www.smartexamresources.com

SMART EXAM RESOURCES
SUBJECT: PHYSICS
TOPIC:RESULTANT FORCE
SET-1-QP-MS

1 A ship sails in a straight line between two ports.
Fig. 1.1 shows the speed–time graph of the ship for the first 100 minutes of its journey between the two ports.

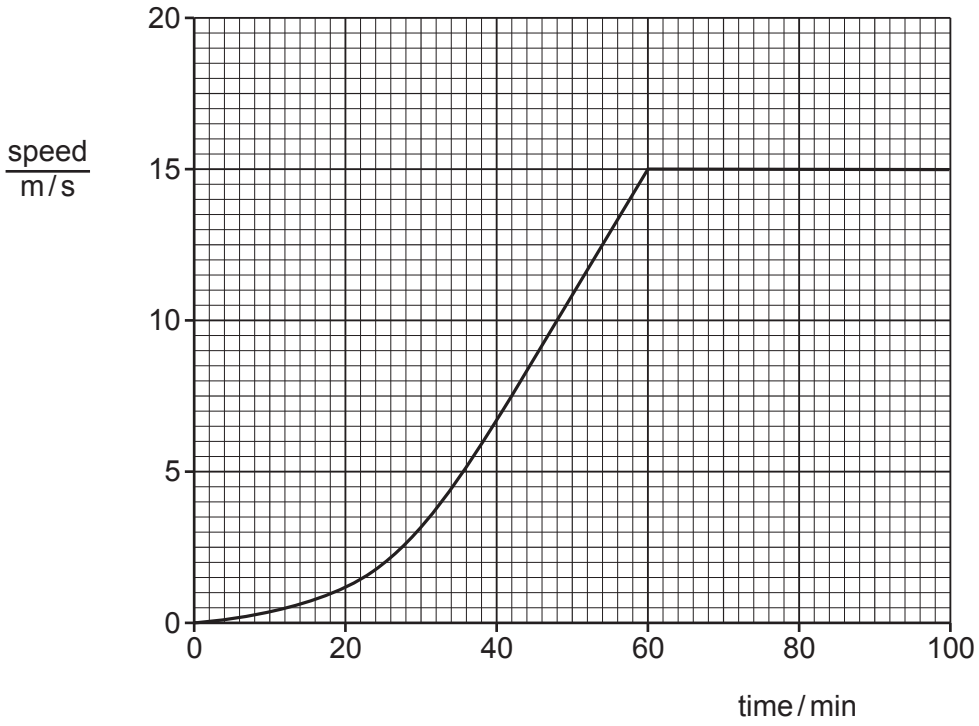

Fig. 1.1

(a) Calculate the maximum acceleration during the first 100 minutes of the ship's journey.

maximum acceleration = ... [2]

(b) Calculate the total distance travelled by the ship between time = 42 min and time = 100 min.

distance travelled = ... [3]

(c) At a time not shown on the graph, the acceleration of the ship is $0.0087\,m/s^2$. The total mass of the ship and its passengers is 2.3×10^7 kg.

(i) Calculate the resultant force on the ship.

force = ... [2]

(ii) Explain why the force on the ship due to the ship's engine is greater than the value you calculated in **(c)(i)**.

.....

..... [1]

[Total: 8]

www.smartexamresources.com

MARK SCHEME:

1(a)	$0.0069\ m/s^2$	**A2**
	(acceleration =) gradient of graph or $\Delta v / \Delta t$ in any form OR $\frac{15-7.5}{(60-42)60}$	C1
1(b)	48 000 m or 48 km	**A3**
	area under graph	C1
	$\frac{1}{2}(18\times7.5\times60)+(7.5\times18\times60)+(15\times40\times60)$	C1
1(c)(i)	(force =) 2.0×10^5 N	**A2**
	(F =) ma OR $2.3\times10^7\times0.0087$ in any form	C1
1(c)(ii)	there is a backward / drag force OR water resistance	**B1**

www.smartexamresources.com

2 An aeroplane accelerates along a horizontal runway before take-off.

The aeroplane accelerates for 35 s. The speed of the aeroplane when it takes off is 72 m / s.

Fig. 1.1 shows how the speed of the aeroplane varies between time t = 0 and t = 35 s.

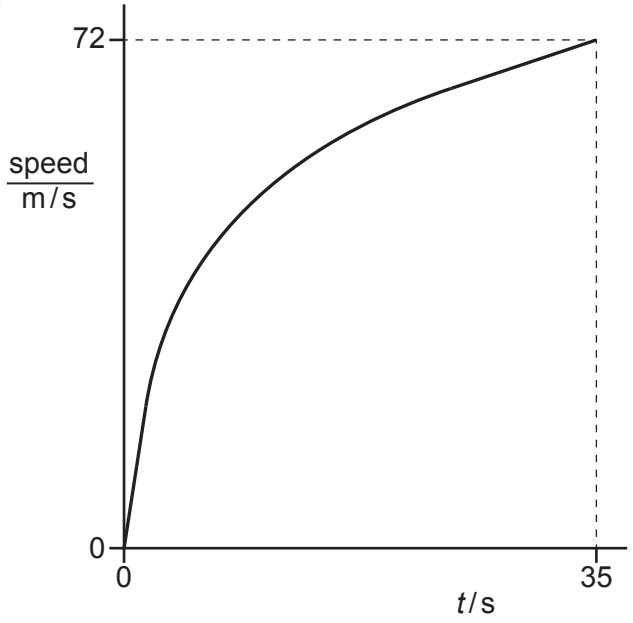

Fig. 1.1

(a) Define acceleration.

.....

..... [1]

(b) **(i)** Calculate the average acceleration of the aeroplane between t = 0 and t = 35 s.

acceleration = ... [1]

(ii) The combined mass of the aeroplane, its passengers and its fuel on take-off is 1.1×10^5 kg.

Calculate the average resultant force on the aeroplane between t = 0 and t = 35 s.

force = ... [2]

www.smartexamresources.com

MARK SCHEME:

(a)	change of velocity per unit time or $\frac{v-u}{t}$	**B1**
(b)(i)	(72 / 35 =) 2.1 m / s^2	**A1**
(b)(ii)	230 000 N OR 230 kN	**A2**
	$F = ma$ **OR** (F =) ma **OR** 110 000 × 2.1	C1

www.smarteyeresources.com

www.smartexamresources.com

3 Fig. 2.1 shows a motorcyclist accelerating along a straight horizontal section of track.

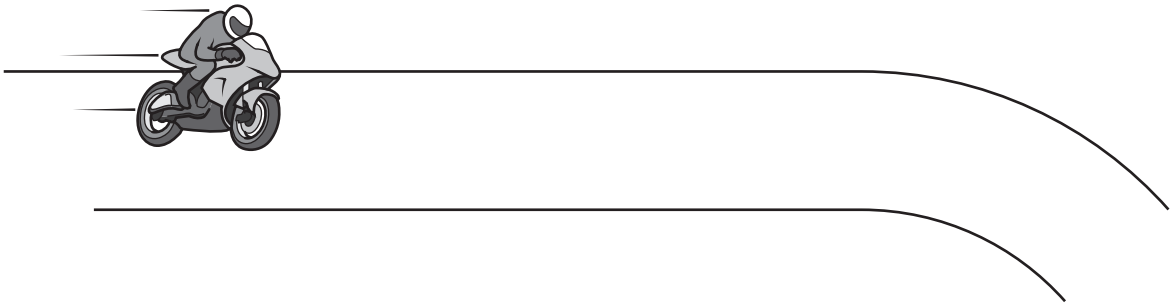

Fig. 2.1

The motorcyclist and motorcycle have a combined mass of 240 kg.

Explain why there must be a resultant force on the motorcyclist as she travels around the bend.

.....

.....

..... [2]

MARK SCHEME:

	any **two** from: • because there is an acceleration / change in velocity / change in direction / change in momentum (which needs a resultant force) • motorcyclist accelerates / changes momentum (because velocity / direction changes) • (resultant) force is perpendicular to the motion (of the motorcycle) **OR** $a \propto F$	**B2**

www.smartexamresources.com