Matematika 3
Vectors

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1 Questions

1. If $z_1 = 5_i - 2_j, z_2 = 3_i + 3_j, z_3 = 4_i - 1_j$, determine:

   (a)

$$\begin{aligned} z_1 + z_2 + z_3 &= (5_i - 2_j) + (3_i + 3_j) + (4_i - 1_j) \\ &= (5_i + 3_i + 4_i) + (-2_j + 3_j - 1_j) \\ &= 12_i + 0_j \\ &= 12_i \end{aligned}$$

   (b)

$$\begin{aligned} z_1 - z_2 - z_3 &= (5_i - 2_j) - (3_i + 3_j) - (4_i - 1_j) \\ &= (5_i - 3_i - 4_i) + (-2_j - 3_j + 1_j) \\ &= -2_i - 4_j \end{aligned}$$

2. If $\overline{OA} = 4_i + 3_j, \overline{OB} = 6_i - 2_j, \overline{OC} = 2_i - j$, determine $\overline{AB}, \overline{BC}, \overline{CA}$, and determine the lengths of the sides of triangle ABC.

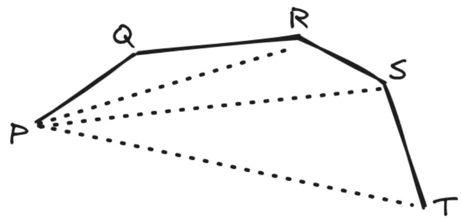
$$\begin{aligned} \overline{AB} &= \overline{OB} - \overline{OA} \\ &= (6_i - 2_j) - (4_i + 3_j) \\ &= (6_i - 4_i) + (-2_j - 3_j) \\ &= 2_i - 5_j \\ \overline{BC} &= \overline{OC} - \overline{OB} \\ &= (2_i - j) - (6_i - 2_j) \\ &= (2_i - 6_i) + (-j + 2_j) \\ &= -4_i + j \\ \overline{CA} &= \overline{OA} - \overline{OC} \\ &= (4_i + 3_j) - (2_i - j) \\ &= (4_i - 2_i) + (3_j + j) \\ &= 2_i + 4_j \end{aligned}$$

The length of the triangle is calculated using the following formula:

$$\begin{aligned}
\overline{AB} &= \sqrt{(2)^2 + (-5)^2} \\
&= \sqrt{4 + 25} \\
&= \sqrt{29} \\
&= 5.385 \\
\overline{BC} &= \sqrt{(-4)^2 + (1)^2} \\
&= \sqrt{16 + 1} \\
&= \sqrt{17} \\
&= 4.123 \\
\overline{CA} &= \sqrt{(2)^2 + (4)^2} \\
&= \sqrt{4 + 16} \\
&= \sqrt{20} \\
&= 4.472
\end{aligned}$$

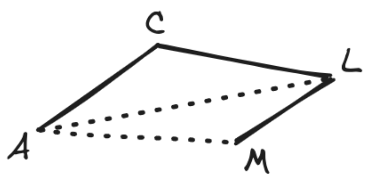
3. Determine the result of adding this vector along with its image:

   (a) $\overline{PQ} + \overline{QR} + \overline{RS} + \overline{ST}$



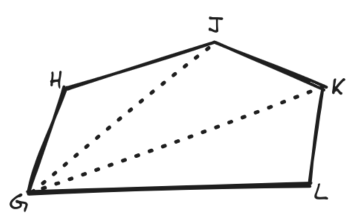
$\overline{PQ} + \overline{QR} + \overline{RS} + \overline{ST} = \overline{PT}$

   (b) $\overline{AC} + \overline{CL} - \overline{ML}$



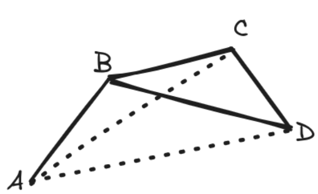
$\overline{AC} + \overline{CL} - \overline{ML} = \overline{AM}$

   (c) $\overline{GH} + \overline{HJ} + \overline{JK} + \overline{KL} + \overline{LG}$



$\overline{GH} + \overline{HJ} + \overline{JK} + \overline{KL} + \overline{LG} = 0$

   (d) $\overline{AB} + \overline{BC} + \overline{CD} + \overline{DB}$



$\overline{AB} + \overline{BC} + \overline{CD} + \overline{DB} = \overline{AB}$