# scalar product

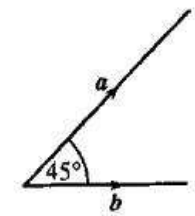
[SQA] 1. The vectors $a$, $b$ and $c$ are defined as follows:

$$a = 2i - k, \quad b = i + 2j + k, \quad c = -j + k.$$

(a) Evaluate $a.b + a.c$. 3

(b) From your answer to part (a), make a deduction about the vector $b + c$. 2

[SQA] 2. 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.



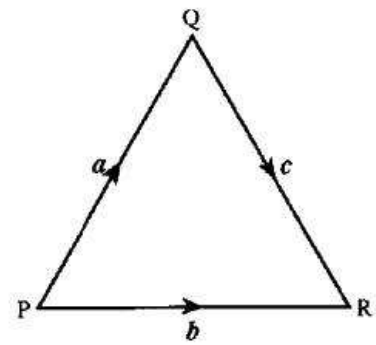

(a) Evaluate (i) $a.a$
(ii) $b.b$
(iii) $a.b$ 2

(b) Another vector $p$ is defined by $p = 2a + 3b$.
Evaluate $p.p$ and hence write down $|p|$. 4

[SQA] 3. PQR is an equilateral triangle of side 2 units.

$\overrightarrow{PQ} = a$, $\overrightarrow{PR} = b$ and $\overrightarrow{QR} = c$.

Evaluate $a.(b + c)$ and hence identify two vectors which are perpendicular. 4




[SQA] 4. Vectors $p$, $q$ and $r$ are defined by

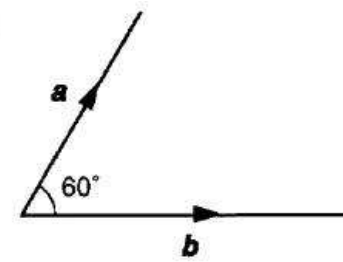
$$p = i + j - k, \quad q = i + 4k \quad \text{and} \quad r = 4i - 3j.$$

(a) Express $p - q + 2r$ in component form. 2

(b) Calculate $p.r$ 1

(c) Find $|r|$. 1

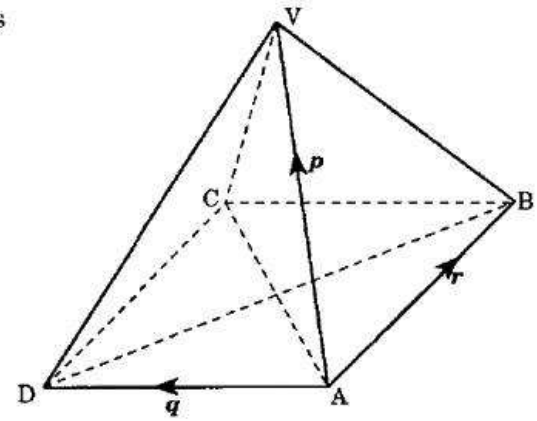
[SQA] 5. The diagram shows representatives of two vectors, $a$ and $b$, inclined at an angle of 60°.
If $|a| = 2$ and $|b| = 3$, evaluate $a.(a + b)$ 3



[SQA] 6. In the square-based pyramid, all the eight edges are of length 3 units.

$\vec{AV} = \boldsymbol{p}$, $\vec{AD} = \boldsymbol{q}$, $\vec{AB} = \boldsymbol{r}$.

Evaluate $\boldsymbol{p}.(\boldsymbol{q}+\boldsymbol{r})$. 4

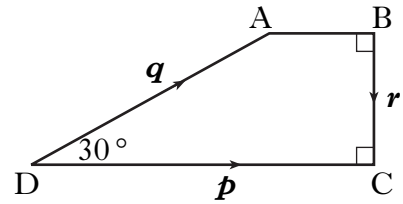



[SQA] 7. Vectors $\boldsymbol{p}$, $\boldsymbol{q}$ and $\boldsymbol{r}$ are represented on the diagram shown where angle ADC $= 30°$.

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

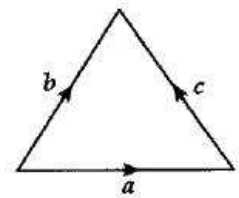
(*a*) Evaluate $\boldsymbol{p}.(\boldsymbol{q}+\boldsymbol{r})$ and $\boldsymbol{r}.(\boldsymbol{p}-\boldsymbol{q})$. 6

(*b*) Find $|\boldsymbol{q}+\boldsymbol{r}|$ and $|\boldsymbol{p}-\boldsymbol{q}|$. 4




[SQA] 8. The sides of this equilateral triangle are 2 units long and represent the vectors $\boldsymbol{a}$, $\boldsymbol{b}$ and $\boldsymbol{c}$ as shown.

Evaluate $\boldsymbol{a}.(\boldsymbol{a}+\boldsymbol{b}+\boldsymbol{c})$. 5




*[END OF QUESTIONS]*