Please attempt the following questions in preparation for the online session on 2nd November 2017.

Q1

Three vectors can be expressed as follows

$\overrightarrow{BC} = -2i - 6j + 3k$

$\overrightarrow{CD} = 3i + 9j - 7k$

$\overrightarrow{AD} = 2i + 3j + k$

(a) Find $\overrightarrow{BD}$.

(b) Hence, or otherwise find $\overrightarrow{BA}$.

Q2

A and C are points (1, 3, -2) and (4,-3,4) respectively.

The point B divides AC in the ratio 1:2.

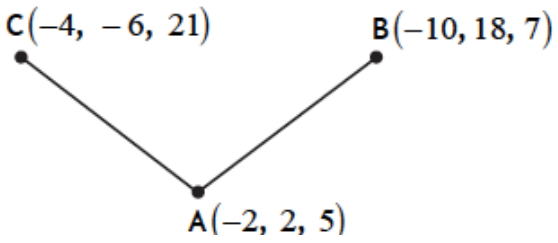
(a) Find the coordinates of B.

$k\overrightarrow{AC}$ is a vector of magnitude 1, where $k > 0$.

(b) Determine the value of k.

Q3

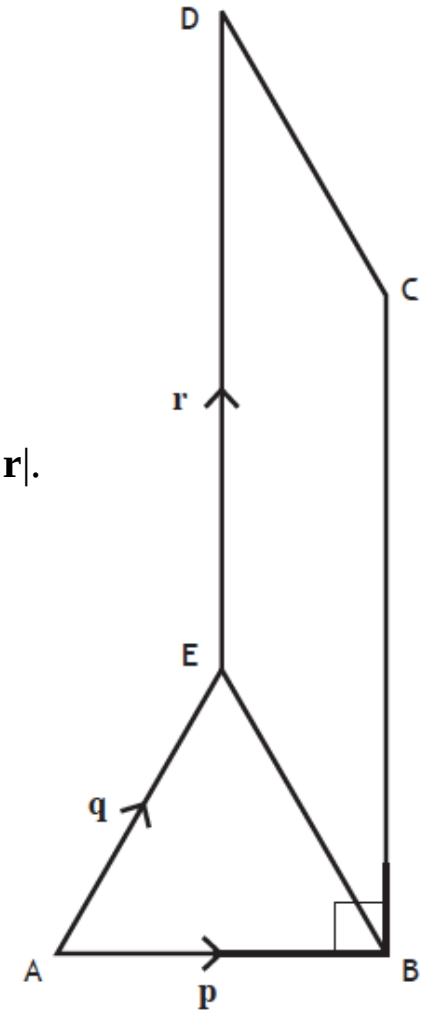
The points A, B and C are shown in the diagram opposite.



Find the size of $\angle BAC$?

Q4 Vectors p, q and r are represented on the diagram opposite.

- BCDE is a parallogram
- ABE is an equilateral triangle
- |p| = 3
- ∠ABC = 90°



(a) Evaluate **p**.(**q** + **r**).

(b) Express EC in terms of **p**, **q** and **r**.

(a) Given that AE . EC = $9\sqrt{3} - \frac{9}{2}$, find |**r**|.

Q5 Vectors **u** = 9**i** + 3**j** – **k** and **v** = -2i + a**j** - 6k are perpendicular. What is the value of a?