**Self-assessment answers: 13 Vectors**

**1.** (a) 



(b) 

∴  and so they are parallel. *[5 marks]*

**2.** (a)  so 

(b) 





= 0.431 radians (24.7°) *[6 marks]*

**3.** (a) = ***a*** + ***b***

 = ***b*** – ***a***

(b)  = |***b***|2 − |***a***|2 = 0

(c) Since the scalar product is zero, the two vectors (i.e. the diagonal directions) are perpendicular. *[7 marks]*

**4.** (a) 



(b) Area of triangle ABC is given as 

(c) 

Require that  = 0.

 = −4 + 2*p* + 2 + 3*q* – 6 = 2*p* + 3*q* − 8 = 0

 = −12 – 2*p* – 2 + 5*q* – 10 = − 2*p* + 5*q* – 24 = 0

(1) + (2) ⇒ 8*q* – 32 = 0

⇒ *q* = 4

(1) ⇒ 2*p* + 4 = 0

⇒ *p* = −2

(d) Volume of tetrahedron ABCD is given by :



Proof of the above formula:

Volume of any (linearly) tapering solid =  × base area × perpendicular height.

If D is considered the apex, then the height *h* = AD cos *θ*, where *θ* is the angle between AD and the perpendicular (normal to plane ABC).

So *h* = , where ***n*** is the normal to ABC.

But we already used the fact that AB × AC = (Area ABC)****.

Therefore, × base area × perpendicular height =  (Area ABC)****.



**** *[12 marks]*