THE UNINTED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

FORM TWO SECONDARY EDUCATION EXAMINATION, 2003

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(a) Fnd the greatest common factor (GCF) and the least common multiple (LCM) of 42, 45, and 50.
Solution
The greatest common factor (GCF) and the least common multiple (LCM) of 42, 45, and 50 are calculated as follows:

GCF(42, 45, 50) = 1
LCM(42, 45, 50) = 3150
Sum of GCF and LCM = 1 + 3150 = 3151
Answer: 3151

(b) Evaluate:
(5/2) + (8/7) - (6/5)

Solution
Converting the fractions to a common denominator:
LCM of 2, 7, and 5 is 70
(5/2) = (175/70)
(8/7) = (80/70)
(6/5) = (84/70)
Performing the addition and subtraction:

(175/70) + (80/70) - (84/70) = (171/70)
Answer: 171/70 or 2.44 (approx)

2. (a) Convert 256800 cm into km

Solution

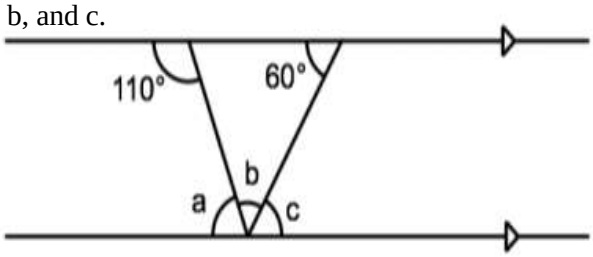
1 cm = 0.00001 km
256800 cm × 0.00001 km/cm = 2.568 km
Answer: 2.568 km

2. (b) Convert 0.125 into percentage
Solution
0.125 × 100 = 12.5%
Answer: 12.5%

3. (a) Round off 260743 to the nearest thousand
Solution
Since the digit in the hundreds place is 7 (which is ≥ 5), we round up.
260743 = 261000
Answer: 261000

3. (b) Round off 0.04261 to three decimal places
Solution
The fourth decimal place is 6, which is ≥ 5, so we round up the third decimal place.
0.04261 = 0.043
Answer: 0.043

4. In the figure that follows, find the values of a, b, and c.



Solution
b = 180° - (180° - 110° + 60°)
b = 50°
c = 60°, a = 70°

5. If log 2 = 0.30103 and log 3 = 0.47712, evaluate log 4 + log 3.

Solution
Since log 4 = log(2^2) = 2 × log 2, we calculate:
log 4 = 2 × 0.30103 = 0.60206
Now, summing:
log 4 + log 3 = 0.60206 + 0.47712 = 1.07918
Answer: 1.07918

6. A piece of copper wire which is 56 cm long is bent to form a rectangle of area 171 cm^2. Find the length and the width of this rectangle.
Solution
Let the length be L and the width be W.
Since the wire forms the perimeter of the rectangle, we use the perimeter formula:
2(L + W) = 56
Dividing by 2:
L + W = 28 … (Equation 1)
The area of the rectangle is given by:
L × W = 171 … (Equation 2)
Now, solve for L and W using these two equations.
From Equation 1:
W = 28 - L
Substituting into Equation 2:
L(28 - L) = 171
Expanding:
28L - L^2 = 171
Rearrange into standard quadratic form:

$L^2 - 28L + 171 = 0$
Solve for L using the quadratic formula:

$L = [-(-28) \pm \sqrt{((-28)^2 - 4(1)(171))}] / (2 \times 1)$
$L = [28 \pm \sqrt{(784 - 684)}] / 2$
$L = [28 \pm \sqrt{100}] / 2$
$L = [28 \pm 10] / 2$
Possible values for L:
$L = (28 + 10) / 2 = 38 / 2 = 19$
or
$L = (28 - 10) / 2 = 18 / 2 = 9$
If L = 19, then W = 9.
If L = 9, then W = 19.
Answer: The length and width are 19 cm and 9 cm.

7. (a) Factorize the expression $3x^2 + 7x - 6$
Solution
To factorize $3x^2 + 7x - 6$, we look for two numbers whose product is $3 \times (-6) = -18$ and whose sum is 7.
The two numbers are 9 and -2 since:
$9 \times (-2) = -18$
$9 + (-2) = 7$
Now, rewrite the middle term using these numbers:
$3x^2 + 9x - 2x - 6$
Group the terms:
$(3x^2 + 9x) - (2x + 6)$
Factor out common terms:
$3x(x + 3) - 2(x + 3)$
Factor out the common binomial factor $(x + 3)$:
$(3x - 2)(x + 3)$
Answer: $(3x - 2)(x + 3)$

7. (b) Evaluate $(10003)^2 - (9997)^2$
Solution
Using the difference of squares formula:
$a^2 - b^2 = (a - b)(a + b)$
Let a = 10003 and b = 9997
$(10003)^2 - (9997)^2 = (10003 - 9997) \times (10003 + 9997)$
$= 6 \times 20000$
$= 120000$
Answer: 120000

8. Express $(2 - \sqrt{5}) / (3 + \sqrt{5})$ in the form $a + b\sqrt{c}$

Solution

To rationalize the denominator, multiply by the conjugate of the denominator:

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

$(2 - \sqrt{5}) \times (3 - \sqrt{5}) / (3 + \sqrt{5}) \times (3 - \sqrt{5})$

Expanding:

Numerator:

$(2 \times 3) + (2 \times -\sqrt{5}) + (-\sqrt{5} \times 3) + (-\sqrt{5} \times -\sqrt{5})$

$= 6 - 2\sqrt{5} - 3\sqrt{5} + 5$

$= 11 - 5\sqrt{5}$

Denominator:

$(3 \times 3) - (\sqrt{5} \times \sqrt{5})$

$= 9 - 5 = 4$

Simplified form:

$(11 - 5\sqrt{5}) / 4$

$= 11/4 - (5/4)\sqrt{5}$

9. Find the volume of the solid shown in the diagram.

Solution

The solid is a triangular prism. The formula for the volume of a triangular prism is given by:

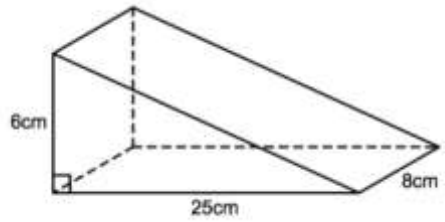
Volume = Base Area × Height

Step 1: Calculate the area of the triangular base.

The base is a right triangle with dimensions:

Base = 8 cm

Height = 6 cm



Area of the triangle = (1/2) × Base × Height

$= (1/2) \times 8 \times 6$

$= 24 \text{ cm}^2$

Step 2: Multiply the area of the base by the prism height (length of the prism).

Prism height = 25 cm

Volume = Base Area × Height

$= 24 \times 25$

$= 600 \text{ cm}^3$

Answer: 600 cm^3

10. Find the difference between x and 80% of x, if x = 950

Solution

80% of 950 = (80/100) × 950

= 760

Difference = 950 - 760

= 190
Answer: 190

11. Given that $a(4 + a) / (a^2 + 1) = 1$, find the value of a
Solution
Solve for a in the equation:
$a(4 + a) / (a^2 + 1) = 1$
Multiply both sides by $(a^2 + 1)$ to eliminate the fraction:
$a(4 + a) = a^2 + 1$
Expanding:
$4a + a^2 = a^2 + 1$
Cancel a^2 from both sides:
$4a = 1$
Divide by 4:
$a = 1/4$
Answer: 1/4

12. Make A the subject of the formula in $D = A / (A - B) - B / CA$
Solution
Rearrange the equation:
$D = A / (A - B) - B / (C \times A)$
Solving for A:
$A = [B(CD - \sqrt{(C^2D^2 + 2CD - 4C + 1) - 1)}] / [2C(D - 1)]$
or
$A = [B(CD + \sqrt{(C^2D^2 + 2CD - 4C + 1) - 1)}] / [2C(D - 1)]$

13. If $4\tan B = 3$ and B is an acute angle, find:
(a) cosB
(b) $4\tan B + 5\sin B$

Solution
From $4\tan B = 3$, we solve for tanB:
$\tan B = 3/4$
Using the Pythagorean identity in a right triangle with opposite = 3 and adjacent = 4, we find the hypotenuse:
$\text{hypotenuse}^2 = 3^2 + 4^2 = 9 + 16 = 25$
$\text{hypotenuse} = 5$
Now,
$\sin B = \text{opposite/hypotenuse} = 3/5$
$\cos B = \text{adjacent/hypotenuse} = 4/5$

(a) Answer: $\cos B = 4/5$
(b) Evaluating $4\tan B + 5\sin B$:

$4\tan B + 5\sin B = (4 \times 3/4) + (5 \times 3/5)$
$= 3 + 3$
$= 6$
Answer: 6

14. If the interior angle of a regular polygon is 6½ times the exterior angle, how many sides does the polygon have?
Solution
Let the exterior angle be x.
The interior angle is given as 6.5x.
Since the sum of an interior and exterior angle in a polygon is always 180°, we form the equation:
$6.5x + x = 180$

$7.5x = 180$
Solving for x:

$x = 180 / 7.5$
$x = 24$

Now, using the formula for the number of sides in a regular polygon:
n = 360 / exterior angle
n = 360 / 24
n = 15
Answer: 15 sides

15. If P * Q is defined as P * Q = P - 3Q, evaluate (5 * 3) * 2

Solution
First, evaluate 5 * 3:
$5 * 3 = 5 - (3 \times 3)$
$= 5 - 9$
$= -4$
Now, evaluate (-4 * 2):
$-4 * 2 = -4 - (3 \times 2)$
$= -4 - 6$
$= -10$

16. Three angles of a triangle are marked as $x + 20^o$, $x - 4^o$, and x. Find the value of x.

Solution
The sum of the angles in a triangle is always 180^o.
$(x + 20) + (x - 4) + x = 180$

Simplify:
$3x + 16 = 180$
Solving for x:
$3x = 180 - 16$
$3x = 164$
$x = 164/3$
Answer: 164/3 or approximately 54.67º

17. John is six years older than Paul. If their ages add up to 30 years, find Paul's age.
Solution
Let Paul's age be x.
John's age is $x + 6$.
Since their total age is 30, we set up the equation:
$x + (x + 6) = 30$
Simplify:
$2x + 6 = 30$
Solving for x:
$2x = 30 - 6$
$2x = 24$
$x = 12$
Answer: Paul is 12 years old.

18. A straight line passes through two points A(-3, 6) and B(-6, 3). Find the gradient of the line AB.
Solution
The gradient of a straight line is given by the formula:
$m = (y_2 - y_1) / (x_2 - x_1)$
Substitute the coordinates:
Point A(-3, 6), Point B(-6, 3)
$m = (3 - 6) / (-6 - (-3))$
$m = (-3) / (-3)$
$m = 1$

19. (a) Find the largest possible number by changing the order of the digits in 47986.
(b) Find the smallest possible number by changing the order of the digits in 47986.

Solution
Arrange the digits of 47986 in descending and ascending order:

(a) Largest possible number: 98764
(b) Smallest possible number: 46789

20. Write 0.0346 in standard form
Solution
To express 0.0346 in standard form:
$0.0346 = 3.46 \times 10^{-2}$

21. The following table shows marks scored by Form Two students in a Mathematics test:

Marks: 40, 45, 50, 55, 60, 65, 70
Number of students: 6, 8, 13, 5, 9, 4, 5

(a) What was the lowest mark?
(b) What mark was scored by the most students?
(c) If 50% was the pass mark, how many students passed the test?
(d) What was the percentage of the students who scored at least 50 percent?

Solution
(a) The lowest mark is 40.
(b) The mark scored by the most students is 50.
(c) Students who passed the test (marks ≥ 50):
$13 + 5 + 9 + 4 + 5 = 36$ students

(d) Percentage of students who scored at least 50 percent:
Total students $= 6 + 8 + 13 + 5 + 9 + 4 + 5 = 50$
Percentage passed $= (36 / 50) \times 100 = 72\%$

22. In a certain office, every man owns either a car or a lorry or both. 23 own lorries, 14 own cars, and 5 own both lorries and cars. How many men are there in that office?

Solution
Using the principle of inclusion and exclusion:

Total men = Men who own lorries + Men who own cars - Men who own both lorries and cars

Total men = 23 + 14 - 5
Total men = 32

23. Joyce used 1/3 of her money to buy sugar, 1/4 of it to buy soap, and she remained with Shs. 35/=.

(a) How much money did she have at the beginning?
(b) How much money did she use to buy sugar?
Solution
Let the total money be M.

From the problem:
(1/3)M + (1/4)M + 35 = M
Solving for M:
M = 84
(a) Joyce had Shs. 84/= at the beginning.
(b) Money used to buy sugar = (1/3)M = (1/3) × 84 = 28

24. Given the diagram, find the value of h, correct to one decimal place.
Solution
In the figure, triangle ABD can be used to find h using trigonometry.
Here, AB is the height (h), and AD is the base of 25 km.

1. Use the tangent function:
For angle 20°,
tan(20°) = AB / AD
h = AB = AD × tan(20°)

2. Use tangent again for angle 10°:
For angle 10°,
tan(10°) = AC / AD
h_2 = AC = AD × tan(10°)
3. Subtract AC from AB to find h (height):
h = AB - AC
Now, calculate:
h = (25 × tan(20°)) - (25 × tan(10°))

Using trigonometry:
h = (25 × tan(20°)) - (25 × tan(10°))
h = 4.7 km (rounded to one decimal place)
Answer: 4.7 km

25. Use mathematical tables to evaluate the following mathematical expression:
(9804 × 23.19) / (0.086 × 41750)
Solution
apply log bothsides,

log(9804 x 23.19)/log(0.086 x 41750)
= log 9804 + log 23.19 - log 0.086 - log 41750
reading the values of log from the mathematical tables
= 3.9914 + 1.3653 - -1.0655 - 4.6207
= 1.8015
Then, solve the log–1,
$\log^{1}(1.8.15)$ = 63.3140