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Student worksheet

7.5 Force equals mass $\times$ acceleration

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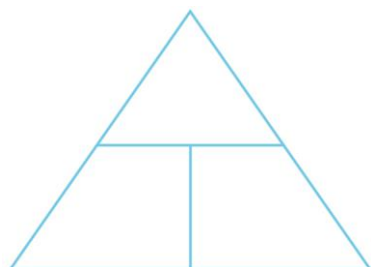
Newton's second law: $F_{\text{net}} = ma$

1 Describe Newton's second law.

2 What is the difference between mass and weight?

3 What formula can be used to calculate net force?

4 Complete the equation triangle for net force below and describe how it works.



Where necessary below, use $g = 9.80 \text{ m s}^{-2}$. Unit conversions: 1000 grams = 1 kilogram and 1000 kilograms = 1 tonne.

5 How much horizontal net force is required to accelerate a 1200-kg car at 1.5 m s^{-2} ?



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- 6 A net force of 16 N gives a bowling ball an initial acceleration of 2.5 m s^{-2} . What is the mass of the bowling ball?

- 7 A speed skater has a mass of 64 kg. She is providing a driving force of 400 N, and there is a frictional force of 240 N against her. Draw these two forces acting on her and then determine her acceleration.





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Extend your understanding

- 8 A skydiver of mass 85 kg is falling through the air at terminal velocity (constant speed).



- a What is the weight force acting on the skydiver?

- b How much air resistance is acting on the skydiver?

- 9 The Airbus A380 has a mass at take-off of 575 tonnes. During take-off, its four engines provide a total thrust of 1300 kN. Its take-off speed is 270 km h^{-1} and it takes 72 seconds from rest to reach this speed.





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- a What is the average acceleration of the A380 during its take-off run? Give your answer correct to two decimal places.

- b What is the average total resistive force acting against the A380 during its take-off run?
