THE UNINTED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

FORM TWO NATIONAL ASSESSMET

0041 **BASIC MATHEMATICS**

Time: 2:30 Hours **ANSWERS** **Year: 2017.**

Instructions:

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

1. (a) Find the LCM and GCF of 13, 52, and 104.

Solution:
First, find the prime factorization of each number.
$13 = 13$
$52 = 2^2 \times 13$
$104 = 2^3 \times 13$

Greatest Common Factor (GCF) is the product of common factors with the lowest power:
GCF = 13

Least Common Multiple (LCM) is the product of the highest power of all prime factors:
LCM = $2^3 \times 13 = 104$

Final answer:
GCF = 13
LCM = 104

(b) Round off the number 568,356 to the nearest thousands and ten thousands.
Solution:
To the nearest thousand: Look at the hundreds digit (3). Since it is less than 5, round down.
568,356 -------- > 568,000

To the nearest ten thousand: Look at the thousands digit (8). Since it is 5 or more, round up.
568,356 ----------> 570,000
2. (a) Determine the improper fraction of $\frac{3}{5} \times 4\frac{1}{5} \div 18/25$.

Solution:
Convert the mixed fractions to improper fractions:
$4\frac{1}{5} = (4\times5+1)/5 = 21/5$

Now multiply:
$(\frac{3}{5}) \times (21/5) = 63/25$

Now divide by 18/25 by multiplying by its reciprocal:
$(63/25) \div (18/25) = (63/25) \times (25/18)$
$= 3\frac{1}{2}$

(b) Convert 1/3 into a repeating decimal.
Solution:
$1 \div 3 = 0.3333...$
Final answer:
$0.\overline{3}$

3. (a) Change 15 km into centimeters.

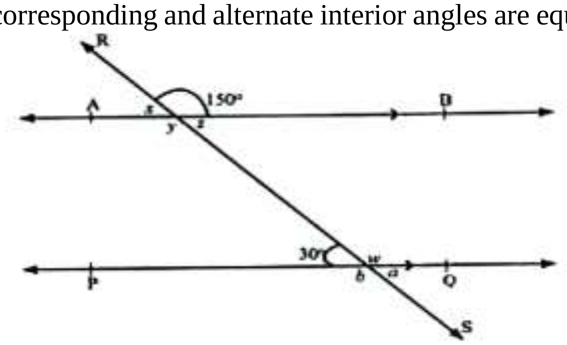
Solution:
1 km = 1000 m
1 m = 100 cm
So,
15 km = 15 × 1000 × 100
= 1,500,000 cm

Final answer:
1,500,000 cm

(b) Find the time in which sh. 200,000 will earn sh. 48,000 at the rate of 4% interest per annum.
Solution:
Use the simple interest formula:
I = P × r × t
Where:
I = 48,000
P = 200,000
r = 4% = 4/100 = 0.04
t = ?
Rearrange for t:
t = I / (P × r)
t = 48,000 / (200,000 × 0.04)
t = 48,000 / 8,000
t = 6 years
Final answer:
6 years

4. (a) In the following figure, AB is parallel to PQ and RS is a transversal. Find the angles labeled a, b, w, x, y, and z.

Solution:
Since AB is parallel to PQ and RS is a transversal, the corresponding and alternate interior angles are equal.



Given that ∠RAB = 150°:
- ∠a (corresponding to ∠RAB) = 150°
- ∠b (supplementary to ∠RAB) = 180° - 150° = 30°

Given that ∠QSR = 30°:
- ∠w (corresponding to ∠QSR) = 30°
- ∠x (alternate interior with ∠QSR) = 30°

- ∠y (vertically opposite to ∠QSR) = 30°
- ∠z (corresponding to ∠a) = 150°

(b) Find the perimeter of a square, if its area is 25 cm^2.

Solution:
Let s be the side length of the square.
Area = $s^2 = 25$
$s = \sqrt{25} = 5$ cm
Perimeter = $4 \times s = 4 \times 5 = 20$ cm
Final answer:
Perimeter = 20 cm
5. (a) Find the value of x in the equation $9 \times 3^{4x} = 27$^(x-1).

Solution:
Rewrite the bases in terms of 3:
$9 = 3^2$ and $27 = 3^3$
So the equation becomes:
$(3^2) \times 3^{4x} = (3^3)$^(x-1)
Using exponent rules:
$3^2 \times 3^{4x} = 3$^(3(x-1))
Since bases are the same, equate the exponents:
2 + 4x = 3(x - 1)
Solve for x:
2 + 4x = 3x - 3
4x - 3x = -3 - 2
x = -5

(b) Factorize the expression $6x^2 - 11x + 4$ by splitting the middle term.

Solution:
Find two numbers that multiply to (6 × 4 = 24) and add to -11:
Numbers: -8 and -3
Rewrite the middle term:
$6x^2 - 8x - 3x + 4$
Group terms:
$(6x^2 - 8x) - (3x - 4)$
Factor each group:
2x(3x - 4) - 1(3x - 4)
Factor out the common term:
(2x - 1)(3x - 4)

6. (a) Find the equation of the straight line passing through the points (3,5) and (7,9). Express your answer in the form $y = mx + c$.

Solution:
Find the slope (m):
$m = (y_2 - y_1) / (x_2 - x_1)$
$m = (9 - 5) / (7 - 3)$
$m = 4/4$
$m = 1$
Use the point-slope formula:
$y - y_1 = m(x - x_1)$
Substituting (3,5):
$y - 5 = 1(x - 3)$
$y = x + 2$
Final answer:
$y = x + 2$

(b) The vertices of a triangle are A(2,2), B(3,4), and C(4,3). If the triangle is reflected in the y-axis, write down the coordinates of the image of points A, B, and C.

Solution:
Reflection in the y-axis changes the x-coordinates of the points while keeping the y-coordinates the same. The transformation rule is $(x, y) \rightarrow (-x, y)$.

Applying the rule:
A(2,2) → A'(-2,2)
B(3,4) → B'(-3,4)
C(4,3) → C'(-4,3)

Final answer:
A'(-2,2), B'(-3,4), C'(-4,3)

7. (a) Rationalize the denominator
$\sqrt{2} / (\sqrt{10} - \sqrt{2})$

Solution:
Multiply numerator and denominator by the conjugate of the denominator:
$(\sqrt{2}(\sqrt{10} + \sqrt{2})) / ((\sqrt{10} - \sqrt{2})(\sqrt{10} + \sqrt{2}))$
Using difference of squares:
Denominator: $(\sqrt{10})^2 - (\sqrt{2})^2 = 10 - 2 = 8$

Numerator: $\sqrt{2} \times \sqrt{10} + \sqrt{2} \times \sqrt{2} = \sqrt{20} + 2$

Thus, the fraction simplifies to:
$(\sqrt{20} + 2) / 8$
Since $\sqrt{20} = 2\sqrt{5}$:
$(2\sqrt{5} + 2) / 8$
Factor out 2:
$2(\sqrt{5} + 1) / 8$
Simplify:
$(\sqrt{5} + 1) / 4$

(b) Without using mathematical tables, find the value of 5 log 5 + 5 log 2 - 2 log 2

Solution:
Using logarithm properties:
$\log a^b = b \log a$
$\log(ab) = \log a + \log b$

Rewriting terms:
$5 \log 5 = \log 5^5 = \log 3125$
$5 \log 2 = \log 2^5 = \log 32$
$2 \log 2 = \log 2^2 = \log 4$

Now compute:
$\log 3125 + \log 32 - \log 4$
$= \log (3125 \times 32 / 4)$
$= \log (100000 / 4)$
$= \log 25000$

Since log 10000 = 4 and log 10 = 1,
$\log 25000 = \log (25 \times 1000) = \log 25 + \log 1000$
$= \log (5^2) + \log (10^3)$
$= 2 \log 5 + 3 \log 10$
$= 2(0.6990) + 3(1)$
$= 1.398 + 3$
$= 4.398$

8. (a) PQR is an isosceles triangle whereby PQ = PR and QS = SR. If S is a point between Q and R, prove that $\Delta PQS \cong \Delta PRS$.

Solution:
To prove $\Delta PQS \cong \Delta PRS$, we use the SAS (Side-Angle-Side) congruence rule:

Given:
PQ = PR (since PQR is isosceles)

QS = SR (given)
∠PQS = ∠PRS (vertically opposite angles)

By SAS congruence,
ΔPQS ≅ ΔPRS
Final proof:
ΔPQS ≅ ΔPRS by SAS congruence criterion.

(b) In the following figure, ΔABC ~ ΔPQR, AC = 4.8 cm AB = 4 cm and PQ = 9 cm find the PR

Given: ΔABC ~ ΔPQR (Triangle ABC is similar to triangle PQR). AC = 4.8 cm, AB = 4 cm, and PQ = 9 cm.
To find: PR
Solution:
Since the triangles are similar, the ratio of corresponding sides is equal:
AB / PQ = AC / PR
Substituting the given values:

4 / 9 = 4.8 / PR
Solving for PR:

PR = (4.8 x 9) / 4
PR = 43.2 / 4
PR = 10.8 cm

9. (a) The sides of an equilateral triangle ABC are 10 cm each. Find the length marked AD in surd form

Given: Equilateral triangle ABC with sides of 10 cm each. AD is the altitude (and also the median).
To find: Length of AD in surd form.
Solution:
Altitude as Median: In an equilateral triangle, the altitude bisects the base. Thus, BD = DC = 10 / 2 = 5 cm.
Right Triangle: Triangle ABD is a right-angled triangle with hypotenuse AB = 10 cm and base BD = 5 cm.
- Pythagorean Theorem: Apply the Pythagorean theorem to triangle ABD:

$AD^2 + BD^2 = AB^2$
$AD^2 + 5^2 = 10^2$
$AD^2 + 25 = 100$
$AD^2 = 75$

Taking the square root of both sides:

$AD = \sqrt{75}$
$AD = \sqrt{(25 \times 3)}$
$AD = 5\sqrt{3}$ cm

Solution

(b) Without using mathematical tables, find the exact value of

(tan 45 + tan 30) / (1 - tan 45 tan 30)

Solution:

We use the tangent addition formula:

$\tan(A + B) = (\tan A + \tan B) / (1 - \tan A \tan B)$

Given A = 45° and B = 30°:

$\tan 45° = 1$
$\tan 30° = 1/\sqrt{3}$

Substituting the values:

$(1 + 1/\sqrt{3}) / (1 - (1 \times 1/\sqrt{3}))$

$= (\sqrt{3}/\sqrt{3} + 1/\sqrt{3}) / (1 - 1/\sqrt{3})$

$= ((\sqrt{3} + 1) / \sqrt{3}) / ((\sqrt{3} - 1) / \sqrt{3})$

$= (\sqrt{3} + 1) / (\sqrt{3} - 1)$

Rationalizing the denominator by multiplying numerator and denominator by $(\sqrt{3} + 1)$:

$= ((\sqrt{3} + 1)^2) / ((\sqrt{3} - 1)(\sqrt{3} + 1))$

$= (3 + 2\sqrt{3} + 1) / (3 - 1)$

$= (4 + 2\sqrt{3}) / 2$

$= 2 + \sqrt{3}$

Final answer: $2 + \sqrt{3}$

10. (a) In a primary school of 150 pupils, 50 study Hisabati, 70 study Sayansi, and 40 study both subjects. By using the appropriate formula, calculate the number of pupils who study neither Hisabati nor Sayansi.

Solution:
Using the formula for union in set theory:
$n(H \cup S) = n(H) + n(S) - n(H \cap S)$

$= 50 + 70 - 40$
$= 80$
The total number of students is 150, so those who study neither subject:

$= 150 - 80$
$= 70$

Final answer: 70 pupils

(b) The marks of 61 students are represented in the following table:

Marks in %	30	35	45	50	60	75	80	85	90
Number of students	3	5	7	10	18	9	4	3	2

From the table, answer the following questions:
(i) Which mark was scored by few students?
The mark scored by the fewest students is 90, with only 2 students.

(ii) What was the highest mark?
The highest mark is 90%.

(iii) If 50% was the pass mark in the examination, how many students passed the examination?
Students who scored 50% or more:

- 50% = 10 students
- 60% = 18 students
- 75% = 9 students
- 80% = 4 students
- 85% = 3 students
- 90% = 2 students

Total students who passed = 10 + 18 + 9 + 4 + 3 + 2 = 46 students

(iv) Which mark was scored by many students?
The mark scored by the most students is 60%, with 18 students.