$70 = u\left(\frac{10}{7}\right) - 4.9\,\frac{100}{49}$

$\therefore\ 70 = \frac{10u}{7} - 10$

$\therefore\ u = 56$ m/s

Q. 6. (i) $u = u,\quad a = -9.8,\quad s = -30,\quad t = 5$

$s = ut + \frac{1}{2}at^2$

$\therefore\ -30 = 5u + \frac{1}{2}(-9.8)(25)$

$\therefore\ 92.5 = 5u$

$\therefore\ u = 18.5$ m/s

(ii) $v = u + at$

$= 18.5 + (-9.8)(5)$

$= -30.5$

$\therefore$ Speed $= 30.5$ m/s

Q. 7. $49t - 4.9t^2 = 78.4$

$\therefore\ 10t - t^2 = 16$

$\therefore\ t^2 - 10t + 16 = 0$

$\therefore\ (t - 2)(t - 8) = 0$

$\therefore\ t = 2, 8$

$\therefore\ t_1 = 2,\ t_2 = 8$

$\therefore\ t_1 + t_2 = 10$ **QED**

OR

$t_1 + t_2 = -\frac{b}{a}$

$\therefore\ t_1 + t_2 = -\frac{(-10)}{1}$

$\therefore\ t_1 + t_2 = 10$

Q. 8. $70t - 4.9t^2 = 210$

$\therefore\ 700t - 49t^2 = 2{,}100$

$\therefore\ 7t^2 - 100t + 300 = 0$

Product of roots $= \frac{c}{a}$

$\therefore\ t_1\,t_2 = \frac{300}{7}$

$\therefore\ 7\,t_1\,t_2 = 300$ **QED**

Exercise 2E

Q. 1. $s = d,\quad t = n,\quad u = 0,\quad a = a$

$s = ut + \frac{1}{2}at^2$

$d = \frac{1}{2}an^2$ ... **Equation A**

$a = d + k,\quad t = 2n,\quad u = 0,\quad a = a$

$s = ut + \frac{1}{2}at^2$

$d + k = \frac{1}{2}a(2n)^2$

$d + k = 2an^2$ ... **Equation B**

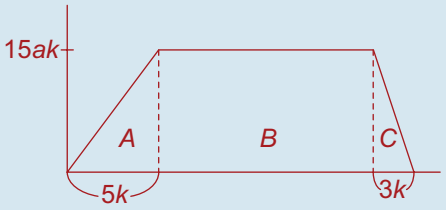
$4 \times$ **Equation A** $\Rightarrow\quad 2an^2 = 4d$

But $2an^2 = d + k$

$\therefore\ d + k = 4d$

$k = 3d$ **QED**

Q. 2. (i)



Distance in $A = \frac{1}{2}(5k)(15ak) = 37\frac{1}{2}ak^2$

Distance in $C = \frac{1}{2}(3k)(15ak) = 22\frac{1}{2}ak^2$

Remainder $= 90ak^2 - 37\frac{1}{2}ak^2 - 22\frac{1}{2}ak^2$

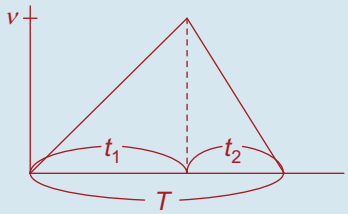
$= 30ak^2$

Time for $B = \frac{30ak^2}{15ak} = 2k$ s

Total time $= 5k + 2k + 3k$

$= 10k$ s

(ii)



Let T = the total time

$t_1 : t_2 = d : a = 5a : 3a = \frac{5}{8} : \frac{3}{8}$

$\therefore\ t_1 = \frac{5}{8}T$ and $t_2 = \frac{3}{8}T$

$v = u + at$

$v = 0 + (3a)\left(\frac{5}{8}T\right) = \frac{15}{8}aT$

Area $= 90ak^2$

$\frac{1}{2}(T)\left(\frac{15}{8}aT\right) = 90ak^2$

$T^2 = 96k^2$

$T = 4\sqrt{6}\,k$