SMART EXAM RESOURCES
9702 PHYSICS TOPIC QUESTIONS
TOPIC: PHYSICAL QUANTITIES AND UNITS
SUB-TOPIC: SCALARS AND VECTORS SUB-
SUB-TOPIC: VECTOR DIAGRAMS
SET-3-QP-MS

1 A weight of 7.0 N hangs vertically by two strings AB and AC, as shown in Fig. 2.1.

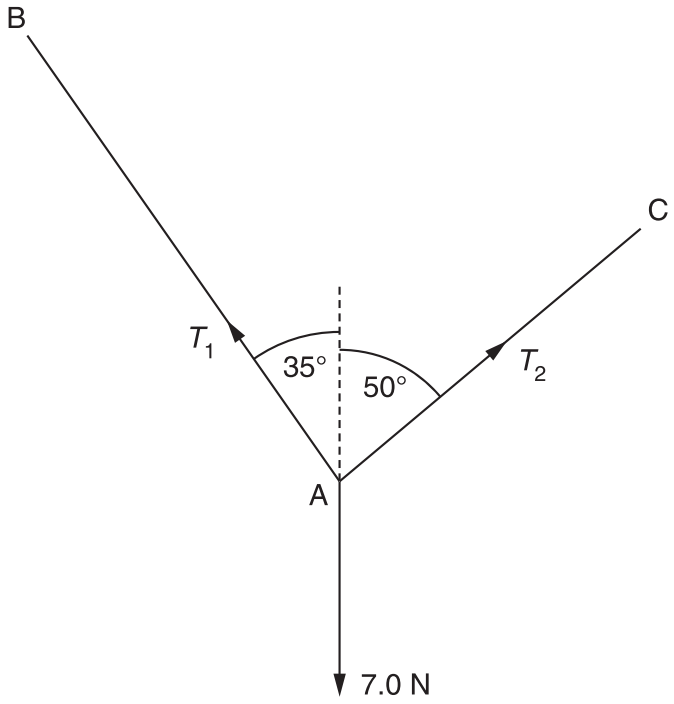

Fig. 2.1

For the weight to be in equilibrium, the tension in string AB is T_1 and in string AC it is T_2.

On Fig. 2.1, draw a vector triangle to determine the magnitudes of T_1 and T_2.

T_1 = ... N

T_2 = ... N
[3]

MARKING SCHEME:

triangle drawn with correct shape (incorrect arrows loses this mark)	B1	
$T_1 = 5.4 \pm 0.2$N	B1	
$T_2 = 4.0 \pm 0.2$N	B1	[3]

2 A climber is supported by a rope on a vertical wall, as shown in Fig. 2.1.

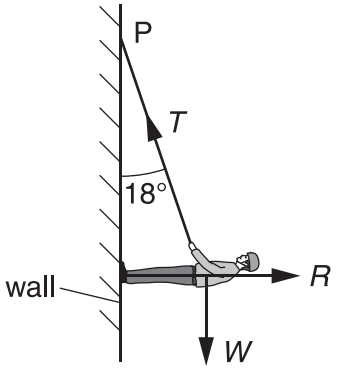

Fig. 2.1

The weight *W* of the climber is 520 N. The rope, of negligible weight, is attached to the climber and to a fixed point P where it makes an angle of 18° to the vertical. The reaction force *R* acts at right-angles to the wall.
The climber is in equilibrium.

(b) Complete Fig. 2.2 by drawing a labelled vector triangle to represent the forces acting on the climber.

Fig. 2.2

[2]

(c) Resolve forces or use your vector triangle to calculate

(i) the tension T in the rope,

T = ... N [2]

(ii) the reaction force R.

R = ... N [1]

(d) The climber moves up the wall and the angle the rope makes with the vertical increases. Explain why the magnitude of the tension in the rope increases.

.....

.....

.....[1]

MARKING SCHEME:

(b)	shape and orientation correct and forces labelled and arrows correct		M1	
	angles correct / labelled		A1	[2]
(c)	**(i)** $T\cos 18° = W$	Scale diagram:	C1	
	$T = 520 / \cos 18° = 547$ N	± 20 N	A1	[2]
	(ii) $R = T\sin 18°$			
	= 169 N	± 20 N	A1	[1]
(d)	θ is larger hence $\cos\theta$ is smaller, $T = W / \cos\theta$		M1	
	hence T is larger		A0	[1]

3 An object B is on a horizontal surface. Two forces act on B in this horizontal plane. A vector diagram for these forces is shown to scale in Fig. 1.1.

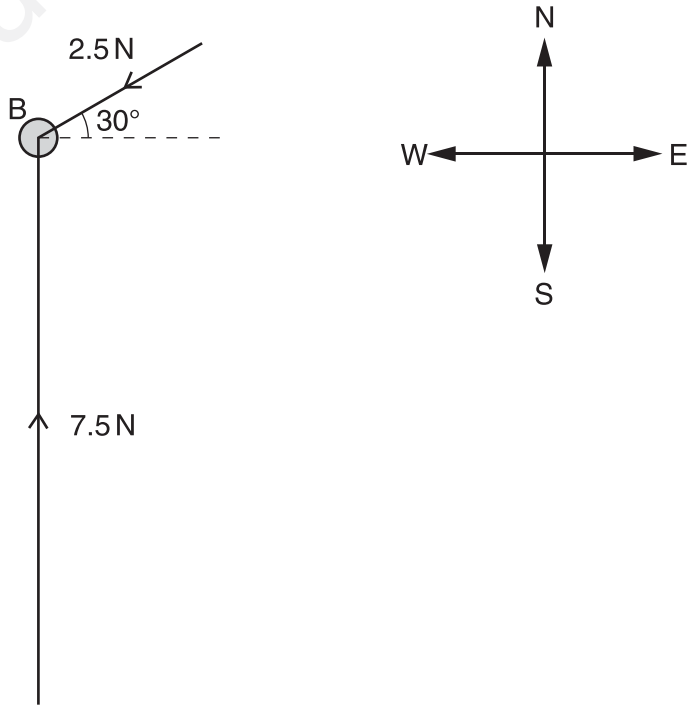

Fig. 1.1

A force of 7.5 N towards north and a force of 2.5 N from 30° north of east act on B.
The mass of B is 750 g.

(i) On Fig. 1.1, draw an arrow to show the approximate direction of the resultant of these two forces. [1]

(ii) **1.** Show that the magnitude of the resultant force on B is 6.6 N.

[1]

2. Calculate the magnitude of the acceleration of B produced by this resultant force.

magnitude = ... $m\,s^{-2}$ [2]

(iii) Determine the angle between the direction of the acceleration and the direction of the 7.5 N force.

angle = ... ° [1]

MARKING SCHEME:

(i)	arrow drawn up to the left of 7.5 N force approximately 5° to 40° to west of north	A1	[1]
(ii)	1. correct vector triangle or working to show magnitude of resultant force = 6.6 N allow 6.5 to 6.7 N if scale diagram	M1	[1]
	2. magnitude of acceleration = 6.6 / 0.75 [scale diagram: (6.5 to 6.7) / 0.75]	C1	
	= 8.8 m s^{-2} [scale diagram: 8.7 – 8.9 m s^{-2}]	A1	[2]
(iii)	19° [use of scale diagram allow 17° to 21° (a diagram must be seen)]	B1	[1]

4 Two forces of magnitude 6.0 N and 8.0 N act at a point P. Both forces act away from point P and the angle between them is 40°.
Fig. 1.1 shows two lines at an angle of 40° to one another.

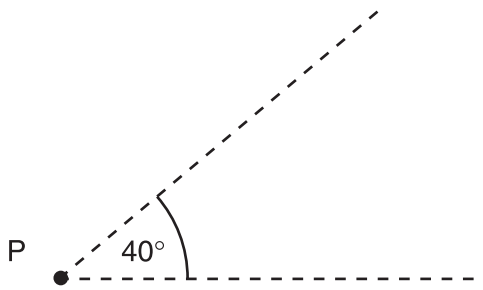

Fig. 1.1

On Fig. 1.1, draw a vector diagram to determine the magnitude of the resultant of the two forces.

magnitude of resultant = ... N [4]

MARK SCHEME:

(b)	diagram has correct shape	M1	
	with arrows in correct directions	A1	
	resultant = 13.2 ± 0.2 N *(allow 2 sig. fig)*	A2	**[4]**
	(for 12.8 → 13.0 and 13.4 → 13.6, allow 1 mark)		
	(calculated answer with a correct sketch, allow max 4 marks)		
	(calculated answer with no sketch – no marks)		