

2 (a) Define acceleration.

.....
..... [1]

(b) A train has a total mass of 520 000 kg. The train accelerates at 1.1 m/s².

(i) Calculate the time taken for the train to increase its speed from 15 m/s to 28 m/s.

time = [2]

(ii) Calculate the force required to produce an acceleration of 1.1 m/s² for this train.

force = [2]

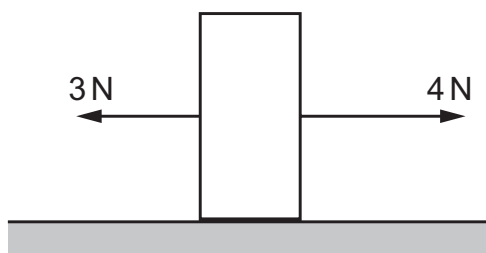
(iii) The train uses electric motors.

Explain why the force on the train due to the motors is greater than the value calculated in (ii).

.....
..... [1]

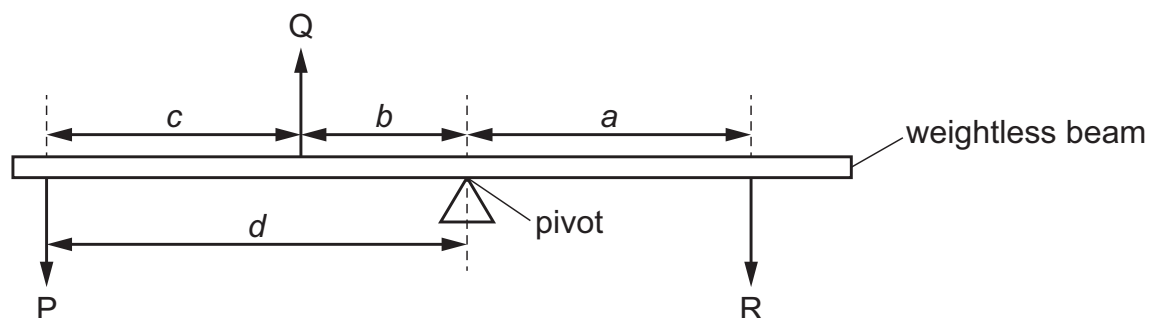
[Total: 6]

- 2 The diagram shows a solid object on a flat surface, with two forces acting on the object.



What is the resultant force on the object?

- A 1 N to the left
 - B 1 N to the right
 - C 7 N to the left
 - D 7 N to the right
- 6 A weightless beam is balanced on a pivot as shown. Forces P, Q and R act on the beam.



Which equation is correct?

- A $(P \times c) + (Q \times b) = (R \times a)$
- B $(P \times c) - (Q \times b) = (R \times a)$
- C $(P \times d) + (Q \times b) = (R \times a)$
- D $(P \times d) - (Q \times b) = (R \times a)$

- 1 (a) Fig. 1.1. is a speed–time graph for the first 5 minutes of a bus journey.

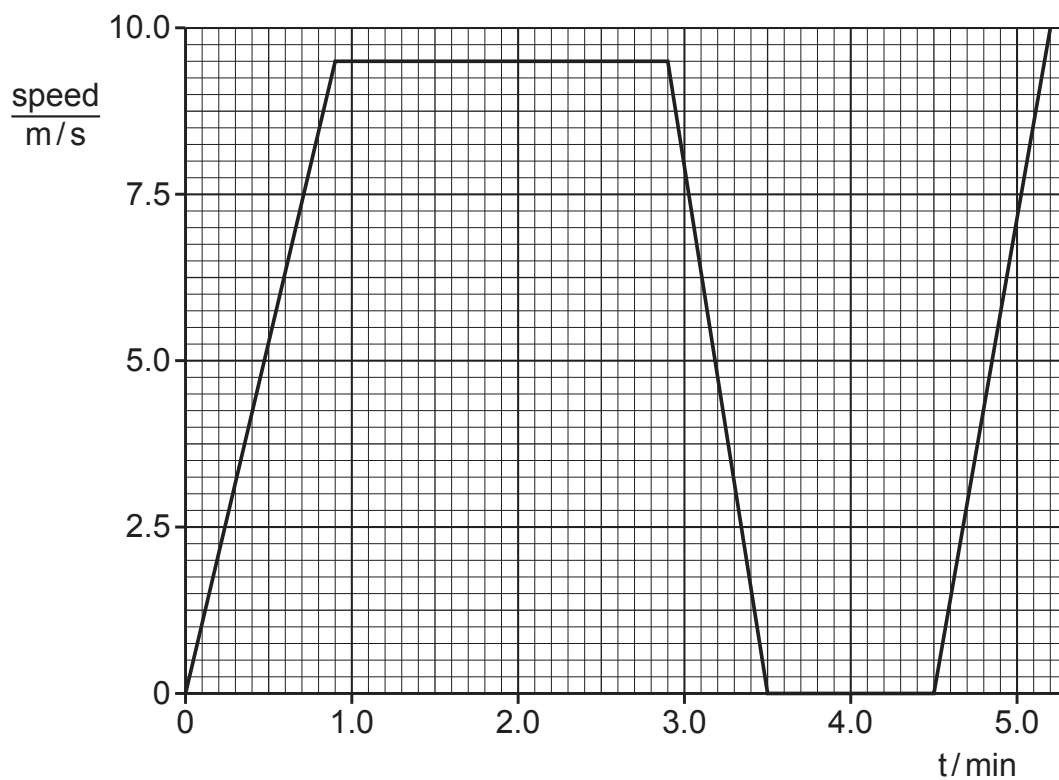


Fig. 1.1

Describe the motion between:

1. $t = 0.90$ min and $t = 2.9$ min
2. $t = 2.9$ min and $t = 3.5$ min
3. $t = 3.5$ min and $t = 4.5$ min

[3]

(b) Another bus travels at a speed of 8.9m/s. The brakes apply a constant force and the bus stops in a distance of 23m. This bus has a mass of 18 000 kg.

(i) Calculate the kinetic energy of the bus before the brakes are applied.

kinetic energy = [2]

(ii) Calculate the force applied to stop the bus.

force = [3]

[Total: 8]

2 (a) Define impulse.

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..... [1]

(b) Fig. 2.1 shows a rocket and its exhaust gases.

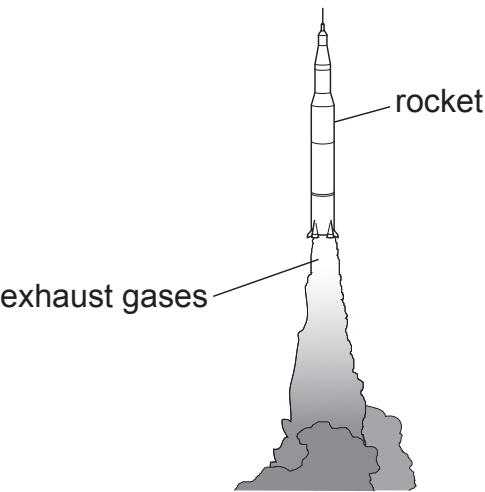


Fig. 2.1

The exhaust gases are emitted from the rocket with a velocity of 1400m/s and at a rate of 2800 kg/s.

(i) Show that the force exerted on the rocket by the exhaust gases is 3900 kN.

State the equation you use.

[2]

(ii) Calculate the maximum mass that this force can lift from the ground. Ignore air resistance.

maximum mass = [3]