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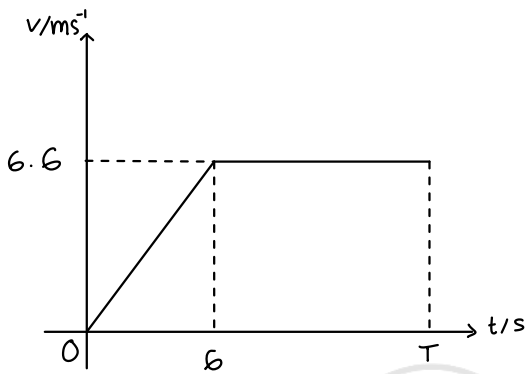
Problem Solving - Set A

Bronze

a) 

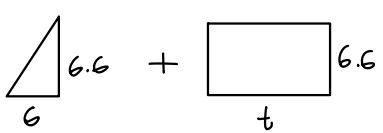
b) $a = \frac{v}{t}$ (gradient)

$= \frac{6.6}{6}$

$= 1.1 ms^{-2}$

c) Distance = velocity x time (area under the graph)

$\frac{1}{2} \times 6 \times 6.8 = 19.8m$

d) 

$19.8 + 6.6t = 200$

$6.6t = 180.2$

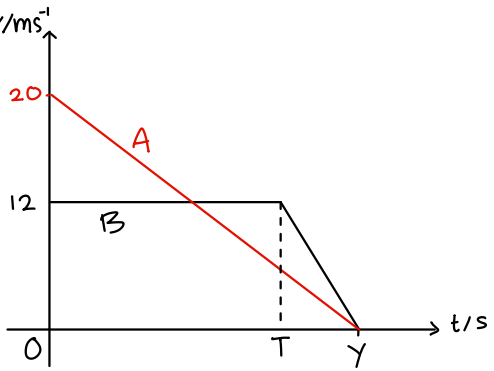
$t = 27.3$

$T = 27.3 + 6$

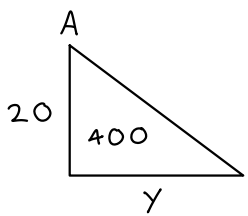
$= 33.3$

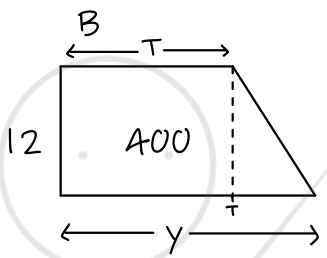
Silver

a)



b)





$$\frac{Y \times 20}{2} = 400$$

$$Y \times 20 = 800$$

$$Y = 40$$

$$\frac{1}{2}(T+40) \times 12 = 400$$

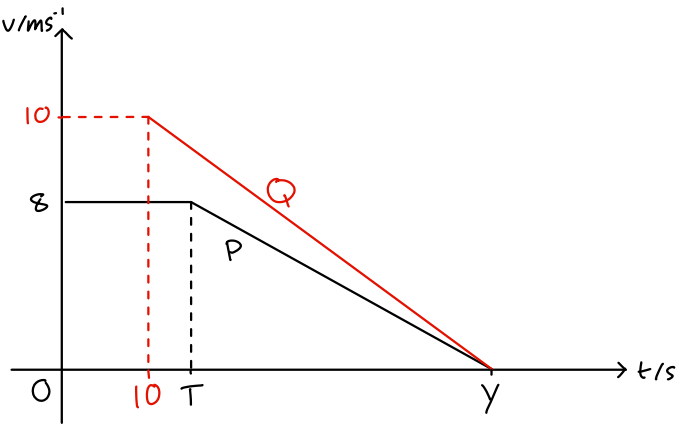
$$(T+40) \times 12 = 800$$

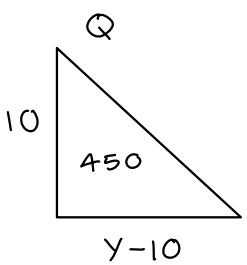
$$T + 40 = 66.7$$

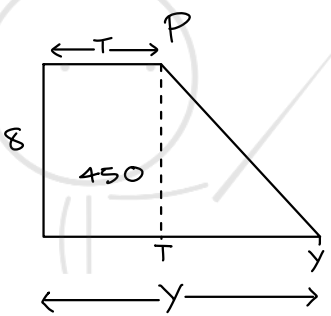
$$T = 26.7$$

Gold

a)







$\frac{(Y-10)10}{2} = 450$

$\frac{10Y-100}{2} = 450$

$10Y - 100 = 900$

$10Y = 1000$

$Y = 100$

$\frac{1}{2}(T+100) \times 8 = 450$

$(T+100) \times 8 = 900$

$T + 100 = 112.5$

$T = 12.5$

b) Deceleration of $P = \frac{8}{100-12.5} = 0.0914\,ms^{-2}$

Deceleration of $Q = \frac{10}{100-10} = 0.111\,ms^{-2}$

As the rate of deceleration of Q is greater than the rate of deceleration of P, the particles will only have the same instantaneous velocity of Q=8 for some t where $10 < t < 12.5$.

Velocity of $Q = 10 + (-0.111)(t-10)$

$10 + (-0.111)(t-10) = 8$

$10 + (-0.111t + 1.11) = 8$

$10 - 0.111t + 1.11 = 8$

$3.11 = 0.111t$

$t = 28 > 12.5$

The particles never have the same instantaneous velocity.