Question Number	Scheme	Marks
2(a)	$v=\dfrac{\mathrm{d}x}{\mathrm{d}t}=\dfrac{1}{(4x+3)}$	
	$\dfrac{\mathrm{d}t}{\mathrm{d}x}=4x+3$	
	$t=\int(4x+3)\mathrm{d}x,=\dfrac{1}{2}\times 4x^2+3x+c$	
	OR $\int_0^2 \mathrm{d}t=\int_0^X(4x+3)\mathrm{d}x,=\left[\dfrac{1}{2}\times 4x^2+3x\right]_0^X$	M1,dM1A1
	$c=0$	
	$t=2=\dfrac{1}{2}\times 4x^2+3x \quad 2x^2+3x-2=0$	dM1
	$x=\dfrac{1}{2}\ (x=-2)$	A1cso (5)
(b)	$a=v\dfrac{\mathrm{d}v}{\mathrm{d}x}$ $\quad alt:\quad a=\dfrac{d}{dx}\left(\dfrac{1}{2}v^2\right)$	M1
	$=\dfrac{1}{4x+3}\times\dfrac{-4}{(4x+3)^2}$	dM1A1
	$\lvert F\rvert=\dfrac{1}{2}\times\dfrac{4}{(2+3)^3}=\dfrac{2}{125}=0.016\,\mathrm{N}$	M1 A1cso (5)
		[10]

(a)	
M1	Rewrite as $\dfrac{dx}{dt}$ **and** separate variables to reach a form ready for integration
dM1	Attempt the integration (at least one power going up).
A1	Correct integration. Constant/limits not needed.
dM1	Use $t=2$ in their expression or substitute correct limits, and solve their 3 term quadratic to find x. If solving an incorrect quadratic, evidence of a correct method must be seen. Depends on the previous M mark.
A1cso	Obtain $x=\dfrac{1}{2}$ (and reject -2 if seen) from completely correct work. Constant of integration must have been seen, although we do not need to see evidence of evaluation.
(b)	
M1	Use $a=v\dfrac{\mathrm{d}v}{\mathrm{d}x}$
dM1	Differentiate the given expression for v and obtain an expression for a. We need to see a power of 2 (or a power of 3 if using $\dfrac{d}{dx}\left(\dfrac{1}{2}v^2\right)$). Depends on the previous M mark.
A1	Correct expression, any form.
M1	Use their acceleration in an equation of motion to obtain a value for F. Mass must be included and they must use their value of x. Independent, but must have found an expression for acceleration.
A1cso	Correct magnitude of F. Correct solution only. Can be fraction or decimal. Must be positive.

3 (a)	$\angle PBA=30°$	B1