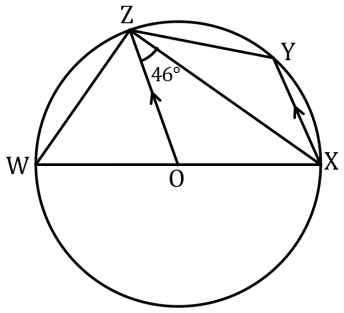
1. (a) Simplify: $\left(4\frac{3}{4} - 1\frac{5}{6}\right) \div 1\frac{1}{24} \times \left(1\frac{2}{3} + 2\frac{1}{2}\right)$.

   (b) If $\frac{3}{4}$ of a number added to $\frac{5}{6}$ gives the same result as subtracting $\frac{7}{8}$ of the number from $20\frac{1}{3}$, findthe number.

2. (a) The ratio of the present ages of Kwasi and Yaw is $2 : 9$. Four years ago, the sum of their ages was 47 years. How old is Yaw now?

   (b) In the diagram, O is the centre of the circle. W, X, Y and Z are points on the circle such that $\overline{OZ}$ is parallel to $\overline{XY}$, $\overline{WOX}$ is the diameter and $\angle OZX = 46°$. Calculate $\angle ZWO$.



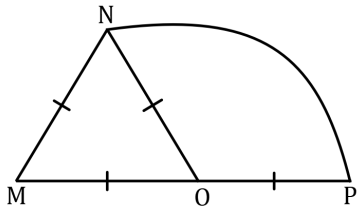
3. (a) Evaluate, correct to two decimal places $q = \dfrac{y(x-m)}{m-p}$ when $y = 2.5, m = 15, x = 10$ and $p = 18$.

   (b) PQR is a triangle in which $|PQ| = |PR|$ and S is a point on PR such that $|QS| = |QR|$. If $\angle PQS = 30°$, calculate $\angle QPR$.

4. (a) Without using tables or calculators, simplify $\dfrac{\sin 45° + \tan 30°}{\tan 45° - \cos 60°}$.

   (b) A small stone is tied to a point vertically above it by an inelastic string 102 cm long. If the string is moved such that it is inclined at an angle of 50° to the vertical, how high does the stone rise? [Correct your answer to two decimal places.]

5. (a) In the diagram, $|MN| = |MO| = |NO| = |OP| = 3.5$ cm. If NP is an arc of a circle centre O, calculate the perimeter of $MNPOM$.



   (b) A box contains 25 balls of which y are red.

   i. If a ball is selected at random from the box, what is the probability that it is red?

   ii. When 15 more balls of which 7 are red are added, the probability of selecting a red ball becomes $\frac{5}{8}$. Find the number of red balls altogether in the box.

6. (a) If $\log_{10} N = \bar{2}.7526$, find the value of N in standard form.

   (b) Given that $425_6 = 320_x$, evaluate $123_x - 34_x$.

   (c) A man invested a certain amount of money in two separate projects in the ratio 3:2. His profit was calculated on interest rates of 15% and 4% simple interest respectively. If after two years, he received a sum of GHC 9200.00 as his profit for the two projects, calculate the total amount he invested in the two projects.

7. (a) i. Solve the inequality: $0.5(2x+1) \leq 0.3x + 1.9$.
   ii. Illustrate your answer on the number line.

   (b) Copy and complete your table of values for the equation $y = x^2 + 3x$ for $-4 \leq x \leq 4$.

x	-4	-3	-2	-1	0	1	2	3	4
y				-2	0		10	18	

   i. Using scales of 2 cm to 1 unit on the x-axis and 2 cm to 5 units on the y-axis, plot the graph of the relation $y = x^2 + 3x$.
   ii. Using your graph, find
      α. the minimum value of y;
      β. the value of y when $x = 1.5$

8. Town M is 20 km from town N and 22 km from town P while N is 18 km from P. A market is to built to serve the three towns. It is to be located such that traders from N and M will always travel equal distance to access the market while traders from P will always travel exactly 10 km to reach the market.

   (a) Using a ruler and a pair of compasses only, find by construction, the possible location for the market. Use a scale of 1 cm to 2 km.

   (b) How many of such locations are there?

   (c) Measure and record the distances of the locations from town N.

   (d) Which of the locations would be convenient for all the three towns?

9. (a) A container in the form of a cube of side 24 cm is three-quarters full of water. How many litres of water does it hold?

   (b) A container of a circle is 88 cm. A and B are points on the circumference of the circle such that $\overline{AB}$ is a chord which subtends an angle of 70° at the centre of the circle. Calculate, correct to three decimal places, the
   i. length of the chord AB,
   ii. area of the minor segment cut off by the chord. $\left[\text{Take } \pi = \frac{22}{7}\right]$.

10. (a) Table 1

$\oplus$	0	1	2	3	4	5
0	0	1	2	3	4	5
1	1	2	3	4	5	0
2	2	3	4	5	0	1
3	3	4	5	0	1	2
4	4	5	0	1	2	3
5	5	0	1	2	3	4

Table 2

$\otimes$	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0	1	2	3	4	5
2	0	2	4	0	a	4
3	0	3	0	3	0	3
4	0	4	2	0	4	2
5	0	5	4	3	2	1

Table 1 and 2 are the addition $\oplus$ and multiplication $\otimes$ tables for modulo six respectively.

i. Find the value of a in Table 2.

ii. If $5 \oplus (m \otimes 3) = 2$, find the values of m.

(b) Given that $x * y = 2x - y$, where x and y are real numbers, find the values of

i. $5 * (4 * 5)$

ii. y if $y * (3 * y) = 6$.

1. (a) (a) If $\tan x = \frac{15}{8}$, $0° \leq x \leq 90°$, find the value of $\cos x$.

(b) Two vertical poles, 3 m and 7 m long are on the same straight line with a point P on the ground. The shorter pole is 20 m from P and is between P and a longer pole. The angle of elevation of the top T of the longer pole from the top R of the shorter one is $30°$. Calculate

i. $|RT|$;

ii. the horizontal distance from P to the longer pole, correct to three significant figures;

iii. the angle of elevation of T from P, correct to the nearest degree.

2. Using a scale of 1 cm to 1 unit on each axis, draw two perpendicular axes Ox and Oy for $-6 \leq y \leq 6$ and $-5 \leq x \leq 5$ on a graph sheet.

(a) Draw on the same graph sheet, labelling all vertices clearly together with their coordinates

i. triangle PQR with vertices $P(-3, 3)$, $Q(-1, -2)$ and $R(3, -1)$;

ii. triangle UVW with vertices $U(-2, 6)$, $V(0, 1)$ and $W(4, 2)$.

(b) Deduce the transformation that maps triangle PQR onto triangle UVW.

(c) Draw, labelling all vertices together with their coordinates

i. the image $U_1V_1W_1$ of triangle UVW under a rotation of $180°$ about the origin where $U \to U_1$, $V \to V_1$ and $W \to W_1$.

ii. the image $U_2V_2W_2$ of triangle $U_1V_1W_1$ under a reflection in the line $x = 0$, where $U_1 \to U_2$, $V_1 \to V_2$ and $W_1 \to W_2$.

3. Out of 40 customers in a shop, 25 bought plantain, 16 bought yam, 21 bought corn. Each of the customers bought at least one of the three items. Eight bought plantain and yam, 11 bought plantain and corn and 6 bought yam and corn.

(a) i. Represent the information on a Venn diagram.