Math:

1. An object is launched at a velocity of 40 m/s in a direction making an angle of 50° upward with the horizontal. Q1. What is the maximum height reached by the object? Q2. What is the object's total flight time (between launch and touching the ground)? Q3. What is the object's horizontal range (maximum x above ground)?
2. A ball is kicked horizontally with a speed of 10 m/s from a height of 5 meters. How long does it take for the ball to hit the ground?

3. If a stone is thrown vertically upward with a velocity of 15 m/s, how high will it go before it starts coming back down?
4. An object is launched at an angle of 30 degrees to the horizontal with an initial speed of 20 m/s. Calculate the time it takes for the object to reach its maximum height.
5. A fielder throws a ball with an initial velocity of 30 m/s at an angle of 45 degrees to the horizontal. Calculate the horizontal and vertical components of the initial velocity.

6. If an object is dropped from a height of 50 meters, how long will it take to reach the ground?
7. A stone is thrown horizontally off a cliff with a speed of 15 m/s. Calculate the time it takes for the stone to reach the ground, neglecting air resistance.
8. A soccer player kicks a ball at an angle of 60 degrees to the horizontal with an initial speed of 25 m/s. Calculate the vertical velocity after 5 seconds.
9. A paper airplane is launched horizontally from a height of 2 meters with a velocity of 5 m/s. How long does it take for the airplane to hit the ground?
10. An object falls freely from rest. Calculate its velocity after 3 seconds.
11. A car accelerates from 20 m/s to 40 m/s in 4 seconds. Find its acceleration.

12. A ball is thrown vertically upward with an initial velocity of 15 m/s. Calculate the time it takes to reach its highest point.
13. An athlete runs at a constant speed of 8 m/s for 10 seconds. How far does the athlete travel?
14. A bicycle accelerates from 5 m/s to 17 m/s in 6 seconds. Determine the distance it travels during this time.
15. A rocket is launched vertically with an initial velocity of 50 m/s and its acceleration is 20 m/s^2. Considering gravity How long will it take to reach a height of 5000 meters?
16. A person lifts a 10 kg box vertically upward through a height of 5 meters. Calculate the work done against gravity. (Use g= 10 m/s^2)
17. A force of 20 N is applied to push an object horizontally across a table for a distance of 4 meters. Calculate the work done.
18. A car applies a braking force of 5000 N to come to a complete stop from a speed of 20 m/s at 4 second. Calculate the work done by the brakes.
19. A spring with a force constant of 100 N/m is compressed by 0.05 meters. Calculate the work done in compressing the spring.
20. A crane lifts a load of 5000 N vertically upward for a distance of 8 meters. Calculate the work done by the crane.
21. A 50 kg box is pushed horizontally with a 1200 N force at an angle of 30 degrees with the horizontal. Given that the coefficient of sliding friction is 0.15, calculate the net force acting on the box and determine its acceleration.
22. If a 30 kg box is moving horizontally with a constant velocity on a rough surface with a coefficient of sliding friction of 0.3, what is the magnitude of the horizontal force being applied to the box?
23. A 60 kg crate is on an inclined plane with an angle of 25 degrees to the horizontal. If a 1000 N force is applied parallel to the incline and the coefficient of sliding friction is 0.25, calculate the frictional force acting on the crate and its acceleration down the incline.
24. A 500 kg object is lifted vertically upwards with a force of 2000 N over a distance of 15 meters. Calculate the net work done on the object.
25. A spring with a force constant of 500 N/m is compressed by 0.1 meters. Calculate the work done in compressing the spring.
26. A 1000 N force is applied to push a heavy crate horizontally across a rough surface for a distance of 10 meters. Given that the frictional force opposes the motion with 300 N of force, calculate the net work done on the crate.
27. A 60 kg hiker climbs a mountain that has a vertical height gain of 500 meters. Calculate the work done by the hiker against gravity during the ascent.
28. A motor exerts a constant force of 800 N to lift an elevator vertically upwards for a distance of 30 meters. Calculate the work done by the motor.
29. A spring is compressed by 0.025 meters when a force of 8.0 N is applied to it. Calculate the force constant (k) of the spring.

30. A 0.2 kg mass is attached to a spring with a force constant (k) of 400 N/m. If the mass is pulled 0.1 meters to the right and released from rest, find the mechanical energy of the oscillating mass-spring system.
31. A spring with a force constant (k) of 300 N/m is compressed by 0.04 meters. Calculate the potential energy stored in the compressed spring.
32. A 0.3 kg mass hangs from a spring with a force constant (k) of 500 N/m. If the mass is released from rest and allowed to fall, calculate the kinetic energy of the mass just before it reaches its equilibrium position.
33. A 0.5 kg mass is attached to a spring with a force constant (k) of 200 N/m. Find the period of oscillation of the mass-spring system when it is pulled 0.1 meters to the right and released from rest.