THE UNINTED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

FORM TWO NATIONAL ASSESSMET

0041 **BASIC MATHEMATICS**

Time: 2:30 Hours **ANSWERS** **Year: 2019**

Instructions:

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

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1. (a) Find the Greatest Common Factor (GCF) of 18, 24, and 60.

Solution:

Prime factorization:
$18 = 2 \times 3^2$
$24 = 2^3 \times 3$
$60 = 2^2 \times 3 \times 5$

The common factors are 2 and 3. The lowest powers of these common factors are:
2^1 and 3^1.
GCF = $2 \times 3 = 6$.

(b) The population of three towns are 65,600, 13,400, and 29,700. Approximate the total population of the three towns to the nearest thousands.

Solution:

65,600 ≈ 66,000
13,400 ≈ 13,000
29,700 ≈ 30,000

Total population = 66,000 + 13,000 + 30,000 = 109,000.

2. (a) Rehema spent 1/8 of her salary on transport and 1/4 on food. If she remained with sh. 80,000, what was her salary?

Solution:

Let her salary be x.
Spent on transport = $x/8$
Spent on food = $x/4 = 2x/8$

Total spent = $x/8 + 2x/8 = 3x/8$
Remaining salary = $x - 3x/8 = 5x/8$

$5x/8 = 80{,}000$
$x = (80{,}000 \times 8)/5 = 640{,}000/5 = 128{,}000$.

Her salary was sh. 128,000.

(b) Change 5/8 into:

(i) Percentage
Solution:
$5/8 \times 100 = 62.5\%$.

(ii) Decimal
Solution:
$5 \div 8 = 0.625$.

3. (a) A machine that costs sh. 180,000 was sold at a profit of 40%. Find the selling price.

Solution:

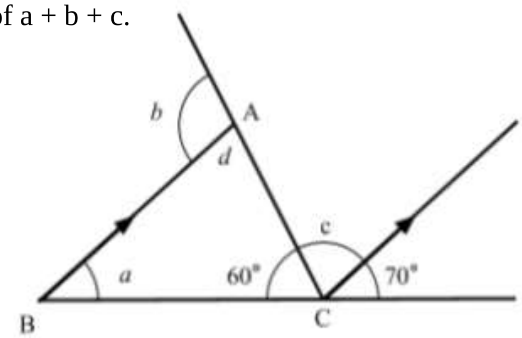
Profit = 40% of 180,000 = $(40/100) \times 180{,}000 = 72{,}000$.
Selling price = Cost price + Profit = $180{,}000 + 72{,}000 = 252{,}000$.

(b) A father divided sh. 150,000 among Rose and Japheth in the ratio 2:3 respectively. How much money did each get?

Solution:

Sum of the ratio = $2 + 3 = 5$.
Rose's share = $(2/5) \times 150{,}000 = 60{,}000$.
Japheth's share = $(3/5) \times 150{,}000 = 90{,}000$.

4. (a) Use the following figure to find the value of a + b + c.



Solution:
Angles on a straight line = 180°.
$60° + 70° + c = 180°$
$c = 50°$
At point A: $a = 70°$
At point C: $c = d = 50°$
$b + d = 180°$, $b = 130°$

Sum: $a + b + c = 70° + 130° + 50° = 250°$.
(b) The perimeter of triangle ABC is 16 cm. If AB = (5 + x) cm, AC = (2 + x) cm, and BC = 5 cm, find the value of x and hence the actual lengths of AB and AC.

Solution:
Perimeter = AB + AC + BC
$16 = (5 + x) + (2 + x) + 5$
$16 = 12 + 2x$
$2x = 16 - 12 = 4$
$x = 2$.

$AB = 5 + x = 5 + 2 = 7$ cm.
$AC = 2 + x = 2 + 2 = 4$ cm.
$BC = 5$ cm.

5. (a) Solve
$x + y = 4$
$2x - y = 5$
by using the substitution method.

Solution:

From the first equation:
$y = 4 - x$

Substitute y in the second equation:
$2x - (4 - x) = 5$
$2x - 4 + x = 5$
$3x = 9$
$x = 3$

Substitute $x = 3$ into $y = 4 - x$:
$y = 4 - 3 = 1$

Solution: $x = 3$, $y = 1$

(b) Find two consecutive positive numbers such that the sum of their squares is equal to 145.

Solution:

Let the two numbers be n and n+1.
$n^2 + (n+1)^2 = 145$
$n^2 + n^2 + 2n + 1 = 145$
$2n^2 + 2n + 1 = 145$
$2n^2 + 2n - 144 = 0$
$n^2 + n - 72 = 0$
Factorize:
$(n + 9)(n - 8) = 0$

$n = -9$ or $n = 8$ (only positive numbers are valid).
$n = 8$, $n+1 = 9$.

Solution: The two numbers are 8 and 9.

6. (a) If the gradient of the straight line $ky = kx + 7$ is 2, find:
(i) the value of k,
(ii) the y-intercept.

Solution:

Rewrite the equation in slope-intercept form:
$ky = kx + 7$
$y = (k/k)x + 7/k$
Gradient = $k/k = 1$.

Given gradient is 2, so $k = 2$.

Substitute $k = 2$ into $y = (k/k)x + 7/k$:
$y = (2/2)x + 7/2$
$y = x + 7/2$.

y-intercept = 7/2.

Solution: (i) $k = 2$, (ii) y-intercept = 7/2.

(b) By using a sketch, find the image of point A(2,3) after a reflection in the line $y = x$ followed by another reflection in the line $y = -x$.

Solution:

First reflection in $y = x$: Swap coordinates.
Image of A(2,3) → A'(3,2).

Second reflection in $y = -x$: Change the sign and swap coordinates.
Image of A'(3,2) → A"(-2,-3).

Solution: The final image is A"(-2,-3).

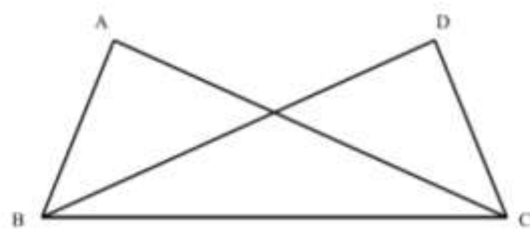
7. (a) Solve for n in the equation $16^{(3-n)} \times 2^{(1+n)} = 1/2$.
Solution:
Rewrite 16 as 2^4:
$(2^4)^{(3-n)} \times 2^{(1+n)} = 2^{-1}$
Simplify the powers of 2:
$2^{4(3-n)} \times 2^{(1+n)} = 2^{-1}$
$2^{(12-4n)} \times 2^{(1+n)} = 2^{-1}$
$2^{(13-3n)} = 2^{-1}$

Equate the exponents:
13 - 3n = -1
Solve for n:
-3n = -1 - 13
-3n = -14
n = 14 / 3
(b) Find the value of x in the equation log(2x + 1) + log 4 = log(7x + 8).

Solution:
Using log properties:
log[(2x + 1) × 4] = log(7x + 8)
8x + 4 = 7x + 8
8x - 7x = 8 - 4
x = 4.
Solution: x = 4.

8. (a) In the following figure, AB = DC and ∠ABC = ∠DCB. Prove that ΔABC ≅ ΔDCB.

Solution:

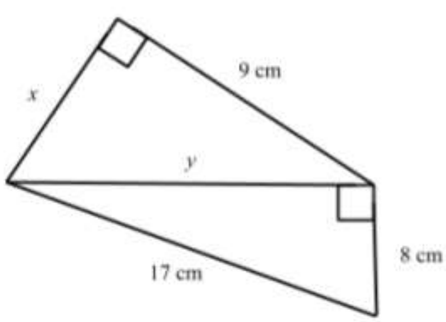


To prove congruence:
(i) AB = DC (given),
(ii) ∠ABC = ∠DCB (given),
(iii) BC is common to both triangles.

By the ASA (Angle-Side-Angle) criterion, ΔABC ≅ ΔDCB.

9. (a) Use the following figure to find the values of x and y.

Solution:



For the triangle with sides 9 cm, x, and 17 cm:
Using Pythagoras' theorem:
$x^2 + 9^2 = 17^2$
$x^2 + 81 = 289$
$x^2 = 289 - 81$
$x^2 = 208$
$x = \sqrt{208}$
x = 14.42 cm (approximately).

For the triangle with sides 8 cm, y, and 9 cm:
Using Pythagoras' theorem:
$y^2 + 8^2 = 9^2$
$y^2 + 64 = 81$
$y^2 = 81 - 64$
$y^2 = 17$
$y = \sqrt{17}$
y = 4.12 cm (approximately).

Solution: x = 14.42 cm, y = 4.12 cm.

(b) Find the value of each of the following expressions and simplify the answer.

(i) sin 60°(cos 45° + sin 30°)

Solution:
$\sin 60° = \sqrt{3}/2$, $\cos 45° = \sqrt{2}/2$, $\sin 30° = 1/2$
$\sin 60°(\cos 45° + \sin 30°) = (\sqrt{3}/2) \times (\sqrt{2}/2 + 1/2)$
$= (\sqrt{3}/2) \times [(\sqrt{2} + 1)/2]$
$= (\sqrt{3}(\sqrt{2} + 1))/4$
$= (\sqrt{6} + \sqrt{3})/4$.

(ii) tan 45°(4cos 60° - √3 tan 30°)

Solution:
$\tan 45° = 1$, $\cos 60° = 1/2$, $\tan 30° = 1/\sqrt{3}$
$\tan 45°(4\cos 60° - \sqrt{3} \tan 30°) = 1 \times (4 \times 1/2 - \sqrt{3} \times 1/\sqrt{3})$
$= (4/2 - \sqrt{3}/\sqrt{3})$
$= 2 - 1$
$= 1$.

Solution:
(i) $(\sqrt{6} + \sqrt{3})/4$
(ii) 1.

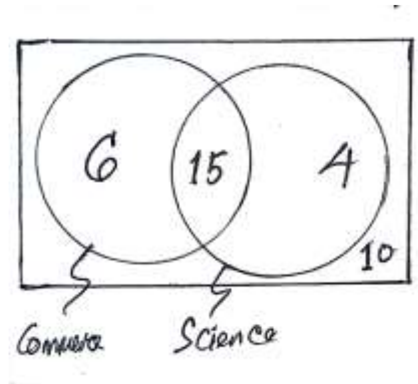
10. (a) In a class of 35 students, 21 study commercial subjects, 15 study both commercial and science subjects, and 4 students study science subjects only. Use a Venn diagram to find:

(i) either science or commercial subjects:
Total = 21 + 4 = 25.

(ii) neither science nor commercial subjects:
Total = 35 - 25 = 10.

(iii) commercial subjects only:
21 - 15 = 6.

(iv) science subjects:
15 + 4 = 19.



(b) The following pie chart represents the distribution of form two students who were selected to participate in sports activities. If there are 200 students who were selected, how many students participate in each activity?

Solution:
The total angle in a circle is 360°. To calculate the number of students in each activity:
Football: (144/360) × 200 = 80 students.
Volleyball: (72/360) × 200 = 40 students.
Swimming: (54/360) × 200 = 30 students.
Netball: (90/360) × 200 = 50 students.