(i) *To answer this question, use only a ruler and a pair of compasses.*

(a) Draw a line segment, PQ, 7 cm long in the middle of a new page.
(b) Bisect line PQ and label the mid-point, X.
(c) Draw a circle such that PQ is the diameter
(d) Locate a point A on the circumference of the circle such that AP = 4.5 cm.
(e) Draw and measure line AQ
(f) Write down the value of angle PAQ

(ii) The transformation T is such that

$$T:\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} x' \\ y' \end{pmatrix}$$

defined by

$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix}+\begin{pmatrix} 3 \\ -2 \end{pmatrix}=\begin{pmatrix} x' \\ y' \end{pmatrix}$$

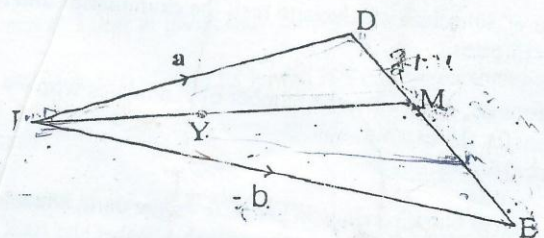
(a) The point (h, k) is mapped by T onto (7, 4). Find the values of h and k.
(b) Find the point which is unchanged under the transformation.

8. i) The operation * is defined on Z, the set of integers by $p * q = p + q + pq$
(a) Evaluate $5 * -2$
(b) Find n, given that $7 * n = 23$
(c) Find y, given that $\left(1 * \frac{1}{2}\right) * y = 5$

(ii) A ship takes off from harbour H and sails due East. After travelling 15 km it reaches a point, P. At P the ship turns and heads due south to reach a point, S, where it then stops. The distance from P to S is 20 km.
(a) Draw a diagram to show the journey of the ship from H to S.
Calculate
(b) how far the ship is from the starting point when it stops.
(c) the distance the ship had traveled before coming to rest.
(c) the bearing of H from S, to the nearest degree.

9. (i) The position vectors of points A and B are respectively $4\mathbf{i} - 6\mathbf{j}$ and $-2\mathbf{i} + 8\mathbf{j}$, where i and j are unit vectors along the x- and y-axes respectively. Given that O is the origin and P and Q are the mid-points of OA and OB respectively,
(a) represent this information in a diagram.
(b) express vectors AB and PQ in a similar manner
(c) state the relationship between vectors AB and PQ
(d) Find $\left|\frac{1}{2}OA\right|$

(ii) Given that FD = a and FE = -b, the point M is on DE such that DM = 2 ME and Y is the mid-point of FM.



(a) Find vector DE in terms of a and b
(b) Show that $\mathbf{DY} = \frac{1}{6}\mathbf{b} - \frac{4}{3}\mathbf{a}$

Juin 2006 Fortanig² Emmanuela

1. (i) A television set costs 220,000 frs CFA on cash payment. Lucy bought the television set on hire purchase thus:
   - she first paid a deposit of 20% of the cash payment price followed by
   - 33 monthly instalments of 5,500 frs CFA

   (a) Find the amount she paid as deposit.
   (b) Find the total amount she paid for the television set.
   (c) Determine how much more she actually paid for the television set.
   (d) Hence, express this extra cost as a percentage of the cost on cash payment. (Express your result to 1 decimal place.)

   (ii) A number x is such that the number squared plus three times the number is equal to 18.
   (a) Form an equation in terms of x.
   (b) Hence, solve, for x, the equation in (a) above.

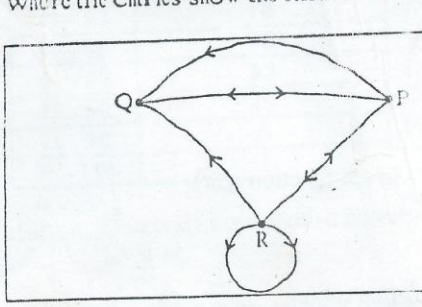
2. (i) Given that $\begin{pmatrix} 3 & 1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 4 & 9 \\ x & 2 \end{pmatrix} = \begin{pmatrix} 15 & y \\ z & 9 \end{pmatrix}$

   find the values of x, y and z.

   (ii) Given the matrices $A = \begin{pmatrix} 3 & -2 \\ 4 & -4 \end{pmatrix}$ and $B = \begin{pmatrix} 5 & 6 \\ -2 & 3 \end{pmatrix}$

   Find,
   (a) the transpose of B
   (b) the inverse of A
   (c) 3A - B

   (iii) The network connecting towns P, Q and R shown in Figure 1 can be expressed as a route matrix, M, where the entries show the number of routes leading to the town.



To

$$M = \text{from} \begin{matrix} \\ P \\ Q \\ R \end{matrix} \begin{matrix} \begin{matrix} P & Q & R \end{matrix} \\ \begin{pmatrix} & 2 & \\ & 0 & \\ 1 & & 2 \end{pmatrix} \end{matrix}$$

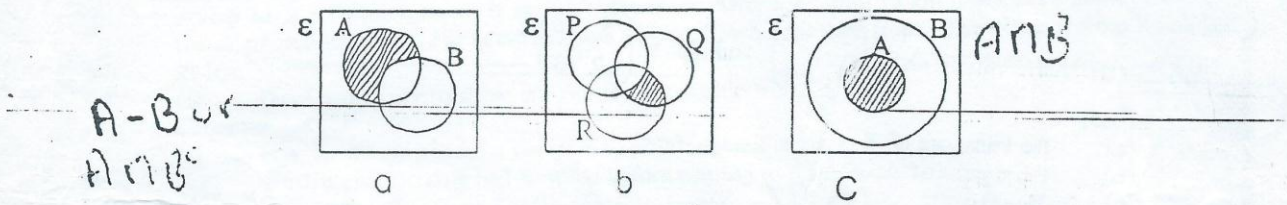
Complete the entries in the matrix, M.

3. (i) In a birthday party 3 main types of drinks were served, namely: Wine(W), Beer (B) and Top (T). Each of the 80 guests at the party drank at least one type of drink. The information below shows the distribution of what guests drank.

x	drank top only
$x+2$	drank beer only
$x+3$	drank wine only
10	drank wine and top only
9	drank wine and beer but not top
17	drank wine and beer
23	drank beer and top

(a) Draw a Venn diagram to represent the above information
(b) Find the value of x
(c) Find the number of guests who drank wine only
(d) Calculate the number of people who drank beer and top but not wine.

(ii) Describe, in set notation, the relationship that exists between the shaded regions and the sets in each of the diagrams below.



4. (i) Given the functions
$f(x) = x^2$, $x \in R$,
$g(x) = \frac{1}{x-4}$, $x \in R$, $x \neq 4$, and
$h(x) = kx + m$, $x \in R$
(a) Explain the meaning of the statement "$x \neq 4$" in the function $g(x)$.
Find
(b) $g(0)$
(c) $g^{-1}(1)$
(d) the values of k and m given that $foh(x) = 9x^2 - 12x + 4$.

(ii) A rectangle x cm wide is such that its length is 5 cm longer than its width. Write expressions, in terms of x, for
(a) the length
(b) the area
(c) the perimeter of the rectangle.

Ronang Emmanuela

(i) Joan left school at 10.00 am for her home 8 km away walking at the rate of 6 km per hour. She spent half an hour at home. She was then given a ride back to school travelling at 16 km per hour.

(a) Determine the time she arrived their house.
(b) Determine the time when she took off from the house to go back to school.
(c) Determine the time she got back to school.
(d) Draw the travel graph of her journey.
(e) Using your graph or otherwise, determine how far she was away from the school at 12.00 noon. Express your answer to 1 decimal place.

(ii) Given the straight lines
A: $y - 3x - 5 = 0$
B: $x = 8 - 3y$
C: $2y = 5 - 6x$
determine which of the lines (if any)
(a) are perpendicular
(b) are parallel
(c) pass through the origin

6. (i) The table below shows the group frequency distribution of examination marks for 120 students. Each mark is a whole number.

Marks	Number of candidates
1 - 10	0
11 - 20	2
21 - 30	6
31 - 40	7
41 - 50	14
51 - 60	20
61 - 70	35
71 - 80	29
81 - 90	6
91 - 100	1

(a) Construct a cumulative frequency table for this frequency distribution. Take the first class to be ≤ 10.

Candidates with a score of 50 or less will have to resit the examination and those with scores above 60 will be given credit certificates.

Using your table or otherwise, determine, the number of candidates who
(b) will have to resit for the examination.
(c) earned credit certificates.

(ii) Bih has 6 red carrings and 10 black carrings in her box. In the dark, she takes two carrings at random, one after the other, without replacement. Find the probability that she took out.
(a) a pair of red carrings
(b) a pair of black carrings
(c) two carrings of different colours.