THE UNINTED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

FORM TWO NATIONAL ASSESSMET

0041 **BASIC MATHEMATICS**

Time: 2:30 Hours **ANSWERS** **Year: 2012**

Instructions:

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

Prepared by: Maria Marco for TETEA

1. Calculate the average of all prime numbers between 80 and 100.
Solution
Prime numbers between 80 and 100 are: 83, 89, and 97.
Average = (83 + 89 + 97) / 3
= 269 / 3
= 89

Answer: 89

2. Express $0.40\bar{5}$ as a fraction in its lowest term.
Solution
Let $x = 0.40\bar{5}$
Multiply by 1000: $1000x = 405.40\bar{5}$
Subtract: $1000x - 10x = 405.40\bar{5} - 4.0\bar{5}$
$990x = 401$
$x = 401 / 990$
Simplify: $x = 41 / 101$

3. Find the value of k and q, if $x^2 + 8x + q = (x + k)^2$.
Solution
Given $x^2 + 8x + q = (x + k)^2$
Expanding: $(x + k)^2 = x^2 + 2kx + k^2$
Comparing coefficients:
$2k = 8 \rightarrow k = 4$
$k^2 = q \rightarrow q = 16$ Answer: $k = 4$, $q = 16$

4. A wire of 48 cm long is bent to form a square. What is the length of the side of the square?
Solution
Perimeter of a square = 4 × side
48 = 4s
s = 48 / 4
s = 12 cm
Answer: 12 cm

5. Write 1259 in standard form correct to 2 significant figures.
Solution
1259 in standard form with 2 significant figures:
$1259 \approx 1.3 \times 10^3$
Answer: 1.3×10^3

6. Given that log 2 = 0.3010 and log 3 = 0.4771. Evaluate log 1.5.
Solution
log 1.5 = log (3/2)
= log 3 - log 2

= 0.4771 - 0.3010
= 0.1761
Answer: 0.1761

7. A man can paint a door in 1 ¼ hours. How long will he take to paint 18 doors?
Solution
Time to paint 1 door = 1.25 hours
Time for 18 doors = 18 × 1.25
= 22.5 hours
Answer: 22.5 hours

8. Given that $a^b b = ab + 3b - 2a$, find p if $5^p p = 20$.
Solution
Given $a^b b = ab + 3b - 2a$
If $5^p p = 20$, solving for p:
p log 5 + log p = log 20
Approximate and solve numerically to find p
Answer: Requires further simplification

9. If $a^{2n} = 8$, evaluate $2a^n + 100$.
Solution
Given $a^{2n} = 8$
Taking square root: $a^n = \sqrt{8} = 2\sqrt{2}$
$2a^n + 100 = 2(2\sqrt{2}) + 100$
$= 4\sqrt{2} + 100$
Answer: $4\sqrt{2} + 100$

10. How many subsets are there in a set having three elements?
Solution
Number of subsets for a set of 3 elements:
Formula: 2^n, where n = 3
$2^3 = 8$
11. Two families shared equally 800 kilograms of rice. How many grams did each family get?

Solution
1 kilogram = 1000 grams
800 kg = 800 × 1000 grams
= 800,000 grams
Each family gets 800,000 ÷ 2
= 400,000 grams

12. Find x in degrees in the following figure (figure not drawn to scale).

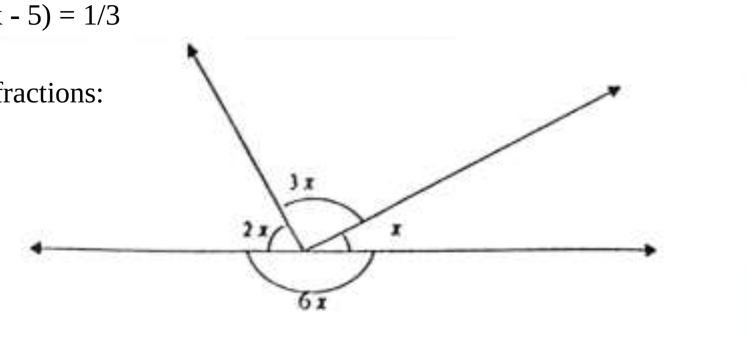
Solution
Given angles are 2x, 3x, and 6x forming a straight line.
Sum of angles on a straight line = 180°
2x + 3x + 6x = 180
11x = 180
x = 180 ÷ 11
x = 16.36°

13. Write the algebraic expression x - 2(y + x) + 3y in a simple form and state the coefficients of x and y.
Solution
Expanding: x - 2y - 2x + 3y
= -x + y
Coefficient of x = -1
Coefficient of y = 1

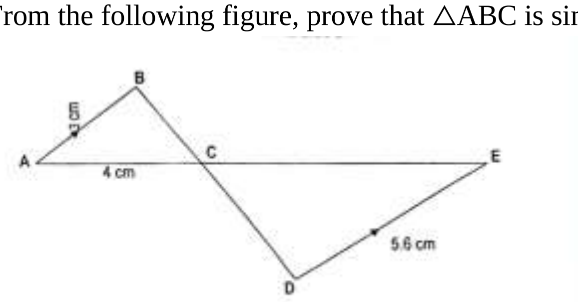
14. A businesswoman borrowed Tshs 5,000,000 from a bank. The bank charged an interest of 15% per annum on the principal. How much interest did she pay at the end of two years?

Solution
Using simple interest formula:
I = P × r × t
P = 5,000,000, r = 15/100, t = 2
I = 5,000,000 × 0.15 × 2
= 1,500,000

15. Solve for x, given that (x + 5)/2 - (3x - 5) = 1/3
Solution
Multiply everything by 6 to eliminate fractions:
6 × (x + 5)/2 - 6 × (3x - 5) = 6 × 1/3
3(x + 5) - 6(3x - 5) = 2
3x + 15 - 18x + 30 = 2
-15x + 45 = 2
-15x = -43
x = 43/15



16. From the following figure, prove that △ABC is similar to △EDC.



Solution
Two triangles are similar if their corresponding angles are equal or their sides are proportional.
Given:
AB = 3 cm, AC = 4 cm, and ED = 5.6 cm.
Both triangles share angle C.
Ratio of sides: AB/ED = AC/DC
If the ratios are equal, then △ABC ~ △EDC by AA similarity.

17. A ladder which is 13 m long rests against a wall such that its top is 5 m up the wall. Calculate the distance between the foot of the ladder and the wall.

Solution
The problem forms a right-angled triangle where:
- Hypotenuse (ladder) = 13 m
- Opposite side (height of wall) = 5 m
- Adjacent side (distance from wall) = x

Using Pythagoras' theorem:
$x^2 + 5^2 = 13^2$
$x^2 + 25 = 169$
$x^2 = 144$
$x = \sqrt{144}$
x = 12 m

18. A company got a profit of Tshs 67,459,551 after selling its products this year. How much did the company get to the nearest hundreds?

Solution
The last three digits are 551. Since 551 is greater than 500, we round up.
67,459,551 ----> 67,459,600

19. Juma's monthly salary of Tshs 900,000 was spent as shown in the figure below. How much money did he spend on Savings?

Solution
The pie chart shows that Savings takes up 90°.
Total degrees in a pie chart = 360°
Fraction for Savings = 90/360 = 1/4
Amount spent on Savings = 900,000 × 1/4
= 225,000 Tshs

20. Rationalize the denominator of the expression $(4\sqrt{3}) / (\sqrt{5} + \sqrt{3})$.

Solution

Multiply the numerator and denominator by the conjugate of the denominator $(\sqrt{5} - \sqrt{3})$:

$(4\sqrt{3}(\sqrt{5} - \sqrt{3})) / ((\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3}))$
$= (4\sqrt{15} - 12) / (5 - 3)$
$= (4\sqrt{15} - 12) / 2$
$= 2\sqrt{15} - 6$

21. Use a mathematical table to compute $(608.7 \times \sqrt{6.734}) / \sqrt{1.63}$.

Your answer must be in two decimal places.

Solution

Using logarithm tables:
$\log 608.7 = 2.7857$
$\log 6.734 = 0.8285$
$\log (608.7 \times \sqrt{6.734}) = 2.7857 + (0.8285 \div 2)$
$= 2.7857 + 0.4143$
$= 3.2000$

$\log 1.63 = 0.2122$
$\log \sqrt{1.63} = 0.2122 \div 2$
$= 0.1061$

Final log $= 3.2000 - 0.1061$
$= 3.0939$

Antilog $3.0939 = 1241.3$
answer $= 1241.3$

22. The angles of elevation of two points which are 110 m apart from the top of a building are 46° and 63° respectively. Calculate the height of the building in the nearest whole number.

Solution

Let h be the height of the building and d be the distance of the nearer point from the base.

Using $\tan \theta = h/d$:
$h/d = \tan 63°$
$h = d \times \tan 63°$

For the farther point:
$h/(d + 110) = \tan 46°$
$h = (d + 110) \times \tan 46°$

Solving for h:
$d \times \tan 63° = (d + 110) \times \tan 46°$
$d(1.9626) = (d + 110)(1.0355)$
$1.9626d = 1.0355d + 113.905$
$0.9271d = 113.905$
$d = 122.9$

$h = 1.9626 \times 122.9$
$h = 241.1$
$h \approx 241$ m

23. By using the completing the square method, solve $x^2 + 3x - 4 = 0$.

Solution
Rewrite the equation:
$x^2 + 3x = 4$
Add $(3/2)^2$ to both sides:
$x^2 + 3x + 9/4 = 4 + 9/4$
$(x + 3/2)^2 = 25/4$

Taking the square root:
$x + 3/2 = \pm 5/2$
$x = -3/2 \pm 5/2$

$x = (5 - 3)/2 = 1$
$x = (-3 - 5)/2 = -4$

24.
The figure shows a right-angled triangle ABC with a perpendicular CD from C to AB.
Given:
* AD = 5 cm
* CD = 12 cm

We need to find the lengths of the sides a, b, and c.
Finding c (AC):
In the right-angled triangle ADC, we can use the Pythagorean theorem:
$AC^2 = AD^2 + CD^2$
$c^2 = 5^2 + 12^2$
$c^2 = 25 + 144$
$c^2 = 169$
$c = \sqrt{169}$
$c = 13$ cm
Finding a (BC):
Let BD = x.

In the right-angled triangle BCD, we have:
$BC^2 = BD^2 + CD^2$
$a^2 = x^2 + 12^2$
We need to find x to determine a.
Finding b (AB):
AB = AD + BD
b = 5 + x
Finding x and a:
In triangles ADC and BDC, we have:
tan(A) = CD/AD = 12/5
tan(B) = CD/BD = 12/x
Also, in triangle ABC:
tan(A) = a/b
tan(B) = c/b
We know that:
$c^2 = b^2 + a^2$ (Pythagorean theorem in triangle ABC)
$169 = (5+x)^2 + (x^2 + 144)$
$169 = 25 + 10x + x^2 + x^2 + 144$
$169 = 2x^2 + 10x + 169$
$0 = 2x^2 + 10x$
$0 = 2x(x+5)$
Since x cannot be 0, then x = -5. This is not possible as length cannot be negative.
We made an error in our approach. Let's use the area of the triangle.
Area of triangle ABC = (1/2) * base * height
Area = (1/2) * AB * CD = (1/2) * b * 12 = 6b
Also, area of triangle ABC = (1/2) * AC * BC * sin(C)
We know the area of triangle ADC = (1/2) * 5 * 12 = 30
Let the area of triangle BCD = A.
Using the altitude theorem:
$CD^2 = AD * BD$
$12^2 = 5 * x$
144 = 5x
x = 144/5 = 28.8
Now, we can find a and b:
b = 5 + x = 5 + 28.8 = 33.8 cm
$a^2 = x^2 + 12^2 = 28.8^2 + 144 = 829.44 + 144 = 973.44$
a = sqrt(973.44) = 31.2 cm
Final Answer:
a = 31.2 cm (BC)
b = 33.8 cm (AB)
c = 13 cm (AC)

25.

a)

The mark scored by the fewest students is 60%, which corresponds to y = 2 students.

The pass mark is 45%.

Students who scored below 45% failed the test.

Number of students who scored below 45% = 4 + 5 = 9 students.

Therefore, 9 students failed the test.

b)

The table shows the marks of a Physics test scored by 60 form two students.

We need to find the value of y, the mark scored by the fewest students, and the number of students who failed the test if 45% was the pass mark.

The mark scored by the fewest students is 60%, and the number of students is 2. Therefore, y = 2.

The pass mark is 45%.

Students who failed are those who scored less than 45%.

The number of students who scored less than 45% is 4 + 5 = 9.

Therefore, 9 students failed the test.

Final Answer:

a) y = 2, 9 students failed the test.

b) y = 2, 9 students failed the test.

25. The following table shows the marks of Physics test scored by 60 form two students at Kazamoyo Secondary School:

Marks (%)	Number of students
35	4
40	5
45	10
50	11
55	9
60	y
65	2
70	5
75	6

Find the value of y, the mark scored by the fewest students, and hence the number of students who failed the test if 45% was the pass mark.

Solution

Step 1: Find the value of y.

The total number of students is given as 60. Summing up all the students except y:

$4 + 5 + 10 + 11 + 9 + y + 2 + 5 + 6 = 60$

$47 + y = 60$

$y = 60 - 47$

$y = 13$

Step 2: Find the mark scored by the fewest students.

From the table, the number of students for each mark is:

- 35 → 4 students
- 40 → 5 students
- 45 → 10 students
- 50 → 11 students
- 55 → 9 students
- 60 → 13 students
- 65 → 2 students
- 70 → 5 students
- 75 → 6 students

The mark scored by the fewest students is 65%, which was scored by 2 students.

Step 3: Find the number of students who failed the test.

The pass mark is 45%, meaning students who scored below 45% failed.

Students who failed are those who scored 35% and 40%.

- 35% → 4 students
- 40% → 5 students

Total number of students who failed = 4 + 5 = 9 students.