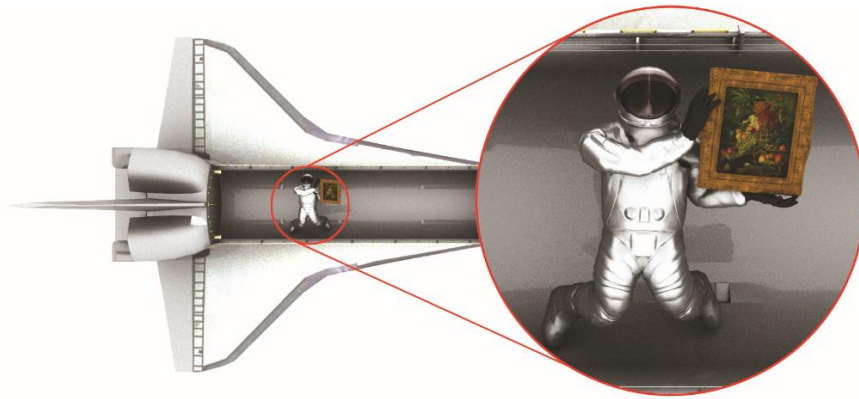


Question 114

An astronaut hangs a picture on the wall of a spacecraft that is moving uniformly at $0.85c$.



The length of the picture is 42 cm, and the width is 35 cm in the reference frame of the astronaut.

- (a) Calculate the width of the picture in the reference frame of a stationary observer on Earth who is viewing the picture through a powerful telescope.

(2 marks) KA4

- (b) State the length of the picture in the reference frame of the stationary observer on Earth and give a reason for your answer.

(2 marks) KA2

114	(a)	$l = l_0 \times \sqrt{\left(1 - \frac{v^2}{c^2}\right)}$ $l = 35 \times \sqrt{\left(1 - \frac{(0.85 \times 3 \times 10^8)^2}{(3 \times 10^8)^2}\right)}$ $l = 18.4 \text{ cm}$	1 1
	(b)	0.42 m The length of the picture is unchanged as the picture is only contracted in the direction parallel to the motion of the spacecraft.	1 1
	(c)	$l_0 = \frac{1}{\sqrt{\left(1 - \frac{v^2}{c^2}\right)}} \times l$ $l_0 = \frac{1}{\sqrt{\left(1 - \frac{(0.85 \times 3 \times 10^8)^2}{(3 \times 10^8)^2}\right)}} \times 0.95$ $l_0 = 1.80 \text{ m}$	1 1