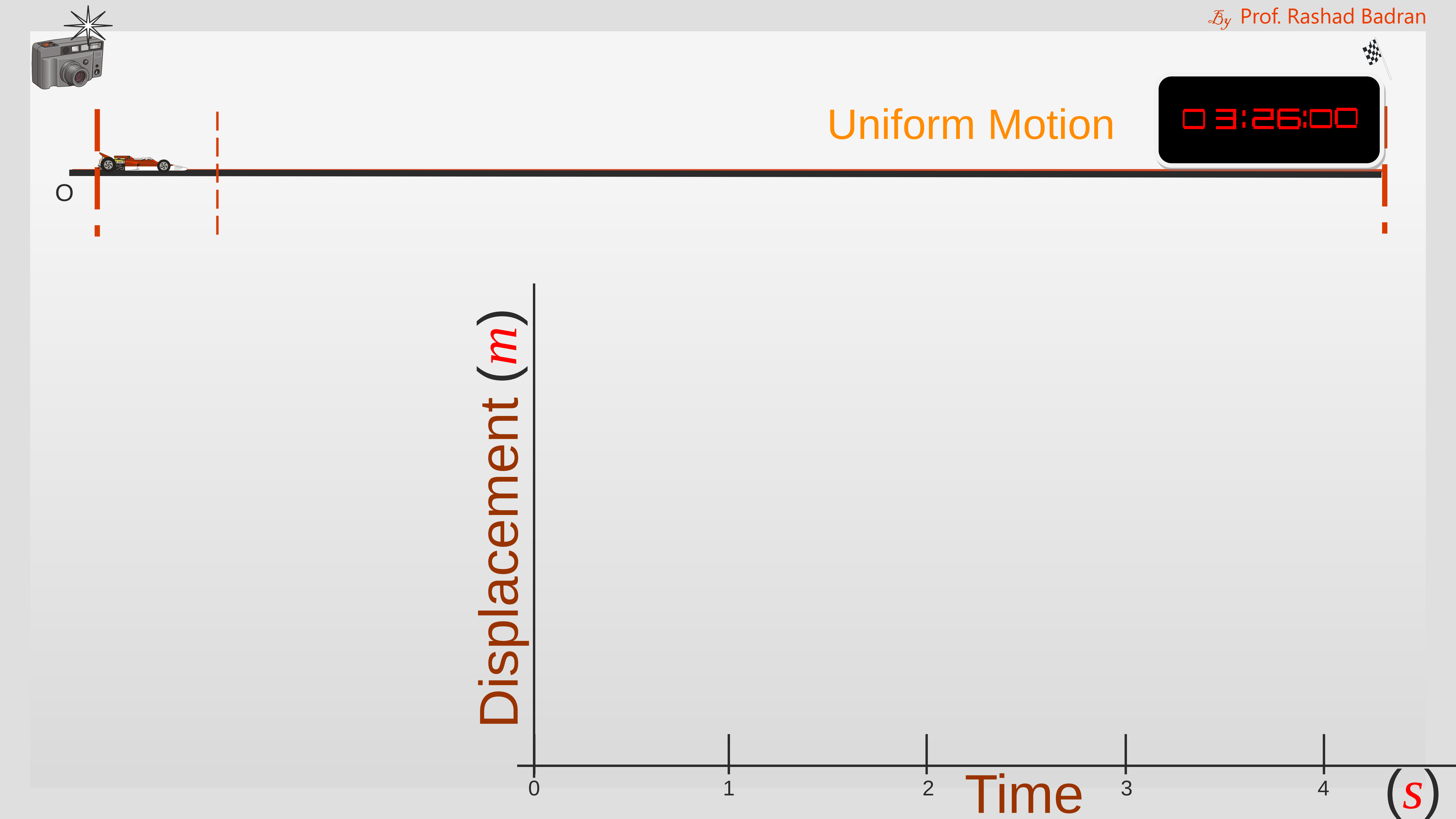
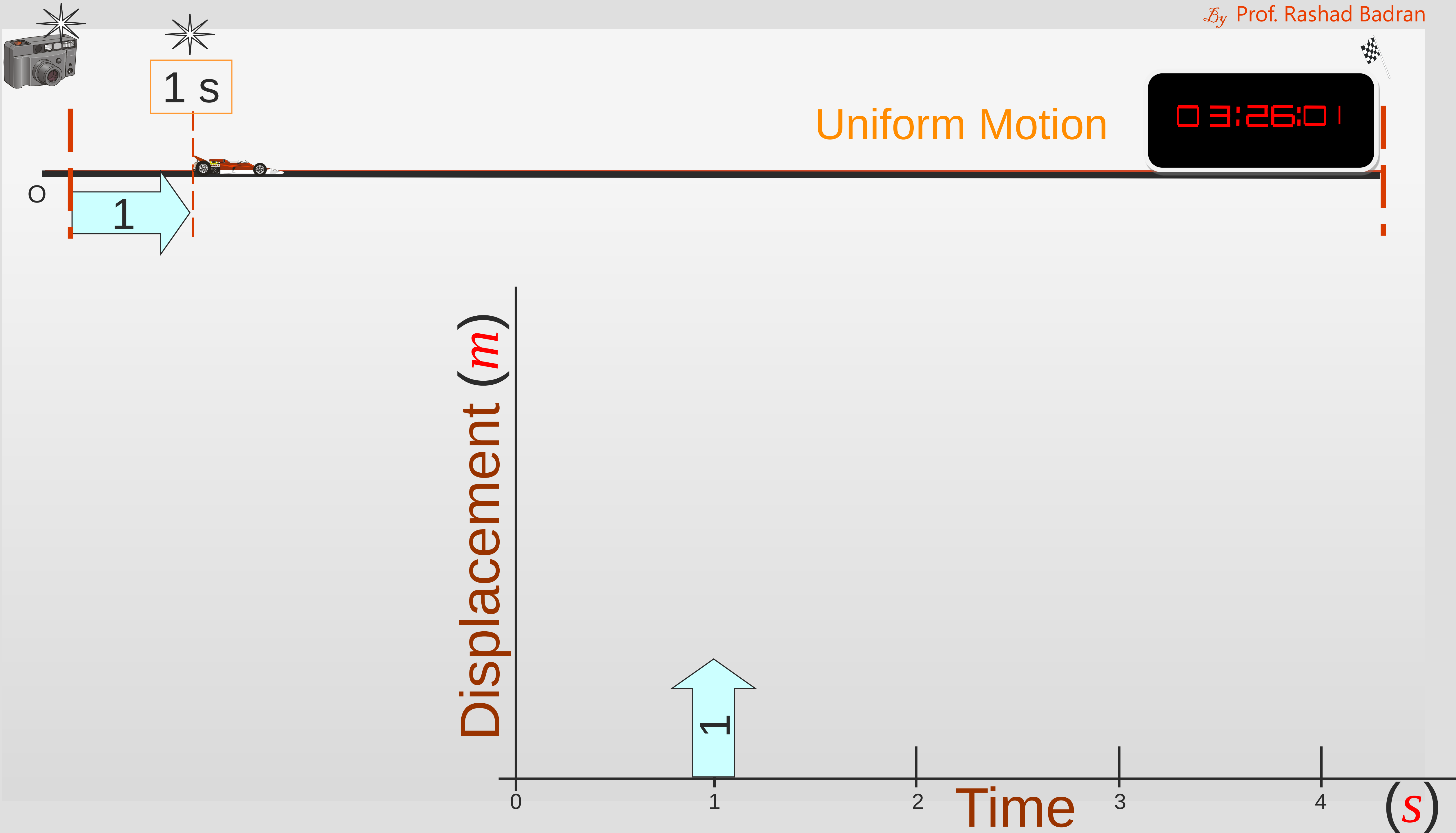
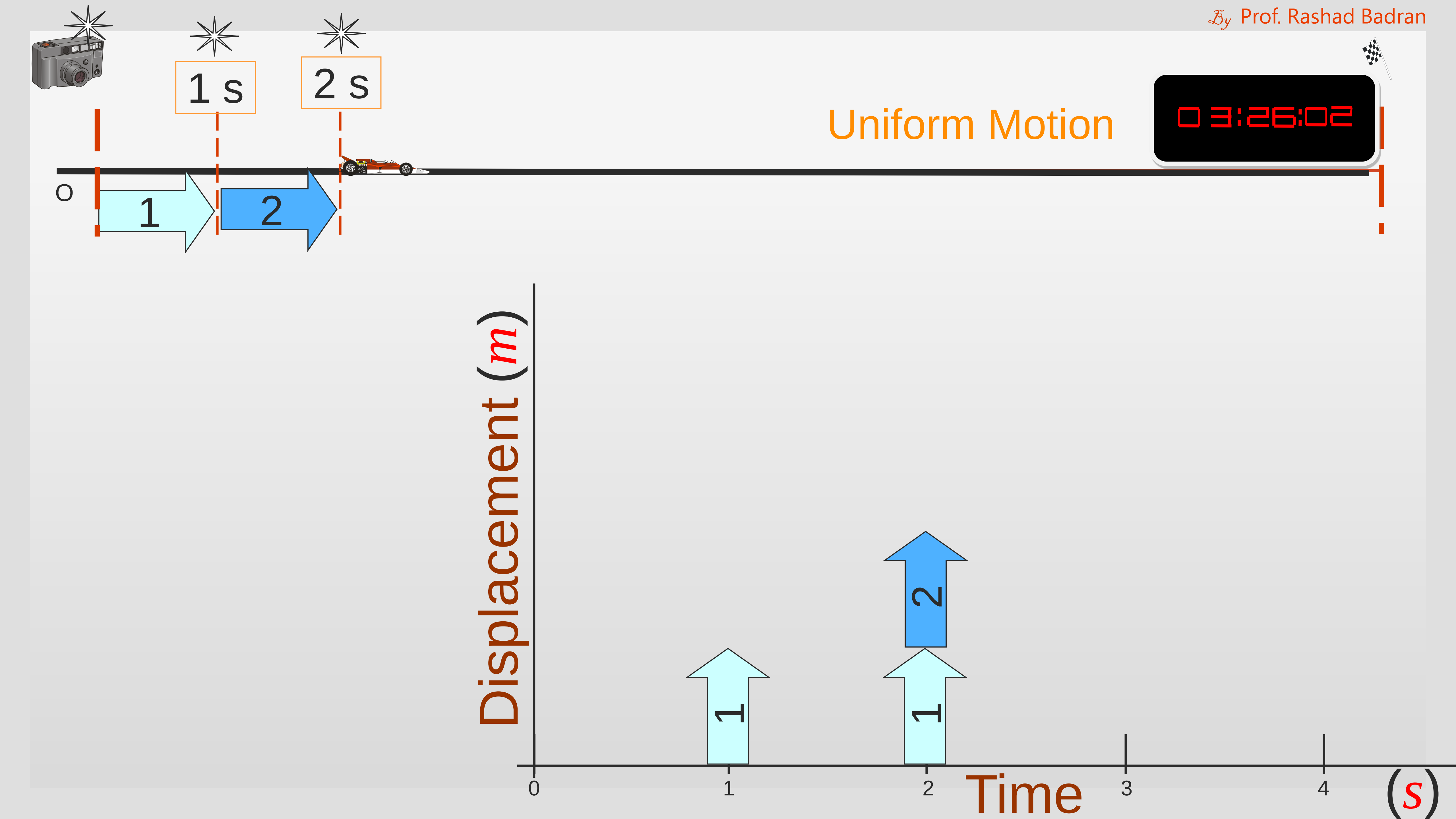
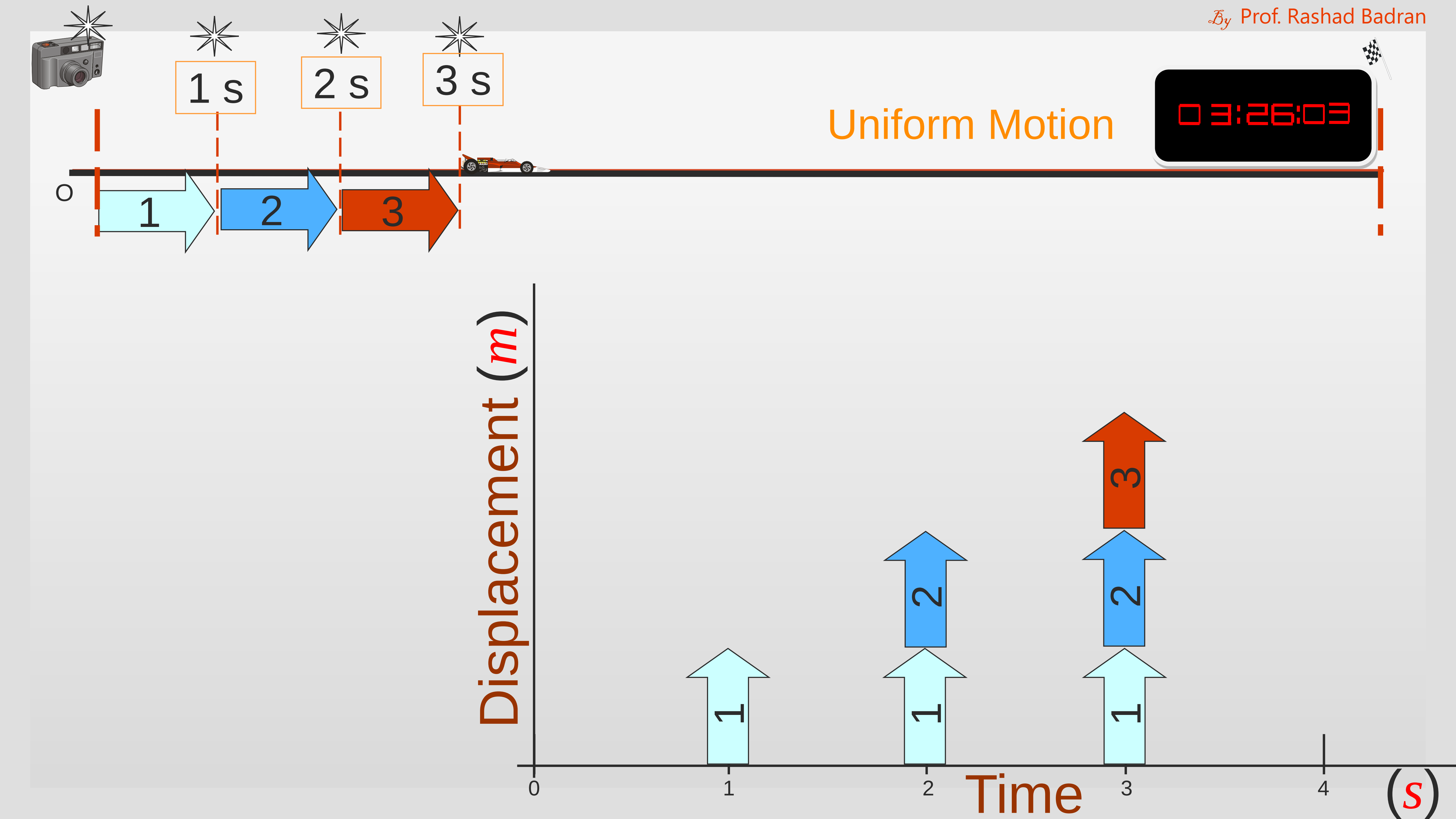

By Prof. Rashad Badran
Uniform Motion
03:26:00
O
Displacement (m)
0
1
2
3
4
Time (s)

By Prof. Rashad Badran

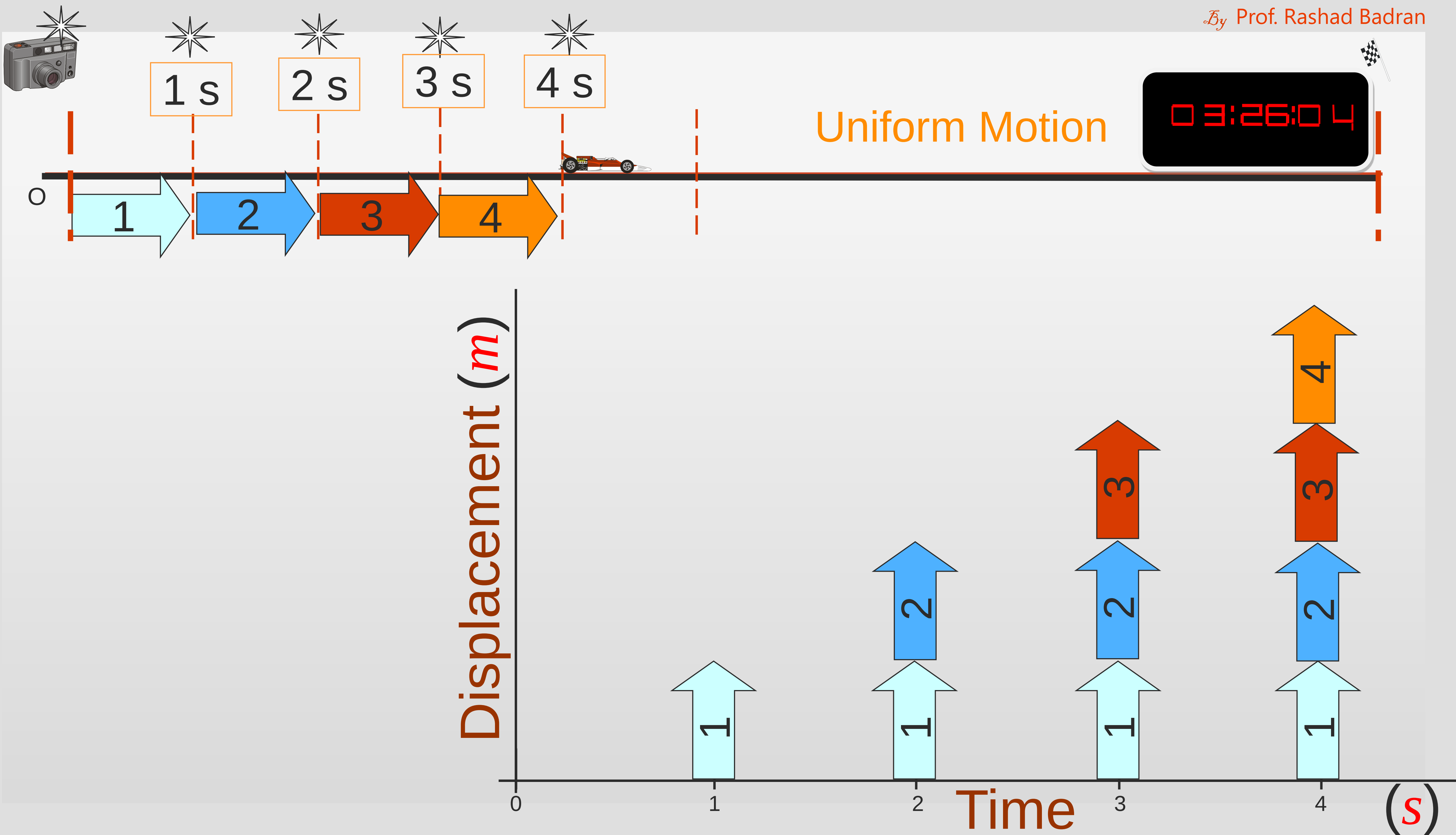
Uniform Motion




By Prof. Rashad Badran
1 s
2 s
Uniform Motion
03:26:02
O
1
2
Displacement (m)
1
1
2
0
1
2
3
4
Time (s)

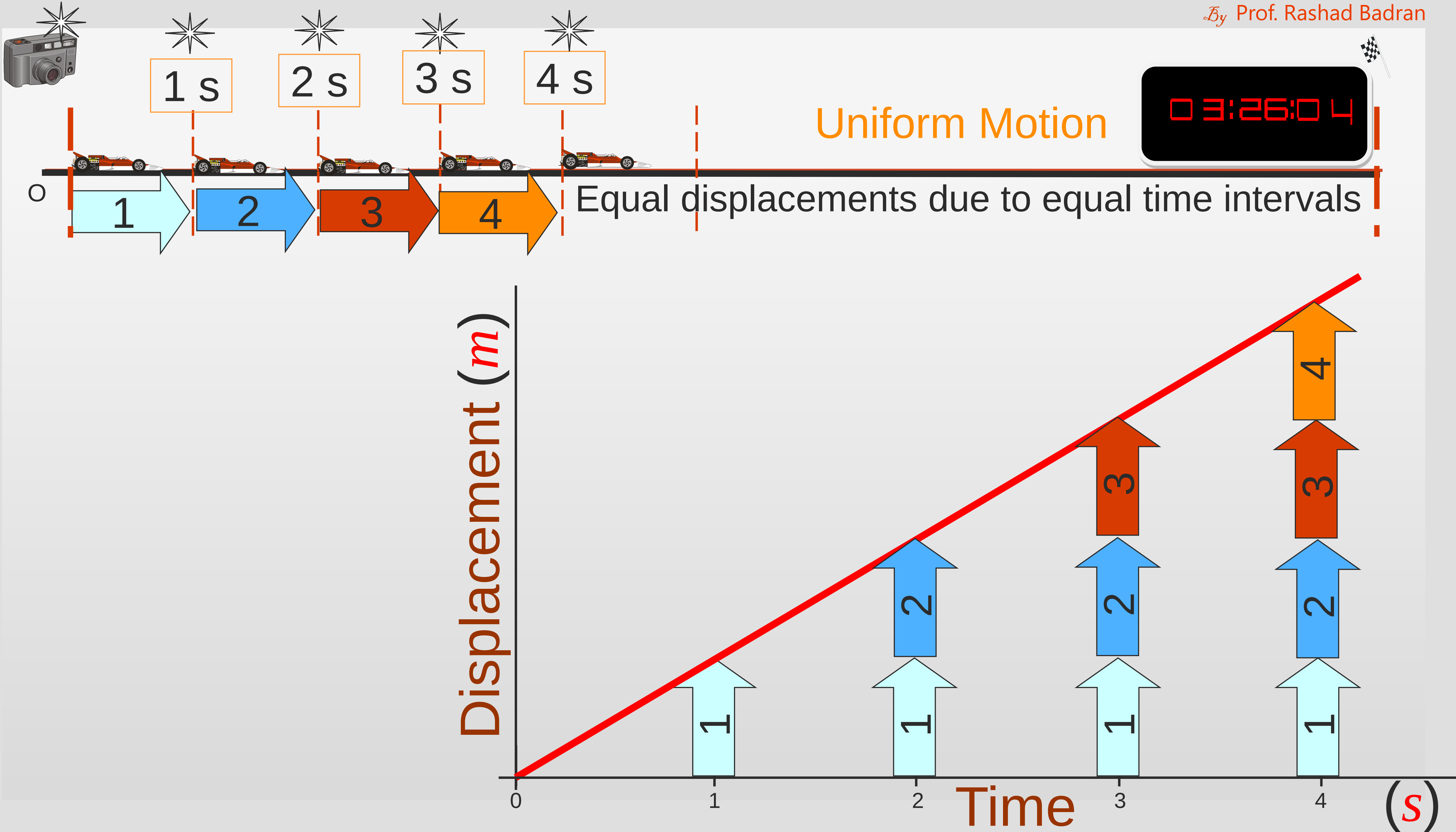


By Prof. Rashad Badran
Uniform Motion
03:26:03
1 s
2 s
3 s
O
1
2
3
Displacement (m)
Time (s)
0
1
2
3
4


By Prof. Rashad Badran
1 s
2 s
3 s
4 s
Uniform Motion
03:26:04
O
1
2
3
4
Displacement (m)
Time (s)
0
1
2
3
4

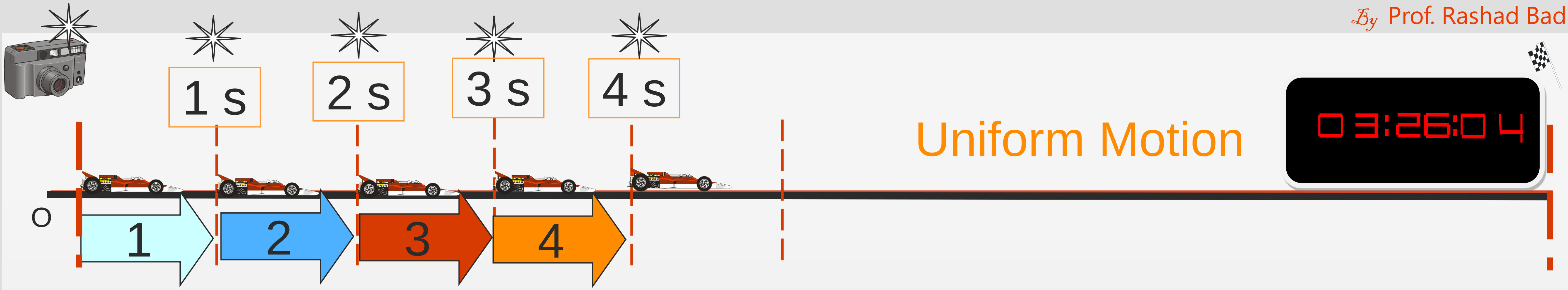
By Prof. Rashad Badran

Uniform Motion

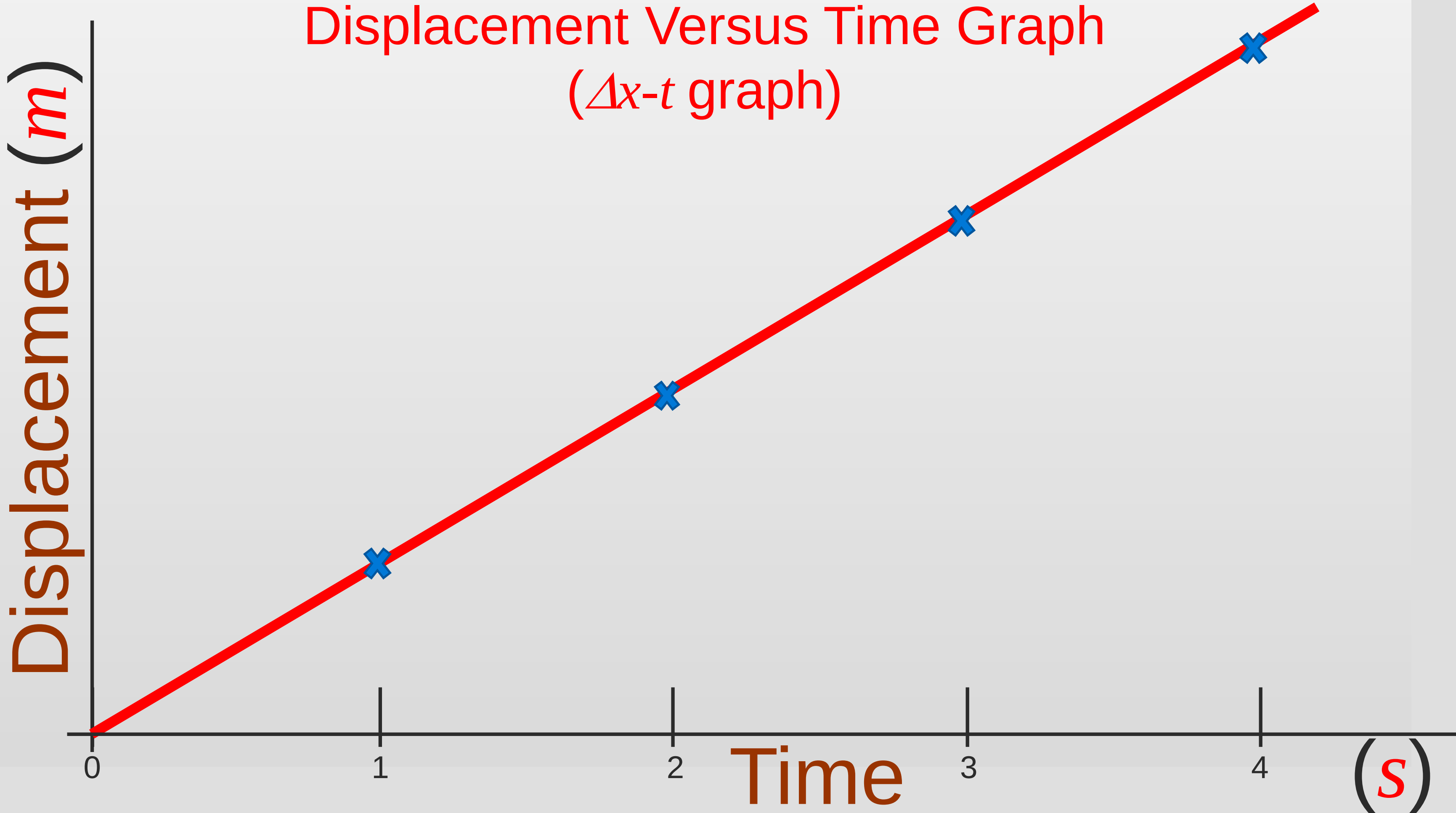


By Prof. Rashad Badran

Uniform Motion



Displacement Versus Time Graph
(Δx-t graph)



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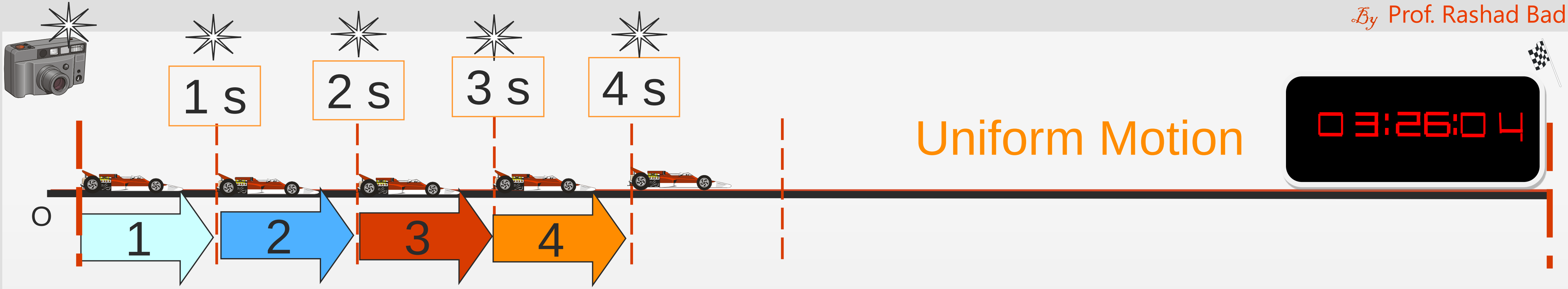
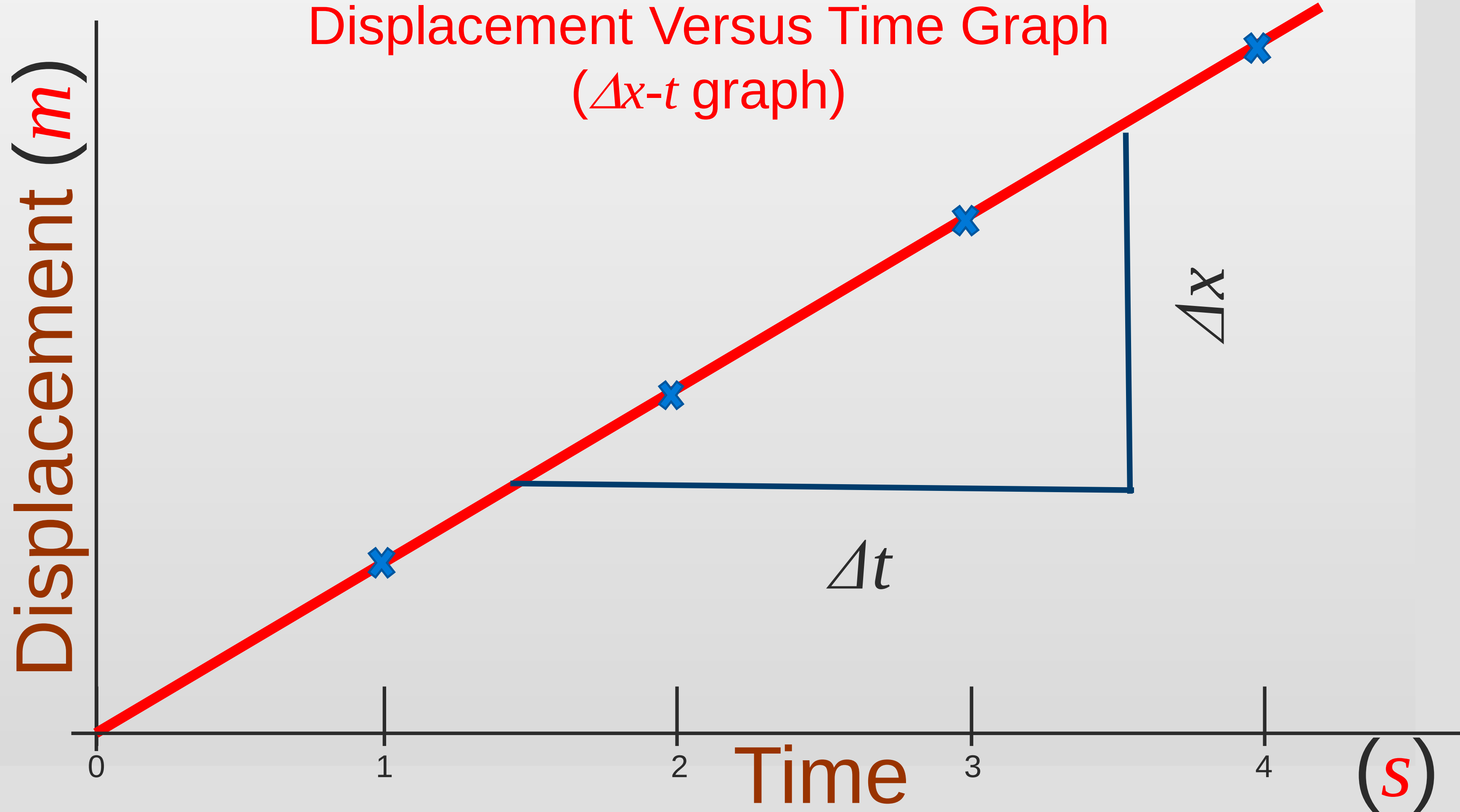
Uniform Motion



Displacement Versus Time Graph
(Δx-t graph)



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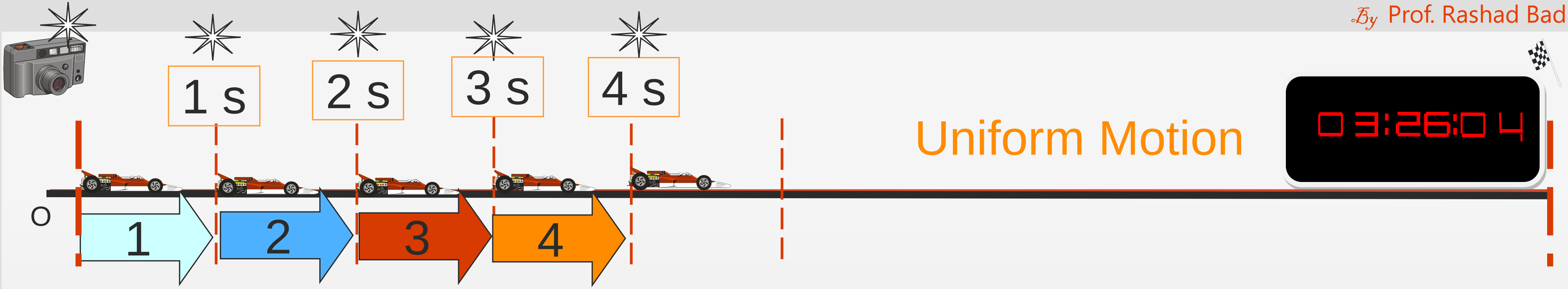
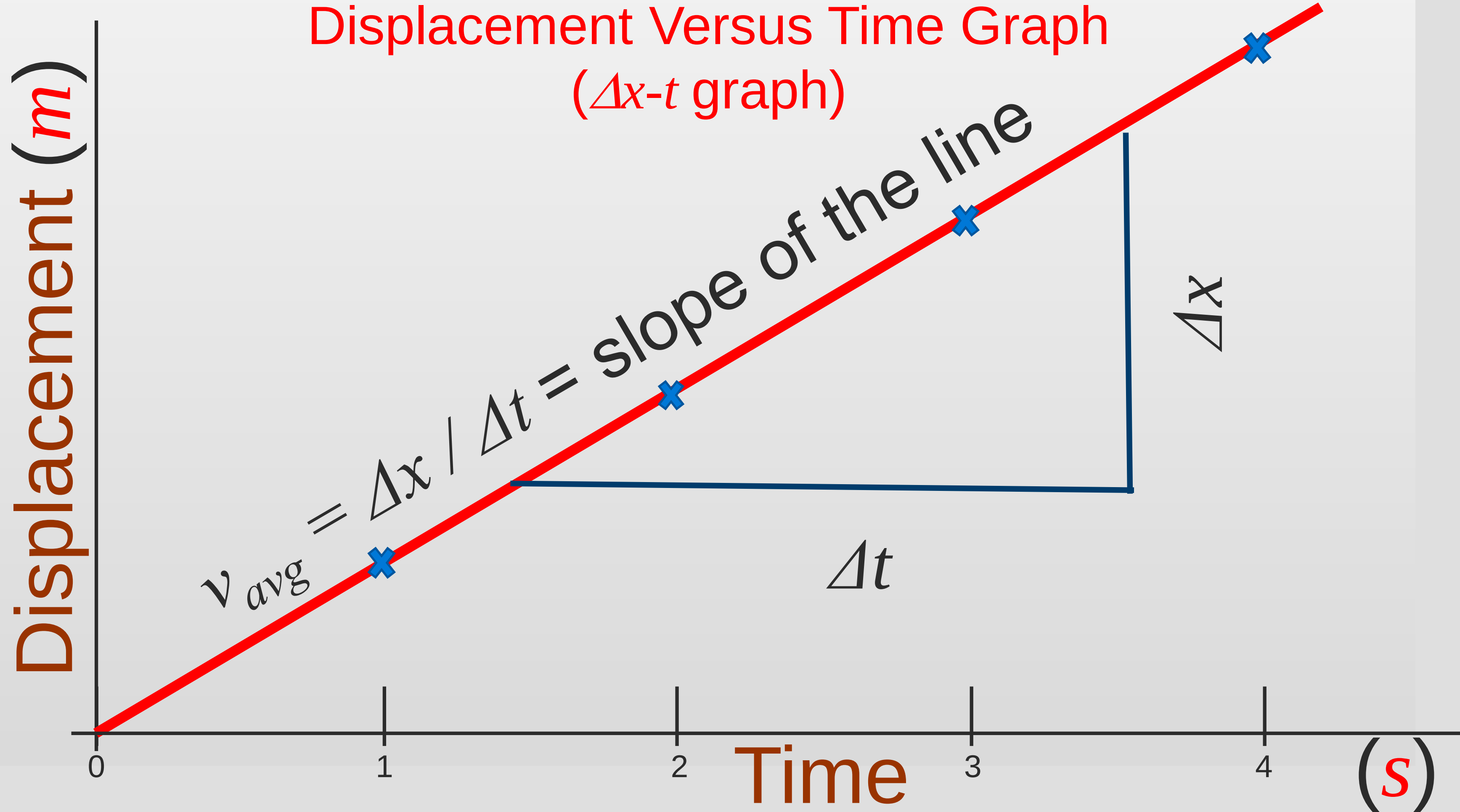


Average velocity can be calculated from the slope of the shown straight line



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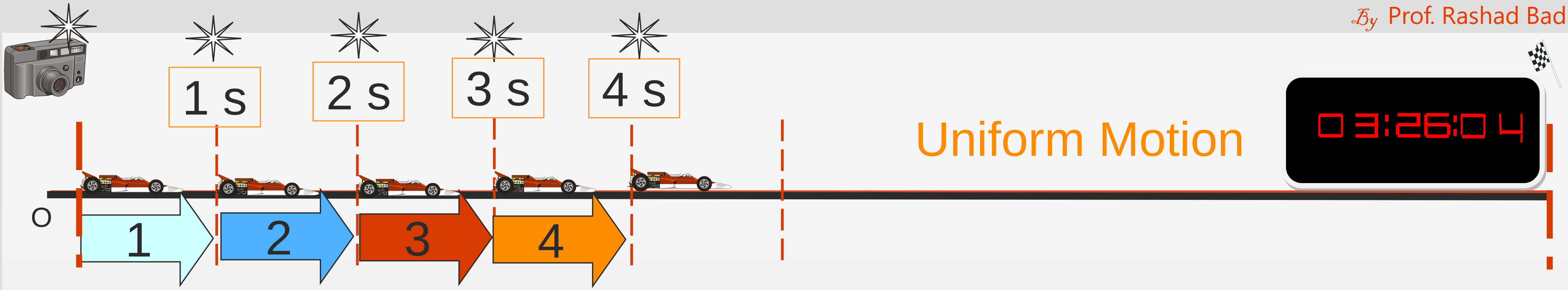
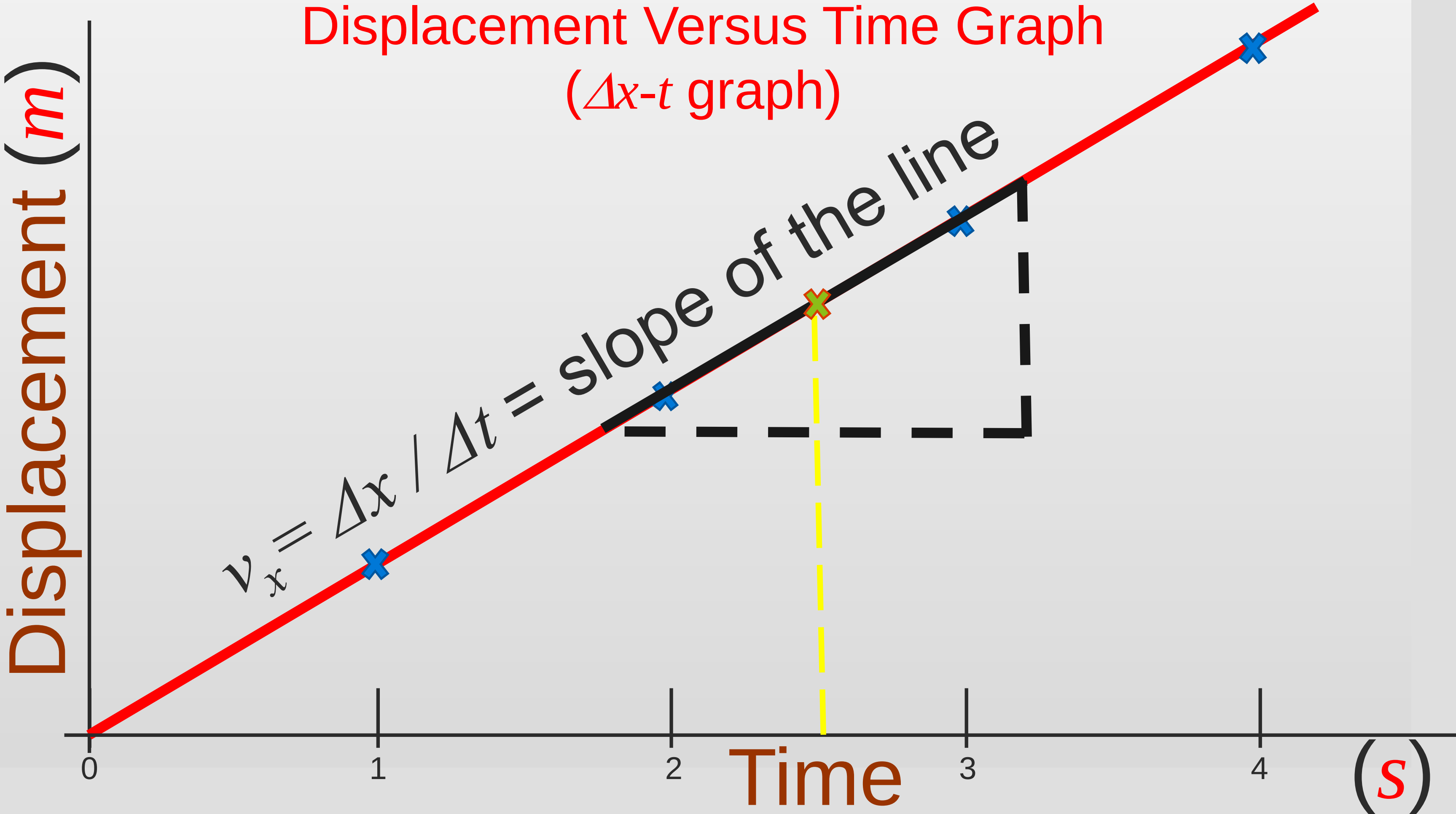


Velocity at any instant of time can be calculated from the projection of a line drawn from Time-axis (yellow line) to intersect the curve (red line). Tangent at point of intersection (black line) has a slope similar to that of the line (red line)



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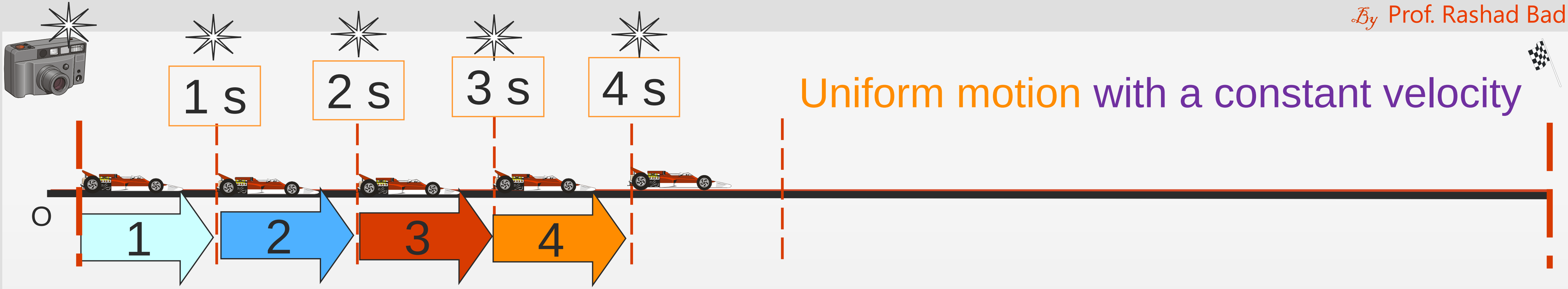
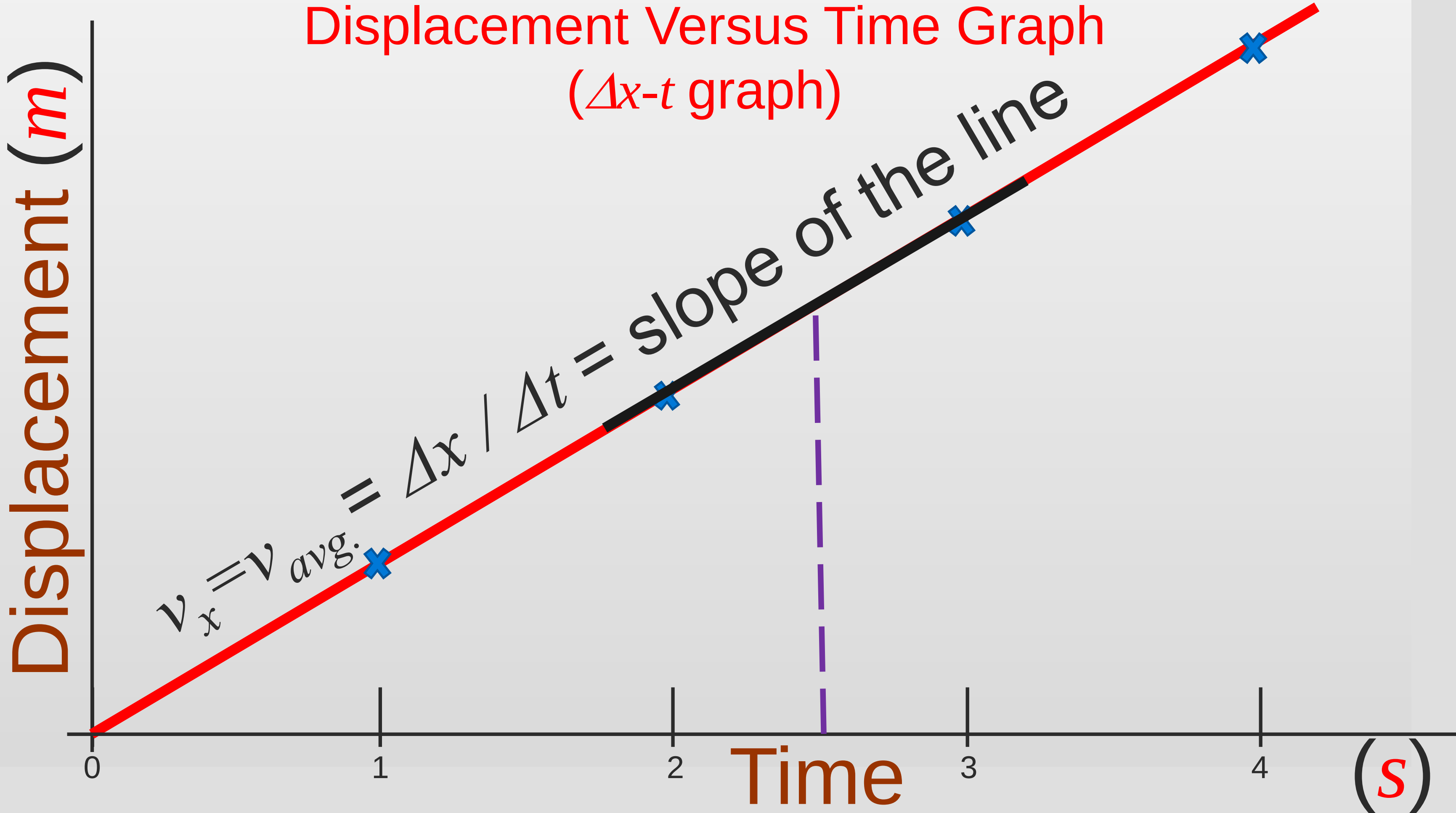


In this motion the instantaneous velocity is equal to the average velocity. This is a uniform motion with a constant velocity.



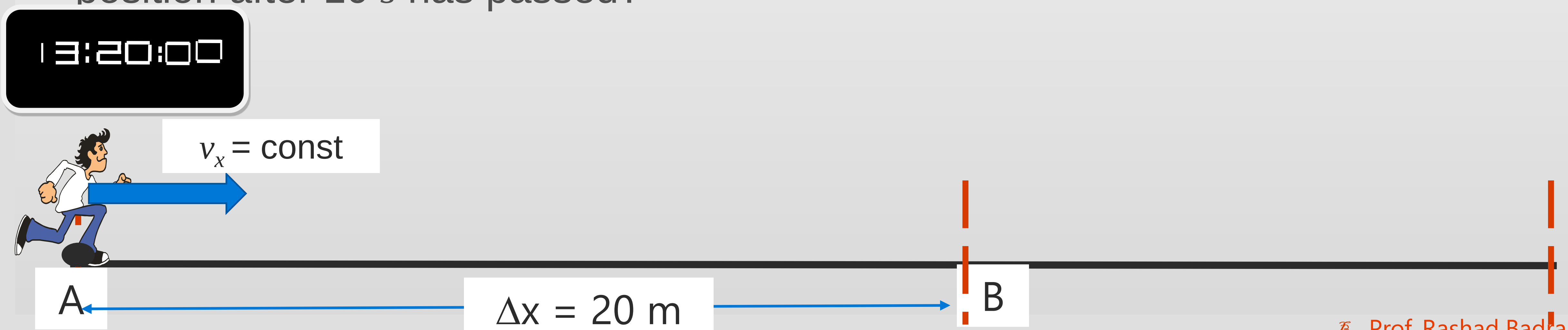
Modeling a Runner as a Particle under Constant Velocity:

Example

A coach starts the stopwatch at the moment a runner passes point A. The runner moves along a straight line at a constant rate towards point B which is located 20 m away from point A. The time interval indicated on the stopwatch is 4 s.

(a) What is the runner velocity?

(b) If the runner continues his motion after the stopwatch is stopped, what is his position after 10 s has passed?



By Prof. Rashad Badran

Modeling a Runner as a Particle under Constant Velocity: **Example**

A coach starts the stopwatch at the moment a runner passes point A. The runner moves along a straight line at a constant rate towards point B which is located 20 m away from point A. The time interval indicated on the stopwatch is 4 s.

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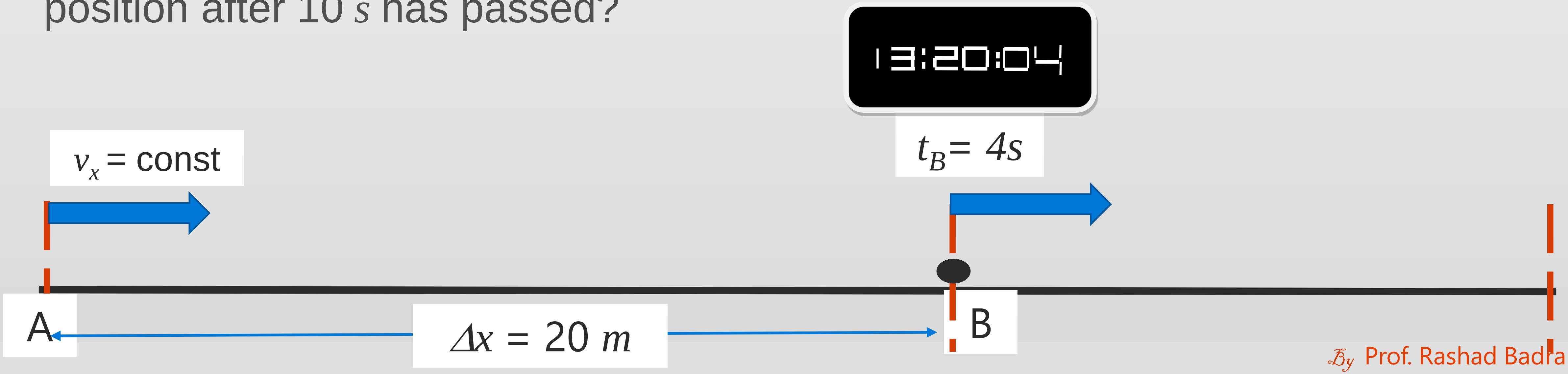
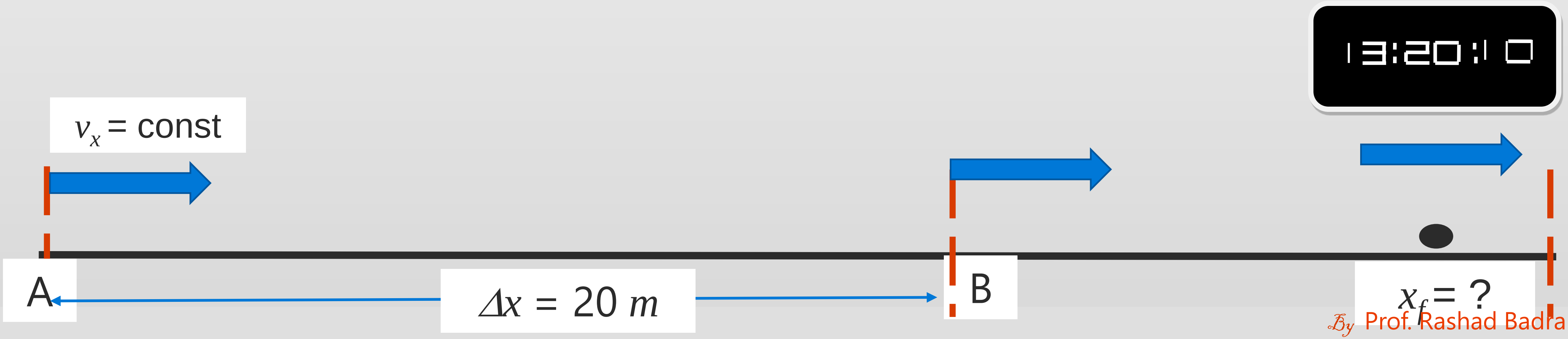


Modeling a Runner as a Particle under Constant Velocity: Example

A coach starts the stopwatch at the moment a runner passes point A. The runner moves along a straight line at a constant rate towards point B which is located 20 *m* away from point A. The time interval indicated on the stopwatch is 4 *s*.

(a) What is the runner velocity?

(b) If the runner continues his motion after the stopwatch is stopped, what is his position after 10 *s* has passed?



Solution:

(a) Since the velocity of the runner (particle) is constant (particle runs at a constant rate), its velocity at any instant during the interval is the same as the average velocity over this interval (*i.e.* $v_x = v_{avg}$.)

$$v_x = \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i} = \frac{20m - 0}{4s} = 5m/s$$ due east (towards +*ve* *x*-axis)

Note: In this problem where the direction of the particle is clearly indicated, the magnitude of the velocity may be referred to as speed.

(b) If the runner continues his motion after the stopwatch is stopped, what is his position after 10 s has passed?

Solution:

(b) Since the velocity of the runner (particle) is constant (particle runs at a constant rate), the previous equation can be used by writing $\Delta t = t - 0$, where $t_f = t = 10s$ and $t_i = 0$, and the equation can be rewritten as:

$$x_f - x_i = v_x t$$

$$x_f - 0 = (5)(10)$$

$$\Rightarrow x_f = 50m$$ towards +*ve* *x*-axis

By Prof. Rashad Badran