

69. The speed of the spaceship after the first increment is  $v_1 = 0.5c$ . After the second one, it becomes

$$v_2 = \frac{v' + v_1}{1 + v'v_1/c^2} = \frac{0.50c + 0.50c}{1 + (0.50c)^2/c^2} = 0.80c ,$$

and after the third one, the speed is

$$v_3 = \frac{v' + v_2}{1 + v'v_2/c^2} = \frac{0.50c + 0.50c}{1 + (0.50c)(0.80c)/c^2} = 0.929c .$$

Continuing with this process, we get  $v_4 = 0.976c$ ,  $v_5 = 0.992c$ ,  $v_6 = 0.997c$  and  $v_7 = 0.999c$ . Thus, seven increments are needed.