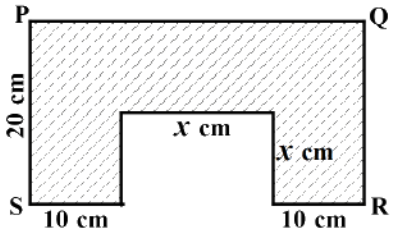
1. (a) Without using mathematical tables or calculators, simplify: $3\frac{4}{9} \div \left(5\frac{1}{3} - 2\frac{3}{4}\right) + 5\frac{9}{10}$.

   (b) A number is selected at random from each of the sets $\{2,3,4\}$ and $\{1,3,5\}$. Find the probability that the sum of the two numbers is greater than 3 and less than 7.

2. (a) Solve the inequality: $4 + \frac{3}{4}(x+2) \leq \frac{3}{8}x + 1$.

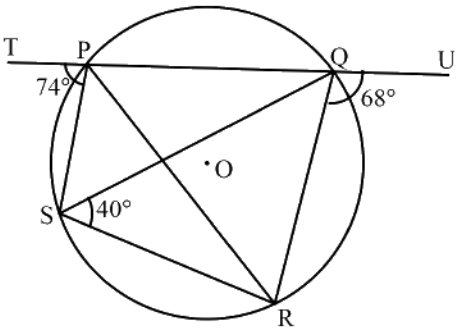
   (b)



   The diagram shows a rectangle $PQRS$ from which a square x cm has been cut. If the area of the shaded portion is 484 cm^2, find the value of x.

3. (a) The ratio of the interior angle to the exterior angle of a regular polygon is 5 : 2. Find the number of sides of the polygon.

   (b)



   The diagram shows a circle $PQRS$ with centre O, $\angle UQR = 68°, \angle TPS = 74°$ and $\angle QSR = 40°$. calculate the value of $\angle PRS$.

4. (a) By how much is the sum of $3\frac{2}{3}$ and $2\frac{1}{5}$ less than 7?

   (b) The height h, of a dock above sea level is given by $h = 6 + 4\cos(15p)°, 0 < p < 6$. Find:

   i. the value of h when $p = 4$.

   ii. correct to two significant figures, the value of p when $h = 9$m.

5. A trapezium $PQRS$ is such that $PQ \parallel RS$ and the perpendicular from P to RS is 40 cm. If $|PQ| = 20$ cm, $|SP| = 50$ cm and $|SR| = 60$ cm, calculate, correct to two significant figures the:

   (a) area of the trapezium;

   (b) $\angle QRS$.

6. (a) i. Illustrate the following statements in a Venn diagram:
   All good Literature students in a school are in General Arts class.

   ii. Use the diagram to determine whether or not the following are valid conclusions from the given statement:

   α. Vivian is in the General Art class therefore she is a good Literature student;

   β. Awudu is not a good Literature student therefore he is not in the General Arts class.

γ. Kwaku is not in the General Arts class therefore he is not a good Literature student.

(b) The cost(c) of producing n is the sum of the fixed amount, h and a variable amount y where y varies directly as n. If it cost GHC 950.00 to produce 600 bricks and GHC 1030.00 to produce 1000 bricks;

i. find the relationship between c, h and n;

ii. calculate the cost of producing 500 units.

7. the table is a relation for $y = px^2 - 5x + q$.

x	-3	-2	-1	0	1	2	3	4	5
y	21	6		-12				0	13

(a) i. Use the table to find the value of p and q.

ii. Copy and complete the table.

(b) Using a scale of 2 cm to 1 unit on the x-axis and 2 cm to 5 unit on the y-axis, draw the graph of the relation for $-3 \leq x \leq 5$.

(c) Use the graph to find:

i. y when $x = 1.8$;

ii. x when $y = -8$.

8. (a) Using a ruler and a pair of compasses only, construct a:

i. trapezium $WXYZ$ such that $|WX| = 8$ cm, $|XY| = 5.5$ cm, $|XZ| = 8.3$ cm, $\angle WXY = 60^\circ$ and $WX \parallel ZY$.

ii. rectangle $PQYZ$ where P and Q are on $\overline{WX}$.

(b) Measure:

i. $|QX|$;

ii. $\angle XWZ$.

9. (a) The first term of an Arithmetic Progression (AP) is -8. If the ratio of the 7th term to the 9th term is 5:8, find the common difference of the AP.

(b) A trader bought 30 baskets of pawpaw and 100 baskets of mangoes for N 2,450.00. She sold the pawpaw at a profit of 40% and the mangoes at a profit of 30%. If her profit on the entire transaction was N 855.00, find the:

i. cost price of a basket if pawpaw;

ii. selling price of the 100 baskets of mangoes.

10. (a) Without using mathematical tables or calculators, simplify: $\dfrac{2\tan 60^\circ + \cos 30^\circ}{\sin 60^\circ}$.

(b) From an aeroplane in the air and at a horizontal distance of 1050 m, the angle of depression of the top and base of a control tower at an instant are 36° and 41° respectively. Calculate correct to the nearest metre, the:

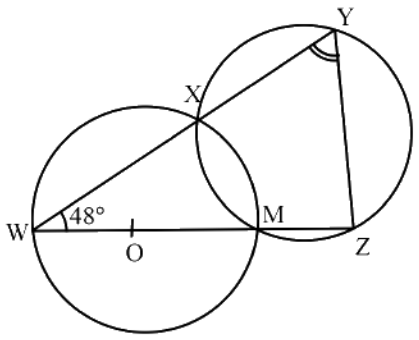
i. height of the control tower;

ii. shortest distance between the aeroplane and the base of the control tower.

11. (a) Make m the subject of the relation

$$h = \frac{mt}{d(m+p)}.$$

(b)



In the diagram, WZ and WY are straight lines, O is the centre of circle WXM and $\angle XWM = 48°$. Calculate the value of $\angle WYZ$.

(c) An operation $(*)$ is defined on the set $X = \{1,3,5,6\}$ by $m(*)n = m + n + 2 (\text{mod } 7)$, where $m, n \in X$.

i. Draw a table for the operation.

ii. Using the table, find the truth set of

α. $3(*)n = 3$;

β. $n(*)n = 3$.

12. A water reservoir in the form of a cone mounted on a hemisphere is built such that the plane face of the hemisphere fits exactly to the base of the cone and the height of the cone is 6 times the radius of the its base.

(a) Illustrate this information in a diagram.

(b) If the volume of the reservoir is $333\frac{1}{3}\pi$ m^3, calculate correct to the nearest whole number, the:

(c) i. volume of the hemisphere;

ii. total surface area of the reservoir. $\left[\text{Take } \pi = \frac{22}{7}\right]$

13. The table shows the marks scored by some candidates in an examination.

Marks (%)	Frequency
$0 - 9$	7
$10 - 19$	11
$20 - 29$	17
$30 - 39$	20
$40 - 49$	29
$50 - 59$	34
$60 - 69$	30
$70 - 79$	25
$80 - 89$	21
$90 - 99$	6

(a) Construct a cumulative frequency table for the distribution and draw a cumulative frequency curve.

(b) Use the curve to estimate, correct to one decimal place, the:

i. lowest mark for distinction if 5% of the candidates passed with distinction;

ii. probability of selecting a candidate who scored at most 45%.