Converting RPM to MPH and MPH to RPM

Date: 04/07/2002 at 13:00:26
From: Jeff
Subject: Deriving a Formula

What is the formula for converting RPM's from an "X" inch diameter wheel into miles per hour?

Example: The diameter of the wheel equals 22.07 inches. Convert a 22.07-inch wheel into miles per hour.

The wheel axle rpm equals 1,107 at 1 second of time. The speed should equal 72.7 miles per hour. Also, at 2 seconds of time, the wheel axle rpm equals 1,978 with a speed of 129.9 miles per hour.

Any help would be greatly appreciated.
Thanks,
Jeff

Date: 04/07/2002 at 14:44:11
From: Doctor Jaffee
Subject: Re: Deriving a Formula

Hi Jeff,

Here is how I would approach this problem. Since the diameter of the wheel is 22.07 inches and circumference equals pi * diameter, the circumference of the wheel is 22.07 * pi inches. In other words, every time the wheel revolves once, the vehicle advances forward 22.07 * pi inches. At the moment that the wheel has been revolving for 1 second it is revolving at the rate of 1,107 revolutions per minute. So, if the vehicle is moving at the speed 22.07 * pi inches for each revolution, it will advance 1,107* 22.07* pi inches in 1 minute.

Since there are 60 minutes in an hour, it will move at a speed of 60 * 1107 * 22.07 * pi inches per hour.

Since there are 12 inches in a foot and 5,280 feet in a mile, the speed of the vehicle will be

$$\frac{60*1107*22.07*\pi}{5{,}280*12} \text{ per hour.}$$

That comes out to approximately 72.7 miles per hour.

Now, when the vehicle has been moving for 2 seconds, its speed has increased. You should be able to justify that the answer you mentioned

above is correct by using a method very much like the one I used. Give it a try and if you want to check your answer with me or if you are having difficulties and need more help, write back and I'll try to give you some assistance.

Good luck.

- Doctor Jaffee, The Math Forum
  http://mathforum.org/dr.math/

Date: 04/07/2002 at 15:58:00
From: Jeff
Subject: Deriving a Formula

Thank you very much, Dr. Jaffee, for the answer to my question. I plugged all the other numbers I had into the formula and it all worked out well.

I have another question now. How would I rewrite the formula you gave me to now convert miles per hour into rpms? For example, finding the rpms for 100 miles per hour.

Jeff

Date: 04/07/2002 at 16:14:08
From: Doctor Jaffee
Subject: Re: Deriving a Formula

Hi Jeff,

I am glad that I was able to help you and you were able to solve the other problem. Now, if you want to convert miles per hour into revolutions per minute, you just have to work the process backward.

Suppose that a vehicle has a speed of m miles per hour.

$$\frac{m \text{ miles}}{\text{hour}} \times \frac{5{,}280 \text{ feet}}{\text{mile}} \times \frac{12 \text{ inches}}{\text{foot}} \times \frac{1 \text{ hour}}{60 \text{ min.}} = \frac{(5{,}280)(12)(m)\text{in.}}{60 \text{ min.}} =$$

1,056m inches per minute.

So, if you divide that by the circumference of the circle, you will have the rpm's.

Give it a try and if you want to check your answer with me or if you are having difficulties and need more help, write back and I'll try to give you some assistance.

Good luck.

- Doctor Jaffee, The Math Forum
  http://mathforum.org/dr.math/

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