**FPS – Energy Math Practice**

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| I can… |
| *Calculate kinetic and potential energy.**Interpret energy calculations.* |

Let’s walk through the math for **gravitational potential energy** and **kinetic energy**.

Label the equation and its units below.

$$GPE =m ∙ g ∙ h$$

Label the equation and its units below.

$$KE =0.5 ∙ m ∙ v^{2}$$

Identify which energies are being addressed in the following scenarios by writing “GPE” or “KE”.

1. A rock resting on a cliff. \_\_\_\_\_\_\_\_\_
2. A skateboarder standing at the top of a ramp. \_\_\_\_\_\_\_\_\_
3. A rock rolling down a hill. \_\_\_\_\_\_\_\_\_
4. A baby sitting in a stroller. \_\_\_\_\_\_\_\_\_
5. A dog chasing a squirrel. \_\_\_\_\_\_\_\_\_

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| **Form** | **Definition** | **Type (KE, PE, or Both)** | **Example (for each type if both)** |
| Mechanical energy | A movement creates energy |  |  |
| Thermal energy | The movement of molecules |  |  |
| Radiant energy | Electromagnetic waves |  |  |
| Electrical energy | Movement of electrons  |  |  |
| Chemical energy |  Stored in bonds of atoms and molecules |  |  |
| Nuclear energy | Stored in the nucleus of an atom; released when nucleus splits |  |  |
| Sound energy | Vibration of waves through material |  |  |
| Gravitational energy | Energy of position or height |  |  |

Complete the energy problems below. SHOW ALL OF YOUR WORK. *Get your teacher’s initials in the box to move on*.

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| ***Thinking about factors affecting energy*** |
| Circle the one with more Potential energy and briefly ***explain why***.1. A 25 kg mass or a 30 kg mass at the top of a hill?
2. A car at the top of the hill or the bottom of a hill?
3. A plane on the ground or a plane in the air?
4. A full plane or an empty plane (both are flying)?

Circle the one with more Kinetic energy and briefly ***explain why***.1. A 25 kg mass or a 30 kg mass going 5 m/s.
2. Two 10 kg masses, one going 75 m/s, one going 45 m/s.
3. A car at rest or a car rolling down a hill.
4. A heavy bike or a light bike.
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| ***Potential Energy*** |
| What is the gravitational potential energy of a rock resting on a 56 meter high cliff if its mass is 813 kg? (Hint: we are on Earth.) |
| Find the potential energy of a 4500 kg roller coaster while it is suspended at the top of the hill at 91 m high. (Hint: we are on Earth.) |
| What is the potential energy of that SAME roller coaster from the previous question if it is on the moon with a gravity of 1.6 m/s2? |
| What is the energy of a car resting on the ground that weighs 2000 kg on Earth? On the moon? |

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| ***Kinetic Energy*** |
| What is the energy of a 4 kg rock rolling 10 m/s down a hill?  |
| What is the energy of an 8kg cat running at 4 m/s to chase a mouse? |
| A car (2000 kg) is traveling at 13.4 m/s. What is its energy? |
| If a plane is traveling at 250 m/s and has a mass of 8930 kg, how much energy does it have? |

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| ***Mixed review*** |
| A 49 kg skateboarder is sitting at the top of a 34 m ramp. How much energy does she have? |
| The same skateboarder begins rolling at 2 m/s. How much energy does she have now?  |
| How much energy does a 0.31 kg bird have as it flies in the air at 1.4 m/s?  |
| A 4112 kg train starts off traveling at 6.5 m/s and speeds up to 12 m/s at its maximum speed. Calculate the energy it has during both speeds and say WHY it has more when it does. |

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| ***Mechanical Energy*** |
| Mechanical energy is the **sum** of the potential energy and the kinetic energy. In other words, it is the two added together. Write the formula and units. |
| Coming down a ramp, a skateboarder has 26 J of potential energy and 34 J of kinetic energy. What is the mechanical energy? |
| A system has 100 J of mechanical energy and 21 J of potential energy. What is the kinetic energy?  |

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| ***CHALLENGE!!!! +1 for each*** |
| What is the mass of an object that has a height of 20 m and 200 J of potential energy? |
| What is the mass of an object with 300 J of energy that is 3 m up high? |
| On Earth, machine with a mass of 20 kg has 100 J of mechanical energy and 21 J of kinetic energy. How high up is the object? (Hint: solve for the potential energy first.) |