

The vector \mathbf{u} has components $\begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix}$.

Which of the following is a unit vector parallel to \mathbf{u} ?

A $-\frac{3}{5}\mathbf{i} + \frac{4}{5}\mathbf{k}$

B $-3\mathbf{i} + 4\mathbf{k}$

C $-\frac{3}{\sqrt{7}}\mathbf{i} + \frac{4}{\sqrt{7}}\mathbf{k}$

D $-\frac{1}{3}\mathbf{i} + \frac{1}{4}\mathbf{k}$

D, E and F have coordinates (10, -8, -15), (1, -2, -3) and (-2, 0, 1) respectively.

(a) (i) Show that D, E and F are collinear.

(ii) Find the ratio in which E divides DF.

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(b) G has coordinates (k , 1, 0).

Given that DE is perpendicular to GE, find the value of k .

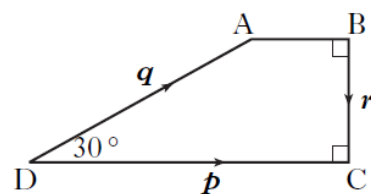
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Vectors \mathbf{p} , \mathbf{q} and \mathbf{r} are represented on the diagram shown where angle ADC = 30° .

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

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

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



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The vectors $\mathbf{u} = \begin{pmatrix} k \\ -1 \\ 1 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} 0 \\ 4 \\ k \end{pmatrix}$ are perpendicular.

What is the value of k ?

A 0

B 3

C 4

D 5

E(-2, -1, 4), P(1, 5, 7) and F(7, 17, 13) are three collinear points.

P lies between E and F.

What is the ratio in which P divides EF?

A 1:1

B 1:2

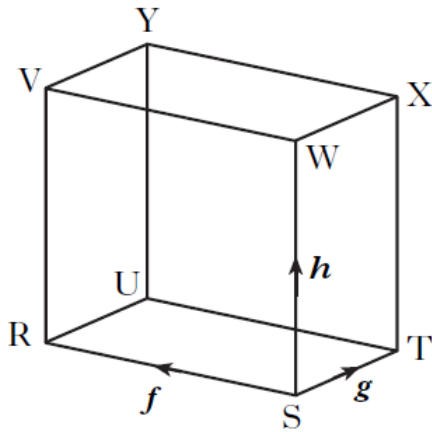
C 1:4

D 1:6

In the diagram RSTU, VWXY represents a cuboid.

\vec{SR} represents vector f , \vec{ST} represents vector g and \vec{SW} represents vector h .

Express \vec{VT} in terms of f , g and h .



A $\vec{VT} = f + g + h$

B $\vec{VT} = f - g + h$

C $\vec{VT} = -f + g - h$

D $\vec{VT} = -f - g + h$

Vectors \mathbf{p} and \mathbf{q} are such that $|\mathbf{p}| = 3$, $|\mathbf{q}| = 4$ and $\mathbf{p} \cdot \mathbf{q} = 10$.

Find the value of $\mathbf{q} \cdot (\mathbf{p} + \mathbf{q})$.

A 0

B 14

C 26

D 28

The diagram shows a cuboid OABC, DEFG.

F is the point (8, 4, 6).

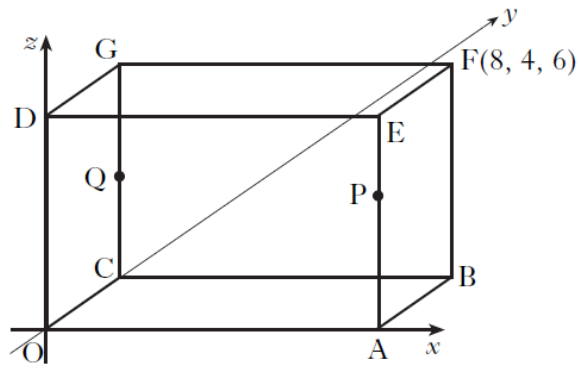
P divides AE in the ratio 2:1.

Q is the midpoint of CG.

(a) State the coordinates of P and Q.

(b) Write down the components of \vec{PQ} and \vec{PA} .

(c) Find the size of angle QPA.



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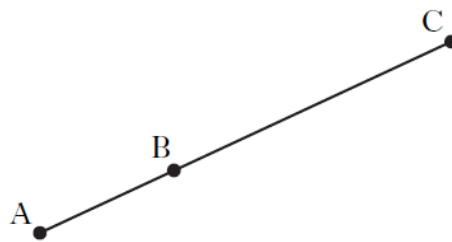
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Relative to a suitable coordinate system A and B are the points (-2, 1, -1) and (1, 3, 2) respectively.

A, B and C are collinear points and C is positioned such that $BC = 2AB$.

Find the coordinates of C.

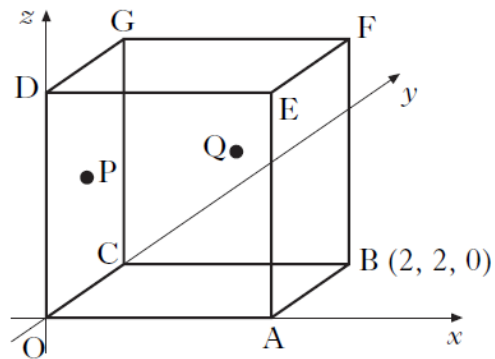


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OABCDEFG is a cube with side 2 units, as shown in the diagram.

B has coordinates (2, 2, 0).

P is the centre of face OCGD and Q is the centre of face CBFG.



(a) Write down the coordinates of G.

(b) Find \mathbf{p} and \mathbf{q} , the position vectors of points P and Q.

(c) Find the size of angle POQ.

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