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- 1 A car starts from rest and accelerates at 2 m s^{-2} for 10 s. It then travels at a constant speed for 30 s. The car then uniformly decelerates to rest over a period of 20 s.

(a) Sketch a velocity-time graph for the motion of the car.

[2]



(b) Find the total distance travelled by the car.

[2]

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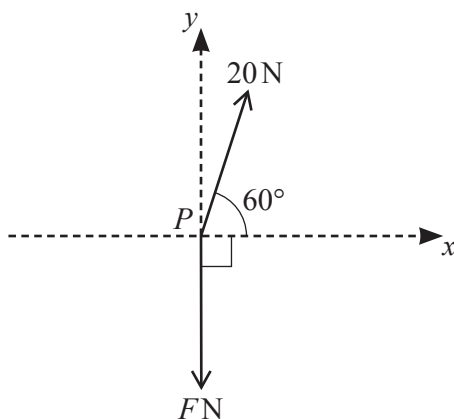
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(a) Given that the resultant force has no component in the y -direction, calculate the value of F . [2]

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- 4 A car of mass 1700 kg is pulling a trailer of mass 300 kg along a straight horizontal road. The car and trailer are connected by a light inextensible cable which is parallel to the road. There are constant resistances to motion of 400 N on the car and 150 N on the trailer. The power of the car's engine is 14000 W .

Find the acceleration of the car and the tension in the cable when the speed is 20 m s^{-1} . [6]

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- (a)** It is given that there is no resistance to the bobsled's motion.

[3]

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[5]

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- 6 A particle moves in a straight line, starting from a point O . The velocity of the particle at time t s after leaving O is $v \text{ ms}^{-1}$. It is given that $v = kt^{\frac{1}{2}} - 2t - 8$, where k is a positive constant. The maximum velocity of the particle is 4.5 ms^{-1} .

(a) Show that $k = 10$.

[5]

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[illegible]

(ii) Find the distance travelled by the particle in the first 16 s. [5]

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- 7 A particle P of mass 0.2 kg is projected vertically upwards from horizontal ground with speed 25 ms^{-1} .
- (a) Show that the speed of P when it reaches 20 m above the ground is 15 ms^{-1} . [2]

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When P reaches 20m above the ground it collides with a second particle Q of mass 0.1 kg which is moving downwards at 20 ms^{-1} . P is brought to instantaneous rest in the collision.

- (b)** Find the velocity of Q immediately after the collision. [2]

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