1MG Level 2 **PLANE GEOMETRY** TEST - **B**

2017-05-12 90 mn Name:

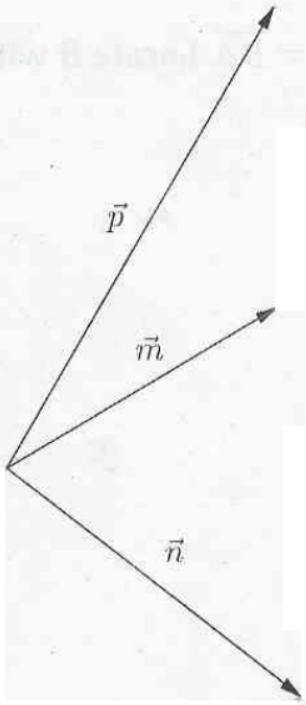
With calculator. Indicate your computations **/ 48 pts**

EXERCISE 1 **[/ 14]**

1) For what value(s) of $k \in \mathbb{R}$ are $\vec{a} = \binom{k-1}{2}$ and $\vec{b} = \binom{3}{k}$ linearly independent ?

2) In V_2 with basis $(\vec{e_1}, \vec{e_2})$, we consider the vectors $\vec{a} = \binom{6}{-4}$, $\vec{b} = \binom{17}{-8}$ and $\vec{c} = \binom{10}{-15}$.
Decompose, by computation, the vector $\vec{c}$ in the basis $(\vec{a}; \vec{b})$.

3) Thanks to a drawing (here below), estimate as precisely as possible, the components of $\vec{n}$ in the basis $(\vec{m}; \vec{p})$.



4) Draw, clearly showing your constructions :

$\vec{c} = -\frac{5}{3}\vec{a} + 0.5\vec{b}$ and $\vec{d} = -\sqrt{3}\,\vec{b}$ (calculator not allowed)

5 The point B is such that $2\,\overrightarrow{OA} - \overrightarrow{CO} = \overrightarrow{BA}$. Locate B with a clear drawing.

EXERCISE 2 **[/ 8]**

We consider the points $A(5; 2), B(32; -4)$ and $D(-2; 4)$.

1) Determine the area of the triangle OAB.

2) Determine, with computations, whether the point $(22; -4)$ is below, on or above the median through A of the triangle OAB.

3) Determine C so that $ABCD$ is a parallelogram.

EXERCISE 3 **[/ 5]**

1) The image of $P(3; -9)$ under an **homothety** with center C and factor -4 is $P'(18; 11)$. Determine C by computations.

2) Give the coordinates of B' the image of $B(4; -3)$ under a **rotation** by $+90°$ around the origin O. (*an answer without computations is accepted*)

EXERCISE 4 **[/ 12]**

Fill the blanks and empty cells in the following table about **three lines**.

	One point	One direction vector	Parametric equations	Cartesian equation	Slope-intercept equation
1)					$y = 5x - 2$
2)				$4x - 5y + 22 = 0$	
3)	$(-7; \ldots)$	$\begin{pmatrix} \ldots \\ -15 \end{pmatrix}$	$\begin{cases} x = 2 + \lambda \\ y = -5 + 3\lambda \end{cases}$		

EXERCISE 5 **[/ 9]**

We consider the triangle PQR. Determine the coordinates of P, Q and R.

Clearly indicate the steps of your resolution, and represent the situation.

We know...

- Its center of gravity is $G(-2; 4)$.
- The midpoint of PQ is $R'(-3.5; 1.5)$
- The line through P and Q is $l_1: 7x + 19y - 4 = 0$
- The line through Q and R has direction vector $\begin{pmatrix} 1 \\ -2{,}2 \end{pmatrix}$