

- 1 (a) all four = 40 N OR all four add up to 160 N upwards B1  
B1
- (b)  $W \times 0.17/0.20/0.23 = 160 \times 0.72/0.75/0.78$  C1  
 $W \times 0.17 = 160 \times 0.78$  or 600 N C1  
730/734 N A1
- (ii) force by P = 160 + answer to (i) correctly evaluated B1
- all others = 0 B1

[Total: 7]

- 2 (a) (i) (note: diagram may be drawn in any orientation)  
sides correct length, by eye B1  
forces drawn at  $45^\circ$ , by eye B1  
parallelogram completed B1  
correct diagonal drawn / correct resultant if intersecting arcs shown B1
- (ii) magnitude: between 5500 N and 5700 B1  
direction: between  $28^\circ$  and  $32^\circ$  B1
- (b) (i) it has direction (as well as magnitude) B1
- (ii) any example which is clearly a vector B1 [8]

- 3 (a) 5 points correctly plotted  $\pm 1/2$  small square –1 e.e.o.o. (ignore 0,0) B2
- (b) 3 N one, however identified OR 3<sup>rd</sup> value OR 4<sup>th</sup> value B1
- (c) good straight line through origin and candidate's remaining points B1
- (d) straight line / constant gradient M1  
 does obey Hooke's Law A1  
 OR  
 special case: obeys Hooke's law because force  $\propto$  extension or wtte B1
- (e) graph becomes non-linear / curves / bends B1  
 Ignore reference to direction of curve or bend.
- (f) will have exceeded / reached proportional / elastic limit  
 OR permanently deformed or equiv OR staightened  
 OR will have broken OR no longer elastic or wtte B1

[8]

- 4 (a) in direction of the force Do not accept forward on is own. B1
- (b) changes direction / causes acceleration / stops straight line motion / keeps object from leaving circle / keeps path circular / pulls object into circle B1
- (c) ( 1. 600 N B1  
 2. same as his 1. accept 600 N if no value given i (c) (i) 1. B1
- (ii) ma OR  $60 \times 2.5$  C1  
 150 N A1
- (iii) 750 N e.c.f. from (c) (i) 2 and/or (c) (ii) B1
- (iv) same as his (c) (i) 2 accept 600 N if no value given in (c) (i) 2. B1

[8]