

**THE UNITED REPUBLIC OF TANZANIA  
NATIONAL EXAMINATIONS COUNCIL  
FORM TWO NATIONAL ASSESSMET**

**0041**

**BASIC MATHEMATICS**

**Time: 2:30 Hours**

**ANSWERS**

**Year: 2022.**

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**Instructions:**

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

1. Mwajuma deposited Tsh. 360,000 in her bank account. If the bank charges Tsh. 1,000 for every withdrawal, calculate the amount of money remained in her account if:

(i) she withdrew Tsh. 106,000.

Solution:

Initial balance = Tsh. 360,000

Withdrawal amount = Tsh. 106,000

Bank charge = Tsh. 1,000

Remaining balance = Initial balance - Withdrawal amount - Bank charge

Remaining balance = 360,000 - 106,000 - 1,000

Remaining balance = Tsh. 253,000

(ii) she makes a further withdrawal of Tsh. 50,000 from the remained amount.

Solution:

Remaining balance after first withdrawal = Tsh. 253,000

Further withdrawal = Tsh. 50,000

Bank charge = Tsh. 1,000

Remaining balance = 253,000 - 50,000 - 1,000

Remaining balance = Tsh. 202,000

(b) Rewrite 2.43 as a mixed fraction.

Solution:

$2.43 = 2 + 0.43$

$0.43 = 43/100$

Mixed fraction =  $2 \frac{43}{100}$

2. A dog, a cat, and a goat have masses of 30.7 kg, 13.44 kg, and 18.26 kg respectively.

(i) Calculate the total mass of all three animals, giving the answer to the nearest whole number.

Solution:

Total mass = 30.7 + 13.44 + 18.26

Total mass = 62.4 kg

Nearest whole number = 62 kg

(ii) Round off the mass of dog to the nearest ones, the mass of cat correctly to one decimal place, and goat to 3 significant figures.

Solution:

Mass of dog (30.7) rounded to nearest ones = 31 kg

Mass of cat (13.44) to one decimal place = 13.4 kg

Mass of goat (18.26) to 3 significant figures = 18.3 kg

(b) (i) Add the following units:

km m mm  
8 799 400  
+ 5 300 609

Solution:

Convert to the same unit (mm):

8 km = 8,000,000 mm

799 m = 799,000 mm

400 mm = 400 mm

5 km = 5,000,000 mm

300 m = 300,000 mm

609 mm = 609 mm

Sum = 8,000,000 + 799,000 + 400 + 5,000,000 + 300,000 + 609

Sum = 14,099,009 mm

Convert back to km, m, mm:

14,099,009 mm = 14 km 99 m 9 mm

(ii) Convert the answer you obtained in 2(b)(i) into meters.

Solution:

14 km = 14,000 m

99 m remains the same

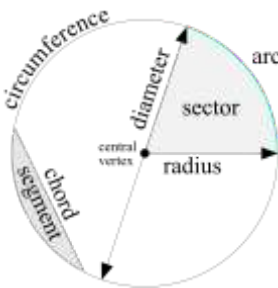
9 mm = 0.009 m

Total in meters = 14,000 + 99 + 0.009

Total in meters = 14,099.009 m

3. (a) Draw a circle with center O and hence indicate the following:

- (i) Arc AB
- (ii) Chord CD
- (iii) Sector AOB
- (iv) Radius AO



(b) The side of a square carpet is 14 m. If a designer decides to make the largest possible circular carpet:

(i) What will be the area of the formed circular carpet?

Solution:

The diameter of the largest possible circular carpet = Side of the square = 14 m

Radius = Diameter  $\div$  2 = 14  $\div$  2 = 7 m

Area of the circle =  $\pi r^2 = 3.14 \times 7^2 = 3.14 \times 49 = 153.86 \text{ m}^2$

(ii) Find the area of the remaining part of the carpet.

Solution:

$$\text{Area of the square carpet} = \text{Side}^2 = 14 \times 14 = 196 \text{ m}^2$$

$$\text{Remaining area} = \text{Area of the square carpet} - \text{Area of the circular carpet}$$

$$\text{Remaining area} = 196 - 153.86 = 42.14 \text{ m}^2$$

4. (a) Solve the system of equations using elimination method:

$$a/2 - b/5 = 1$$

$$3b = 24 + a$$

Solution:

Rewrite the equations:

1.  $(a/2) - (b/5) = 1$ -----> Multiply through by 10 to eliminate fractions:  $5a - 2b = 10$

2.  $3b = 24 + a$ -----> Rewrite as  $a = 3b - 24$

Substitute  $a = 3b - 24$  into the first equation:

$$5(3b - 24) - 2b = 10$$

$$15b - 120 - 2b = 10$$

$$13b = 130$$

$$b = 10$$

Substitute  $b = 10$  into  $a = 3b - 24$ :

$$a = 3(10) - 24$$

$$a = 30 - 24$$

$$a = 6$$

Solution:  $a = 6, b = 10$

(b) The length of a book exceeds its width by 5 cm. Calculate the dimensions of the book given that its area is  $50 \text{ cm}^2$ .

Solution:

Let the width be  $x$  cm. Then the length is  $(x + 5)$  cm.

$$\text{Area} = \text{Length} \times \text{Width}$$

$$50 = x(x + 5)$$

$$x^2 + 5x - 50 = 0$$

Solve the quadratic equation:

$$x = \frac{-5 \pm \sqrt{(5^2 - 4(1)(-50))}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{(25 + 200)}}{2}$$

$$x = \frac{-5 \pm \sqrt{225}}{2}$$

$$x = \frac{-5 \pm 15}{2}$$

$$x = (10 / 2) = 5 \text{ or } x = (-20 / 2) = -10 \text{ (not possible)}$$

Width = 5 cm, Length = 5 + 5 = 10 cm

5. (a) Asha and Juma received 630,000 shillings from their father. The father wanted to give Asha twice as much money as the amount that could be given to Juma. How much did Asha receive?

Solution:

Let the amount Juma received be  $x$  shillings.

Asha received twice the amount of Juma, which is  $2x$  shillings.

$$\text{Total amount given} = x + 2x = 630,000$$

$$3x = 630,000$$

$$x = 630,000 \div 3$$

$$x = 210,000$$

$$\text{Amount Asha received} = 2x = 2 \times 210,000 = 420,000 \text{ shillings}$$

(b) Mr. and Mrs. Juma deposited some money in a bank that pays a simple interest of 3% per annum. After 4 years they earned an interest of 900,000 shillings. Determine the amount of money:

(i) deposited initially.

Solution:

Using the simple interest formula:

$$\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time}$$

$$900,000 = P \times 0.03 \times 4$$

$$900,000 = 0.12P$$

$$P = 900,000 \div 0.12$$

$$P = 7,500,000$$

(ii) accumulated after a period of four years.

Solution:

$$\text{Accumulated amount} = \text{Principal} + \text{Interest}$$

$$\text{Accumulated amount} = 7,500,000 + 900,000$$

$$\text{Accumulated amount} = 8,400,000$$

6. (a) If the line whose equation is  $y = 3x - p$  passes through the points (6,10) and (q,22), find the value of  $p$  and  $q$  where  $p$  and  $q$  are integers.

Solution:

For the point (6,10):

$$y = 3x - p$$

$$10 = 3(6) - p$$

$$10 = 18 - p$$

$$p = 18 - 10$$

$$p = 8$$

For the point (q,22):

$$y = 3x - p$$

$$22 = 3q - 8$$

$$22 + 8 = 3q$$

$$30 = 3q$$

$$q = 30 \div 3$$

$$q = 10$$

(b) A mason wants to design a small room 500 cm by 200 cm.

(i) Draw a diagram of the room at a scale of 1:100.

Solution:

In a scale of 1:100, the dimensions of the room will be:

$$\text{Length} = 500 \div 100 = 5 \text{ cm}$$

$$\text{Width} = 200 \div 100 = 2 \text{ cm}$$

The diagram would be a rectangle of 5 cm by 2 cm.

(ii) Calculate the area of the room using the result of 6(b)(i).

Solution:

Actual dimensions of the room:

$$\text{Length} = 500 \text{ cm}$$

$$\text{Width} = 200 \text{ cm}$$

$$\text{Area} = \text{Length} \times \text{Width}$$

$$\text{Area} = 500 \times 200$$

$$\text{Area} = 100,000 \text{ cm}^2 \text{ or } 10 \text{ m}^2$$

7. (a) Two quantities P and Q are such that  $P = \sqrt{2} - 3$  and  $Q = \sqrt{2} + 1$ . Use these quantities to show that:

(i)  $PQ = -1 - 2\sqrt{2}$

Solution:

$$PQ = (\sqrt{2} - 3)(\sqrt{2} + 1)$$

$$PQ = (\sqrt{2})(\sqrt{2}) + (\sqrt{2})(1) - (3)(\sqrt{2}) - (3)(1)$$

$$PQ = 2 + \sqrt{2} - 3\sqrt{2} - 3$$

$$PQ = (2 - 3) + (\sqrt{2} - 3\sqrt{2})$$

$$PQ = -1 - 2\sqrt{2}$$

(ii)  $P/Q = 5 - 4\sqrt{2}$

Solution:

$$P/Q = (\sqrt{2} - 3)/(\sqrt{2} + 1)$$

Multiply numerator and denominator by  $(\sqrt{2} - 1)$ :

$$P/Q = [(\sqrt{2} - 3)(\sqrt{2} - 1)]/[(\sqrt{2} + 1)(\sqrt{2} - 1)]$$

Denominator:

$$(\sqrt{2} + 1)(\sqrt{2} - 1) = (\sqrt{2})^2 - 1^2 = 2 - 1 = 1$$

Numerator:

$$\begin{aligned} (\sqrt{2} - 3)(\sqrt{2} - 1) &= (\sqrt{2})(\sqrt{2}) - (\sqrt{2})(1) - (3)(\sqrt{2}) + (3)(1) \\ &= 2 - \sqrt{2} - 3\sqrt{2} + 3 \end{aligned}$$

Combine like terms:

$$= (2 + 3) + (-\sqrt{2} - 3\sqrt{2})$$

$$= 5 - 4\sqrt{2}$$

(b) Express  $x$  in terms of  $p$  and  $q$  from the formula  $p = \sqrt{q + x}$ . Hence, find the value of  $x$  if  $p = 3$  and  $q = -1$ .

Solution:

Square both sides to eliminate the square root:

$$p^2 = q + x$$

Rearrange to solve for  $x$ :

$$x = p^2 - q$$

Substitute  $p = 3$  and  $q = -1$ :

$$x = 3^2 - (-1)$$

$$x = 9 + 1$$

$$x = 10$$

8. (a) A young designer has designed a building whose side view structure is represented by the following figure:

(i) State with reasons the pair of similar triangles.

Solution:

The triangles  $FEM$  and  $GNM$  are similar because:

- They share the same angle at  $M$ .
- Both triangles are right-angled triangles.
- The corresponding sides are proportional ( $FE/GN = EM/NM$ ).

(ii) Determine the length of side  $FE$ .

Solution:

Using the proportionality of similar triangles:

$$FE/GN = EM/NM$$

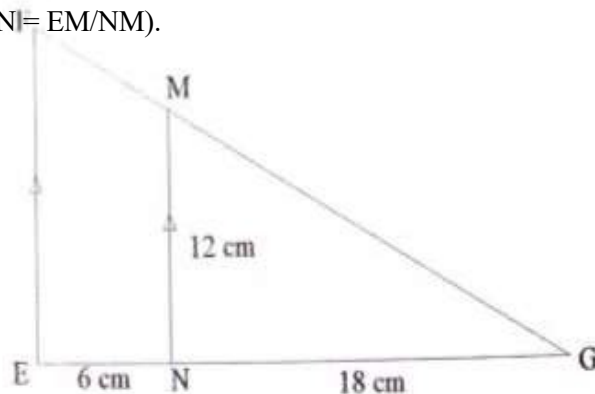
Let  $FE = x$ .

$$x/18 = 12/6$$

Cross-multiply:

$$6x = 18 \times 12$$

$$6x = 216$$



$$x = 216 \div 6$$

$$x = 36 \text{ cm}$$

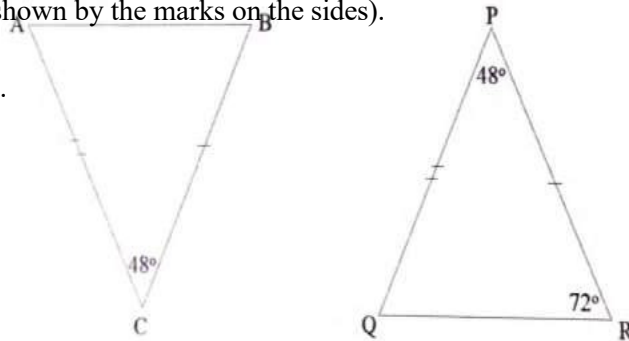
(b) Form Two students were challenged on the use of corresponding angles and sides to prove for the congruence of triangles. One student managed to draw triangles of the same size and shape as follows:

(i) State why triangles ABC and PQR are congruent.

Solution:

Triangles ABC and PQR are congruent because:

- They have the same size and shape.
- The corresponding angles are equal ( $48^\circ$ ,  $72^\circ$ , and the third angle).
- The corresponding sides are equal (as shown by the marks on the sides).



(ii) Calculate the value of the angle RQP.

Solution:

The sum of angles in a triangle is  $180^\circ$ .

In triangle PQR:

$$\text{Angle P} + \text{Angle R} + \text{Angle Q} = 180^\circ$$

$$48^\circ + 72^\circ + \text{Angle RQP} = 180^\circ$$

$$120^\circ + \text{Angle RQP} = 180^\circ$$

$$\text{Angle RQP} = 180^\circ - 120^\circ$$

$$\text{Angle RQP} = 60^\circ$$

9. (a) A photograph which has a diagonal of 7.8 cm long is to be fitted in a frame. Show whether the photograph will fit in the frame measuring 6 cm long and 5 cm wide.

Solution:

Using the Pythagorean theorem, calculate the diagonal of the frame:

$$\text{Diagonal} = \sqrt{(\text{length}^2 + \text{width}^2)}$$

$$\text{Diagonal} = \sqrt{(6^2 + 5^2)}$$

$$\text{Diagonal} = \sqrt{(36 + 25)}$$

$$\text{Diagonal} = \sqrt{61}$$

$$\text{Diagonal} \approx 7.81 \text{ cm}$$

Since the photograph's diagonal is 7.8 cm and the frame's diagonal is approximately 7.81 cm, the photograph will fit in the frame.

(b) A square tile whose diagonal is 8 cm long makes an angle of  $45^\circ$  with a side of the tile. Evaluate the length of the side of the tile.

Solution:

For a square, the diagonal is related to the side by the formula:

$$\text{Diagonal} = \text{side} \times \sqrt{2}$$

$$8 = \text{side} \times \sqrt{2}$$

$$\text{side} = 8 \div \sqrt{2}$$

$$\text{side} = 8 \times (\sqrt{2}/2)$$

$$\text{side} = 4\sqrt{2} \text{ cm}$$

10. (a) In a village of 1500 villagers, 600 keep goats, 700 keep cows, and 300 do not keep any of these animals. Use a Venn diagram to find the number of villagers who:

(i) both goats and cows

Let  $x$  represent the number of villagers who keep both goats and cows.

Total villagers = 600 (goats) + 700 (cows) -  $x$  (both) + 300 (neither)

$$1500 = 1600 - x$$

$$x = 1600 - 1500$$

$$x = 100$$

(ii) goats only

$$\text{Villagers keeping goats only} = 600 - 100 = 500$$

(iii) cows only

$$\text{Villagers keeping cows only} = 700 - 100 = 600$$

(iv) goats or cows

$$\text{Villagers keeping goats or cows} = 600 (\text{goats}) + 700 (\text{cows}) - 100 (\text{both})$$

$$\text{Villagers keeping goats or cows} = 1200$$

(b) The grades on a Mathematics test taken by 100 students are as shown in the following distribution table:

Marks: 50-59, 60-69, 70-79, 80-89, 90-99

Number of students: 3, 21, 32, 27, 17

(i) What is the size of each class interval of this distribution?

$$\text{Size} = \text{Upper boundary} - \text{Lower boundary}$$

$$\text{Size} = 60 - 50 = 10$$

(ii) Which class interval had the highest number of students?

The class interval 70-79 had the highest number of students (32).

(iii) Find the class mark of the highest class interval.

$$\text{Class mark} = (\text{Lower boundary} + \text{Upper boundary}) \div 2$$

$$\text{Class mark} = (70 + 79) \div 2$$

$$\text{Class mark} = 149 \div 2$$

$$\text{Class mark} = 74.5$$

(iv) Find the number of students who passed if the pass mark was 70.

Students who passed = Students in 70-79, 80-89, and 90-99

Students who passed =  $32 + 27 + 17$

Students who passed = 76

(v) Use the condition given in 10(b)(iv), find the number of students who failed the test.

Total students = 100

Students who failed = Total students - Students who passed

Students who failed =  $100 - 76$

Students who failed = 24