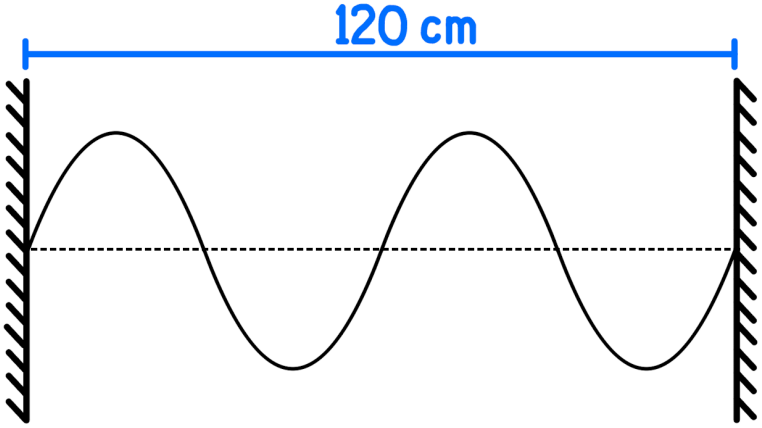
A standing wave with a frequency of 500 Hz is created in a string fixed at both ends as shown.



a) What is the wave speed on the string?

b) What are the frequencies of the next three harmonics?

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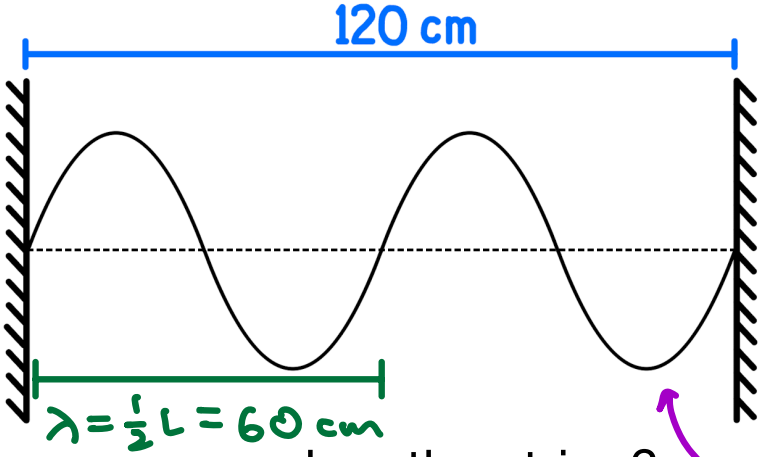


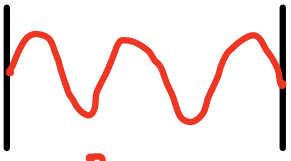
a) What is the wave speed on the string?

$\lambda_4 = 0.6$ m
$f_4 = 500$ Hz

$v = \lambda_4 f_4 = (0.6)(500)$
$= \boxed{300 \text{ m/s}}$

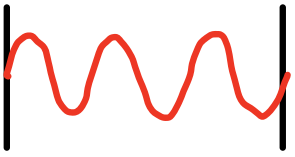
b) What are the frequencies of the next three harmonics?

METHOD 1:



$\lambda_5 = \frac{2}{5}L = 0.48$ m

$f_5 = \frac{v}{\lambda_5} = \frac{300}{0.48} = \boxed{625 \text{ Hz}}$



$\lambda_6 = \frac{1}{3}L = 0.4$ m

$f_6 = \frac{v}{\lambda_6} = \frac{300}{0.4} = \boxed{750 \text{ Hz}}$

$\lambda_7 = \frac{2}{7}L = 0.343$ m

$f_7 = \frac{v}{\lambda_7} = \frac{300}{0.343} = \boxed{875 \text{ Hz}}$

METHOD 2:

$f_1 = \frac{1}{4} f_4$

$= \frac{1}{4}(500)$

$= 125$ Hz

$f_5 = 5 \cdot f_1 = 5(125)$

$= \boxed{625 \text{ Hz}}$

$f_6 = 6 \cdot f_1 = 6(125)$

$= \boxed{750 \text{ Hz}}$

$f_7 = 7 \cdot f_1 = 7(125)$

$= \boxed{875 \text{ Hz}}$