(b) When $n = 2$, $s = 17$

$17 = u + 2a - \frac{1}{2}a$

$u + 1\frac{1}{2}a = 17$

When $n = 7$, $s = 47$

$47 = u + 7a - \frac{1}{2}a$

$u + 6\frac{1}{2}a = 47$

Solving these gives $a = 6$, $u = 8$

(i) $n = 10$

$s = u + an - \frac{1}{2}a$

$= 8 + (6)(10) - \frac{1}{2}(6)$

$= 65$ m

(ii) $n = n$

$s = 8 + 6n - \frac{1}{2}(6)$

$= (6n + 5)$ m

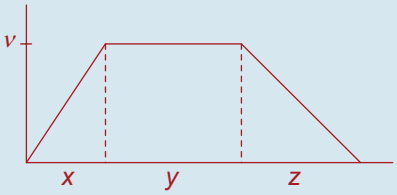
(c) $s_n + s_{n+1} = 256$

$6n + 5 + 6(n + 1) + 5 = 256$

$n = 20$

Answer: In the 20th and 21st seconds

Q. 7.



Average speed $= \frac{\text{total distance}}{\text{total time}}$

$= \frac{\frac{1}{2}xv + yv + \frac{1}{2}zv}{x + y + z}$

$= \frac{5v}{6}$

$\therefore 5xv + 5yv + 5zv = 3xv + 6yv + 3zv$

$\therefore 5x + 5y + 5z = 3x + 6y + 3z$

$\therefore 2x + 2z = y$

$\therefore x + z = \frac{1}{2}y$

Fraction of distance travelled at constant speed $= \frac{yv}{\frac{1}{2}xv + yv + \frac{1}{2}zv}$

$= \frac{y}{\frac{1}{2}x + y + \frac{1}{2}z}$

$= \frac{2y}{x + 2y + z}$

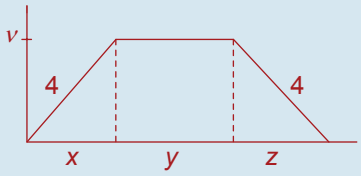
$= \frac{2y}{(x + z) + 2y}$

$= \frac{2y}{\frac{1}{2}y + 2y}$

$= \frac{2y}{2\frac{1}{2}y}$

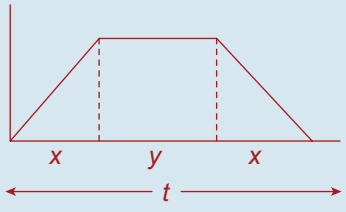
$= \frac{4}{5}$ **QED**

Q. 8. (i)



(ii) $v = 4x = 4z$

$\therefore x = z$ and $v = 4x$



$2x + y = t$

$\therefore x = \frac{t - y}{2}$

$\therefore v = 4x = 2(t - y)$

Area under curve $= d$

$\frac{1}{2}\left(\frac{t - y}{2}\right)(2(t - y)) + y(2)(t - y) + \frac{1}{2}\left(\frac{t - y}{2}\right)(2(t - y)) = d$

$\therefore \frac{1}{2}(t - y)^2 + 2yt - 2y^2 + \frac{1}{2}(t - y)^2 = d$

$\therefore (t - y)^2 + 2yt - 2y^2 = d$

$\therefore t^2 - 2yt + y^2 + 2yt - 2y^2 = d$

$\therefore t^2 - y^2 = d$

$\therefore y^2 = t^2 - d$

$\therefore y = \sqrt{t^2 - d}$ **QED**