

The formula for acceleration is: $a = (v - u) \div t$

Where:

a = acceleration (m/s^2)

v = final velocity (m/s)

u = initial (starting) velocity (m/s)

t = time (s)

Task

Answer the following questions.

- Re-arrange the formula so that you can calculate final velocity.
 - Re-arrange the formula so that the initial velocity can be calculated.
 - What is the correct re-arranged formula for calculating time?
- Calculate the acceleration of these vehicles. Give your answer to 3 significant figures.
 - A Porsche 911 Carrera T goes from 0 to 27.8 m/s in 4.5 seconds.
 - A Land rover defender 90 does the same speed change in 15.8 seconds.
 - A Ford transit van does the same but takes 24.6 seconds.
- A skier starts off from rest at the top of a black run which is 4.8 kilometres long, and it takes her 5 minutes 20 seconds.
 - What is her average speed?
 - At the steepest part of the run her speed increases to 22 m/s. If this happens over 3.5 seconds, what is her acceleration from her average speed?
- A plane takes off. Its velocity changes from rest to 100 m/s over half a minute.
 - Calculate the acceleration of the plane.
 - The plane prepares to land. Its velocity changes from 155 m/s to 140 m/s over two minutes. Calculate the deceleration of the plane.
- A 'Thingamajig' travels in a straight line at 50 m/s and then speeds up 90 m/s over 15 seconds. Calculate the Thingamajig's acceleration.
- If a cyclist speeds up from 12 m/s with an acceleration of 0.2 m/s^2 , how long will it take to reach a speed of 20 m/s?
- A runner is racing around a track at 6 m/s. If they accelerate at 0.05 m/s^2 for the last 30 seconds, at what speed will they cross the finish line?
- Lewis Hamilton trips the speed trap going at 375 km/h. If his acceleration off the previous bend is 42.5 km/s^2 and it took him 5.4 seconds to cover the straight, how fast did he come off the turn?

Answers

1.

a. $v = at + u$

b. $u = v - at$

c. $t = (v - u) \div a$

2.

a. 6.18 m/s^2

b. 1.76 m/s^2

c. 1.13 m/s^2

3.

a. 15 m/s

b. 2 m/s^2 or $(22 - \text{their } a) \div 3.5$

4.

a. 3.3 m/s^2

b. $(-) 0.125 \text{ m/s}^2$

5. 2.7 m/s^2

6. 40 s

7. 7.5 m/s

8. 145.5 km/h