Some vector questions (force vectors)

1. (a) State the difference between scalar and vector quantities.

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..... [1]

(b) Give two examples of a vector quantity.

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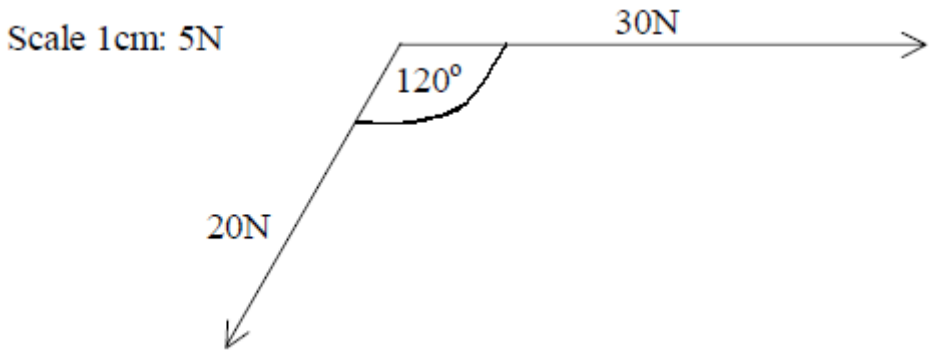
..... [2]

2 (a) (i) Complete the vector diagram below showing the resultant force.



[1]

(ii) Label the resultant with its magnitude

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[2]

(b) Calculate the acceleration of an object of mass 4kg experiencing such a force [1]

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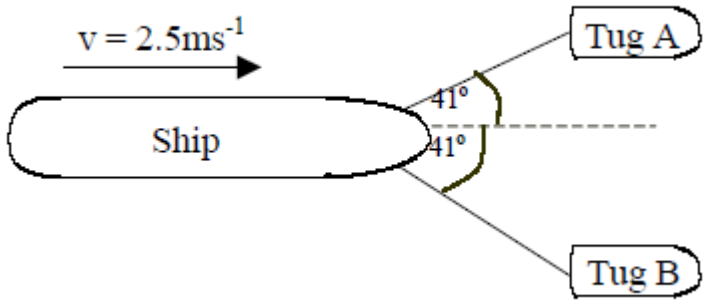
3. A ship is pulled at a constant speed, v, of 2.5ms^{-1} by two tugs, A and B. Each tug is connected to the ship by a cable so that the angle each of the cables makes with the direction of travel is 41°. The ship experiences a drag force



given by 8000v^{2} Newtons.

(a) Calculate the tension in each cable while travelling at this constant speed.

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..... [3]

(b) The harbour authorities want to move the ship to clear the harbour walls sooner. This requires that the tugs increase the tensions in the cables to the ship. The maximum safe tension in the cables is 50kN and the tugs need to maintain a minimum angle of 60° between the cables connecting them to the ship. Calculate the maximum speed at which the tugs can pull the ship.

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..... [4]