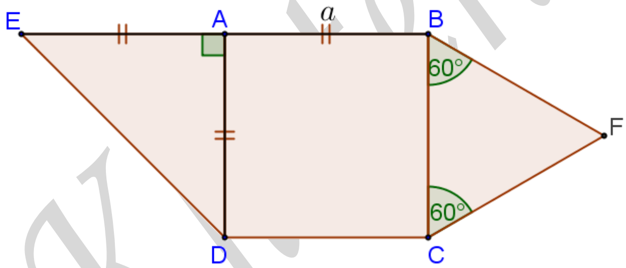
I- Consider the vector $\vec{a}(-2;1)$.

a. Find the coordinates of the vector $\vec{b}$, where $\vec{a} \perp \vec{b}$ and given that $\|\vec{b}\| = 10cm$.

b. Find a unit vector $\vec{c}$ collinear with $\vec{a}$, and of the same sense as $\vec{a}$.

II- Consider a triangle ABC so that $AB = 2, AC = 4$ & $BC = 3$. Calculate length of median AI.

III- Calculate the following scalar products:



$a)\ \vec{DA}.\vec{DB}$ $\quad b)\ \vec{DA}.\vec{BF}$ $\quad c)\ \vec{EA}.\vec{AC}$

$d)\ \vec{EA}.\vec{EB}$ $\quad e)\ \vec{FC}.\vec{DA}$ $\quad f)\ \vec{FC}.\vec{FD}$

$g)\ \vec{EC}.\vec{EF}$.

IV- Consider the points A (1; 2), B (-1; 3), M (x; y) & N (m; 0) and vectors $\vec{S}(-3,1)$ & $\vec{T}(1,2)$

a. Determine the relation that exists between the coordinates of point M (x; y), so that points M, A, & B are collinear.

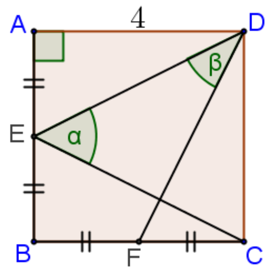
b. Determine the value of m in the following cases:

1- $\vec{v}(3,5)$ & $\vec{u}(m-2, m+3)$ are orthogonal.

2- $\vec{S}$ & $\vec{W}$ are orthogonal where $\vec{W} = \vec{S} + m\vec{T}$.

3- $\cos(\vec{AB}, \vec{AN}) = \dfrac{\sqrt{2}}{2}$.

V- Consider a square $ABCD$ with side equal to $4cm$.
Let E & F be the respective midpoints of sides AB & BC.



i. Calculate $\vec{EC}.\vec{ED}$, and then deduce the value of $\cos\alpha$.

ii. Calculate $\vec{DE}.\vec{DF}$, and then deduce the value of $\cos\beta$.

iii. Show that (DE) is perpendicular to (AF).

VI- Consider in an orthonormal system of axes $(O, \vec{i}, \vec{j})$ the two vectors $\vec{a}(x; 2x-1)$, $\vec{b}(x;2)$ and the two lines $(D): 3x - y - 2 = 0$ *and* $(D_1): x - 3y - m = 0$ *where* x & $m \in \Re$

1- a. Calculate $f(x) = \vec{a}.\vec{b}$.

b. Find the value of $f(-1)$.

2- a. Determine the directing vectors of equations of lines representing (D) and $x-axis$.

b. Calculate the acute angle between the straight lines (D) & $x-axis$.

3- a. Calculate the distance from a point $I(-1;1)$ to straight line (D).

b. Determine the value of m such that point I belongs to one of the bisectors of the angle formed between lines (D) & (D_1).

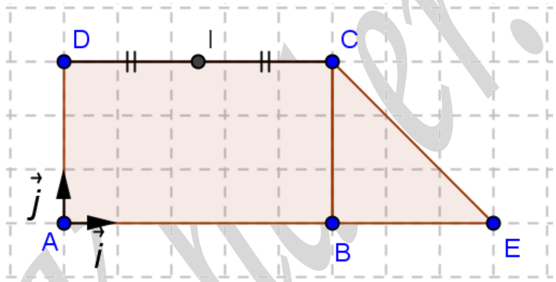
4- Find coordinates of the point I', the symmetric of I w.r.t straight line (D).

VII- Find two points on $x-axis$ at a distance equal to $\sqrt{2}$ from the straight line : $x-y-2=0$.

VIII- Two vectors $\vec{u}\ \&\ \vec{v}$ are given such that: $\|\vec{u}\|=2units, \|\vec{v}\|=1unit\ \&\ (\vec{u},\vec{v})=\dfrac{\pi}{3}$.

- ***a.*** Construct triangle ABC so that: $\vec{AB}=\vec{u}\ \&\ \vec{AC}=\vec{v}$.
- ***b.*** Calculate $\|\vec{u}+\vec{v}\|\ \&\ \|\vec{u}-\vec{v}\|$.

IX- The adjacent figure represents an isosceles triangle BCE and a rectangle $ABCD$ of dimensions $AB=5cm\ \&\ AD=3cm$.



1- Calculate the following scalar products:

$a.\ \vec{AB}.\vec{IC}$ $\quad b.\ \vec{AC}.\vec{IC}$

$c.\ \vec{AB}.\vec{DE}$ $\quad d.\ \vec{AC}.\vec{DE}$

2- Consider the system $(A;\vec{i},\vec{j})$ with $\vec{i}=\dfrac{\vec{AB}}{5}\ \&\ \vec{j}=\dfrac{\vec{AD}}{3}$.

- ***a.*** Determine the coordinates of the points $B, C, D, E\ \&\ I$.
- ***b.*** Find again the scalar products you have calculated before.

3- Let $M(m;2)\ \&\ N(x;y)$ be any two points in the given system.

- ***a.*** Determine the abscissa of M so that $A\hat{M}B=\dfrac{\pi}{2}$.
- ***b.*** Write the equation of (d), that verifies the set of points $N(x;y)$, such that: $\vec{BN}.\vec{CE}=0$.
- ***c.*** Verify that, (d) represents the perpendicular bisector of $[CE]$.

X- Given the two straight lines $(D): 2x-y-1=0\ \&\ (D'): x-2y-2=0$.

- ***a.*** Find the equations of the bisector straight lines of the angles between lines $(D)\ \&\ (D')$.
- ***b.*** Specify the number and position of points, $M(x;y)$, that are equidistant from both straight lines $(D)\ \&\ (D')$. Give two ordered pairs for M.
- ***c.*** Find the points of the straight line $(L):\begin{cases} x=3m+1 \\ y=m+2 \end{cases}$ which are equidistant from the two straight lines $(D)\ \&\ (D')$.

XI- Let $M(x;y)$ be any point on a circle (c) of diameter $[AB]$ where $A(-3;1)\ \&\ B(5;3)$

- ***a.*** Determine the value of: $\overrightarrow{AM}\cdot\overrightarrow{BM}$.
  - i. Without calculation. Justify your answer.
  - ii. In terms of $x\ \&\ y$.
- ***b.*** What does the expression found represent? Explain.
- ***c.*** Determine the center and radius of (c) in two different ways.

XII- Match each expression(s) with the most convenient figure(s):

Expressions:

1) $\vec{AB}.\vec{AC} = \|\vec{AB}\| \times \|\vec{AC}\|$ 2) $\vec{BA}.\vec{CA} = \vec{AB}.\vec{AC}$ 3) $\vec{AB}.\vec{AC} = 0.$

4) $\vec{AB}.\vec{CB} = \frac{1}{2}\|\vec{AB}\|^2$ 5) $\vec{AB}.\vec{AC} = -\|\vec{AC}\|^2$ 6) $\vec{AB}.\vec{AC} = -\|\vec{AB}\| \times \|\vec{AC}\|.$

7) $\vec{AB}.\vec{BC} = -\|\vec{CB}\|^2$ 8) $\vec{AB}.\vec{AC} = \vec{AB}.\vec{CA}$ 9) $\vec{AB}.\vec{AC} = \frac{1}{2}\|\vec{AB}\|^2.$

10) $\vec{AB}.\vec{AC} = -\|\vec{AC}\|^2$ 11) $\vec{AB}.\vec{AC} = \|\vec{AB}\|^2$ 12) $\|\vec{AB} + \vec{BC}\| = \|\vec{AB}\| + \|\vec{BC}\|.$

13) $\vec{AB}.\vec{AC} = \frac{1}{2}\|\vec{AC}\|^2$ 14) $\vec{BA}.\vec{CB} = 0.$

Figures

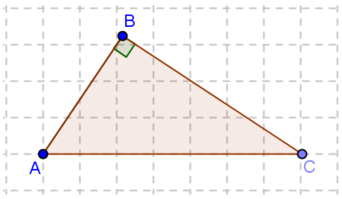


Fig-1:
Exp: ....

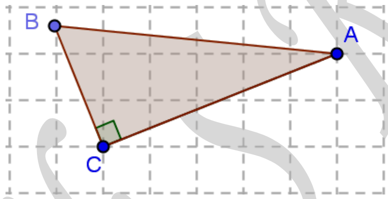


Fig-2:
Exp: ....

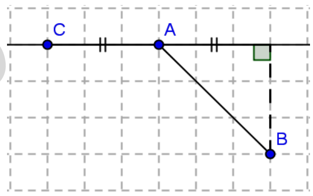


Fig-3:
Exp: ....

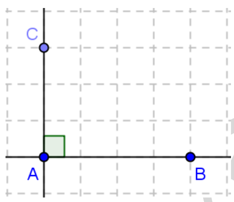


Fig-4:
Exp: ....

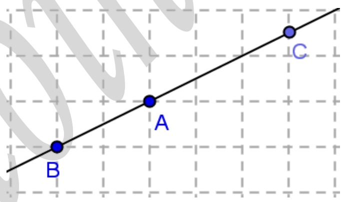


Fig-5:
Exp: ....

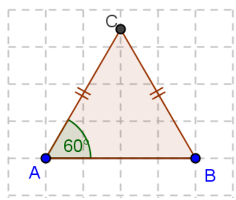


Fig-6:
Exp: ....

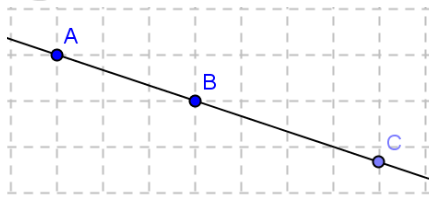


Fig-7:
Exp: ....

Mastering problems		
Chapter	*Exercises*	*Pages*
CH-11: Scalar product	7,8 & 9	233
	14 & 15	235
CH-12: Analytic form of a scalar product	1 ⟶ 4	250
	5 & 6	251
	7,9,11,12&15	251,253,254&255