Forces

Mark Scheme 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Forces
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: **47 minutes**

Score: **/39**

Percentage: **/100**

1	**(a)**	Size / magnitude (NOT distance) and direction	B1	
	(b)	Vectors towards East and North with arrows correct by eye	B1	
		Complete triangle or rectangle for candidate's vectors	B1	
		Resultant with correct arrow	B1	
		Resultant 94 to 96 m/s by scale OR 95 m/s by calculation *Unit penalty applies	B1	
		Angle measured 13.5° – 15.5° OR 15° by calculation *Unit penalty applies	B1	**[6]**
		*Apply unit penalty once only		
2	**(a)**	No resultant/net force OR no resultant force in any direction OR no resultant force in any two perpendicular directions	B1	
		No resultant/net moment/turning effect/couple/torque OR (total) clockwise moment = (total) anticlockwise moment	B1	
		Either order		
	(b) **(i)**	F × 120 / F × 0.12	C1	
		= 20 × 500 OR 20 × 0.5	C1	
		F = 83.3 N at least 2 significant figures. Allow $83\frac{1}{3}$ *Unit penalty applies	A1	
	(ii)	F/A or in words OR 83.3/0.0036 ecf from **(b)(i)**	C1	
		= 23100 Pa / N/m^2 OR 2.31 N/cm^2 OR 23.1 kPa *Unit penalty applies	A1	**[7]**
		*Apply unit penalty once only		

3 **(a** horizontal by eye M1
arrow to left A1
idea of airliner accelerating/changing direction AND caused by force in that direction o.w.t.t.e. OR centripetal force
OR force/acceleration towards centre of circle B1 [3]

(b) 2 lines approximately length ratio 1.16:1 at 30°/150° to each other M1
parallelogram with line across short diagonal/triangle with original lines at 30° M1
resultant to the left, horizontal by eye A1 [3]
for first two marks ignore arrows, ignore labels unless they clarify an otherwise confusing diagram

calculation route
both forces used in cosine rule (M1)
3rd force from previous line and correct angle used in sine rule (M1)
calculation shows horizontal resultant (A1)

(c) direction changing B1
(therefore) velocity changing or speed/magnitude constant B1 [2]

4 **(a (i)** (a =) v/t **or** 65/26 C1
2.5 m/s^2 *Unit penalty applies A1

(ii) (F =)ma **or** 3.4 × 10^5 × 2.5 ecf from **3(a)(i)** C1
8.5 × 10^5 N *Unit penalty applies ecf from **3(a)(i)** A1

(b) (i) any two of: KE **or** GPE **or** heat/internal energy/thermal energy B2

(ii) chemical energy **not** heat B1

(iii) thermal energy/sound is lost (to the atmosphere) **or** KE of air B1

(c) perpendicular to path **or** towards centre of circle **or** centripetal B1 **[9]**

***Apply unit penalty once onl

5	**(a**	force AND perpendicular distance (of force) from the point.	B1	
	(b)	downward arrow at centre of bar	B1	
	(ii)	0.5(0) m / 50 cm		
	(iii)	40 × 1.2 OR 48 seen anywhere (+) 30 × 0.5 0R 15 seen anywhere = 63 N m	C1 C1 A	
	(iv)	F × 0.2 = 63 F = 63/0.2 = 315 N	C1 A1	
	(v)	make bar / B longer OR move pivot / stone to the left OR increase distance between force and pivot (by moving pivot to left) OR increase mass of the bar / B	B1	[9]