



Q	Answer	Marks
1	a) 25 m s^{-1} b) 1200 kg c) 0.0075 m s^{-1}	3
2	a) the size of the parcel is ignored, so its mass acts at a single point and it does not rotate b) the mass of the rope is ignored, so the tension is the same all along it c) the rope does not stretch, so the parcel moves with the same speed and acceleration as the end of the rope d) there is no friction between the parcel and the floor	4
3	a) 700 m b) 500 m on a bearing of 037° (036.9°) c) average speed 1.4 m s^{-1} , average velocity magnitude 1 m s^{-1}	5
4	a) 13 m s^{-1} b) 157°	4
5	a) $(22\mathbf{i} - 2\mathbf{j}) \text{ m}$ b) $t = 3$ c) 14 m	5
6	a) $(6\mathbf{i} - 4.5\mathbf{j}) \text{ km h}^{-1}$ b) 7.5 km h^{-1} c) 127°	6
7	a) $k = 1.25$ b) 5.30 m s^{-1}	5
8	a) $p = 5, q = 12$ b) 6.40 m s^{-2} c) 51.3°	6
9	a) the model ignores friction from the ice (and air resistance), so the resultant force in the model is larger than in reality b) it ignores the size and shape of the sledge, so air resistance and any turning of the sledge are not included c) include a friction force between the sledge and the ice (or include air resistance)	4
10	a) 10.2 km b) $\mathbf{b} - \mathbf{a} = (10 - 5t)\mathbf{i} + (2 + t)\mathbf{j}$ shown c) 14:00, 4 km apart	7
11	a) velocity $(4\mathbf{i} - 3\mathbf{j}) \text{ m s}^{-1}$, speed 5 m s^{-1} b) $ \mathbf{r} ^2 = 25t^2 - 68t + 52$ shown c) 2.4 m when $t = 1.36 \text{ s}$	8
12	a) $(104\mathbf{i} - 20\mathbf{j}) \text{ m}$ b) 106 m on a bearing of 101° c) average speed 4 m s^{-1} , average velocity magnitude 2.12 m s^{-1} d) speed uses the total distance (200 m) but velocity uses the straight-line displacement (106 m), and he changed direction	8

Full worked solutions, written out by hand, are on the solutions sheet for this topic.