Question			Answer	Marks	AOs	Guidance	
11	**(a)**		Resultant force from the tug boats is positive so it is moving east	**E1**	**2.2a**	$(600\mathbf{i})$	
			There is zero resultant force in the **j** direction, so it is not moving north or south	**E1**	**2.2a**		
				[2]			
11	**(b)**		$350 + 250 - 200 = 100000a$	**M1**	**3.3**	Use $F = ma$. Allow sign errors and one missing force	
			Obtain $0.004\,\mathrm{m\,s^{-2}}$	**A1**	**1.1**		
				[2]			
11	**(c)**		$400 = 1.5t + \dfrac{1}{2}(0.004)t^2$	**M1**	**3.1b**	Use $s = ut + \frac{1}{2}at^2$	
			$0.002t^2 + 1.5t - 400 = 0$	**A1**	**1.1**	Obtain correct quadratic. Any equivalent form	
				M1	**3.4**	Use any method to solve their quadratic	Including BC
			Obtain 209 (seconds)	**A1**	**1.1**	If negative root given (-958.63088) this must be clearly discarded	Accept better (208.630877) but not 208
			$v^2 = 1.5^2 + 2(0.004)(400)$	**M1**	**3.4**	Use $v^2 = u^2 + 2as$ with their a or $v = u + at$ with their a and t	
			Obtain 2.33 ($\mathrm{m\,s^{-1}}$)	**A1**	**1.1**	Accept better (2.3345235)	
				[6]			