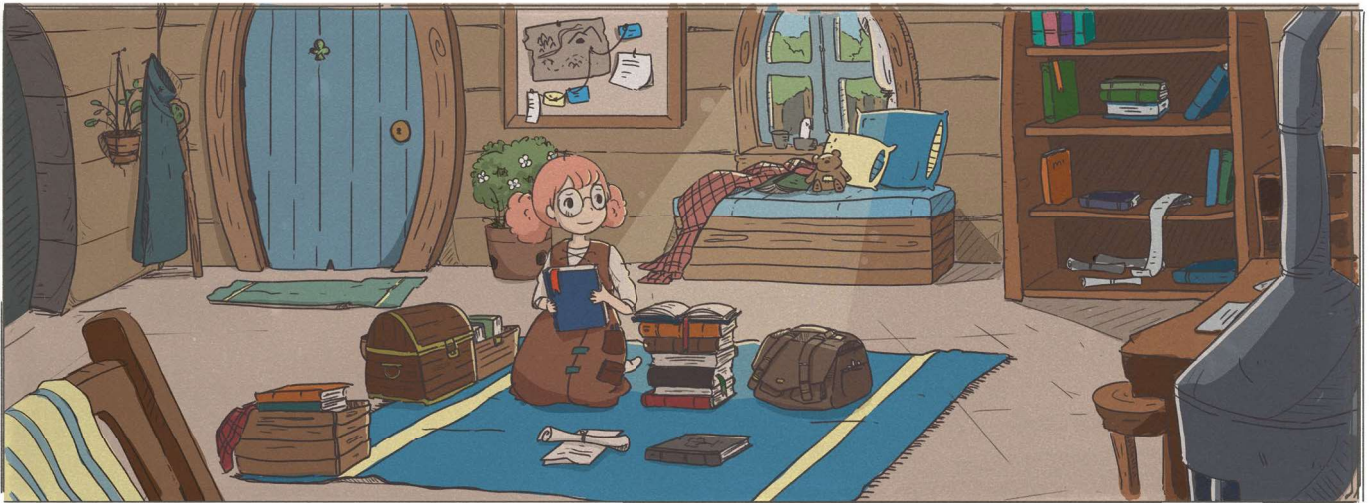


Name: _____

Date: _____ Period: _____

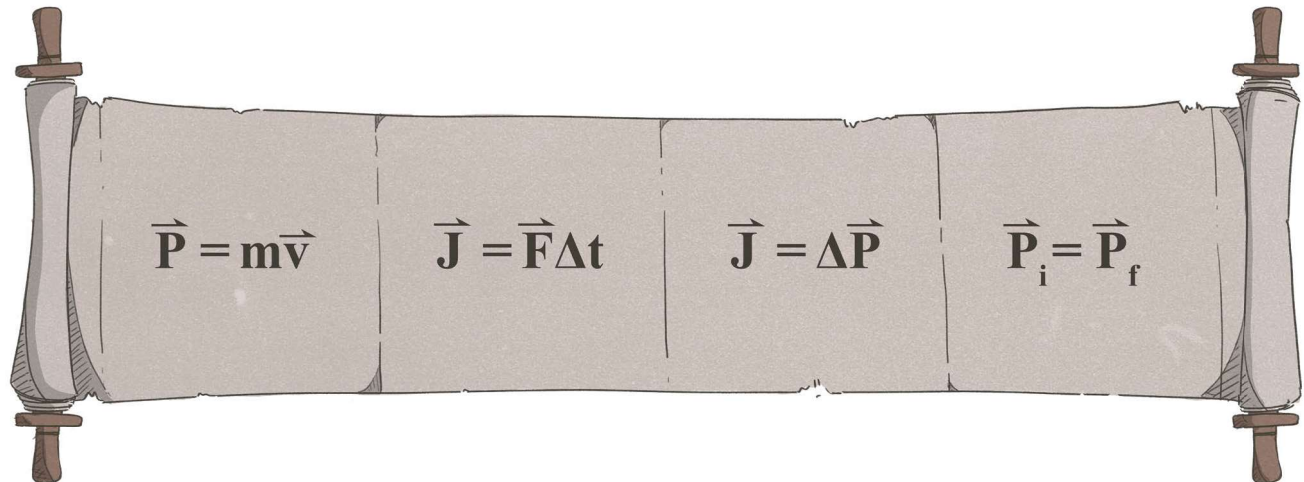
MOMENTUM

A PHYSICS STORY



t's time! This is the year! You're finally going to do it! The king's adventurer finally died a horrible, grisly death and now they're holding tryouts for his replacement! Yes, this will mean you'll have to leave your cozy woods cottage, which is a definite downside, but you've been planning this for years. You have charts and graphs and contingency scenarios outlined on scraps of parchment pinned to every wall, and you've thought it through from every angle. You know you can do it. Plus, it's not like you can't bring your books and notes with you.

You narrow your collection down to just the essential 47 books (mostly reference tomes, but a few good adventure stories, just in case you need inspiration), pack them all into waterproof trunks, stack them in your wagon, and set off for the capital.

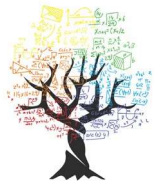




On the way, you practice, thinking through every possible science calculation you might need. Sure, the adventurers of the past have all been heroic fighters (although, usually the more heroic they were the shorter their time in office was--Hildegard the Insanely Brave was famously so heroic she only lasted 6 minutes before being eaten by the dragon whose jaws she had clambered into), but you are sure that you could be an adventurer, too, just a different kind. Sure, you've never left your little village and to be honest you barely leave your house (your favorite shoes are your fuzzy slippers with built-in heat packs), but you've thought it through and you're pretty confident you can do this.



- #1 While riding your wagon through the sun-dappled dirt road, the spring-green leaves overhead rustling in the warm breeze, you contemplate your turtle-badger as it pulls you and your cart along. It looks like it has a mass of around 135 kg, and you estimate your speed is around 4 m/s. How much momentum does the turtle-badger have?



#2 Your wagon, on the other hand, loaded down as it is with trunks and books and adventuring supplies and you, has a much greater mass. You'd guess the momentum of the wagon is $860 \text{ kg}\cdot\text{m/s}$. Since your wagon is travelling at the same speed as the turtle-badger (4 m/s), how much mass does it have?

#3 You start to imagine all the exciting things that could happen in the trials. Maybe, as you and the turtle-badger and wagon (total mass 350 kg) are all travelling along down the road at 4 m/s , a huge griffin (maybe as much as 165 kg !) would land on the back of your wagon and try to steal your books. You know you could think of the griffin landing on the wagon as a collision, and you know momentum would be conserved in that collision, which means you could figure out how much this would immediately reduce your speed. You consider a few exciting scenarios. First, as a starting point, what if it just gently landed on the wagon, such that it was barely moving at all as it landed?

