Conservation of Energy and Momentum

3 Different Equations

Elastic Collision: When two objects bounce off each other
m1 v1i + M1 V2i = m1 v2f + M2f V2f

Inelastic Collision: When two objects stick together
M1 V1i + M2 V2i = (M1 + M2) Vf

Explosion: When two objects repel each other
(m1 + m2)Vi = M1 V1f + M2 V2f

Problems

Mary Shealer, the former platform diver for the Ringling Brothers circus, had a kinetic energy of 13,000 J just prior to hitting the bucket of water. If Mary's mass is 45 kg, then what is her speed?

If the rhino were identically running a non-existing rhino will mass of 1800kg what would it's final velocity be? (Assume same velocity as +5 rhino minus final velocity of +1 m/s)

When doing a chin-up, a physics student lifts her 12.0 kg body a distance of 0.25 meters in 2 seconds. What is the power delivered by the student's biceps?

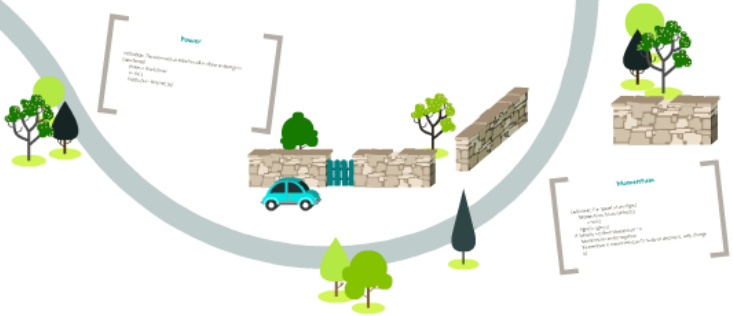
Momentum Continued

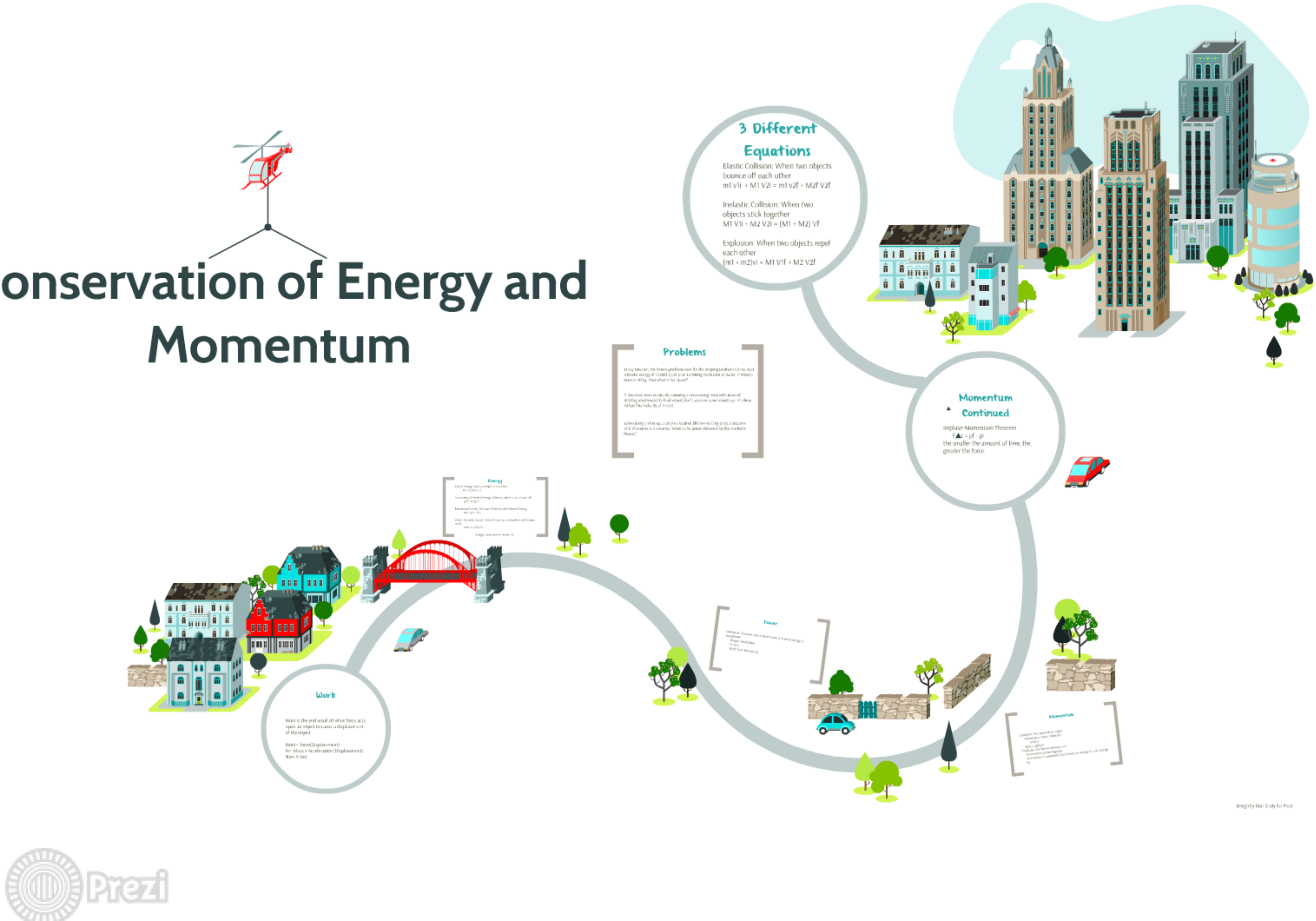
Impulse-Momentum Theorem
F▲t = pf - pi
the smaller the amount of time, the greater the force

Work

Work is the end result of when force acts upon an object to cause a displacement of the object

Work= Force(Displacement)
W= Mass x Acceleration (Displacement)
Nm= N (m)

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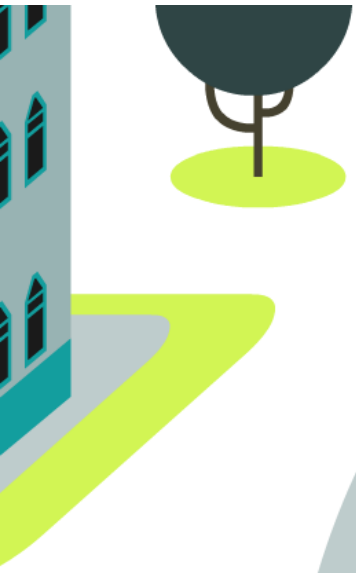

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Energy

Kinetic Energy: When an object is in motion

KE= 1/2 (m) v^2

Gravitational Potential Energy: When an object is at a stand still

gPE= m (g) h

Mechanical Energy: The sum of Kinetic and Potential Energy

ME= gPE + KE

Elastic Potential Energy: Stored in springs, trampolines and bungee cords

ePE= 1/2 (k) d^2

Energy is measured in Joules (J).

Power

Definition: The time rate at which work is done or energy is transferred

Power= Work/time

P= W/t

Watts (w)= Nm/sec (s)

Momentum

Definition: The speed of an object

Momentum= Mass (Velocity)

p=m(v)

kgm/s= g(m/s)

If Velocity = 0 then Momentum = 0

Momentum can be negative

Momentum is conserved (Can't create or destroy it, only change it)

Momentum ▲ Continued

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Inelastic Collision: When two objects stick together

$M_1 V_{1i} + M_2 V_{2i} = (M_1 + M_2) V_f$

Explosion: When two objects repel each other

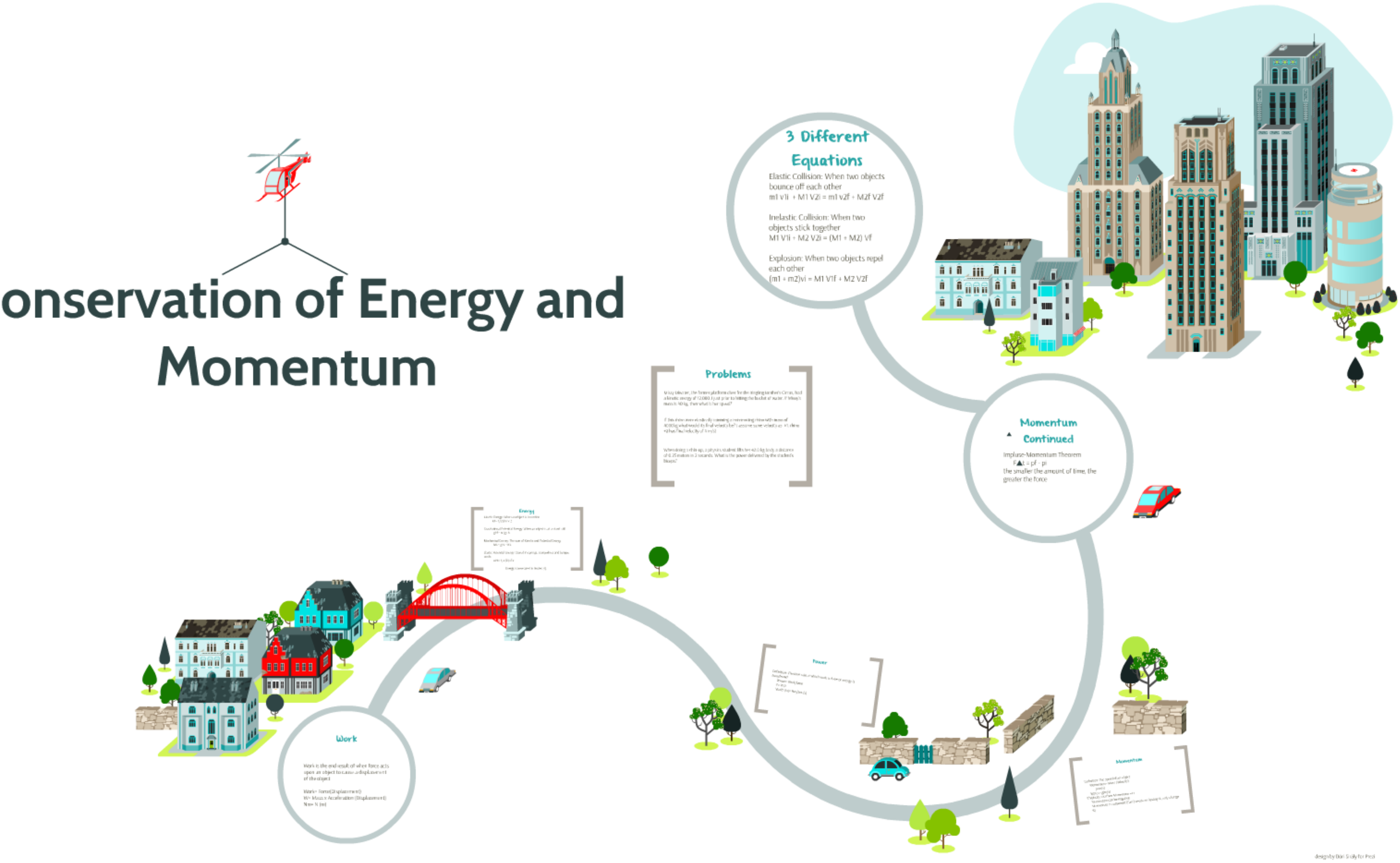
$(m_1 + m_2)v_i = M_1 V_{1f} + M_2 V_{2f}$

Problems

Missy Diwater, the former platform diver for the Ringling Brother's Circus, had a kinetic energy of 12,000 J just prior to hitting the bucket of water. If Missy's mass is 40 kg, then what is her speed?

If this rhino were elastically ramming a non-moving rhino with mass of 4000kg what would its final velocity be? (assume same velocity as #1. rhino #2 has final velocity of 4 m/s)

When doing a chin-up, a physics student lifts her 42.0 kg body a distance of 0.25 meters in 2 seconds. What is the power delivered by the student's biceps?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