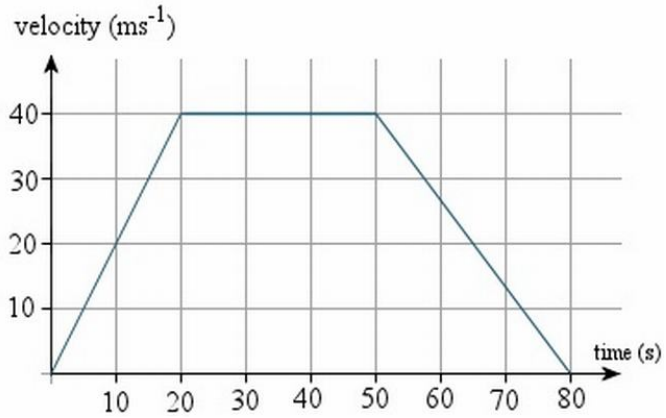
Example : A speedboat starts from rest, accelerating at 2 ms^{-2} for 20 s. It then continues at a steady speed for a further 30 s and decelerates to rest in 30 s. Find:

(a) the distance travelled in m,
(b) the average speed in ms^{-1} and,
(c) the time taken to cover half the distance.



Solution : a) distance=area of trapezium $= \dfrac{(a+b)\,h}{2}$

$= \dfrac{(80+30)\,(40)}{2}$

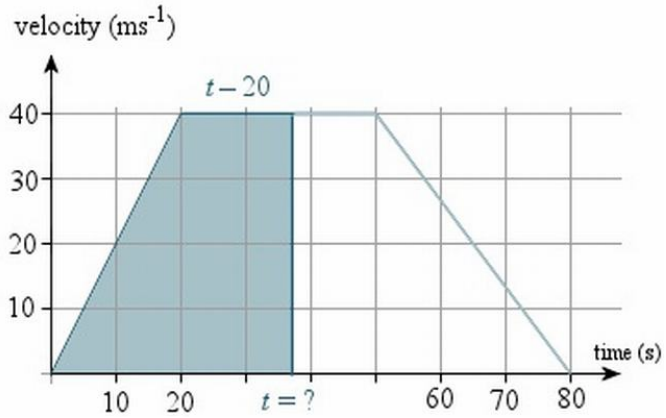
=2200 m

b) average speed $= \dfrac{\text{distance travelled}}{\text{time taken}}$

$= \dfrac{2200}{80}$

=27.5 ms^{-1}

c) We need to find the time when the area of the trapezium is half of its original area, or 1100m , as shown in the graph.



The base of this unknown trapezium has length \displaystyle{t}t, and the top of the trapezium will have length t−20. So we have:

area of trapezium $= \dfrac{(a+b)\,h}{2}$

$1100 = \dfrac{(t+[t-20])\,40}{2} = 20\,(2t-20)$

55=2t−20

75=2t

t=37.5s

So it will take 37.5 s to cover half the distance.