

Graphing Calculations

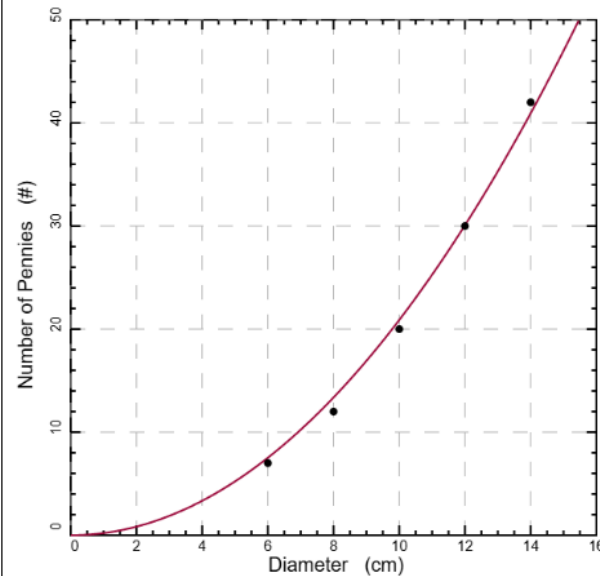
IB PHYSICS | SCIENCE SKILLS

Using a Mathematical Model | 1

Data Table

x data	y data
Diameter (cm)	# of pennies
6	7
8	12
10	20
12	30
14	42

Graph with Line of Fit



Roughly how many pennies would fit in a 50-cm diameter circle?

Select a model

- Proportional ($y = Ax$)
- Linear ($y = Ax + B$)
- Square Law ($y = Ax^2$)**
- Inverse ($y = A/x$)
- Inverse Square ($y = A/x^2$)

A = **0.209**

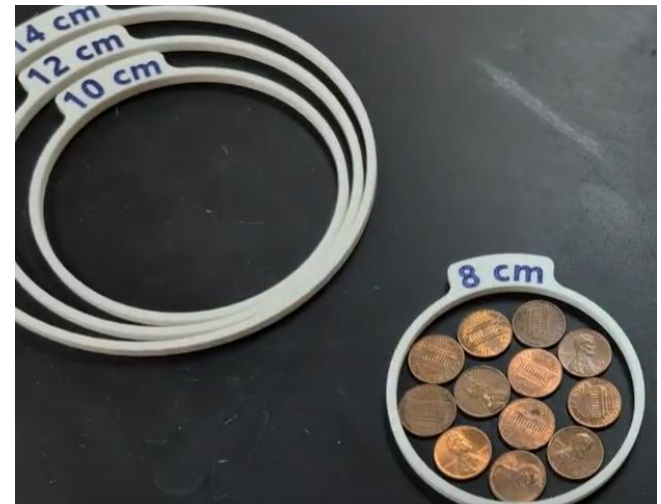
y → p (pennies)

x → D (diameter)

Best fit equation with substitutions

$$y = Ax^2$$

$$p = 0.209D^2$$

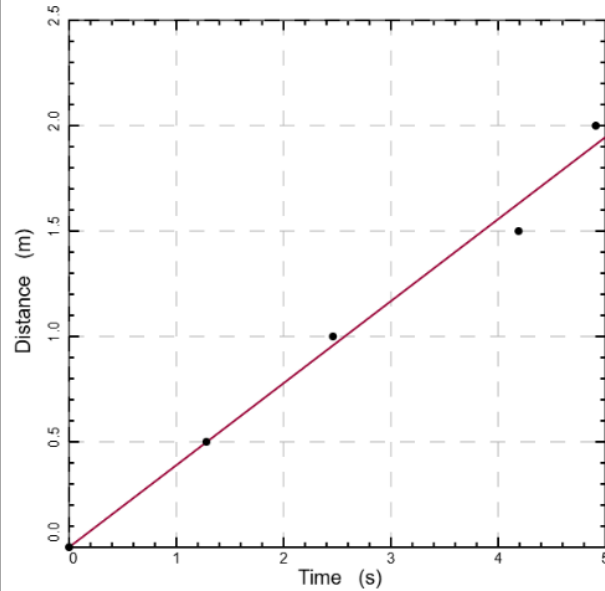


Using a Mathematical Model | 2

Data Table

x data	y data
Time (s)	Distance (m)
0	0
1.28	0.5
2.46	1.0
4.19	1.5
4.91	2.0

Graph with Line of Fit



How long would it take this toy car to travel 400 m?

Select a model

- Proportional ($y = Ax$)**
- Linear ($y = Ax + B$)
- Square Law ($y = Ax^2$)
- Inverse ($y = A/x$)
- Inverse Square ($y = A/x^2$)

A = **0.389**

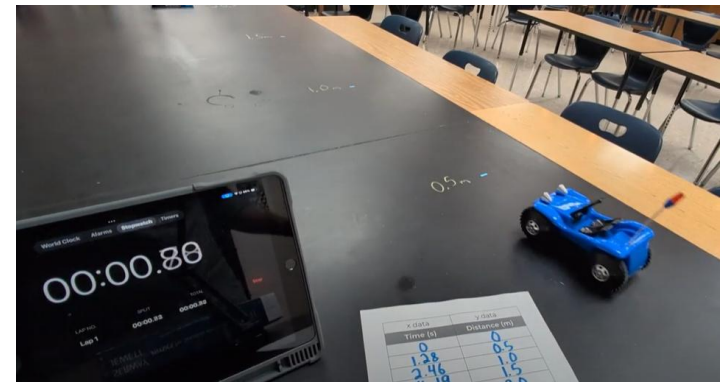
y → d (distance)

x → t (time)

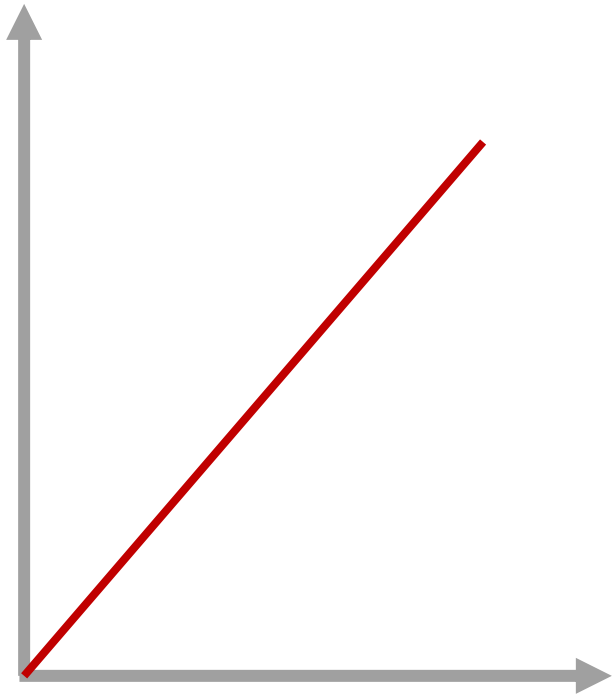
Best fit equation with substitutions

$$y = Ax$$

$$d = 0.389t$$

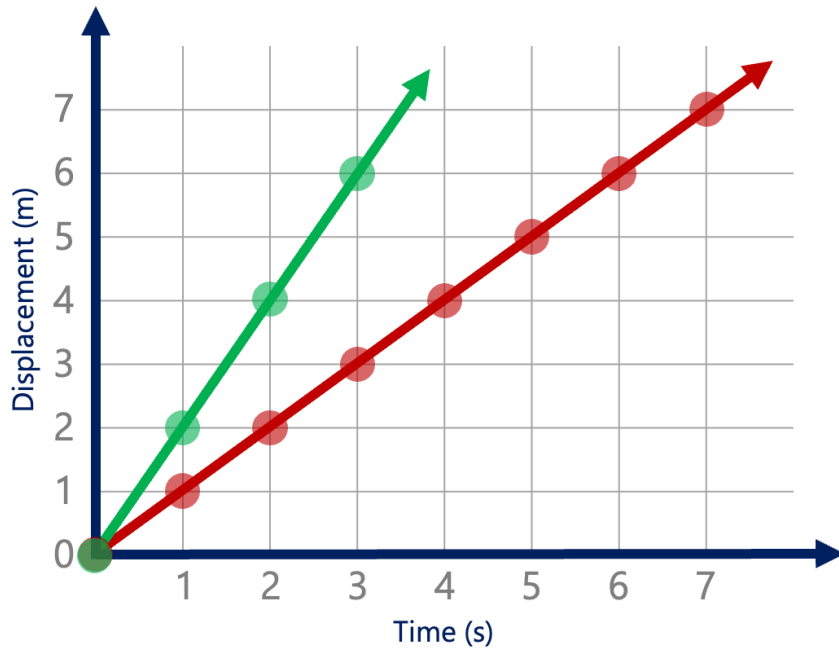


Slope



Equation
Value
Units

Slope as Velocity



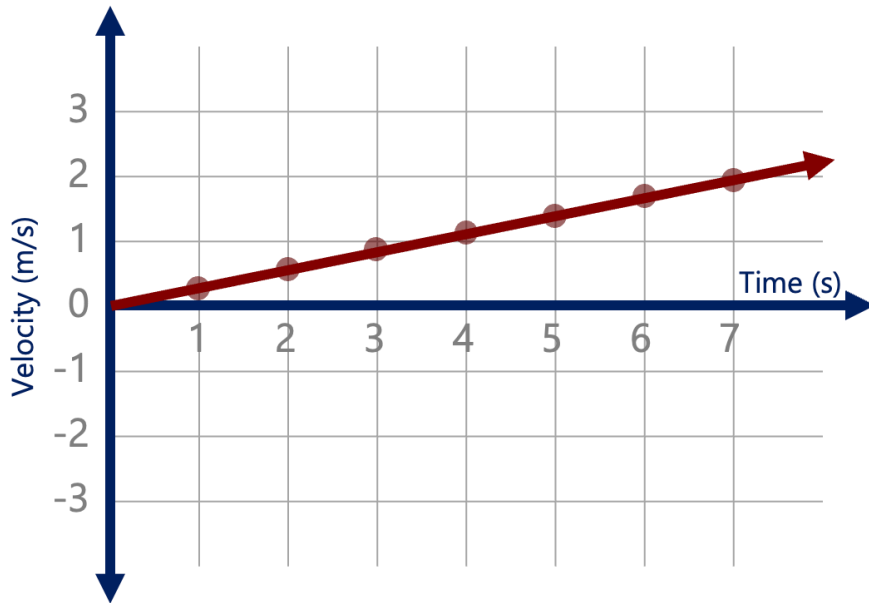
Equation

Value

Value

Units

Slope as Acceleration



Equation

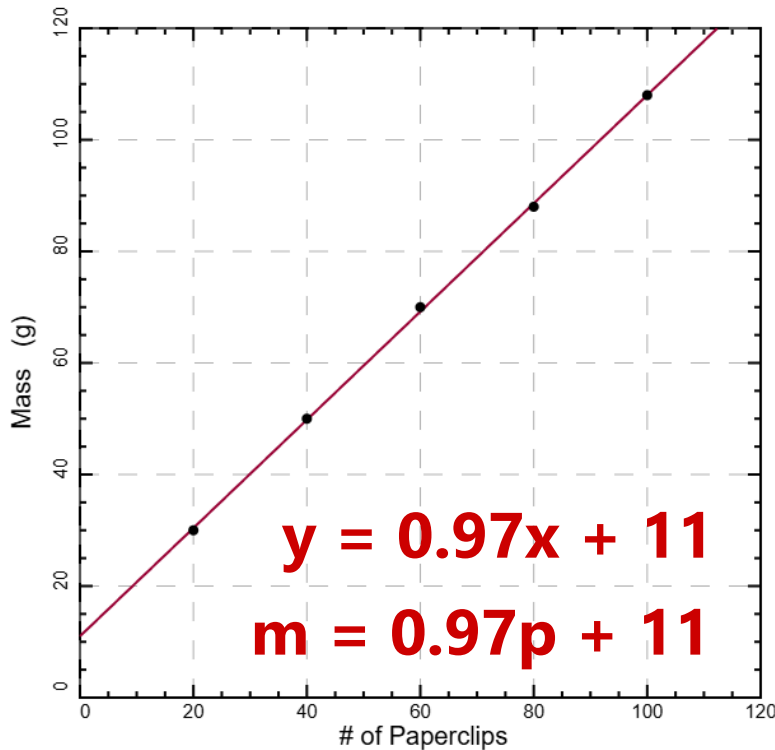
Value

Units

Y-Intercept has Meaning Too!



Graph of paperclip boxes with different numbers of paperclips

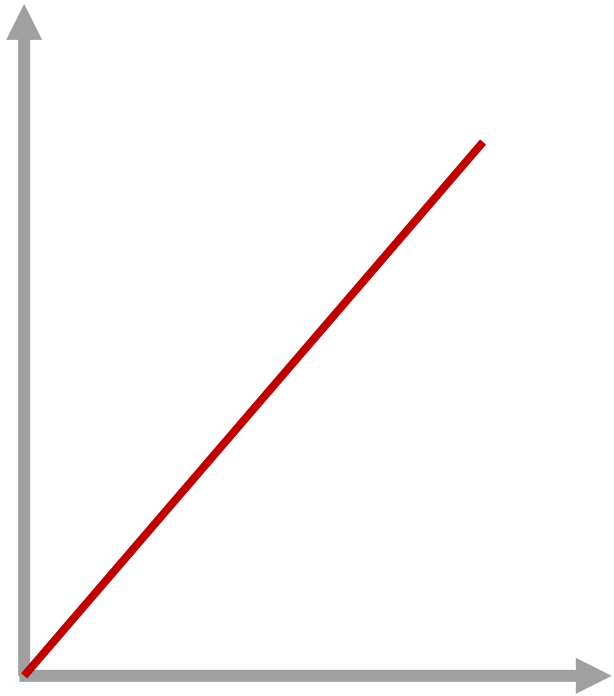


Slope

Y-Intercept

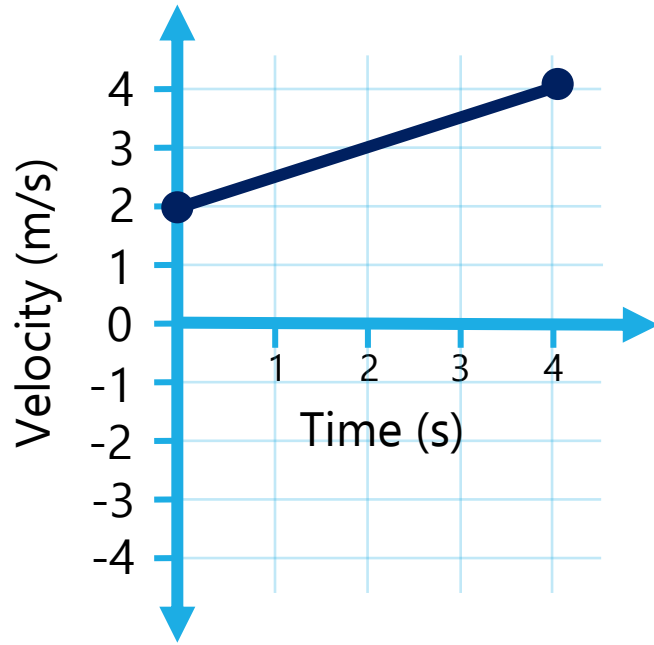
Value (with units)	
Meaning	
Value (with units)	
Meaning	

Area



Equation
Value
Units

Area as Displacement

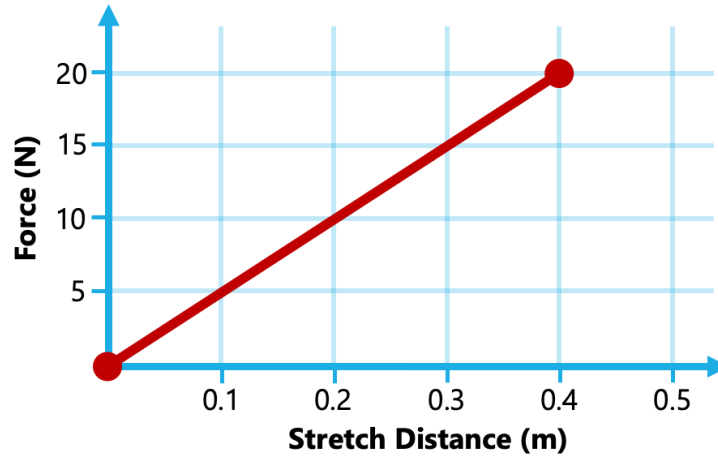


Equation

Value

Units

Try it...



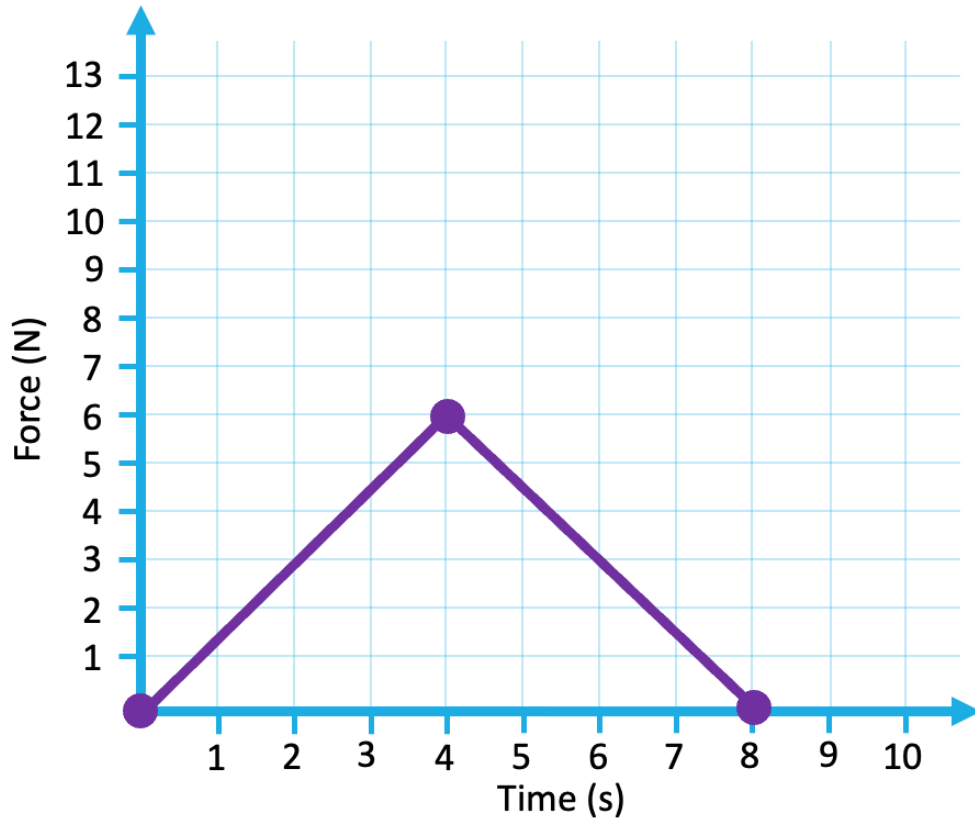
Slope

Area

Equation
Value
Units

Equation
Value
Units

Try it...



You have been asked to calculate something called **impulse** with units of "N x s". What is this value?

Lesson Takeaways

- I can use a mathematical model to make a prediction
- I can determine the equation, values, and units for the slope of a graph
- I can determine the equation, values, and units for the area of a graph
- I can identify strategies to calculate displacement, velocity, and acceleration from a graph