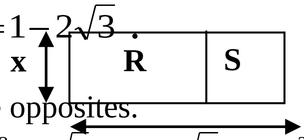
Subject: Mathematics

Grade 9

I) (1.5 points)

Choose the correct answer with justification:

No"	Statements	A	B	C
1	$\vec{u}(2;-6)$ and $\vec{u}=\overrightarrow{AB}$ The slope of (AB) is :	- 4	- 12	-3
2	x,y, and z are proportional to 3,5, and 7 such that 2x-y+z=16. The values of x,y, and z are respectively:	3 ,5, 7	2, 4, 16	6 , 10 , 14
3	The perimeter of the rectangle **R** is less than that of the square **S** for:  	x < 6	x = 6	x > 6

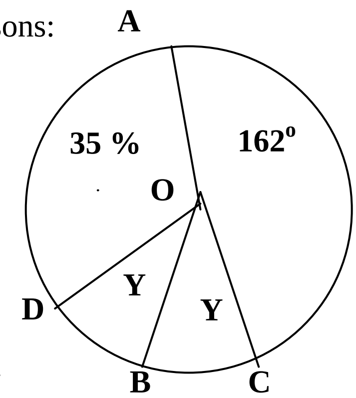
II) (2.25 points)

1) Given $A=\sqrt{13-4\sqrt{3}}$ and $B=1-2\sqrt{3}$.
   - **a.** Calculate A^2 and B^2.
   - **b.** Deduce that A and B are opposites.
2) Show that ($(\sqrt{2}\sin x+\sqrt{3}\cos x)^2+(\sqrt{3}\sin x-\sqrt{2}\cos x)^2=5$ (for all value of x)

III) (2. 5 points)

The adjacent figure corresponds to the distribution of ages (x) of 600 persons:

- $A\hat{O}C$: For age x is less than or equal to 20 years.
- $A\hat{O}D$: For age x is between 20 and 40 years.
- $C\hat{O}B$: For age x: $40 \leq x < 60$.
- $B\hat{O}D$: For age x: $60 \leq x < 80$.



1) Find the values of the angles $A\hat{O}D$ and Y in degrees.
2) Construct the frequency and the increasing cumulative frequency table.
3) Calculate the percentage of people whose age is at least 40 years.

IV) (3.75 points)

Let $A(x) = (3x-6)(x-1) + (x^2-4) + (4-2x)(x+3)$.

1)
   - **a.** Show that $A(x) = (x-2)(2x-7)$.
   - **b.** Solve $A(x) = 0$.
2) Given $B(x) = ax^2+bx+4$.
   Calculate a and b so that 1 and 2 are the roots of B(x).
3) Given $B(x) = 2(x-1)(x-2)$ and $F(x) = \dfrac{A(x)}{B(x)}$.
   - a- Determine the domain of definition of F(x).
   - b- Simplify F(x) and solve $F(x) = -2$.
   - c- Does the equation $F(x) = 1$ admit solution? Justify.

V) (5.5 points)

In an orthonormal system plot the points A(1 ;2) , B(4 ;3) and C(5 ; 0).

1) Verify that the equation of (AB) is: $y = \dfrac{x}{3} + \dfrac{5}{3}$

2) (AB) cuts (x'x) in F and (y'y) in E.
   - a- Find the coordinates of F and E.
   - b- Deduce the angle $E\hat{F}O$ to the nearest degree**.**

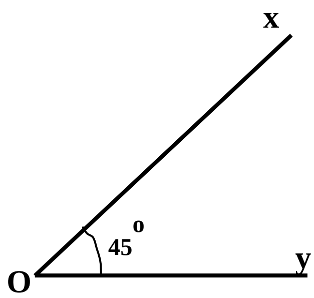
3)
   - a- Find the equation of (BC).
   - b- Show that ABC is right isosceles triangle.

4)
   - a- Determine the coordinates of point D such that $\overrightarrow{BA} - \overrightarrow{CB} = \overrightarrow{BD}$, then locate D.
   - b- Deduce the nature of ABCD.
   - c- Calculate the coordinates of M the intersection of diagonals of ABCD.

5) Let (d) be the image of (AB) by the translation $\overrightarrow{MC}$ **.**
   - a- Show that (d) is the perpendicular bisector of [BC].
   - b- Find the equation (d).

VI) **(4.5 points)**

1) Draw the adjacent figure, locate the points: A on [Ox), B and C on [Oy) such that OA=3 cm, OB=1.5cm and OC=6cm.
2)
   - a- Calculate the ratios $\dfrac{OA}{OB}$ *and* $\dfrac{OC}{OA}$.
   - b- Show that the 2 triangles OAB and OAC are similar. Deduce the equal angles**.**



3) H is the orthogonal projection of A on [Oy); using sinÔ, show that HA=HO= $\dfrac{3\sqrt{2}}{2}$ cm.
4) The parallel through O to (AB) cuts (HA) in F.
   - a- Calculate HB then HF to the nearest 10^{-2}.
   - b- Deduce the measure of $H\hat{O}F$ to the nearest degree.
5) M is a variable point on [CY) and N is the orthogonal projection of C on (AM). Determine the locus of N.

Good work