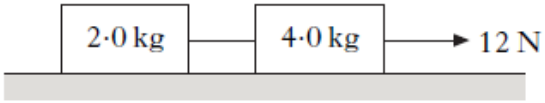
Unit 1 – Our Dynamic Universe
Section 2 - Forces, Energy & Power

2008 **3.** Two boxes on a frictionless horizontal surface are joined together by a string. A constant horizontal force of 12 N is applied as shown.



The tension in the string joining the two boxes is

A 2·0 N

B 4·0 N

C 6·0 N

D 8·0 N

E 12 N.

2009 **4.** A skydiver of total mass 85 kg is falling vertically.

At one point during the fall, the air resistance on the skydiver is 135 N.

The acceleration of the skydiver at this point is

A $0{\cdot}6\,m\,s^{-2}$

B $1{\cdot}6\,m\,s^{-2}$

C $6{\cdot}2\,m\,s^{-2}$

D $8{\cdot}2\,m\,s^{-2}$

E $13{\cdot}8\,m\,s^{-2}$.

2012 **3.** A rocket of mass 200 kg accelerates vertically upwards from the surface of a planet at $2{\cdot}0\,m\,s^{-2}$.

The gravitational field strength on the planet is $4{\cdot}0\,N\,kg^{-1}$.

What is the size of the force being exerted by the rocket's engines?

A 400 N

B 800 N

C 1200 N

D 2000 N

E 2400 N

2013 **4.** Two blocks are linked by a newton balance of negligible mass.

The blocks are placed on a level, frictionless surface. A force of 18·0 N is applied to the blocks as shown.

The reading on the newton balance is

A 7·2 N

B 9·0 N

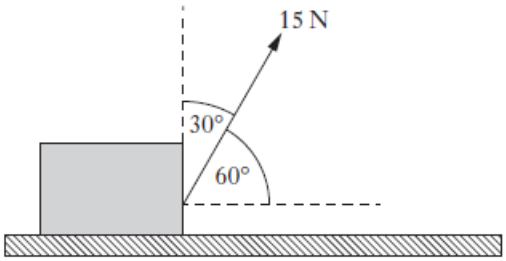
C 10·8 N

D 18·0 N

E 40·0 N.

2013 Revised 5. A box is placed on a horizontal surface.

A force of 15 N acts on the box as shown.



Which entry in the table shows the horizontal and vertical components of the force?

	Horizontal component/N	*Vertical component*/N
A	15 sin 60°	15 sin 30°
B	15 cos 60°	15 sin 30°
C	15 sin 60°	15 cos 60°
D	15 cos 30°	15 sin 30°
E	15 cos 60°	15 sin 60°

2015 3. The mass of a car is 900 kg. The car is being towed at a steady speed of 4·0 m s^{-1}. The tow rope breaks and the car travels a further 6·0 m in a straight line before coming to rest.

The magnitude of the average unbalanced force acting on the car while coming to rest is

A 600 N

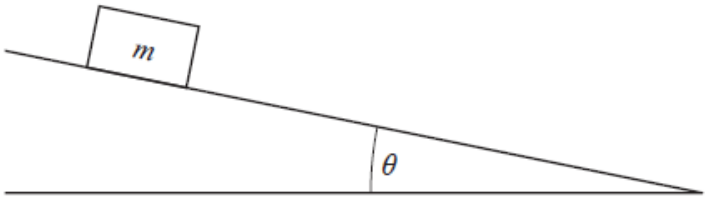
B 1200 N

C 1350 N

D 3600 N

E 5400 N.

2015 3. A box of mass m rests on a slope as shown.



Which row in the table shows the component of the weight acting down the slope and the component of the weight acting normal to the slope?

	Component of weight acting down the slope	*Component of weight acting normal to the slope*
A	$mg\sin\theta$	$mg\cos\theta$
B	$mg\tan\theta$	$mg\sin\theta$
C	$mg\cos\theta$	$mg\sin\theta$
D	$mg\cos\theta$	$mg\tan\theta$
E	$mg\sin\theta$	$mg\tan\theta$

2015 4. A person stands on bathroom scales in a lift.

The scales show a reading greater than the person's weight.

The lift is moving

A upwards with constant speed

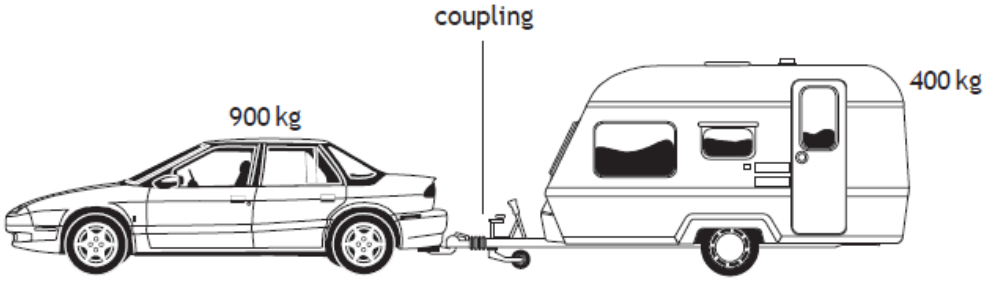
B downwards with constant speed

C downwards with increasing speed

D downwards with decreasing speed

E upwards with decreasing speed.

2015 5. A car of mass 900 kg pulls a caravan of mass 400 kg along a straight, horizontal road with an acceleration of $2{\cdot}0\,m\,s^{-2}$.



Assuming that the frictional forces on the caravan are negligible, the tension in the coupling between the car and the caravan is

A 400 N

B 500 N

C 800 N

D 1800 N

E 2600 N.

2015 6. Water flows at a rate of $6{\cdot}25 \times 10^8$ kg per minute over a waterfall.

The height of the waterfall is 108 m.

The total power delivered by the water in falling through the 108 m is

A $1{\cdot}13 \times 10^9$ W

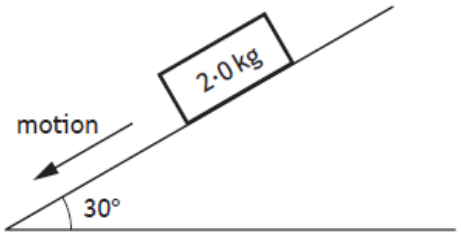
B $1{\cdot}10 \times 10^{10}$ W

C $6{\cdot}62 \times 10^{11}$ W

D $4{\cdot}05 \times 10^{12}$ W

E $3{\cdot}97 \times 10^{13}$ W.

2016 3. A block of wood slides with a constant velocity down a slope. The slope makes an angle of 30° with the horizontal as shown. The mass of the block is 2·0 kg.

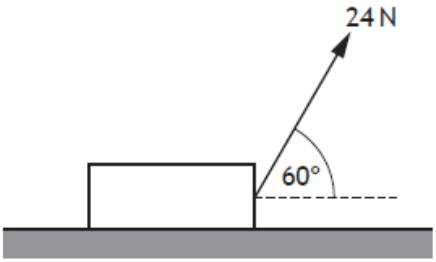


The magnitude of the force of friction acting on the block is

A 1·0 N
B 1·7 N
C 9·8 N
D 17·0 N
E 19·6 N.

2017 2. A block is resting on a horizontal surface.

A force of 24 N is now applied as shown and the block slides along the surface.



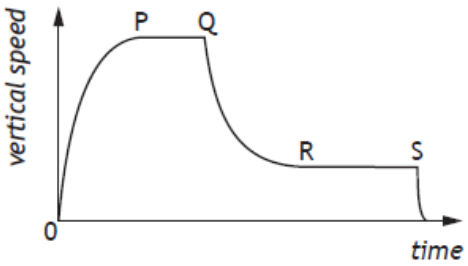
The mass of the block is 20 kg.

The acceleration of the block is 0·20 m s^{-2}.

The force of friction acting on the block is

A 4·0 N
B 8·0 N
C 12 N
D 16 N
E 25 N.

2017 **3.** The graph shows how the vertical speed of a skydiver varies with time.



A student uses information from the graph to make the following statements.

I The acceleration of the skydiver is greatest between P and Q.

II The air resistance acting on the skydiver between Q and R is less than the weight of the skydiver.

III The forces acting on the skydiver are balanced between R and S.

Which of these statements is/are correct?

A I only

B II only

C III only

D I and II only

E I , II and III

2018 **3.** A block of mass 6·0 kg and a block of mass 8·0 kg are connected by a string.

A force of 32 N is applied to the blocks as shown.

A frictional force of 4·0 N acts on **each** block.

The acceleration of the 6·0 kg block is

A $1{\cdot}7\ m\ s^{-2}$

B $2{\cdot}0\ m\ s^{-2}$

C $2{\cdot}3\ m\ s^{-2}$

D $2{\cdot}9\ m\ s^{-2}$

E $5{\cdot}3\ m\ s^{-2}$.

2018 **4.** A person stands on a weighing machine in a lift. When the lift is at rest, the reading on the weighing machine is 700 N.

The lift now descends and its speed increases at a constant rate.

The reading on the weighing machine

A is a constant value higher than 700 N

B is a constant value lower than 700 N

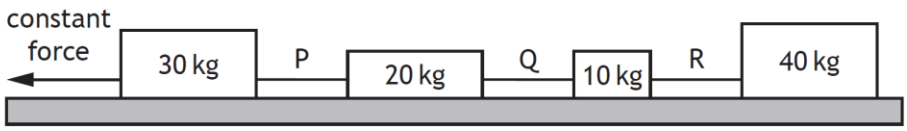
C continually increases from 700 N

D continually decreases from 700 N

E remains constant at 700 N.

2019 **5.** Four masses on a horizontal, frictionless surface are linked together by strings P, Q and R.

A constant force is applied as shown.



The tension in the strings is

A greatest in P and least in Q

B greatest in P and least in R

C greatest in R and least in Q

D greatest in R and least in P

E the same in P, Q and R.