2011

9 (b) A uniform solid cylinder floats upright with $\frac{1}{3}$ of its axis immersed when placed in liquid A.

When placed in liquid B, the uniform solid cylinder floats upright with $\frac{3}{5}$ of its axis immersed.

What fraction of the cylinder's axis is immersed when the cylinder floats upright in a uniform mixture of equal volumes of the two liquids?

A	$B_A = W$	
	$\frac{\frac{1}{3}Ws_A}{s} = W$	
	$\Rightarrow s_A = 3s$	5
B	$B_B = W$	
	$\frac{\frac{3}{5}Ws_B}{s} = W$	
	$\Rightarrow s_B = \frac{5}{3}s$	5
A + B	$B_M = W$	
	$\frac{yWs_M}{s} = W$	
	$\Rightarrow s_M = \frac{1}{y}s$	5
	$s_A V + s_B V = s_M(2V)$	5
	$s_A + s_B = 2s_M$	
	$3s + \frac{5}{3}s = \frac{2}{y}s$	5
	$\frac{14}{3}s = \frac{2}{y}s$	
	$\Rightarrow y = \frac{3}{7}$	5

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