THE UNINTED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

FORM TWO SECONDARY EDUCATION EXAMINATION, 2009

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. Given the following numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20. Identify all prime numbers and show them on a number line.

Answer:
Prime numbers are numbers greater than 1 that have no divisors other than 1 and themselves.
The prime numbers from the list are: 2, 3, 5, 7, 11, 13, 17, 19.

Number line representation:
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
   P P P   P   P   P   P   P

Answer: Prime numbers are 2, 3, 5, 7, 11, 13, 17, 19.

I can definitely write the equations in the same format for question 2 as well. Here is the rewritten solution for question 2 using the same style:

2. Given that $(2^{a-1})(3^{b+1}) = (3^3)(2^8)$, find (a - b) / b.

Answer:
Equate the powers of 2 and 3 on both sides:
For 2:
a - 1 = 8
a = 9.
For 3:
b + 1 = 3
b = 2.
Now calculate (a - b) / b:
(a - b) / b = (9 - 2) / 2 = 7 / 2 = 3.5.

Answer: (a - b) / b = 3.5.

3. A form two student has to do eleven examination papers. The student has already done M of them. How many examination papers have been left if M = 3?

Answer:
Total papers = 11
Papers done = M = 3
Papers left = 11 - 3 = 8

Answer: 8 papers.

4. Solve 6812 x 4257 - 6812 x 3257.

Answer:
Factorize the expression:
6812 x 4257 - 6812 x 3257 = 6812 x (4257 - 3257)
= 6812 x 1000
= 6812000

Answer: 6812000.

5. If Fatuma is 4 years less than Bakari and 3 times Fatuma's age is equal to 2 times Bakari's age, what are their ages?

Answer:
Let Bakari's age be x.
Fatuma's age = x - 4.

From the condition:
3(x - 4) = 2x
3x - 12 = 2x
x = 12.

Bakari's age = x = 12.
Fatuma's age = x - 4 = 12 - 4 = 8.

Answer: Bakari is 12 years old, and Fatuma is 8 years old.

6. Find 5.84 x 6 correct to 2 significant figures.

5.84 x 6 = 35.04.
Rounded to 2 significant figures: 35.
Answer: 35.

7. In the following figure ABCD, AC = 8 cm and BD = 10 cm. Determine its area.

Solution:
The area of a quadrilateral where the diagonals bisect each other at right angles is given by:
Area = 1/2 × AC × BD.

Substitute the given values:
Area = 1/2 × 8 × 10 = 40 cm².
Answer: The area is 40 cm².

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8. How many integers are in the given range -3 < k ≤ 6?

Solution:
The integers in the range are: -2, -1, 0, 1, 2, 3, 4, 5, 6.
Count the integers: There are 9 integers.
Answer: There are 9 integers.

9. 50% of the content in a box weigh 8 kg 40 gm. What does the whole content weigh?
Solution:
50% weight = 8 kg 40 gm = 8.04 kg.
The whole content weighs:
$8.04 \times 2 = 16.08$ kg.

Answer: The whole content weighs 16.08 kg.
10. Which is greater: $\sqrt[3]{27}$ or $\sqrt{32}$?

Solution:
$\sqrt[3]{27} = 3$ (since $3^3 = 27$).
$\sqrt{32} \approx 5.657$ (calculated as $\sqrt{32}$).

Compare:
$3 < 5.657$.
Answer: $\sqrt{32}$ is greater.

11. A girl walks 4 km due North from point A and then walks 3 km due East to point P. What is the shortest distance from point A to P?

Solution:
The shortest distance is the hypotenuse of a right triangle with legs 4 km and 3 km.
Using the Pythagoras theorem:
$AP^2 = 4^2 + 3^2$
$AP^2 = 16 + 9$
$AP = \sqrt{25} = 5$ km.

Answer: The shortest distance is 5 km.

12. If $(a - b)^2 = 20$ and $a^2 + b^2 = 10$, find the value of ab.

Solution:
Expand $(a - b)^2$:
$(a - b)^2 = a^2 - 2ab + b^2$.
Substitute the given values:

$20 = a^2 - 2ab + b^2$.

We also know:

$a^2 + b^2 = 10$.

Substitute $a^2 + b^2$ into the equation:

$20 = 10 - 2ab$.

$10 = -2ab$.

$ab = -5$.

Answer: $ab = -5$.

13. If x - 65° and 4x + 10° are complementary angles, then what is the value of x?

Solution:

Complementary angles sum to 90°:

(x - 65°) + (4x + 10°) = 90°.

Simplify:

x - 65° + 4x + 10° = 90°.

5x - 55° = 90°.

5x = 145°.

x = 29°.

Answer: x = 29°.

14. By how much is the sum of 2 ⁴/₅ and 4 ¹/₂ less than 8 ¹/₁₀?

Solution:

Convert to improper fractions:

$2 \frac{4}{5} = 14/5$, $4 \frac{1}{2} = 9/2$, and $8 \frac{1}{10} = 81/10$.

Sum of 2 ⁴/₅ and 4 ¹/₂:

(14/5) + (9/2) = (28/10) + (45/10) = 73/10.

Difference:

(81/10) - (73/10) = 8/10 = 4/5.

Answer: The sum is 4/5 less than 8 ¹/₁₀.

15. Find the simple interest on 180,000/= for 3 years at the rate of 5% per year.

Solution:

Simple interest formula:

$SI = P \times R \times T / 100$,

where P = 180,000, R = 5%, and T = 3 years.

$SI = (180,000 \times 5 \times 3) / 100 = 27,000$.

Answer: The simple interest is 27,000/=.

16. Without using mathematical tables, complete the table below.

Solution:
For θ = 15° + 15° = 30°:
Sinθ = 1/2, Cosθ = √3/2, Tanθ = 1/√3.

For θ = 20° + 25° = 45°:
Sinθ = √2/2, Cosθ = √2/2, Tanθ = 1.

Answer:

θ°	Sinθ	Cosθ	Tanθ
30°	1/2	√3/2	1/√3
45°	√2/2	√2/2	1

17. If log 2 = 0.3010, log 3 = 0.4771, and log 7 = 0.8451, evaluate log 42.

Solution:
log 42 = log (6 × 7) = log 6 + log 7.
log 6 = log (2 × 3) = log 2 + log 3.

Substitute values:
log 6 = 0.3010 + 0.4771 = 0.7781.
log 42 = log 6 + log 7 = 0.7781 + 0.8451 = 1.6232.
Answer: log 42 = 1.6232.

18. In a box of 200 books, 150 have red colour and the rest have blue colour. What is the percentage of each colour?

Solution:
Total number of books = 200.
Number of red books = 150.
Number of blue books = 200 - 150 = 50.

Percentage of red books:
(150 / 200) × 100 = 75%.
Percentage of blue books:
(50 / 200) × 100 = 25%.

Answer: Red books = 75%, Blue books = 25%.

19. Given A = {mango, orange}. How many subsets are in set A? List them.

Solution:
The number of subsets of a set is given by 2^n, where n is the number of elements in the set.
For A = {mango, orange}, n = 2.
Number of subsets = 2^2 = 4.
The subsets are:
{}, {mango}, {orange}, {mango, orange}.

Answer: Subsets = {}, {mango}, {orange}, {mango, orange}.

20. What is the centre of an enlargement, given that the image of A(3, 2) under the enlargement scale factor 2 is A'(6, 4)?

Solution:
The coordinates of the centre of enlargement (h, k) can be found using the formula:
$(h, k) = [(x_1 - sx_2) / (1 - s), (y_1 - sy_2) / (1 - s)]$,
where s is the scale factor, and (x_1, y_1) and (x_2, y_2) are the original and image points respectively.

Substitute:
(x_1, y_1) = (3, 2), (x_2, y_2) = (6, 4), s = 2.

$(h, k) = [(3 - 2{\times}6) / (1 - 2), (2 - 2{\times}4) / (1 - 2)]$
$(h, k) = [(-9) / (-1), (-6) / (-1)]$
(h, k) = (9, 6).

Answer: The centre of enlargement is (9, 6).

21. The following are the masses in kg of 30 form II students of Maendeleo Secondary School:

43, 45, 50, 47, 51, 58, 52, 47, 42, 54
61, 50, 45, 55, 57, 41, 46, 49, 51, 50
59, 44, 53, 57, 49, 40, 48, 52, 51, 48.

(a) Prepare a frequency distribution table by grouping the data values in the class width of 5.
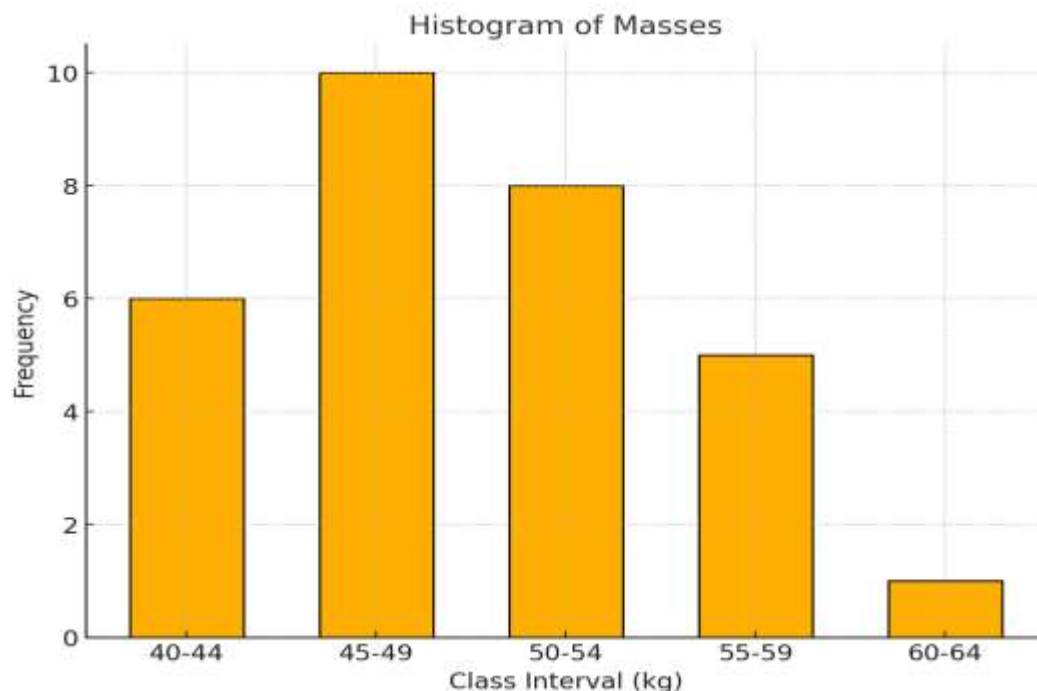
Solution:
Class intervals: 40-44, 45-49, 50-54, 55-59, 60-64.

Class Interval	Frequency
40-44	6
45-49	10
50-54	8
55-59	5
60-64	1

Answer: The frequency distribution table is as shown above.

(b) Use the table in part (a) above to draw a Histogram of the data.

Histogram of Masses

22. In the figure below: XN/XZ = 3/2, XM/XY = 3/2, and NM/ZY = 3/2. Name the triangles which are similar and identify the corresponding angles.

Solution:
By the Side-Side-Side (SSS) similarity theorem, if the ratios of the corresponding sides of two triangles are equal, the triangles are similar.

Given:
XN/XZ = 3/2, XM/XY = 3/2, and NM/ZY = 3/2,
triangles XNM and XYZ are similar.

Corresponding angles:
angle X = angle X (common),
angle N = angle Z,

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angle M = angle Y.

Answer: Triangles XNM and XYZ are similar. Corresponding angles are angle X = angle X, angle N = angle Z, angle M = angle Y.

23. An observer on top of a cliff 40 m above sea level views a ship on the sea at an angle of depression 35°. How far is the ship from the foot of the cliff?

Solution:
Using trigonometry:
$\tan(35) = $ Opposite/Adjacent.

Let the distance from the foot of the cliff to the ship be x:
$\tan(35) = 40/x$.

Rearranging for x:
$x = 40/\tan(35)$.
From a calculator: $\tan(35) \approx 0.7002$,
$x = 40/0.7002 = 57.14$ m.

Answer: The ship is approximately 57.14 m from the foot of the cliff.

24. Solve graphically the following pair of equations:
$x + 3y = 0$
$x = 3y + 6$

Solution:
Rewrite the equations in slope-intercept form:
From $x + 3y = 0$: $y = -1/3 \ x$.
From $x = 3y + 6$: $y = 1/3 \ x - 2$.

Graphical Solution of x + 3y = 0 and x = 3y + 6

Solution:
The graphical representation above shows the solution of the given pair of equations. The point of intersection of the two lines is the solution. From the graph, the point of intersection is approximately (3, -1).

Answer: The solution is x = 3, y = -1.