

Name _____

Date _____

Acceleration I

1. A car traveling in a straight line has a velocity of $+8.5 \text{ m/s}$. After 5.5 s , its velocity is $+5.0 \text{ m/s}$. What is the car's average acceleration in this time interval?

Solution: $a = -0.636 \text{ m}\cdot\text{s}^{-2}$

2. A car traveling at $9.0 \text{ m}\cdot\text{s}^{-1}$ accelerates at the rate of $0.8 \text{ m}\cdot\text{s}^{-2}$ for an interval of 3.0 s . Find v .

Solution: $v = 11.4 \text{ m}\cdot\text{s}^{-1}$

3. A ball initially at rest rolls down a hill with an acceleration of $3.3 \text{ m}\cdot\text{s}^{-2}$. If it accelerates for 6.5 s , how far will it move?

Solution: $s = 69.7 \text{ m}$

4. A bus slows down uniformly from 75.0 km/h ($21 \text{ m}\cdot\text{s}^{-1}$) to 0.0 km/h in 280 m . How long does it take to stop?

Solution: $t = 26.7 \text{ s}$

5. An excited teenager hops into a *new and different* roller coaster, one that starts at the highest point in the ride and goes *backwards*. If the roller coaster track begins by sliding backwards down the track, and accelerates from rest at $\text{m}\cdot\text{s}^{-2}$:

A. What is the velocity at the end of 8 s ?

B. What is the displacement after 8 s ?

Solution:

A. $v = -24 \text{ m}$

B. $s = 96 \text{ m}$

6. A plane lands with a velocity of $120 \text{ m}\cdot\text{s}^{-1}$ and accelerates at a maximum rate of $-4.0 \text{ m}\cdot\text{s}^{-2}$.

A. From the instant the plane touches the runway, what is the minimum time needed before it can come to rest?

B. What is the minimum distance the plane needs to land?

C. Can this plane land on a naval aircraft carrier where the runway is 2.10 km long?

i. insufficient information

ii. yes

iii. no

Solution:

A. $t = 30 \text{ s}$

i. yes

B. $s = 1.8 \text{ km}$

7. The first person to break the sound barrier in a car was Andy Green, in the jet-propelled car named ThrustSSC, at a speed of 763 mph ($341 \text{ m}\cdot\text{s}^{-1}$) (Nevada, 1997). He also holds the land speed record, as the fastest vehicle ever driven. If the car accelerated to $270 \text{ m}\cdot\text{s}^{-1}$ in 16 seconds, find the distance the car travels during this time.

Solution: $s = 2160 \text{ m}$