Outcome 4 – Calculating Magnitude

Bronze example

Examples... **|a| means the magnitude of a.**

Vector **a** = $\begin{pmatrix}5\\3\end{pmatrix}$ and vector **b** = $\begin{pmatrix}4\\-7\end{pmatrix}$.

Calculate $|a+b|$.

To calculate the magnitude of a vector;

√(all the components squared and added together)

$a+b=\begin{pmatrix}5\\3\end{pmatrix}+\begin{pmatrix}4\\-7\end{pmatrix}=\begin{pmatrix}9\\-4\end{pmatrix}$

$|a+b|=\sqrt{81+16}=\sqrt{97}$

Silver example

Examples... **|a| means the magnitude of a.**

Vector **a** = $\begin{pmatrix}2\\0\\5\end{pmatrix}$ and vector **b** = $\begin{pmatrix}7\\-4\\1\end{pmatrix}$.

Calculate $|a+b|$.

To calculate the magnitude of a vector;

√(all the components squared and added together)

$a+b=\begin{pmatrix}2\\0\\5\end{pmatrix}+\begin{pmatrix}7\\-4\\1\end{pmatrix}=\begin{pmatrix}9\\-4\\6\end{pmatrix}$

$|a+b|=\sqrt{81+16+36}=\sqrt{133}$

Gold example

Examples... **|a| means the magnitude of a.**

Vector **a** = $\begin{pmatrix}5\\1\\4\end{pmatrix}$ and vector **b** = $\begin{pmatrix}3\\-2\\0\end{pmatrix}$.

Calculate $|4a-5b|$.

To calculate the magnitude of a vector;

√(all the components squared and added together)

$4a-5b=\begin{pmatrix}20\\4\\16\end{pmatrix}-\begin{pmatrix}15\\-10\\0\end{pmatrix}=\begin{pmatrix}35\\14\\16\end{pmatrix}$

$|4a-5b|=\sqrt{1225+196+256}=\sqrt{1677}$

Bronze Questions

Calculate the magnitude for the following vectors...

1. Vector **c** = $\begin{pmatrix}8\\6\end{pmatrix}$.

   Calculate $|c|$.

2. Vector **h** = $\begin{pmatrix}8\\-3\end{pmatrix}$.

   Calculate $|h|$.

3. Vector **m** = $\begin{pmatrix}3\\9\end{pmatrix}$ and vector **n** = $\begin{pmatrix}2\\1\end{pmatrix}$.

   Calculate $|m+n|$.

4. Vector **r** = $\begin{pmatrix}7\\-4\end{pmatrix}$ and vector **s** = $\begin{pmatrix}-2\\1\end{pmatrix}$.

   Calculate $|r-s|$.

Silver Questions

Calculate the magnitude for the following vectors...

1. Vector **c** = $\begin{pmatrix}6\\0\\7\end{pmatrix}$.

   Calculate $|c|$.

2. Vector **h** = $\begin{pmatrix}2\\-9\\-5\end{pmatrix}$.

   Calculate $|h|$.

3. Vector **m** = $\begin{pmatrix}4\\0\\-5\end{pmatrix}$ and vector **n** = $\begin{pmatrix}1\\2\\3\end{pmatrix}$.

   Calculate $|m+n|$.

4. Vector **r** = $\begin{pmatrix}8\\-5\\0\end{pmatrix}$ and vector **s** = $\begin{pmatrix}-1\\-2\\6\end{pmatrix}$.

   Calculate $|r-s|$.

Gold Questions

Calculate the magnitude for the following vectors...

1. Vector **c** = $\begin{pmatrix}3\\0\\7\end{pmatrix}$.

   Calculate $|3c|$.

2. Vector **h** = $\begin{pmatrix}4\\-1\\-5\end{pmatrix}$.

   Calculate $|5h|$.

3. Vector **m** = $\begin{pmatrix}2\\0\\-6\end{pmatrix}$ and vector **n** = $\begin{pmatrix}1\\-5\\3\end{pmatrix}$.

   Calculate $|3m+4n|$.

4. Vector **r** = $\begin{pmatrix}1\\-3\\0\end{pmatrix}$ and vector **s** = $\begin{pmatrix}-5\\2\\6\end{pmatrix}$.

   Calculate $|6r-2s|$.

Bronze Answers

1. 10
2. $\sqrt{73}$
3. $\sqrt{125} = 5\sqrt{5}$
4. $\sqrt{106}$

Silver Answers

1. $\sqrt{85}$
2. $\sqrt{110}$
3. $\sqrt{33}$
4. $\sqrt{126} = 3\sqrt{14}$

Gold Answers

1. $\sqrt{58}$
2. $\sqrt{1050} = 5\sqrt{42}$
3. $\sqrt{536} = 2\sqrt{134}$
4. $\sqrt{884} = 2\sqrt{221}$