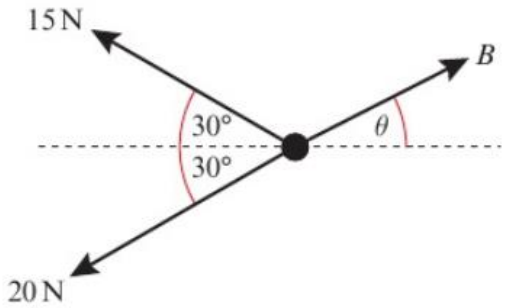
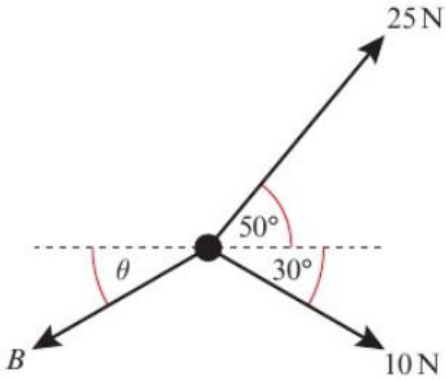
(P) **4** Three forces act upon a particle as shown in the diagrams below.

Given that the particle is in equilibrium, calculate the magnitude of B and the value of θ.

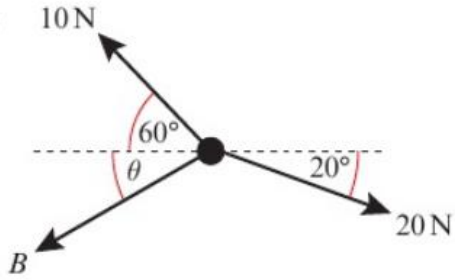
a



b



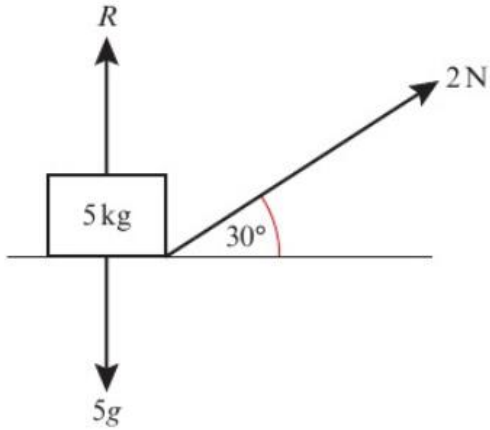
c



5 A box of mass 5 kg lies on a smooth horizontal floor. The box is pulled by a force of 2 N applied at an angle of 30° to the horizontal, causing the box to accelerate horizontally along the floor.

a Work out the acceleration of the box.

b Work out the normal reaction of the box with the floor.



(E) **6** A force P is applied to a box of mass 10 kg causing the box to accelerate at $2\,\text{m s}^{-2}$ along a smooth, horizontal plane. Given that the force causing the acceleration is applied at 45° to the plane, work out the value of P. **(3 marks)**

4 **a** $B = 30.4\,\text{N}, \theta = 4.72°$

b $B = 28.5\,\text{N}, \theta = 29.8°$

c $B = 13.9\,\text{N}, \theta = 7.52°$

5 **a** $\frac{\sqrt{3}}{5}\text{m s}^{-2}$ **b** $48\,\text{N}$

6 $20\sqrt{2}\,\text{N}$

1 A particle of mass 3 kg slides down a smooth slope that is inclined at 20° to the horizontal.

a Draw a force diagram to represent all the forces acting on the particle.

b Work out the normal reaction between the particle and the plane.

c Find the acceleration of the particle.

2 A force of 50 N is pulling a particle of mass 5 kg up a smooth plane that is inclined at 30° to the horizontal. Given that the force acts parallel to the plane,

a draw a force diagram to represent all the forces acting on the particle

b work out the normal reaction between the particle and the plane

c find the acceleration of the particle.

3 A particle of mass 0.5 kg is held at rest on a smooth slope that is inclined at an angle α to the horizontal. The particle is released. Given that $\tan\alpha = \frac{3}{4}$, calculate:

a the normal reaction between the particle and the plane

b the acceleration of the particle.

E **4** A force of 30 N is pulling a particle of mass 6 kg up a rough slope that is inclined at 15° to the horizontal. The force acts in the direction of motion of the particle and the particle experiences a constant resistance due to friction.

a Draw a force diagram to represent all the forces acting on the particle. **(4 marks)**

Given that the particle is moving with constant speed,

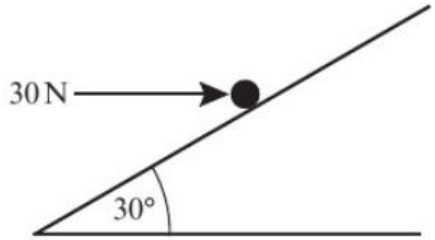
b calculate the magnitude of the resistance due to friction. **(5 marks)**

E **5** A particle of mass m kg is sliding down a smooth slope that is angled at 30° to the horizontal. The normal reaction between the plane and the particle is 5 N.

a Calculate the mass m of the particle. **(3 marks)**

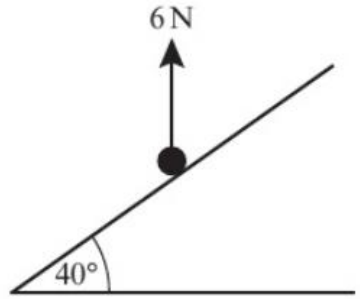
b Calculate the acceleration of the particle. **(3 marks)**

E/P **6** A force of 30 N acts horizontally on a particle of mass 5 kg that rests on a smooth slope that is inclined at 30° to the horizontal as shown in the diagram.
Find the acceleration of the particle.

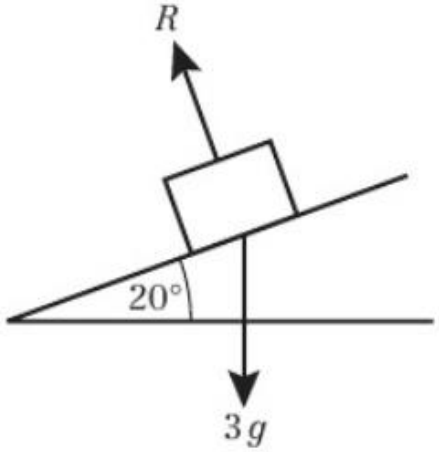


(4 marks)

E/P **7** A particle of mass 3 kg is moving on a rough slope that is inclined at 40° to the horizontal. A force of 6 N acts vertically upon the particle. Given that the particle is moving at a constant velocity, calculate the value of F, the constant resistance due to friction.

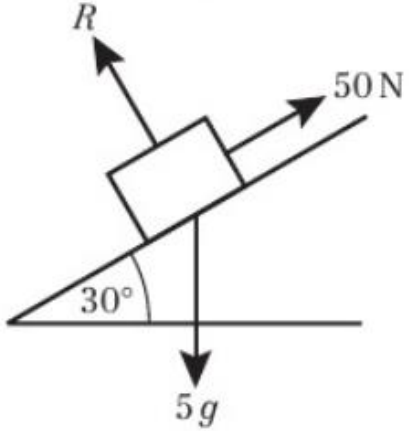


1 **a**



b 27.6N (3 s.f.) **c** 3.35ms^{-2}

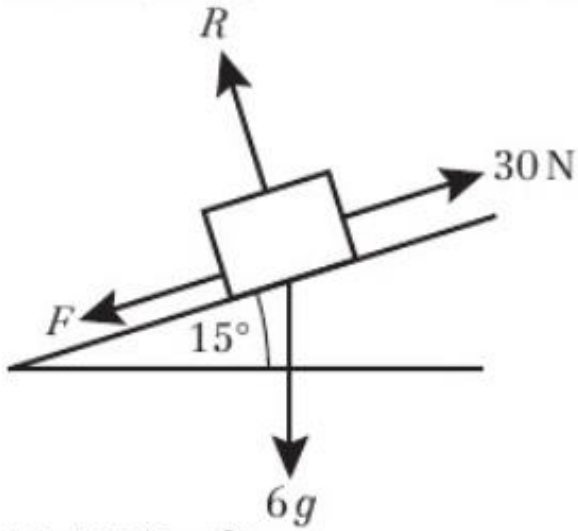
2 **a**



b 42.4N (3 s.f.) **c** 5.1ms^{-2}

3 **a** 3.92N (3 s.f.) **b** 5.88ms^{-2} (3 s.f.)

4 **a**



b 14.8N (3 s.f.)

5 **a** 0.589kg (3 s.f.) **b** 4.9ms^{-2}

6 0.296ms^{-2} (3 s.f.)

7 15.0N (3 s.f.)