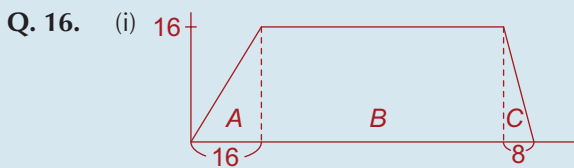
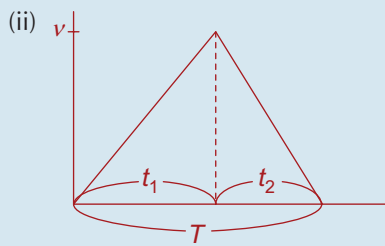


**Q. 15.** 1st part:  $s = ut + \frac{1}{2}at^2$   
 $24 = u(2) + \frac{1}{2}a(2)^2$   
 $u + a = 12$   
 1st and 2nd parts:  $48 = u(3) + \frac{1}{2}a(3)^2$   
 $2u + 3a = 32$   
 Solving these gives  $a = 8, u = 4$   
 First three parts:  $72 = 4t + \frac{1}{2}(8)t^2$   
 $t^2 + t - 18 = 0$   
 $t = 3.772$  ( $t = -4.772$  is rejected)  
 Time taken =  $3.772 - 3$   
 $= 0.772$  s



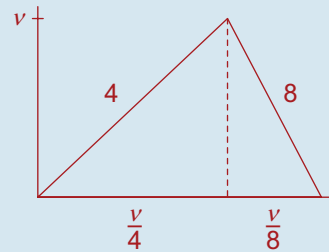
Distance in A =  $\frac{1}{2}(16)(16) = 128$  m  
 Distance in C =  $\frac{1}{2}(8)(16) = 64$  m  
 Total distance travelled = 192 m  
 Remainder for B =  $300 - 192$   
 $= 108$  m  
 Time taken =  $\frac{108}{16} = 6.75$  s  
 Total time =  $16 + 6.75 + 8$   
 $= 30.75$  s



Let  $T =$  the time taken  
 $t_1 : t_2 = d : a = 2 : 1 = \frac{2}{3} : \frac{1}{3}$   
 $\therefore t_1 = \frac{2}{3}T$  and  $t_2 = \frac{1}{3}T$   
 $v = u + at$   
 $v = 0 + (1)\left(\frac{2}{3}T\right) = \frac{2}{3}T$   
 Area = 300  
 $\frac{1}{2}(T)\left(\frac{2}{3}T\right) = 300$   
 $T = 30$  s

**Q. 17.** (i)  $s_1 = 0 + \frac{1}{2}\left(\frac{1}{2}\right)t^2 = \frac{1}{4}t^2$   
 $s_2 = 0 + \frac{1}{2}(1)t^2 = \frac{1}{2}t^2$   
 Distance apart,  $s = s_1 + s_2$   
 $= \frac{3}{4}t^2$   
 When  $t = 10, s = \frac{3}{4}(100) = 75$  m  
 (ii) When  $s = 108$   
 $\frac{3}{4}t^2 = 108$   
 $t^2 = 144$   
 $t = 12$  s  
 This is  $12 - 10 = 2$  seconds later

**Q. 18.** Let  $v =$  top speed



$\frac{1}{2}\left(\frac{v}{4} + \frac{v}{8}\right)v = 1,200$   
 $\frac{1}{2}\left(\frac{3v}{8}\right)v = 1,200$   
 $\frac{3v^2}{16} = 1,200$   
 $v^2 = 6,400$   
 $v = 80$  m/s  
 $\therefore$  Time =  $\frac{v}{4} + \frac{v}{8} = \frac{80}{4} + \frac{80}{8} = 30$  s

**Q. 19.** Let  $t =$  time after cyclist passes  $P$

Greatest gap  $v_1 = v_2$   
 $12 = 0 + 1(t - 5)$   
 $t = 17$

at  $t = 17, s_1 = 12(17) = 204$  m  
 $s_2 = \frac{1}{2}(1)(17 - 5)^2 = 72$  m  
 Gap =  $204 - 72 = 132$  m

**Q. 20.** Greatest gap  $\Rightarrow v_1 = v_2$   
 $8 + 4t = 30 + 3(t - 2)$   
 $8 + 4t = 30 + 3t - 6$   
 $t = 16$

at  $t = 16, s_1 = 8(16) + \frac{1}{2}(4)(16)^2 = 640$   
 at  $t = 16 - 2 = 14,$   
 $s_2 = 30(14) + \frac{1}{2}(3)(14)^2 = 714$   
 Gap =  $714 - 640 = 74$  m **QED**