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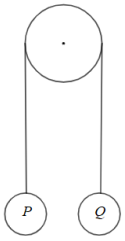
3 Exam Questions
Yr 1 – Connected Particles

(1) Two particles P of mass 4kg and Q of mass 3kg and connected by a light inextensible string over a smooth fixed pulley. The particles are initially at rest 1.2m above the ground as shown in the diagram below.



The particles are released from rest.
(a) Find the tension in the string.
(b) Find the acceleration of the 2 particles.
(c) Particles P hits the floor and doesn't rebound. Find the maximum height above the ground that particles Q reaches. *(You can assume particles Q doesn't hit the pulley).*
(2) A car of mass 1200kg is towing a trailer of mass 400kg on a straight horizontal road by a light inextensible tow bar. The car's engine has a driving force of 3kN and experiences resistances to motion of 700N. The trailer experiences resistances of 300N. The car and trailer start from rest.
(a) Find the tension in the tow bar
(b) Find the acceleration of the car and trailer.
(c) 12 seconds into the journey the tow bar breaks. Given that the trailer still experiences resistances of 400N, find how far the trailer travels before it comes to rest.
(3) An 80kg person stands in a lift of mass 1000kg. The lift moves vertically upwards by a light, inextensible cable with a tension of 12kN.
(a) Find the acceleration of the lift.
(b) Find the force exerted on the floor of the lift by the man.

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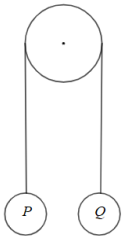

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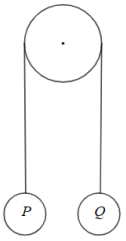

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