THE UNINTED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

FORM TWO NATIONAL ASSESSMET

0041 **BASIC MATHEMATICS**

Time: 2:30 Hours **ANSWERS** **Year: 2021.**

Instructions:

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

1. (a)
(i) Write 498,030 in words.
Solution: Four hundred ninety-eight and thousand thirty.

(ii) Express the number given in part (a)(i) in standard notation.
Solution: 4.9803×10^5.

(iii) By using the listing method, write the lowest common multiple of 3, 10, and 15.
Solution:
Multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30...
Multiples of 10: 10, 20, 30, 40, 50...
Multiples of 15: 15, 30, 45, 60...
The lowest common multiple is 30.

(b)
(i) Write in numerals: Nine hundred ninety-nine million nine hundred ninety-nine thousand nine hundred and one.
Solution: 999,999,901.

(ii) Determine the number of significant figures in each of the numbers: 400, 0.0045, and 0.06006, then approximate each number into one significant figure.
Solution:
- 400 has 1 significant figure when approximated: 4×10^2.
- 0.0045 has 2 significant figures when approximated: 0.004.
- 0.06006 has 4 significant figures when approximated: 0.06.

2. (a)
(i) Write the fractions 2/3, 3/4, 5/8 and 1/2 in order of magnitude starting with the smallest fraction.
Solution:
Converting fractions to decimals:
- 2/3 = 0.6667
- 3/4 = 0.75
- ⅝ = 0.625
- 1/2 = 0.5
Order: 1/2, 5/8, 2/3, 3/4.

(ii) Find the product of the fractions given in part (a)(i).
Solution:
$(2/3) \times (3/4) \times (5/8) \times (1/2) = (2 \times 3 \times 5 \times 1) / (3 \times 4 \times 8 \times 2) = 5/32$

(b) Subtract 0.02 of Tsh. 270,000 from 36% of Tsh. 50,000.
Solution:
$0.02 \times 270{,}000 = 5{,}400$.

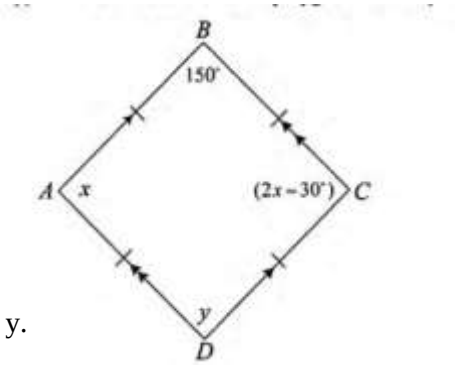
36% × 50,000 = 0.36 × 50,000 = 18,000.
18,000 - 5,400 = 12,600.

3. (a) Find the value of 500 cm + 3150 mm + 3.5 m. (Give the answer in metres).
Solution:
Convert all measurements to metres:
- 500 cm = 500 ÷ 100 = 5 m
- 3150 mm = 3150 ÷ 1000 = 3.15 m
- 3.5 m = 3.5 m

Add: 5 + 3.15 + 3.5 = 11.65 m.
Final answer: 11.65 m.

(b) Find the number of years in which Tshs. 20,000 will earn an interest of Tshs. 4,800 if the interest rate is 4% per annum.
Solution:
Using the simple interest formula:
Interest = Principal × Rate × Time
4,800 = 20,000 × 0.04 × Time
4,800 = 800 × Time
Time = 4,800 ÷ 800 = 6 years.
Final answer: 6 years.

4. (a) (i) Write the name of the polygon ABCD represented in the following figure.
Solution:
The polygon shown is a rhombus because all sides are equal, and opposite angles are congruent.
Final answer: Rhombus.



(b) (ii) From the figure given in part (a)(i), find the values of x and y.
Solution:
In a rhombus, opposite angles are equal, and adjacent angles are supplementary.

- The angle at B is given as 150°.
- The angle at A (x) and angle at D (y) are equal.
- Using the property of a rhombus:
  x + 150° = 180°
  x = 180° - 150° = 30°

Thus, x = 30°.

- The angle at C (2x):
2x = 2 × 30° = 60°

- y is opposite to x, so y = x = 30°.
Final answer: x = 30°, y = 30°.

(b) Calculate the area of the following figure, if O is the center of the circle and OABC is a square.
Solution:
The square OABC has a side length of 7 cm.
The area of the square = side² = 7² = 49 cm².

The circle has a radius equal to the side of the square, r = 7 cm.
The area of the circle = πr² = 22/7 × 7 × 7 = 154 cm².
But, the circle is only ¾ of the whole, and 154 cm² is the area of the whole circle, so
To get the area of the portion of the circle ¾ we do this,
Area = ¾ x 154 = 115 cm².
Then, total area = area of square + area of ¾circle
= 49 + 115
= 164 cm²

5. (a) The age of the father is three times the age of his son. If the sum of their ages is 64 years, find their ages.
Solution:
Let the son's age be x.
The father's age is 3x.
The sum of their ages: x + 3x = 64.
4x = 64.
x = 64 ÷ 4 = 16.

The son's age is 16 years.
The father's age is 3 × 16 = 48 years.

Final answer: Son's age = 16 years, Father's age = 48 years.

5. (b) Solve the quadratic equation x² + 7x + 12 = 0 by using the factorization method.
Solution:
x² + 7x + 12 = 0
Find two numbers whose product is 12 and sum is 7: These numbers are 3 and 4.
Rewrite the equation:
x² + 3x + 4x + 12 = 0
Group terms:

$x(x + 3) + 4(x + 3) = 0$
Factorize:
$(x + 3)(x + 4) = 0$
Set each factor to zero:
$x + 3 = 0$ or $x + 4 = 0$
$x = -3$ or $x = -4$
Final answer: $x = -3$ or $x = -4$.

6. (a) A line passes through the points A(6, 4) and B(12, 6). Find the slope and the equation of the line.
Solution:
The formula for the slope (m) is:
$m = (y_2 - y_1) / (x_2 - x_1)$
$m = (6 - 4) / (12 - 6) = 2 / 6 = 1/3$

Using the point-slope form of a line equation:
$y - y_1 = m(x - x_1)$
Using point A(6, 4):
$y - 4 = (1/3)(x - 6)$
Simplify:
$y - 4 = (1/3)x - 2$
$y = (1/3)x + 2$

Final answer: Slope = 1/3, Equation of the line: $y = (1/3)x + 2$.

(b) (i) A translation takes the origin to (-3, -4). Without drawing, find where it takes Q(1, -2).
Solution:
The translation vector is (-3, -4).
New coordinates of Q:
x-coordinate: 1 - 3 = -2
y-coordinate: -2 - 4 = -6

Final answer: Q is translated to (-2, -6).

(ii) Find the images of the points A(-5, 2) and B(4, -7) after reflection in the y-axis.
Solution:
Reflection in the y-axis changes the sign of the x-coordinates:
A(-5, 2) --> A'(5, 2)
B(4, -7) ----> B'(-4, -7)

Final answer: A'(5, 2), B'(-4, -7).

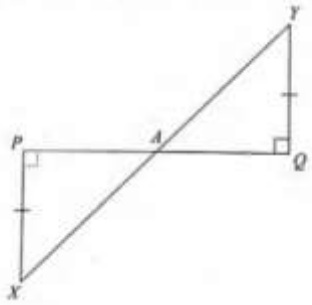
7. (a) Find the value of x in the equation $(1/3)^{(\sqrt{x})} = 81^{(-x)}$.
Solution:
Rewrite 1/3 as $3^{(-1)}$ and 81 as 3^4:
$(3^{(-1)})^{(\sqrt{x})} = (3^4)^{(-x)}$.
Simplify the exponents:
$3^{(-\sqrt{x})} = 3^{(-4x)}$.
Equate the exponents since the bases are the same:
$-\sqrt{x} = -4x$.
Divide through by -1:
$\sqrt{x} = 4x$.
Square both sides:
$x = 16x^2$.
Rearrange:
$16x^2 - x = 0$.
Factorize:
$x(16x - 1) = 0$.
Solutions:
$x = 0$ or $x = 1/16$.

(b) If $\log_{10}(x/5) = \log_{10}(2/x) + 1$, find the value of x.
Solution:
$\log_{10}(x/5) = \log_{10}(2/x) + 1$.
Using log rules, rewrite:
$\log_{10}(x/5) - \log_{10}(2/x) = 1$.
Combine logs:
$\log_{10}((x/5) \div (2/x)) = 1$.
Simplify:
$\log_{10}(x^2 / 10) = 1$.
Rewrite in exponential form:
$x^2 / 10 = 10^1$.
Simplify:
$x^2 = 100$.

Solve for x:
$x = \pm\sqrt{100}$.
Since x must be positive,
Final answer: $x = 10$.

8. (a) In the following figure, PX and QY are perpendicular to PQ and PX = QY. Show that the two triangles XPA and YQA are congruent.
Solution:
To prove $\Delta XPA \cong \Delta YQA$:
1. PX = QY (Given).

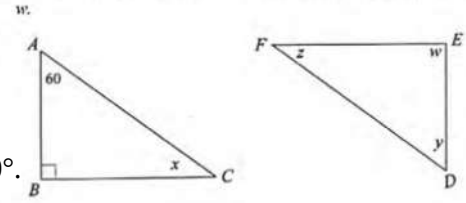
2. ∠XPA = ∠YQA = 90° (Both are right angles).
3. PA is common to both triangles.



By the RHS (Right Angle-Hypotenuse-Side) congruence criterion:
ΔXPA ≅ ΔYQA.

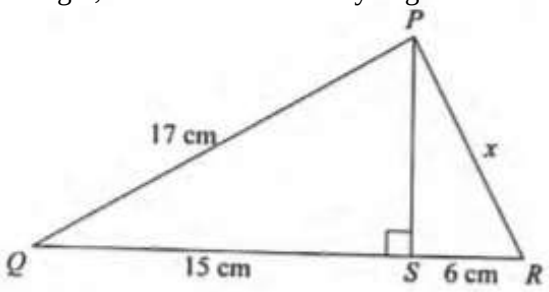
Final answer: The two triangles are congruent by RHS.

(b) Triangles ABC and DEF are similar. Find the size of the angles labeled x, y, z, and w.
Solution:
In triangle ABC:
- ∠A = 60° (Given).
- ∠B = 90° (Right angle).
- ∠C = 180° - (∠A + ∠B) = 180° - (60° + 90°) = 30°.



Since triangles ABC and DEF are similar, their corresponding angles are equal:
- ∠D = ∠B = 90° (y = 90°).
- ∠F = ∠A = 60° (z = 60°).
- ∠E = ∠C = 30° (w = 30°).
Final answer: x = 30°, y = 90°, z = 60°, w = 30°.

9. (a) In the following figure, PQ = 17 cm, QS = 15 cm, RS = 6 cm, and PR = x. Find the value of x.
Solution:
In the right triangle PQS, PS is the height, and we can use the Pythagorean theorem:
$PQ^2 = PS^2 + QS^2$.



First, calculate PS:
$17^2 = 15^2 + PS^2$
PS = 8 cm

Again, for triangle PSR,
$PS^2 + SR^2 = PR^2$
$64 + 36 = x^2$
x = 10 cm

(b) The angle of elevation of the top of a vertical building from a point on the ground is 25°. The point on the ground is 80 m away from the base of the building. By sketching a diagram representing this information, calculate the height of the building.
Solution:
Using the tangent function:
tan(25°) = height / 80.
Rearrange to solve for height:
height = 80 × tan(25°).

Using a calculator:
$\tan(25°) \approx 0.4663$.
height $\approx 80 \times 0.4663 \approx 37.3$ m (to one decimal place).
Final answer: The height of the building is approximately 37.3 m.

10. (a) In a class of 30 students, 17 participate in English debate and 12 participate in both English debate and Mathematics club. If every student is required to participate in at least one of these two events, find the number of students who participate in:

(i) English debate only.
Solution:
Let the total number of students participating in English debate = 17.
The number of students participating in both English debate and Mathematics club = 12.
The number of students participating in English debate only = 17 - 12 = 5.

Final answer: 5 students.

(ii) Mathematics club only.
Solution:
Total students = 30.
Students participating in English debate = 17.
Students participating in both = 12.
Students participating in Mathematics club only = Total - (English debate only + both).

Mathematics club only = 30 - (5 + 12) = 13.

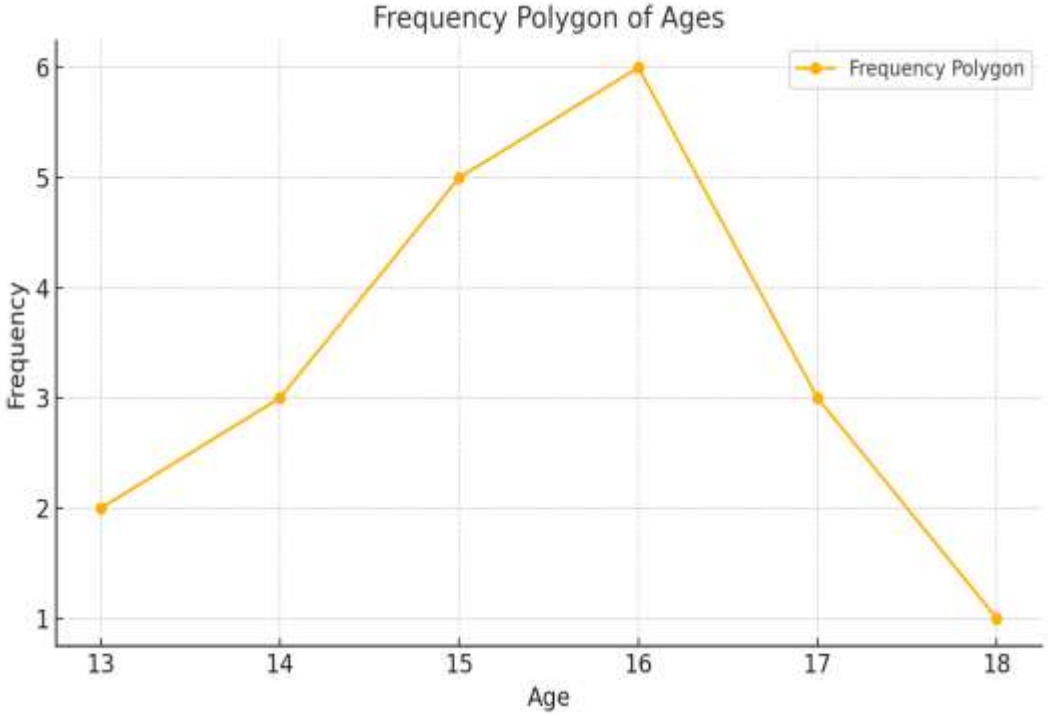
Final answer: 13 students.

(b) The ages of students selected to participate in a debate competition were recorded as follows:
13, 15, 17, 16, 15, 14, 16, 18, 17, 16, 15, 14, 13, 16, 14, 17, 15, 16, 15, 16.

(i) Prepare a frequency table showing the ages of students and their corresponding frequencies.
Solution:

Age	Frequency
13	2
14	3
15	5
16	6
17	3
18	1

(ii) Draw a frequency polygon representing the given information in part (b)(i).



Solution: