DTEC 105
Calculating Wheel Speed

If you know the engine speed, gear ratios for the transmission, transfer case ratio (if applicable), rear end ratio and the diameter of the tires it is possible to calculate how fast the vehicle will travel. This can be useful in a variety of ways including knowing what speed a vehicle will go if you are changing tire sizes, transmissions, or rear end ratios. With some additional calculations, which we will cover later, it is also possible to determine the right combination of engine and drive line components to see if a truck will perform up to expectations.

For the purpose of this exercise a 2 wheel drive gasoline pick-up truck will be used with the following specifications:

- Engine is turning at 3750 rpm
- Transmission Low Gear Ratio: 6.23:1
- Rear axle ratio: 3.73:1
- Tires are LT265/75R16 and have an overall diameter of 31 inches

Procedure for calculating wheel speed.

1. Calculate the gear ratio:
   a. Multiply all of the ratios from the transmission to the wheel ends. (if the vehicle has a transfer case and/or final drives those ratios must be included too.)

   Overall ratio = transmission ratio X rear axle ratio

   Overall ratio = 6.23 X 3.73 = 23.24 or 23.24:1

2. Calculate the revolutions at the wheel ends in revolutions per minute (rpm)

   Wheel rpm = engine speed/overall ratio
   Wheel rpm = 3750 rpm/23.24 = 161.37 rpm

3. Calculate how many times the wheel rotates in and hour (rev/hr)

   Rev/hr = wheel rpm * 60
   Rev/hr = 161.37 X 60 = 9682.46 rev/hr
4. Calculate the wheel circumference in feet

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\text{Circumference} = \text{diameter} \times \pi
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\text{Circumference} = 31 \text{ inches} \times 3.14159 = 97.40 \text{ inches}
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\text{Circumference in feet} = \text{circumference in inches}/12
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\text{Circumference in feet} = 97.40 \text{ inches}/12 = 8.12 \text{ feet}
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5. Calculate how many times the wheels turn in one mile (rev/mi)

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\text{Rev/mi} = 5280/\text{circumference}
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\text{Rev/mi} = 5280/8.12 \text{ feet} = 650.49 \text{ rev/mi}
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6. Calculate the wheel speed (mph)

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\text{Wheel Speed} = (\text{rev/hr})/(\text{rev/mi})
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\text{Wheel Speed} = (9682.46 \text{ rev/hr})/(650.49 \text{ rev/mi}) = 14.88 \text{ mph}
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