Notes: Kinematics Part 2

Kinematic Equation

$$v_{final} = v_{initial} + a\ t$$

v_{final}

$v_{initial}$

a

t

Kinematic Equation

$$v_{final} = v_{initial} + a\ t$$

v_{final} is the final velocity, the velocity at the end of the problem

$v_{initial}$

a

t

Kinematic Equation

$$v_{final} = v_{initial} + a\ t$$

v_{final} is the final velocity, the velocity at the end of the problem

$v_{initial}$ is the initial velocity, the velocity at the beginning of the problem

a

t

Kinematic Equation

$$v_{final} = v_{initial} + a\,t$$

v_{final} is the final velocity, the velocity at the end of the problem

$v_{initial}$ is the initial velocity, the velocity at the beginning of the problem

a is the acceleration, the rate that the velocity changes

t

Kinematic Equation

$$v_{final} = v_{initial} + a\,t$$

v_{final} is the final velocity, the velocity at the end of the problem

$v_{initial}$ is the initial velocity, the velocity at the beginning of the problem

a is the acceleration, the rate that the velocity changes

t is the time, measured in seconds

How to Solve a Kinematics Problem

1. Read the following problem
2. Highlight your “proof” for assigning variables
3. List the givens
4. Solve
5. Write your answer with the proper units

A fully loaded Boeing 747 with all engines at full thrust accelerates at 2.6 m/s^2. Its minimum takeoff speed is 70 m/s. How much time will the plane take to reach its takeoff speed?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
v_i =	
v_f =	
a =	
t =	

A fully loaded Boeing 747 with all engines at full thrust accelerates at 2.6 m/s^2. Its minimum takeoff speed is 70 m/s. How much time will the plane take to reach its takeoff speed?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f =$ $a =$ $t =$	

A fully loaded Boeing 747 with all engines at full thrust accelerates at 2.6 m/s^2. Its minimum takeoff speed is 70 m/s. How much time will the plane take to reach its takeoff speed?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
v_i = 0 m/s v_f = 70 m/s a = t =	

A fully loaded Boeing 747 with all engines at full thrust accelerates at 2.6 m/s^2. Its minimum takeoff speed is 70 m/s. How much time will the plane take to reach its takeoff speed?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f = 70$ m/s $a = 2.6$ m/s^2 $t =$	

A fully loaded Boeing 747 with all engines at full thrust accelerates at 2.6 m/s^2. Its minimum takeoff speed is 70 m/s. How much time will the plane take to reach its takeoff speed?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f = 70$ m/s $a = 2.6$ m/s^2 $t = ?$	

A fully loaded Boeing 747 with all engines at full thrust accelerates at 2.6 m/s^2. Its minimum takeoff speed is 70 m/s. How much time will the plane take to reach its takeoff speed?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f = 70$ m/s $a = 2.6\ m/s^2$ $t = ?$	$v_{final} = v_{initial} + a\ t$

A fully loaded Boeing 747 with all engines at full thrust accelerates at 2.6 m/s^2. Its minimum takeoff speed is 70 m/s. How much time will the plane take to reach its takeoff speed?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f = 70$ m/s $a = 2.6$ m/s^2 $t = ?$	$v_{final} = v_{initial} + a\ t$ $70 = 0 + 2.6\ t$

A fully loaded Boeing 747 with all engines at full thrust accelerates at 2.6 m/s^2. Its minimum takeoff speed is 70 m/s. How much time will the plane take to reach its takeoff speed?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s	$v_{final} = v_{initial} + a\,t$
$v_f = 70$ m/s	$70 = 0 + 2.6\,t$
$a = 2.6$ m/s^2	$t = 27$ s
$t = ?$	

Small frogs that are good jumpers are capable of remarkable acceleration. One species reaches a takeoff speed of 3.7 m/s in 0.060 s. What is the frog's acceleration during the jump?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
v_i =	
v_f =	
a =	
t =	

Small frogs that are good jumpers are capable of remarkable acceleration. One species reaches a takeoff speed of 3.7 m/s in 0.060 s. What is the frog's acceleration during the jump?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f =$ a = t =	

Small frogs that are good jumpers are capable of remarkable acceleration. One species reaches a takeoff speed of 3.7 m/s in 0.060 s. What is the frog's acceleration during the jump?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f = 3.7$ m/s a = t =	

Small frogs that are good jumpers are capable of remarkable acceleration. One species reaches a takeoff speed of 3.7 m/s in 0.060 s. What is the frog's acceleration during the jump?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f = 3.7$ m/s a = ? t =	

Small frogs that are good jumpers are capable of remarkable acceleration. One species reaches a takeoff speed of 3.7 m/s in 0.060 s. What is the frog's acceleration during the jump?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f = 3.7$ m/s a = ? t = 0.060 s	

Small frogs that are good jumpers are capable of remarkable acceleration. One species reaches a takeoff speed of 3.7 m/s in 0.060 s. What is the frog's acceleration during the jump?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s $v_f = 3.7$ m/s a = ? t = 0.060 s	$v_{final} = v_{initial} + a\ t$

Small frogs that are good jumpers are capable of remarkable acceleration. One species reaches a takeoff speed of 3.7 m/s in 0.060 s. What is the frog's acceleration during the jump?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s	$v_{final} = v_{initial} + a\ t$
$v_f = 3.7$ m/s	$3.7 = 0 + a\ 0.060$
a = ?	
t = 0.060 s	

Small frogs that are good jumpers are capable of remarkable acceleration. One species reaches a takeoff speed of 3.7 m/s in 0.060 s. What is the frog's acceleration during the jump?

- Initial velocity - m/s, starting from rest, initially/beginning, how fast...
- Final velocity - m/s, comes to a stop/rest, finally/end, how fast...
- Acceleration - m/s^2
- Time - s, how long…

Givens	Work
$v_i = 0$ m/s	$v_{final} = v_{initial} + a\ t$
$v_f = 3.7$ m/s	$3.7 = 0 + a\ 0.060$
$a = ?$	$a = 62\ m/s^2$
$t = 0.060$ s	