

MT1612: EXAMPLE SHEET¹ VI (for April 28, 1999)

1.) Given the vectors $\mathbf{a} = (1, 2, 3)$, $\mathbf{b} = (3, 2, 1)$ and $\mathbf{c} = (1, 1, 2)$ find

- (i) $4(\mathbf{a} + 3\mathbf{b}) - \mathbf{c}$
- (ii) $|2(\mathbf{a} + 3\mathbf{c})|$
- (iii) the unit vector \mathbf{e}_d parallel to $\mathbf{d} = 3(\mathbf{b} - 2\mathbf{c})$.

2.) A weight is suspended from the asymmetrically arranged string shown in Fig. 1. The

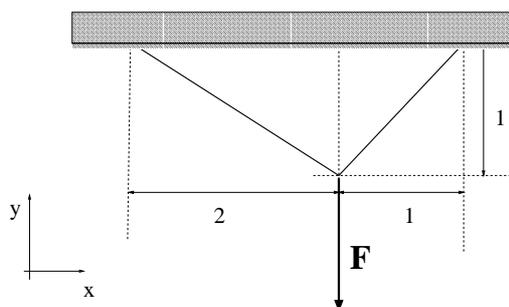


Figure 1: Sketch of a weight (represented by the force \mathbf{F}) suspended asymmetrically from a string.

weight can be represented by the force $\mathbf{F} = (0, -F)$ which acts vertically downwards.

- (i) Work out the tensions T_1 and T_2 in the left and right parts of the string respectively. [Hint: A string can only support forces parallel to its centreline].
 - (ii) What is the total length of the string²?
- 3.) Show that the diagonals of a parallelogram bisect each other. [Hint: Let the parallelogram be $OACB$. Take the origin of the position vectors at O and let the position vectors of the vertices A and B be \mathbf{a} and \mathbf{b} , respectively.]

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²At last the answer to the question: 'How long is a piece of string?'