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# 9.3 : Constant acceleration formulae 1

1) $u = 3$, $a = 5$, $t = 10$

$v = u + at$

$v = 3 + (5)(10) = 3 + 50$

$v = 53 ms^{-1}$

2) $u = 9$, $v = 0$, $t = 20$

$v = u + at$

$0 = 9 + a(20) = 20a + 9 = 0$

$20a = -9$

$a = -9/20 = -0.45$

$a = 0.45 ms^{-2}$

3) $u = 1.2$, $v = 6.8$, $t = 7$

$s = \left(\frac{1.2 + 6.8}{2}\right) \times 7$

$s = 28m$

4) $S = 720$, $u = 26$, $v = 10$

$s = \frac{u+v}{2} \times t$

$\frac{26+10}{2} \times t = 720$ $t = 40$seconds

5) $v = 1.8$, $a = -2.4$, $t = 8$

$v = u + at$

$1.8 = u + (-2.4)(8)$

$u - 19.2 = 1.8$

$u = 21 ms^{-1}$

6) $S = 120$, $u = 4.5$, $t = 15$

$\left(\frac{4.5 + v}{2}\right) \times 15 = 120$

$4.5 + v = 16$

$v = 11.5 ms^{-2}$

7) a) $u = 4$, $v = 14$, $a = 4$

$v = u + at$ $t = 2.5$seconds.

$14 = 4 + 4t$

$4t = 10$

b) $\left(\frac{4+14}{2}\right) \times 2.5 = 22.5m$

8) a) $S = 400$, $u = 14$, $v = 18$, $t = 25$

$\left(\frac{u+18}{2}\right) \times 25 = 400$

$\left(\frac{u+18}{2}\right) = 16$ $u + 18 = 32$

$u = 14 ms^{-1}$

b) $v = u + at$

$18 = 14 + a(25)$

$25a = 4$

$a = 0.16 ms^{-2}$

9) a) $u = 0$, $v = 15$, $a = \frac{1}{2}$, $t = 30$

$v = u + at$

$15 = 0 + a(30)$

$30a = 15$

$a = 0.5 ms^{-2}$

b) $S = \left(\frac{0+15}{2}\right) \times 30 = 225m$

c) $u = 0$, $a = 0.5$, $t = 20$

$v = u + at$

$v = 0 + (0.5)(20$

$v = 10 ms^{-1}$

d) $\left(\frac{0+10}{2}\right) \times 20 = 100m$

10) a) $S = 360$, $u = 68.4$, $v = 32.4$

$\left(\frac{19+9}{2}\right) \times t = 360$

$14 \times t = 360$

$t = 40$seconds.

b) $v = u + at$

$9 = 19 + a(40)$

$40a = -10$

$a = -0.4$

$4a = 0.4 ms^{-2}$

11) Alex:

$u = 0$, $v = 8$, $t =$, $S = 1000m$

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

$a = \frac{8-0}{20} = 0.4 ms^{-2}$

$d = 0 + \frac{1}{2}(0.4)(20) = 0.2 \times 400m = 80m$

$1000m - 80m = 920m$

$t = \frac{d}{v} = \frac{920}{8} = 115s + 20s =$ 135seconds Alex time

Ben: $a = \frac{9-0}{50} = 0.18$

$S = 0 + \frac{1}{2}(0.18)(50)^2 = 225m$

$1000 - 225 = 775m$ $\frac{775m}{9} = 86.11s$

$50 + 86.11 = 136.11s$ Ben time

$135 < 136.11s$

- Alex wins the race.

12) a) $S = ut + \frac{1}{2}at^2$

$57 = 22(3) + \frac{1}{2}(a)(3)^2$

$57 = 66 + \frac{1}{2}(a)(9)$

$57 = 66 + \frac{9}{2}a$

$a = -2 ms^{-2} \rightarrow 2 ms^{-2}$

b) $v^2 = u^2 + 2as$

$v = u + at$

$v = 22 + (-2)(3) = 22 - 6 = 16 ms^{-2}$

$v^2 = u^2 + 2as$

$0 = (16)^2 + 2(-2)$

$0 = 256 - 4s$

$4s = 256$

$s = 64m$

$AC = 57 + 64 = 121m$.

a) $t = 5$

13 $15 = u + 5a$

$29 = u + 15a$

$3u - u = (3 \times 15) - 29 \Rightarrow u = 8 ms^{-1}$

$a = 1.4 ms^{-2}$.

b) A to B $= 0.5 \times (8 + 15) = 0.5 \times 23 = 11.5 ms^{-1}$

$AB = 11.5 \times 5 = 57.5m$.

B to C $= 0.5 \times (15 + 29) = 0.5 \times 44 = 22 ms^{-1}$

$15 - 5 = 10$ $BC = 22 \times 10 = 220m$

AB : BC

57.5 : 220

23 : 88.