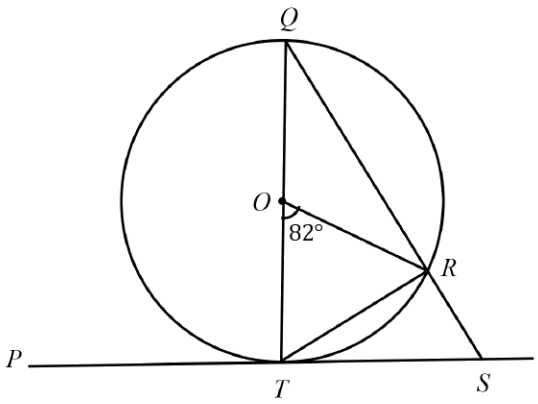
1. (a) Simplify, without using mathematical tables or calculator, $\dfrac{4\frac{1}{4} - 3\frac{1}{2} + 3\frac{1}{8}}{3\frac{2}{3}\text{of}1\frac{1}{4} \div 2\frac{5}{6}}$

   (b) If two numbers are selected at random, one after the other, with replacement from the set $A = \{5, 6, 7, 8, 9\}$, find the probability of selecting at least one prime number.

2. (a) Given that $\cos x = \frac{3}{5}$, $0° < x < 90°$, calculate, without using mathematical table or calculator $\dfrac{3\tan x}{2\sin x + 3\cos x}$.

   (b)



   In the diagram, PS is tangent to the circle of centre O. If QS is a straight line and $\angle TOR = 82°$, find $\angle RST$.

3. (a) For what values of x is the expression $\dfrac{5}{x^2 + 2x - 8}$ not defined?

   (b) Three times the age of Felicia is four more than the age of Asare. In three year, the sum of their ages will be 30 years. Find their present ages.

4. If P, Q and R are sets such that $n(P) = 20, n(Q) = 16, n(R) = 21, n(P \cap Q) = 7, n(P \cap R) = 8, n(Q \cap R) = 5$ and $n(P \cap Q \cap R) = 3$,

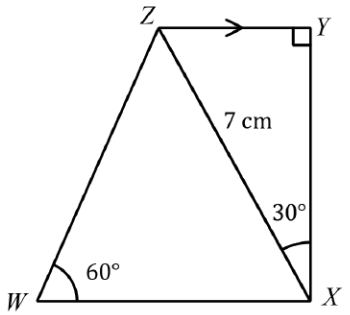
   (a) represent this information on a Venn diagram

   (b) find

      i. $n(P \cup Q \cup R)$;

      ii. the probability of $[(P \cup Q)' \cap R]$.

5.



   In the diagram $WXYZ$ is a trapezium, $|XZ| = 7$ cm, $\angle ZYX = 90°, \angle ZWX = 60°$ and $\angle ZXY = 30°$. Calculate, correct to the nearest whole number, the area of $WXYZ$.

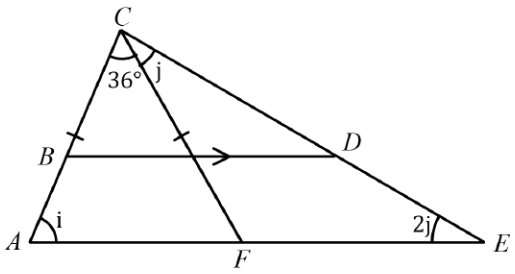
6. (a) If p varies directly as t^3 and $p = 9.6$ when $t = 4$, find t when $p = 150$.

   (b) A farmer has 1 hectare of land. One half of the land was used for planting oranges, $\frac{1}{3}$ of the remainder was used for plantng mangoes while plantain was planted on the rest.

   (c) i. Express the area of land used for magoes as a fraction of that used for plantain.

ii. If a labourer was given a week to weed the orange plantation and he completes $\frac{1}{5}$ of it on the first day, what area, in square metres, was left?
[Take 1 hectare = 10,000 m^2]

7. (a)



In the diagram, ACE is a triangle, CF is a straight line, $BD//AE$ and $|BC| = |CG|$. If $\angle BCG = 36°$, $\angle BAF = i$, $\angle GCD = j$ and $\angle DEF = 2j$, find the values of i and j.

(b) An aeroplane flies from P to Q in 1 hour at a speed of 120 km/min., where P and Q are on the parallel of latitude 60° N. If the aeroplane flies along this parallel if latitude, calculate, correct to three significant figures, the difference in longitudes of P and Q.
[Take $\pi = \frac{22}{7}$, radius of the earth = 6400 km]

8. (a) Using a ruler and a pair of compasses only, construct quadrilateral, $PQRS$, such that $|PQ| = 8$ cm, $|SQ| = 10.2$ cm, $|QR| = 7.5$ cm, $\angle QPS = 75°$ and $PS//QR$.
   i. Draw locus, l_1, of points equidistant from SR and QR;
   ii. Draw locus, l_2 of points equidistant from P and Q;

   (b) Measure $|TQ|$, where T is the point of intersection of l_1 and l_2.

9. (a) Copy and complete the table of values for the relation $y = x^2 - 5x + 5$ for $-1 \leq x \leq 6$.

x	-1	0	1	2	3	4	5	6
y		5	1				5	

(b) Using scales of 2 cm to represent 1 unit on the x-axis and 2 cm to represent 2 unit on the y-axis, draw the graph of $y = x^2 - 5x + 5$ for $-1 \leq x \leq 6$.

(c) Use the graph to find the:
   i. minimum value of y;
   ii. roots of $x^2 - 5x + 5 = 0$;
   iii. solution of $x^2 + 2x + 5 = 7x + 2$.

10. The table shows the distribution of 40 students in a class according to their clubs and the corresponding sectoral angles.

Club	No. of students	Sectoral angle
Debating	10	90°
Cultural	x	$(7y)°$
Literacy	14	$(18x)°$
Red Cross	y	81°

(a) Find the value of x and y.

(b) Illustrate the data on a pie chart.

(c) Find the percentage of students who were in the cultural club.

11. (a) It was observed that the shadow of a vertical pole was 6 m longer when the angle of elevation of the sun was 30° than when it was 60°. By means of a sketch diagram, calculate, correct to **two** decimal places, the height of the pole.

    (b) The length of each non-parallel sides of a trapezium is 18 m while the parallel sides are 32 and 20 m long, respectively. Calculate, correct to the nearest degree, the angle which one of the non-parallel sides makes with the shorter of the parallel sides.

12. The bearing of points X and Y from Z are 040° and 300° respectively. If $|XY| = 19.5$ km and $|YZ| = 11.5$ km.

    (a) Illustrate the information in a diagram

    (b) Calculate, correct to the nearest whole number,

    i. $\angle ZXY$

    ii. $|XZ|$

13. (a) A binary operation $\otimes$ is defined on the set of real numbers, $\mathbb{R}$, by
    $m \otimes n = mn - n - 2m$, where , $n \in \mathbb{R}$
    If $5 \otimes x = 22$, find the value of x.

    (b) Given that $P(2, -3)$ is a vertex of a triangle PQR, $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and $\overrightarrow{RP} = \begin{pmatrix} -4 \\ -1 \end{pmatrix}$,

    i. find

    α. the coordinates of Q and R;

    β. $|\overrightarrow{QR}|$.

    ii. If M is the midpoint of $\overrightarrow{PR}$, find $\overrightarrow{MQ}$.