Answer **all** the questions in the spaces provided.

1(a) Define the terms *moment of a force* and *torque of a couple*. For each of the terms, draw a labelled sketch to illustrate the meaning of the terms. [4]

Moment of a force:

……

……

Torque of a couple:

……

……

(b) A 1500 kg truck is positioned on an incline that makes an angle of 40° with the horizontal, as shown in Fig. 1.1. The truck is held in place by a frictionless and massless pulley system connected to a counterweight of mass *m*. The smaller pulley at the top of the incline has a radius *r*, and the larger pulley has a radius of 3*r*. The two pulleys at the top are attached together so that they turn together as one. The incline is frictionless.

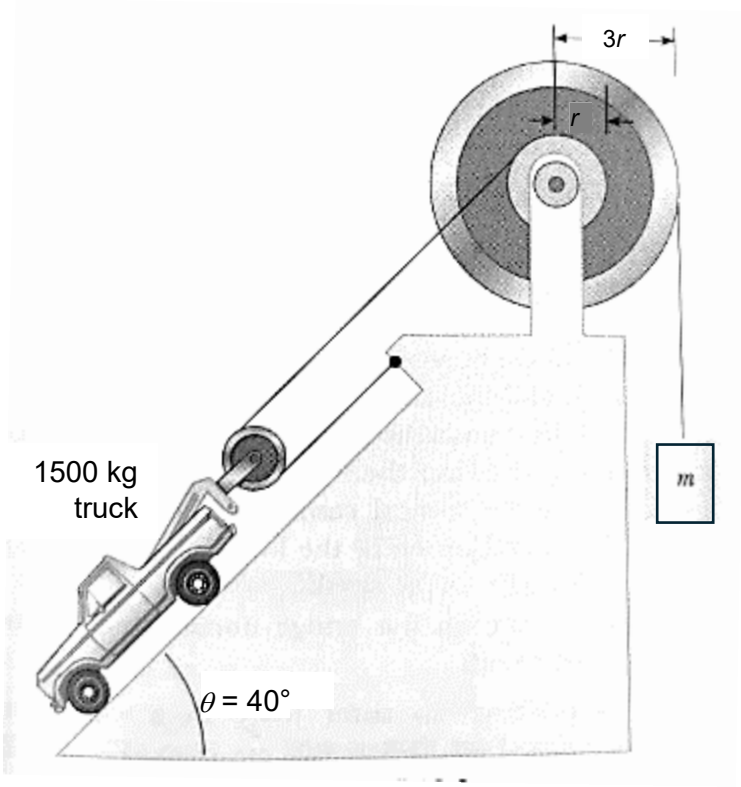

Fig. 1.1

(i) On Fig. 1.2, label all the forces exerted on the truck and the pulley attached to the back of the truck clearly. You do not need to include the internal forces acting between the pulley and the truck. [2]

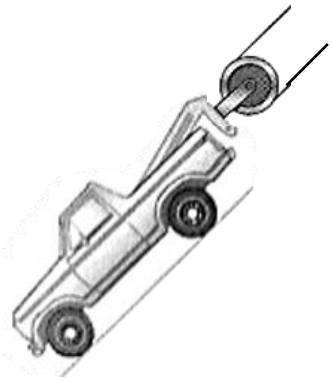

Fig. 1.2

(ii) Determine the mass m of the counterweight needed to balance the 1500 kg truck on the incline. [4]

Mass m = ……