Question	Scheme	Marks	AOs
1(a)	Use **total** distance = 400 to set up an equation in T only (oe e.g. $400-12.5-37.5=350$, $350\div 5=70$, $70+20=90$) by using area under graph and/or using *suvat* on each section. Must be a complete method, including use of $(T-20)$	M1	3.4
	$\frac{1}{2}(T+(T-20))\times 5=400$ **OR** $\frac{1}{2}\times 5\times 5+(T-20)\times 5+\frac{1}{2}\times 15\times 5=400$ **OR** $\frac{1}{2}\times 5\times 5+\frac{1}{2}\times(T-5+(T-20))\times 5=400$ **OR** $\frac{1}{2}\times(T-15+(T-20))\times 5+\frac{1}{2}\times 15\times 5=400$ **OR e.g.** $\frac{1}{2}\times 1\times 5^2+(T-20)\times 5+(5\times 15-\frac{1}{2}\times\frac{1}{3}\times 15^2)=400$ (*suvat*)	A1	1.1b
	$T=90$	A1	1.1b
		(3)	
(b)	e.g. The change from constant acceleration to constant speed (zero acceleration) will not be instantaneous. The change from constant speed to constant deceleration will not be instantaneous. The runner is unlikely to maintain constant speed. The runner is unlikely to maintain constant acceleration or deceleration The timing(s) may not be exact. Air or wind resistance on the runner. The runner is unlikely to run in a straight line (obstacles in the road) Any physical limitation of the runner or the terrain e.g. smoothness of the road i.e. bumps in the road. The runner may run more than 400 m. Traffic on the road.	B1	3.5b
		(1)	
			(Total 4 marks)

Notes:

(a)

M1: Must cover the total distance.
If using areas, must be using a correct formula for a triangle and/or a trapezium
e.g. if ½ is missing then M0.

A1: Correct unsimplified equation in T (allow T replaced by e.g. t throughout)

A1: Cao, allow $t = 90$

(b)

B1: Any appropriate limitation of the model.
B0 if incorrect extra answer(s) are included:
e.g. the road not being straight, friction from the road, the road not being horizontal, the road not being flat