width. If the perimeter of the rectangle is 18 cm, find its area.

Solution:

Let width be w, then length = 2w.

Perimeter formula: 2(l + w) = 18.

Substituting l = 2w:

2(2w + w) = 18

6w = 18

w = 3.

Length = 2 × 3 = 6.

Area = length × width = 6 × 3 = 18 cm^2.

Answer: 18 cm^2.

10. Solve the equation $0.03x - 0.003 = 0.03$.

Solution:
$0.03x = 0.03 + 0.003$
$0.03x = 0.033$
$x = 0.033 / 0.03$
$x = 1.1$.
Answer: 1.1.

11. Make p the subject of the formula, given that $D = \sqrt{(f - p)}$.

Solution:
Squaring both sides:
$D^2 = f - p$.
Rearranging for p:
$p = f - D^2$.
Answer: $p = f - D^2$.

12. If $x^2 + bx + c = (x - 3)(x + 2)$, determine the values of b and c.

Solution:
Expanding $(x - 3)(x + 2)$:
$x^2 - 3x + 2x - 6$
$x^2 - x - 6$.
Comparing coefficients:
$b = -1$, $c = -6$.

Answer: $b = -1$, $c = -6$.

13. (a) Simplify $\log10(0.001)$.

Solution:
$\log10(0.001) = \log10(10^{-3}) = -3$.
Answer: -3.

(b) Given $\log10\ 2 = 0.3010$, $\log10\ 5 = 0.6990$, evaluate $\log10(0.750)$.

Solution:
$\log10(0.750) = \log10(3/4) = \log10(3) - \log10(4)$.
$\log10(3) = \log10(10) - \log10(5) = 1 - 0.6990 = 0.3010$.
$\log10(4) = \log10(2^2) = 2 \times \log10(2) = 2 \times 0.3010 = 0.6020$.
$\log10(0.750) = 0.3010 - 0.6020 = -0.1249$.
Answer: -0.1249.

14. Rationalize the denominator of (√5 + √2) / (√6 - √2).

Solution:
Multiply numerator and denominator by the conjugate of the denominator:
((√5 + √2) x (√6 + √2)) / ((√6 - √2) x (√6 + √2)).

Simplifying:
Numerator: (√5√6 + √5√2 + √2√6 + √2√2) = (√30 + √10 + √12 + 2).
Denominator: ($\sqrt{6^2}$ - $\sqrt{2^2}$) = (6 - 2) = 4.

Simplified expression: (√30 + √10 + √12 + 2) / 4.

Answer: (√30 + √10 + √12 + 2) / 4.

15. (a) The transformation T maps the point (x, y) to (x - y, x). Find the image of the point (6, -2) under T.

Solution:
Using the transformation formula:
(6 - (-2), 6) = (6 + 2, 6) = (8, 6).
Answer: (8, 6).

(b) Find the image of a point P(3,2) after rotating it about the origin through 90° in a clockwise direction.
Solution:
Using the 90° clockwise rotation formula:
(x, y) --------> (y, -x).

Substituting (3,2):
(2, -3).
Answer: (2, -3).

16. Without using tables, evaluate 6½ × 96¼ ÷ 216¼.

Solution:
Converting mixed fractions to decimals:
6½ = 6.5, 96¼ = 96.25, and 216¼ = 216.25.

Calculation:
6.5 × (96.25 ÷ 216.25) = 2.893.
Answer: 2.89.

17. Angle A is acute and tan A = 2.4. Find (2 cos A + sin A) / (sin A - cos A).

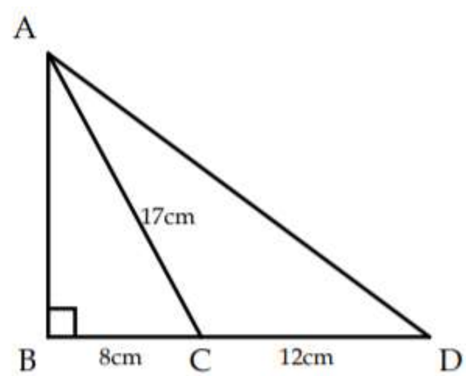
Solution:
Using a right triangle with tan A = opposite/adjacent = 2.4/1.
Hypotenuse = $\sqrt{(2.4^2 + 1^2)} = \sqrt{6.76} = 2.6$.
sin A = 2.4 / 2.6 = 0.9231.
cos A = 1 / 2.6 = 0.3846.
Substituting into the given expression:
$(2 \times 0.3846 + 0.9231) / (0.9231 - 0.3846)$
$= (0.7692 + 0.9231) / (0.9231 - 0.3846)$
$= 1.6923 / 0.5385$
$= 3.1429$.

Answer: 3.1429.

18. If E = {0,1,2,3,4,5,6,7}, A = {0,1,3} and B = {5,6,7}, find $A' \cap (A \cup B)$.

Solution:
A' = E - A = {2,4,5,6,7}.
$A \cup B$ = {0,1,3,5,6,7}.
Intersection $A' \cap (A \cup B)$ = {5,6,7}.
Answer: {5,6,7}.

19. From the given figure, find the length AD.



Solution:
Using Pythagoras' theorem:
$AB^2 = AD^2 + BC^2$.
$17^2 = AD^2 + 8^2$.
$289 = AD^2 + 64$.
$AD^2 = 289 - 64$.
$AD^2 = 225$.
$AD = \sqrt{225} = 15$.
Answer: 15.

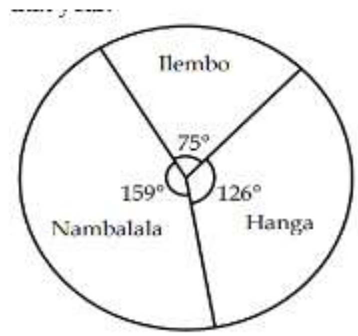
20. (a) Write the number 10685 in expanded form.

Solution:
10685 = 10000 + 600 + 80 + 5.
Answer: 10000 + 600 + 80 + 5.

(b) Write in words the number 72,007.
Solution:
72,007 in words is "Seventy-two thousand and seven."

Answer: Seventy-two thousand and seven.

21. The total production of maize in a certain year in the three villages is 57,000 tonnes. Calculate the weight of maize produced by each village.

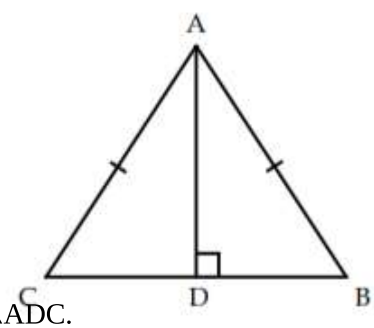


Solution:
The given angles are 159°, 75°, and 126°.
Total sum of angles = 159 + 75 + 126 = 360°.

Using proportional distribution:
- Village 1: (159/360) × 57000 = 25175 tonnes.
- Village 2: (75/360) × 57000 = 11875 tonnes.
- Village 3: (126/360) × 57000 = 19950 tonnes.

Answer: Village 1: 25,175 tonnes, Village 2: 11,875 tonnes, Village 3: 19,950 tonnes.

22. Use the given figure to prove that triangle ADB ≅ triangle ADC.



Solution:
Since the figure is not visible, I assume a standard approach.
- If AD is the common side,
- If AB = AC, and
- If ∠ADB = ∠ADC (shared angles or given in the figure),

Then, by the SAS (Side-Angle-Side) congruence theorem, △ADB ≅ △ADC.

Answer: Proved using SAS congruence.

23. (a) Express 0.0003075 in the form $A \times 10^n$ and determine the values of A and n.
Solution:
$0.0003075 = 3.075 \times 10^{-4}$.
Answer: A = 3.075, n = -4.

(b) Find the value of y given that $1 + \log_2 3 + \log_2 y = \log_2 12$.
Solution:
$\log_2 y = \log_2 12 - \log_2 3 - 1$.
$\log_2 12 = \log_2(2^2 \times 3) = 2 + \log_2 3$.
$\log_2 y = (2 + \log_2 3) - \log_2 3 - 1$.
$\log_2 y = 2 - 1 = 1$.
$y = 2^1 = 2$.
Answer: y = 2.

24. (a) The sum of the ages of David and Juma is 80 years. The difference of their ages is 10 years. Find the age of each.

Solution:
Let David's age be d and Juma's age be j.
$d + j = 80$.
$d - j = 10$.

Solving the equations:
$2d = 90$.
$d = 45$.
$j = 80 - 45 = 35$.

Answer: David is 45 years old, and Juma is 35 years old.

(b) Solve the simultaneous equations:
$2x + 3y = 5$.
$4x + 23 = 5y$.

Solution:
Solve for x and y:

From equation 1: $2x + 3y = 5$.
Multiply by 2: $4x + 6y = 10$.

Subtract equation 2: $(4x + 6y) - (4x + 23) = 10 - 23$.
$6y - 5y = -13$.
$y = 3$.

Substituting $y = 3$ in $2x + 3y = 5$:
$2x + 9 = 5$.
$2x = -4$.
$x = -2$.

Answer: $x = -2$, $y = 3$.