

Question	Scheme	Marks	AOs
<b>13(a)</b>	$R = \sqrt{109}$	B1	1.1b
	$\tan \alpha = \frac{3}{10}$	M1	1.1b
	$\alpha = 16.70^\circ$ so $\sqrt{109} \cos(\theta + 16.70^\circ)$	A1	1.1b
		<b>(3)</b>	
<b>(b)</b>	(i) e.g. $H = 11 - 10 \cos(80t)^\circ + 3 \sin(80t)^\circ$ or $H = 11 - \sqrt{109} \cos(80t + 16.70)^\circ$	B1	3.3
	(ii) $11 + \sqrt{109}$ or 21.44 m	B1ft	3.4
		<b>(2)</b>	
<b>(c)</b>	Sets $80t + "16.70" = 540$	M1	3.4
	$t = \frac{540 - "16.70"}{80} = (6.54)$	M1	1.1b
	$t = 6$ mins 32 seconds	A1	1.1b
		<b>(3)</b>	
<b>(d)</b>	Increase the '80' in the formula For example use $H = 11 - 10 \cos(90t)^\circ + 3 \sin(90t)^\circ$		3.3
		<b>(1)</b>	

**(9 marks)**

**Notes:**

**(a)**

**B1:**  $R = \sqrt{109}$  Do not allow decimal equivalents

**M1:** Allow for  $\tan \alpha = \pm \frac{3}{10}$

**A1:**  $\alpha = 16.70^\circ$

**(b)(i)**

**B1:** see scheme

**(b)(ii)**

**B1ft:** their  $11 +$  their  $\sqrt{109}$  Allow decimals here.

**(c)**

**M1:** Sets  $80t + "16.70" = 540$ . Follow through on their 16.70

**M1:** Solves their  $80t + "16.70" = 540$  correctly to find  $t$

**A1:**  $t = 6$  mins 32 seconds

**(d)**

**B1:** States that to increase the speed of the wheel the 80's in the equation would need to be increased.