

Q1.(2019)

the tendency of an object to
continue in its state of rest or
motion

Q2.(2019)

a)

longer arrow pointing vertically
downwards

labelled weight

b)

initially air resistance is less
than weight / gravity so the
skydiver accelerates

acceleration causes the air
resistance to increase

resultant force decreases to
zero

so the skydiver falls at terminal
velocity

c)

distance at 7s = 200 (m)
distance at 12s = 450 (m)

$$\text{speed} = \frac{450 - 200}{12 - 7} \text{ or } \frac{250}{5}$$

50 (m/s)

d)

The higher the altitude the less dense the air

so the air resistance on the skydiver (falling from 39000m) was less (at the same speed)

so the skydiver was able to accelerate for longer before reaching (a higher) terminal velocity

or

so the skydiver was able to accelerate for longer before air resistance = weight / gravity

Q3.(2021)

a)

friction

b)

(area of rectangle =) 108 (m)

(area of triangle =) 54 (m)

(total area / distance =) 162 (m)

c)

(the force on the pedal) causes a moment about the pedal axle

which causes a force on the chain (which causes a moment about the rear axle)

d)

$$2.4^2 (-0^2) = 2 \times a \times 18$$

$$a = \frac{2.4 \times 2.4}{36}$$

$$a = 0.16 \text{ (m/s}^2\text{)}$$

alternative method

$$t = 18 / 1.2$$

$$t = 15 \text{ (s)} \quad (1)$$

$$a = 2.4 / 15 \quad (1)$$

$$a = 0.16 \text{ (m/s}^2\text{)} \quad (1)$$

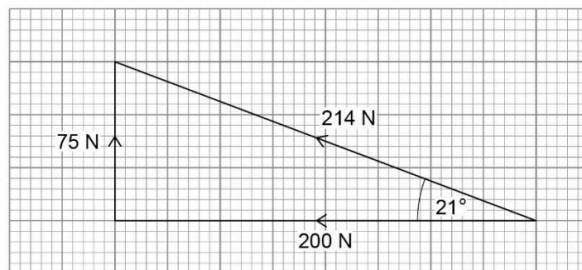
e)

horizontal (200N) **and** vertical
(75N) forces drawn to the same
scale

resultant force drawn in the
correct direction

resultant force with a value in
the range 212 to 218 (N)

direction in the range 20–22
(degrees from the horizontal)



Q4.(2024)

a)

0 (N)

the child isn't accelerating
(vertically)

or

upwards forces are equal to the
downwards forces

b)

work done = force $\times$ distance

or

$$W = F \times s$$

c)

$$35 = F \times 2.8$$

$$F = \frac{35}{2.8}$$

$$F = 12.5 \text{ (N)}$$

d)

the resistive force has
decreased

so the resultant force increases

e)

moment = force $\times$ distance

or

$$M = F \times d$$

f)

$$7.5 \text{ cm} = 0.075 \text{ m}$$

$$M = 2.0 \times 0.075$$

$$M = 0.15 \text{ (Nm)}$$

g)

gear B rotates in the opposite direction (to gear A)

or

gear B rotates clockwise

or

gear B rotates faster than gear A

(because) gear A exerts a force on gear B

or

(because) gear A causes a moment about the pivot of gear B

Q5.(2024)

a)

tension

b)

(combined) mass of trolley and mass hanger

c)

divide distance travelled by time
taken to give (average / mean)
velocity

double mean velocity (to give
maximum velocity)

divide change in velocity by time
taken (to give acceleration)

d)

(range =) $0.06 \text{ (m/s}^2\text{)}$

or

(mean =) $1.36 \text{ (m/s}^2\text{)}$

uncertainty = $\pm 0.03 \text{ (m/s}^2\text{)}$

e)

a component of the weight of
the trolley acts parallel to
runway

(so) resultant force increases so
acceleration increases