



Horse Power

Have you ever wondered about the origin of the term, “Horse Power”? How much power does a horse actually have, and can we measure it? In this activity, we will look into the history of the term and relate horsepower to science and math today.

***This packet can be done in a group or individually and is intended for students aged 13-15.**



History of the term, “Horsepower”

The concept of “**horsepower**” did not exist until the invention of machines and engines that could now do what only horses could do before. James Watt, an inventor who **patented** a new steam- powered engine in 1781, coined the term horsepower as a marketing trick for customers who were not familiar with the capabilities of his engines. For this concept and unit of measurement, the science community named another unit of measurement after him, the **watt**.

Does the term horsepower literally mean the weight one horse can pull? How does one measure something like that when horses come in all sizes? The official measurement for one horsepower is *the power needed to lift 550 pounds off the ground in one second.**

Generally, a horse should not carry or pull more than one-eighth to one-tenth its weight at one time. For example, a 1,200 pound horse can sustain pulling about 120-150 pound over a long distance.



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Unlike humans, horses can store power and use it in necessary times. In a team, horses can sometimes pull or carry their own weight combined! For this reason and many more, horses, draft horses in particular, have been vital to transportation. Prior to the invention of the automobile in the 1880s, horses were the primary source of power and transportation.



Horsepower in everyday life:

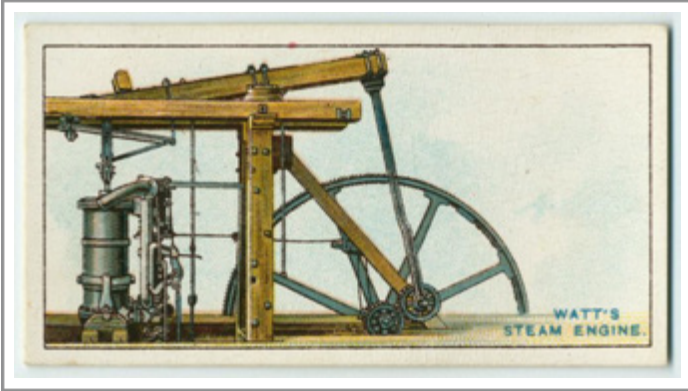


Image of Watt's steam engine design.
Courtesy of the New York Public Library

One of the more popular ways to use the term “horsepower” is in car commercials. We have all heard various brands mentioning their horsepower as compared to other brands. How do these car companies measure the horsepower of their vehicles?

The best way to measure horsepower in a vehicle or any machine is through a **dynamometer**. This is a device used for measuring force or power of a machine. For example, with vehicles, you would add weight to the vehicle and measure its power or speed based as the weight rises. Engineers would hook the car up to a dynamometer and floor it. Below is a chart of various cars with their respective horsepower, courtesy of howstuffworks.com

Vehicle	Horsepower	Weight (lbs)	0-60 mph (seconds)	Price
Dodge Viper	450	3,320	4.1	\$66,000
Ferrari 355 F1	375	2,975	4.6	\$134,000
Shelby Series 1	320	2,650	4.4	\$108,000
Lotus Esprit V8	350	3,045	4.4	\$83,000
Chevrolet Corvette	345	3,245	4.8	\$42,000
Porsche Carrera	300	2,900	5.0	\$70,000
Ford Escort	110	2,470	10.9	\$12,000



Calculating Horsepower

Now that you know a little about horsepower and how it is used, let's see what horses can really do. Below are some word problems, calculate all of the factors to figure out the horsepower needed. Show your work, please.

Solve for horsepower:

F= Force (lbs.)

D= Distance (feet)

T= Time (Seconds)

$$\text{Hp} = \frac{F \times D}{T}$$

Remember: 1 horsepower(Hp)= 550ft-lbs/second

1. A 350Hp engine applies 275 pounds of force in 4 minutes. Through what distance would it be applied? (Answer in feet)

2. Refer to the chart on the previous page. How much time would it take the Chevy Corvette to apply a force of 625 pounds through a distance of 200 feet?

3. New reports have suggested that BMW will have a 650 horsepower car, the M8, in 2016. How much total power does it have? (Refer to the measurement of Hp above)



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