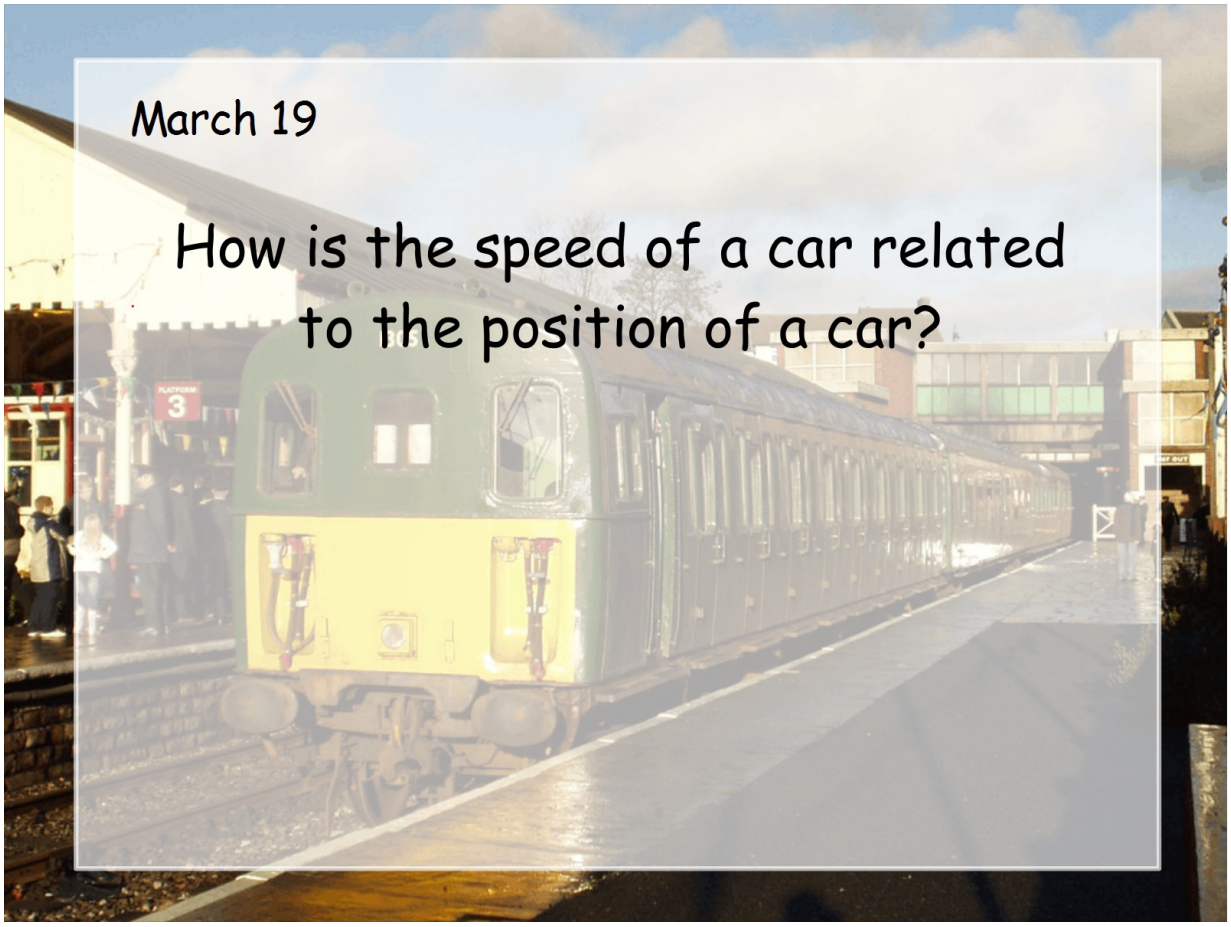
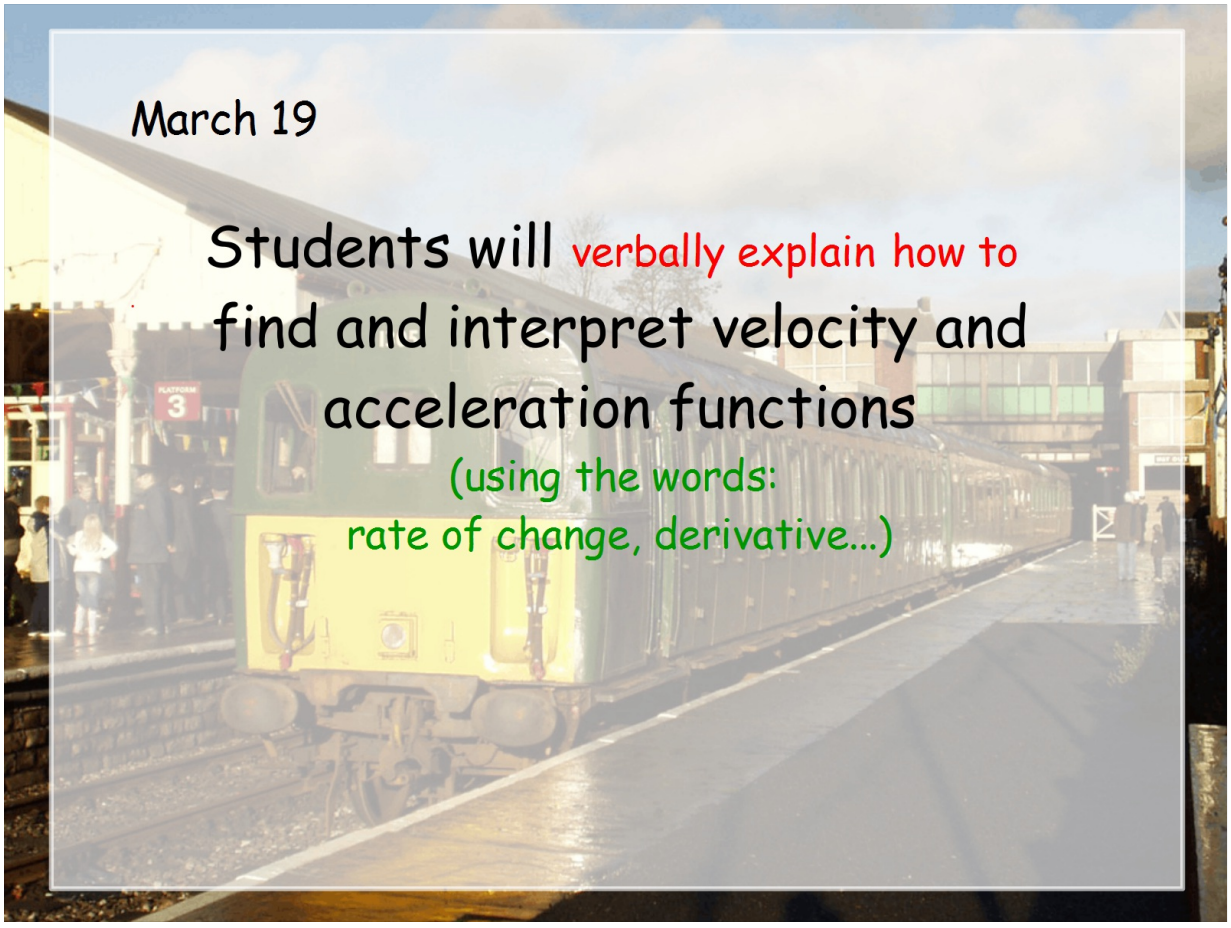


March 19

How is the speed of a car related to the position of a car?



March 19

Students will verbally explain how to find and interpret velocity and acceleration functions

(using the words: rate of change, derivative…)

Position Function	s(t)
Displacement	Change in Position final position - starting position
Average Velocity	Average Rate of Change $\frac{\text{Change in Position}}{\text{Change in time}} = \frac{s(b) - s(a)}{b - a}$
Instantaneous Velocity	- Instantaneous Rate of Change in position - Derivative of Position = $s'(t) = v(t)$ - If positive, then it is moving right/up/forward - If negative, then it is moving left/down/backward
Speed	Absolute Value of Velocity = $\lvert s'(t)\rvert = \lvert v(t)\rvert$
Acceleration	Instantaneous Change in Velocity - Derivative of Velocity = $v'(t) = a(t)$ - 2nd Derivative of Position = $s''(t) = a(t)$

The position of an object is given by $s(t) = t^3 - 12t^2 + 45t - 6$

Find the average velocity on $[0, 3]$

$0 \le t \le 3$

$\frac{\text{change in position}}{\text{change in time}}$ → slope of secant line

$$\frac{s(0) - s(3)}{0 - 3} = \frac{(0^3 - 12(0)^2 + 45(0) - 6) - (3^3 - 12(3)^2 + 45(3) - 6)}{0 - 3}$$

$$= \frac{-6 - 48}{-3} = \frac{-54}{-3} = 18$$

average velocity

find the instantaneous velocity at $t = 4$

derivative of position

$s'(t) = v(t) = 3t^2 - 24t + 45$

$v(4) = 3(4)^2 - 24(4) + 45 = -3$

instantaneous velocity

find the function that models the acceleration.

second derivative of position

first derivative of velocity

$s''(t) = v'(t) = a(t) = 6t - 24$