

Question		Answer	Marks	AO	Guidance	
9	(a)		<b>M1*</b>	<b>2.1</b>	Resolve vertically <b>or</b> horizontally – correct number of relevant terms. Allow sign errors and sin/cos mix but must be using correct angles	
		$R(\uparrow) : \pm(12 \cos 20 + 17 \cos 50)$	<b>A1</b>	<b>1.1</b>	Need not be simplified	$\pm 22.20370081\dots$
		$R(\rightarrow) : \pm(17 \sin 50 - 12 \sin 20)$	<b>A1</b>	<b>1.1</b>	Need not be simplified	$\pm 8.918513813\dots$
		Magnitude is $\sqrt{(12 \cos 20 + 17 \cos 50)^2 + (17 \sin 50 - 12 \sin 20)^2}$	<b>M1dep*</b>	<b>3.4</b>	Correct method to calculate magnitude from expressions with the correct number of relevant terms	
		$\tan \theta = \frac{17 \sin 50 - 12 \sin 20}{12 \cos 20 + 17 \cos 50}$	<b>M1dep*</b>	<b>3.4</b>	Correct method to calculate a relevant angle (so allow reciprocal) from expressions with the correct number of relevant terms	
		Resultant force is 23.9 (N) on a bearing of 022(°)	<b>A1</b>	<b>2.2a</b>	awrt 23.9 <b>and</b> awrt 022 (so 021.9 is okay but 21.9 is <b>A0</b> )	23.927896... 21.883744...
		<b>Alternative method</b>				
		$R^2 = 17^2 + 12^2 - 2(17)(12) \cos \alpha$	<b>M1*</b>		Correct cosine rule with any angle $\alpha$	
		$R^2 = 17^2 + 12^2 - 2(17)(12) \cos 110$	<b>B1 A1</b>		<b>B1</b> for correct angle of 110 seen, <b>A1</b> for correct expression for $R$ or $R^2$	110 may be seen on a diagram
		$\frac{\sin \theta}{12} = \frac{\sin \alpha}{R}$ or $\cos \theta = \frac{R^2 + 17^2 - 12^2}{2 \times R \times 17}$	<b>M1dep*</b>		Correct sine rule with their $\alpha$ or correct cosine rule	If correct $\theta = 28.11625\dots$
Bearing = $50 - \theta$	<b>M1dep*</b>		Correct calculation for bearing	<b>Dep. both M marks</b>		
Resultant force is 23.9 (N) on a bearing of 022(°)	<b>A1</b>		awrt 23.9 and awrt 022 (so 021.9 is okay but 21.9 is <b>A0</b> )			
		<b>[6]</b>				

Question			Answer	Marks	AO	Guidance	
9	(b)		<p>Magnitude of <b>F</b> is 23.9 (N)</p> <p>On a bearing of 202(°)</p>	<p><b>B1FT</b></p> <p><b>B1FT</b></p>	<p><b>1.2</b></p> <p><b>3.1b</b></p>	<p>Follow through their resultant in (a)</p> <p>Follow through the answer to (a) – if <math>0 &lt; \theta &lt; 180</math> then FT is <math>180 + \theta</math> and if <math>180 &lt; \theta &lt; 360</math> then FT is <math>\theta - 180</math></p>	<p><b>As in part (a) their bearing must be at least three figures (with leading zeros if necessary) but allow greater accuracy</b></p>
				[2]			