SQA Past paper questions

2019 – Paper 1 – Question 9

Vectors **u** and **v** have components $\begin{pmatrix} p \\ -2 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} 2p+16 \\ -3 \\ 6 \end{pmatrix}$, $p \in \mathbb{R}$.

   (a)   (i) Find an expression for **u.v**.   **1**

               (ii) Determine the values of p for which **u** and **v** are perpendicular.   **3**

   (b) Determine the value of p for which **u** and **v** are parallel.   **2**
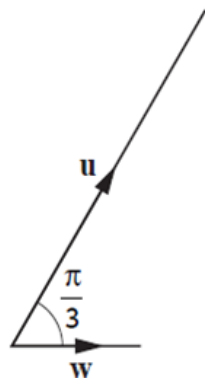
Click here for video solution.

2017 – Paper 1 – Question 5

Vectors **u** and **v** are $\begin{pmatrix} 5 \\ 1 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ -8 \\ 6 \end{pmatrix}$ respectively.

(a) Evaluate **u.v**.   **1**

(b)

Vector **w** makes an angle of $\dfrac{\pi}{3}$ with **u** and $|\mathbf{w}| = \sqrt{3}$.

Calculate **u.w**.   **3**

Click here for video solution.

2015 – Paper 1 – Question 1

Vectors $\mathbf{u} = 8\mathbf{i} + 2\mathbf{j} - \mathbf{k}$ and $\mathbf{v} = -3\mathbf{i} + t\mathbf{j} - 6\mathbf{k}$ are perpendicular.

Determine the value of t.   **2**

Click here for video solution.

2015 – Paper 2 – Question 6

Vectors $\mathbf{p}$, $\mathbf{q}$ and $\mathbf{r}$ are represented on the diagram as shown.

- BCDE is a parallelogram
- ABE is an equilateral triangle
- $|\mathbf{p}| = 3$
- Angle ABC = 90°

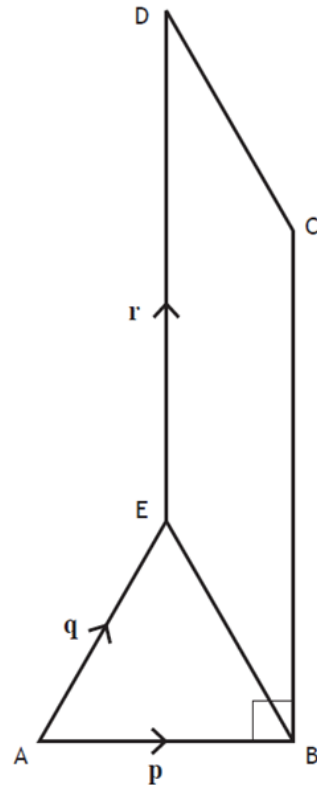(a) Evaluate $\mathbf{p} \cdot (\mathbf{q} + \mathbf{r})$.   **3**

(b) Express $\overrightarrow{EC}$ in terms of $\mathbf{p}$, $\mathbf{q}$ and $\mathbf{r}$.   **1**

(c) Given that $\overrightarrow{AE} \cdot \overrightarrow{EC} = 9\sqrt{3} - \dfrac{9}{2}$, find $|\mathbf{r}|$.   **3**

Click here for video solution.

2009 – Paper 2 – Question 7

Vectors $\boldsymbol{p}$, $\boldsymbol{q}$ and $\boldsymbol{r}$ are represented on the diagram shown where angle ADC = 30°.

It is also given that $|\boldsymbol{p}| = 4$ and $|\boldsymbol{q}| = 3$.

(a) Evaluate $\boldsymbol{p} \cdot (\boldsymbol{q} + \boldsymbol{r})$ and $\boldsymbol{r} \cdot (\boldsymbol{p} - \boldsymbol{q})$.   **6**

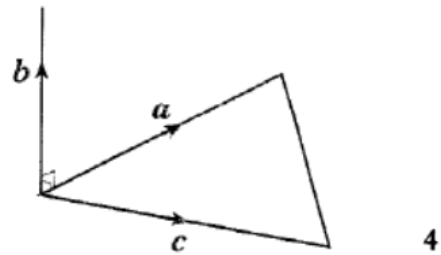(b) Find $|\boldsymbol{q} + \boldsymbol{r}|$ and $|\boldsymbol{p} - \boldsymbol{q}|$.   **4**
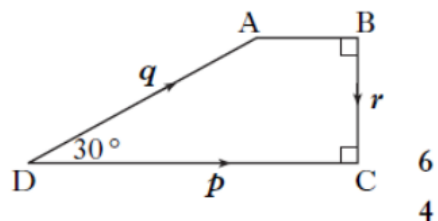
Click here for video solution.

2005 – Paper 2 – Question 10

Vectors a and c are represented by two sides of an equilateral triangle with sides of length 3 units, as shown in the diagram.

Vector b is 2 units long and b is perpendicular to both a and c.

Evaluate the scalar product $a.(a + b + c)$.

4

Click here for video solution.

2003 – Paper 1 – Question 3

Vectors u and v are defined by $u = 3i + 2j$ and $v = 2i - 3j + 4k$.

Determine whether or not u and v are perpendicular to each other.   2
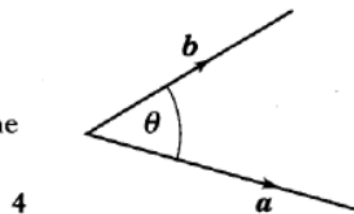
Click here for video solution.

2003 – Paper 2 – Question 9

The diagram shows vectors a and b.

If $|a| = 5$, $|b| = 4$ and $a.(a + b) = 36$, find the size of the acute angle θ between a and b.

4

Click here for video solution.

2000 – Paper 2 – Question 7

For what value of t are the vectors $u = \begin{pmatrix} t \\ -2 \\ 3 \end{pmatrix}$ and $v = \begin{pmatrix} 2 \\ 10 \\ t \end{pmatrix}$ perpendicular?   2

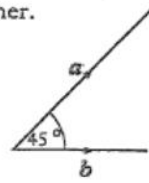Click here for video solution.

1999 – Paper 1 – Question 17

The diagram shows two vectors a and b, with $|a| = 3$ and $|b| = 2\sqrt{2}$.

These vectors are inclined at an angle of 45° to each other.

(a) Evaluate   (i) $a.a$

      (ii) $b.b$

      (iii) $a.b$ (2)

(b) Another vector p is defined by $p = 2a + 3b$.

    Evaluate $p.p$ and hence write down $|p|$.   (4)
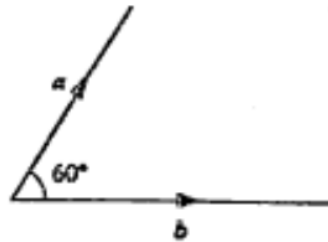
Click here for video solution.

1992 – Paper 1 – Question 18

The diagram shows representatives of two vectors, a and b, inclined at an angle of 60°.

If $|a| = 2$ and $|b| = 3$, evaluate $a.(a + b)$.   (3)
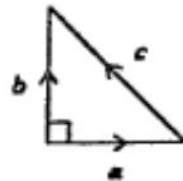
Click here for video solution.

1991 – Paper 1 – Question 17

Diagram 4 shows a right-angled isosceles triangle whose sides represent the vectors a, b and c.
The two equal sides have length 2 units.

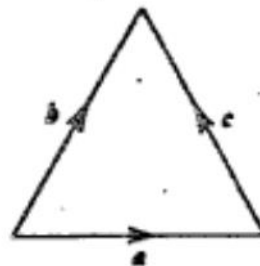Find the value of $b.(a + b + c)$.   (5)

Click here for video solution.

1989 – Paper 1 – Question 9

The sides of this equilateral triangle are 2 units long and represent the vectors a, b and c as shown in the diagram.

Evaluate $a.(a + b + c)$.   (5)

Click here for video solution.