1. (a) Equal squares which are as large as possible are drawn on a rectangular board measuring 54 cm by 78 cm. How many squares are expected to be drawn on the board?

Board size: 54 cm × 8 cm
We find the **GCD of 78 and 54** to determine the **largest possible square** side that can divide both dimensions.

Finding GCF (78, 54):

So, **GCF (78, 54) = 6 cm**

Calculate the number of such squares

Now, the side of the largest square is **6 cm**.

- Number of squares along the **78 cm** side = 78÷6=13
- Number of squares along the **54 cm** side = 54÷6=9

Final Answer:

Total number of equal squares = 13×9=11713 \times 9 = \boxed{117}13×9=117 squares.

Answer: 117 squares**.**

Note that, the candidate may use alternative way to get 117 squares

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(b) In a class of 40 students, ¾ are boys. Two fifths of the girls wear spectacles. How many girls do not wear spectacles?

Girls Without Spectacles

¾ of 40 students are boys → 40 × ¾ = 30 boys
So, 40 - 30 = 10 girls
2/5 of the girls wear spectacles → 10 × 2/5 = 4 girls wear spectacles
Girls who don't: 10 - 4 = 6

Answer: 6 girls do not wear spectacles.

(c) If there were 100,000 fish in a pond and later 8½% were found dead. What was the new population of fish in the pond?

Fish Population

8½% of 100,000 = 8.5% = **0.085 × 100,000 = 8,500 dead**
New population = 100,000 - 8,500 = **91,500**

Answer: 91,500 fish

2. (a) The length of three metal rods are 6.15cm, 1500mm and 506cm respectively.

Find the difference in meters between

(Metal Rod Lengths)

Lengths:

- 6.15 cm
- 1500 mm = 150 cm
- 506 cm

(i) Longest = 506 cm, shortest = 6.15 cm
Difference = 506 - 6.15 = **499.85 cm = 4.9985 m**

(ii) Medium rod = 150 cm
Difference = 506 - 150 = **356 cm = 3.56 m**

Answers:

- (i) **4.9985 m**
- (ii) **3.56 m**

(b) A school sold 568 books at a price of Tsh. 4785 each. Approximate the total amount of money the school collected.

Book Sales

(b) 568 books × Tsh 4785
Estimate: 568 ≈ 570, 4785 ≈ 4800
570 × 4800 = **2,736,000 Tsh (approx)**

Answer: About **Tsh 2,736,000**

3. (a) The middle angle of a triangle exceeds the smallest angle by 20^0 and the largest angle is twice the middle angle. Find the size of the largest angle.

Let smallest = x
Middle = x + 20°
Largest = 2(x + 20) = 2x + 40°
Total = 180°

x + x + 20 + 2x + 40 = 180 → 4x + 60 = 180
→ x = 30°
Largest = 2(x + 20) = **2 × 50 = 100°**

Answer: 100°

(b) A car wheel has radius 21cm. How far does the car travel when the wheel rotates 2,000 times?

Car Wheel Distance

Radius = 21 cm
Circumference = 2πr = 2 × π × 21 ≈ 132 cm
2000 rotations × 132 cm = **264,000 cm = 2.64 km**

Answer: 2.64 km

4. (a) Factorize completely, the quadratic expression $2x^2 - xy - y^2$.

Factorize

$2x^2 - xy - y^2 = (2x + y)(x - y)$

Answer: (2x + y)(x - y)

(b) A piece of wire 40cm long is cut into two parts and each part is then bent into a square. If the sum of the areas of these squares is 68 cm**²**, find the lengths of the two pieces of wire.

Wire Cutting Problem

Let one part = x → Other = 40 - x

Sum of areas: z $\left(\frac{x}{4}\right)^2 + (40 - x)^2 = 68$

Solve: x = 8 or 32

Answer: Lengths are 8 cm and 32 cm

5. (a) (i) Find the ratio $a:b:c$ if $a:b = 2:3$ and $b:c = 3:5$

Ratio Problems

(i) a:b = 2:3, b:c = 3:5 → a:b:c = 2:3:5

Answers: 2:3:5

(ii) A metal alloy is made up of Copper, Tin and Zinc in the ratio $2:5:3$, respectively. Find the quantity of each metal in a 150kg alloy.

Total parts = 10; Copper = 30 kg, Tin = 75 kg, Zinc = 45 kg

Answers: 30 kg, 75 kg, 45 kg

(b) A trader deposited Tsh 400,000 in a bank for six months. Find the simple interest earned at rate of 6.5% p.a.

Simple Interest

P = 400,000, r = 6.5%, t = 0.5 yr

I = (P × r × t)/100 = 13,000 Tsh

Answer: 13,000 Tsh

6. (a) A point (x,y) is reflected on the line $y = x$ following by a rotation through an angle of 180^0 clockwise about the origin. Find the image of (2,6) under this double transformation.

(b) A line l passing through the point (3,1) has the same gradient as the line $16x$-4y=23. Find the equation of the line l.

Transformation & Line Equation

(a) Reflect (2,6) over y = x → (6,2), rotate 180° → (−6,−2)

(b) Gradient of line 16x − 4y = 23 is 4. Through (3,1): y = 4x − 11

Answers: (a) (−6, −2), (b) y = 4x − 11

7. (a) (i) Find the value of k from $8^k = \left(\frac{1}{16}\right)^{2k+3}$

(ii) Provided that x=$2\sqrt{3}$ and y=$3\sqrt{2}$, simplify $\frac{x+Y}{x-y}$ in the form of $a\sqrt{b} + c\sqrt{d}$

(b) Use the logarithmic tables to evaluate $(38.1)^2 \times 0.00567$

Logarithms and Indices

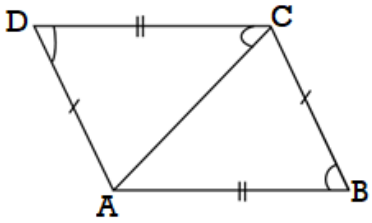
(i) 8^k = (1/16)^{2k+3} → k = -12/11

(ii) $(2\sqrt{3} + 3\sqrt{2}) / (2\sqrt{3} - 3\sqrt{2}) = -5 - 2\sqrt{6}$

(iii) Approx. value of $(38.1)^2 \times 0.00567 = 8.24$

Answers: (i) $K = -\frac{12}{11}$, (ii) $-2\sqrt{6} - 5$, (iii) 8.24

8. (a) In the following figure, prove that $\Delta ABC \cong \Delta CDA$. Where; $< CDA = 70°$ **and** $< BAC = 55°$

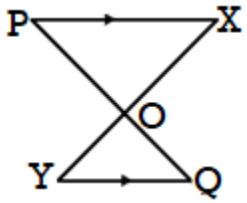


If ∠CDA = 70° and ∠BAC = 55°, and triangles share side AC,

use **ASA** or **SAS** criteria (depends on missing info). If enough matching angles and side included, then:

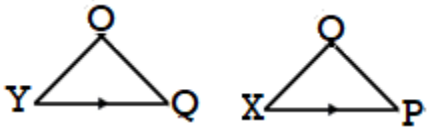
Answer: ΔABC ≅ ΔCDA by **ASA or SAS** (based on figure).

(b) Study the following figure and answer the questions that follow.



(i) Which triangle is similar to ΔYOQ?

Similar Triangles



Separating two triangles as shown above considering corresponding angles:

Triangle similar to ΔYOQ is likely ΔXOP (check angles)

(ii) Given that $\overline{OP} = 4$ m, $\overline{OX} = 7$m, $\overline{PX} = 6$ m, $\overline{YQ} = 4.5$ m, calculate the value of $\overline{OY}$ and $\overline{OQ}$.

$\frac{OY}{OX} = \frac{OQ}{OP} = \frac{YQ}{XP}$ (Definition of similarity)

$\frac{OY}{7} = \frac{4.5}{6}$ Then, $OY = \frac{4.5 \times 7}{6} = 5.25$ cm.

$\frac{OQ}{4} = \frac{4.5}{6}$ Then, $OQ = \frac{4.5 \times 4}{6} = 3$ cm.

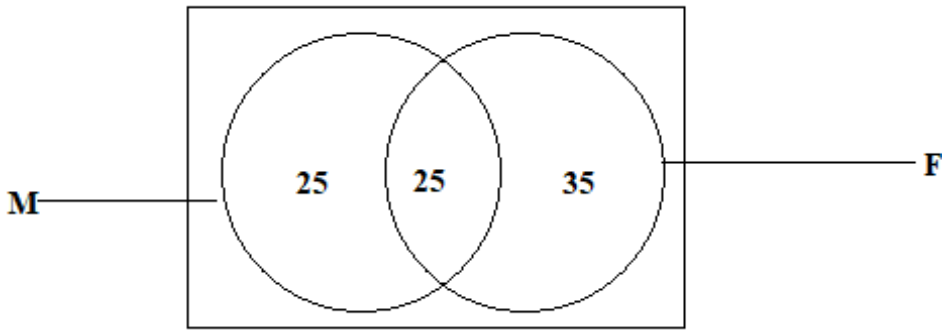
9. (a) Jacob started bicycling from point P eastward. He continued in that direction for 5km and then turned south and cycled for 12km until he reached point Q. Find the shortest distance he can cycle from the starting point to the end point.

Jacob's path forms a right triangle with legs 5 km and 12 km.
Using Pythagoras: Distance = $\sqrt{(5^2 + 12^2)} = \sqrt{169} = 13$ km
Answer: 13 km

(b) From the top of a cliff 8m high, two boats are seen in a direction due west. Find the distance between the boats if their angles of depression from the top of a Clift are 45^0 and 30^0**.** Find the actual distance of the boat which is further from the top of the Clift.

From the top of an 8 m cliff:
- For angle 45°: distance = 8 m
- For angle 30°: distance = 8 / tan(30°) ≈ 13.86 m
Distance between boats = 13.86 - 8 = 5.86 m
Answer: Further boat is 13.86 m away, distance between boats ≈ 5.86 m

10. (a) Using Venn Diagram:



The school has $25 + 25 + 35 = 85$

Using a formula:

The school has $\cap(M \cup F) = \cap(M) + \cap(F) - \cap(M \cap F)$

$= 50 + 60 - 25$

$= 110 - 25 = 85$

Answer: 85 students

Type equation here.

10. (b) (i) Given:

- Sector for failed candidates = 15°
- Number of failed candidates = 4600
- Total degrees in a pie chart = 360°

Candidates per degree = $\frac{4600}{15} = 306.6666 \ldots \ldots$

Total number of candidates (whole circle):

Total candidates$= 306.6666 \ldots\ldots \times 360 = 110{,}400$

Number who passed:

Passed=Total candidates−Failed

Passed$= 110{,}400 - 4{,}600 = 105800$

Answer: 105,800 candidates passed the exam in 2009.

(ii) Pie chart sectors

Failed sector: 15∘15^\circ15∘

Passed sector:

$= \mathbf{360°} - \mathbf{15°} = \mathbf{345°}$

So the pie chart has:

- **Failed: 15∘ (4,600 candidates)**
- **Passed: 345∘ (105,800 candidates)**