

Resolving Non-Perpendicular Forces at a Point (From OCR 4728)

Q1, (Jan 2007, Q2)

(i)	M1 15 x 0.28 and 11x 0.8 Y= 15x0.28 + 11x0.8 - 13 Component is zero AG	A1 A1ft A1	4	For resolving forces vertically Allow use of = 16.3 and =53.1 Ft cv(15 x 0.28 and 11x 0.8) SR 15sin + 11sin -13 = 0 gets M1A0A1ftA0
(ii)	X = 15 x 0.96 – 11 x 0.6 Magnitude is 7.8N	M1 A1 A1	3	For resolving forces horizontally Allow use of = 16.3 and =53.1 Accept 7.79, -7.8
(iii)	Direction is that of the (+ve) x -axis	B1	1	Do not allow horizontal, 90° from vertical. Do not award if = 16.3 and =53.1 have been used.

Q2, (Jan 2009, Q3)

(i)	5cos30 or 5 sin 60 or 4.33 5cos 60 or 5sin30 or 2.5	B1 B1 [2]	Order immaterial, accept +/- . May be awarded in (ii) if no attempt in (i)
(ii)	7-4.33 (= 2.67) and 9 - 2.5 (= 6.5) $R^2 = 2.67^2 + 6.5^2$ R = 7.03 $\tan\theta = 6.5/2.67$ $\theta = 67.6, 67.7\text{degrees}$	M1* A1 D*M 1 A1 D*M 1 A1 [6]	Subtracts either component from either force 3sf or better Valid trig for correct angle 3sf or better

Q3, (Jun 2010, Q3)

i	H = +/- (9 - 5cos60) H = 6.5 N	AG	M1 A1 [2]	+/- (9 + 5cos120)
ii	V = +/- (12 - 5sin60) V = 7.67 N		M1 A1 [2]	+/- (12 + 5cos150) Accept 7.666 or better, or 7.6 recurring
iii	$R^2 = 6.5^2 + 7.67^2$ R = 10.1 N $\tan A = 6.5/7.67$ or $7.67/6.5$ A = 40(.3) or 49.7 Bearing = 320°		M1 A1 M1 A1 A1 [5]	Uses Pythagoras on forces V(ii) and 6.5 10.053.. Uses trigonometry in relevant triangle May be implied by final answer As this is not a final answer, exact accuracy is not an issue Or better

Q4, (Jun 2012, Q1)

(i)	$F^2 = 17^2 - 8^2$ $F = 15$ $\cos\alpha = 8/17$ $\alpha = 61.9^\circ$	M1 A1 M1 A1 [4]	$F^2 = 17^2 +/- 8^2$ Exact accept 15.0 Correct method for angle between 8 N and 17 N forces Accept 62° from correct work
(ii)	$E = 17$ Angle = $118(.1)^\circ$ OR 242° (241.9°)	B1 B1 FT [2]	Exact $180 - cv(\alpha(i))$ OR $180 + cv(\alpha(i))$ Must be 3sf or better

Q5, (Jun 2014, Q2)

(i)	$2.5\sin\theta = 2.4$ $\theta = 73.7$ $2.5\cos\theta = F$ $F = 0.7$ OR $2.4^2 + F^2 = 2.5^2$ or $F^2 = 2.5^2 - 2.4^2$ $F = 0.7$	M1 A1 M1 A1 [4] M1 A1	$2.5\cos\theta = 2.4$ Accept 74 $F = 2.5\sin\theta$, opposite to that above Exact, but allow 0.702 (3 sf) $\theta = 73.7$	$2.5\cos\theta = 2.4$ M1 hence $\theta = 16.3$ A0 $2.5\sin\theta = F$ M1 hence $F = 0.7(00)$ A1 SC F can then be used to find θ
(ii)	$2.4 = 0.2a$ $a = 12 \text{ ms}^{-2}$ Bearing $(0)90^\circ$ OR "To right", "opposite old 2.4 N force" etc	M1 A1 B1 [3]	N2L, Any horizontal force other than F , 0.7, 2.5 (Do not treat removing/using 2.5 as a MR) 12.0 from $2.5\sin 73.7 / 0.2$ Angle value other than exactly 90° or 0° B0 Allow B1 for force dirn, if accn not found	Including g, automatically M0 Horizontal is B0 (ambiguous)

Q6, (Jun 2015, Q4)

(i)	$x = +/- (10 - 6\cos 70)$, $y = 6\sin 70$ OR $+/- (10\cos 70 - 6)$, $10\sin 70$ OR correct resolving in 2 perpendicular directions $R^2 = \{+/- (10 - 6\cos 70)\}^2 + (6\sin 70)^2 =$ $\{+/- (10\cos 70 - 6)\}^2 + (10\sin 70)^2$ $R = 9.74 \text{ N}$ $\text{Tan } \alpha = (6\cos 70)/(10 - 6\sin 70)$ $\alpha = 35.4^\circ$	B1,B1 M1 A1 M1 A1 [6]	$10\cos 55 + 6\cos 55 (= 9.177)$ $+/- (10\sin 55 - 6\sin 55) (= +/- 3.2766)$ $R^2 = (10\cos 55 + 6\cos 55)^2 +$ $(10\sin 55 - 6\sin 55)^2$ $R = 9.74 \text{ N}$ www	B1 B1 $R = 9.74 \text{ N}$ $\text{Sin } \alpha / 6 = \sin 70 / 9.744$ $\alpha = 35.4^\circ$ M1 B1 B1 A1 M1 A1
(ii)	$\text{Force} = (20 - 9.74) = 10.3 \text{ N}$	B1ft [1]	Difference of weight and Resultant ft $20 - cv(9.74)$	
(iii)	$\text{Tan } \theta = +/- (10 - 6\cos 70) / 6\sin 70$ OR $\text{Tan } \phi = +/- (6\sin 70) / (10 - 6\cos 70)$ $\text{Angle} = 54.6^\circ$	M1 A1 [2]	Uses resultant is vertical	$\text{Angle} = 90 - cv(35.4)$ $\text{Angle} = 54.6^\circ$ M1 A1