Lowell’s School Tools

Ideas for using Bluegrass Vehicle Report 2009 in your school or with your kids

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Lowell’s Independent Automotive, Inc.

Independent Toyota, Lexus, and Scion Specialists

111 Mechanic Street

Lexington, Kentucky 40507

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Blog: http://lowells.typepad.com

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Lowell's School Tools

April 2009

What are Lowell's School Tools?

Using state registration data, Lowell's compiled statistics on vehicles in 7 Bluegrass counties, and produced the *Bluegrass Vehicle Report 2009* to discuss the results in a fun and informative way.

For instance, we found that Lexington consumes enough gasoline each year to fill up Rupp Arena, and calculated that all of the Toyotas in Lexington – placed bumper to bumper – would fill all four lanes of New Circle Road.

We felt that this data could be tailored by teachers and parents to help students develop their own interesting real-world insights about cars in the Bluegrass through some basic research, creativity, and applied mathematics.

So, we created this 'School Tools' companion guide with ideas and resources to help teachers and parents utilize the *Report* to educate and entertain their children.

These materials are meant as a starting point – please adapt them to your particular needs and your students' particular aptitudes. Our request: Give us suggestions to help us make these materials better!

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Overview

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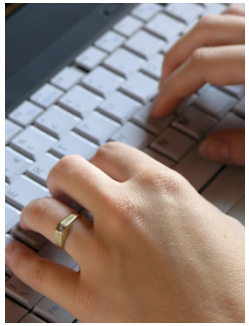
Overall Approach

Our overall approach uses 4 basic steps

1. Select

Choose a group of vehicles, a place, and a measure which interests your student

2. Research



Conduct research with online tools and document sources

3. Calculate

Figure out "how much that is"

4. Visualize

Find a creative way to visualize the measure

(Will require more research and calculation)

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Select

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Select

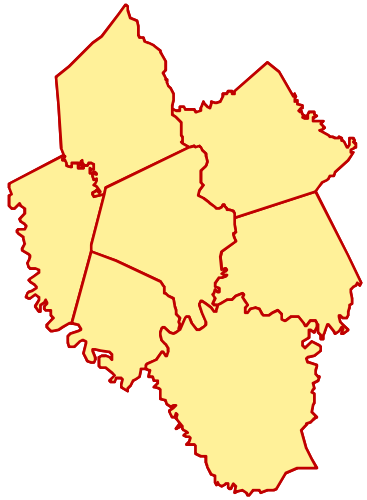
Forming a central research question

Choose a group of vehicles, a place, and a measure

Vehicles

Rank	Make	Total
1	Toyota	33,624
2	Ford	31,018
3	Chevrolet	29,712
4	Honda	14,591
5	Nissan	11,896
6	Dodge	11,848
7	Jeep	6,220
8	Buick	5,677
9	Pontiac	5,204
10	Chrysler	4,878
11	GMC	4,702
12	Mazda	4,214
13	Cadillac	4,079
14	Lexus	4,016

Place



Measure

Examples

How long?

How much weight?

How many miles driven?

How much gasoline consumed?

What is the carbon footprint?

How much time?

How much cost?

Forming a central research question

Choose a group of vehicles, a place, and a measure

Vehicles

Rank	Make	Total
1	Toyota	33,624
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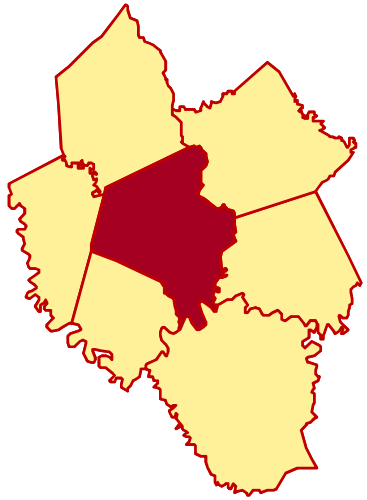
Dodge

Place



Fayette

Measure

Examples

How long?

How much weight?

How many miles driven?

How much gasoline consumed?

What is the carbon footprint?

How much time?

How much cost?

Gasoline Consumed

Select

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Select

Forming a central research question

Choose a group of vehicles, a place, and a measure

Vehicles

Rank	Make	Total
1	Toyota	33,624
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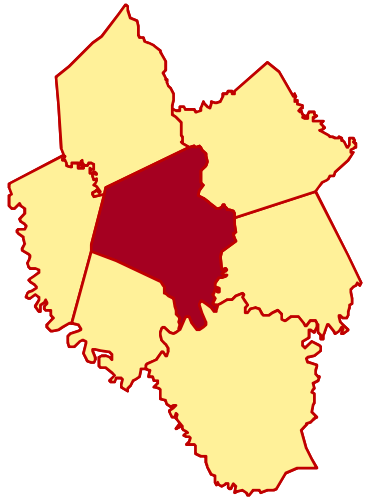
Place



Measure

Examples

How long?

How much weight?

How many miles driven?

How much gasoline consumed?

What is the carbon footprint?

How much time?

How much cost?

Dodge

Fayette

Gasoline Consumed

Central Research Question:

How much gasoline was consumed by Dodge vehicles in Fayette County?

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Select

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Other Examples

Choose a group of vehicles, a place, and a measure

Dodge	Fayette	Gasoline Consumed?

Central Research Question:

How much gasoline was consumed by Dodge vehicles in Fayette County?

Toyota	Scott	Carbon Footprint?

Central Research Question:

What is the carbon footprint of all of the Toyotas in Scott County?

All	Bourbon	How Long?

Central Research Question:

How long are all of the vehicles in Bourbon County?

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Research

Research

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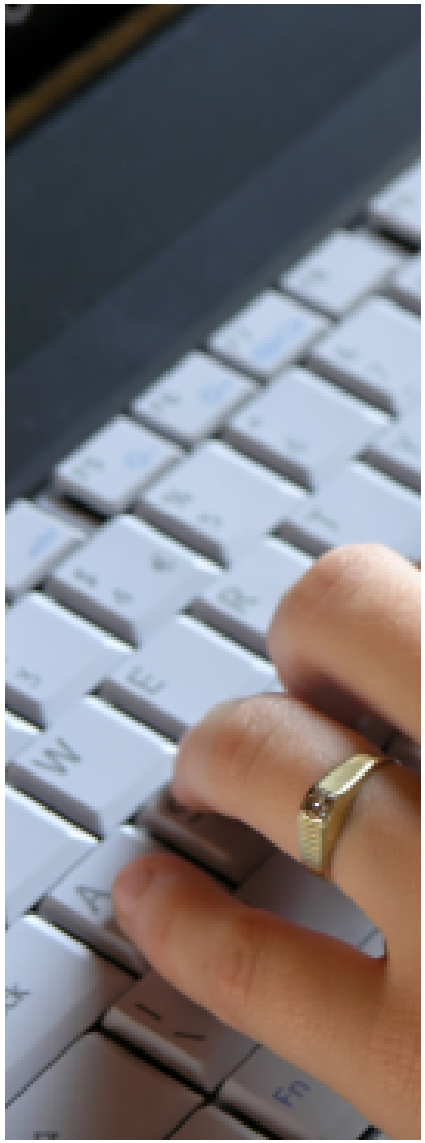
Research process

Conduct research with online tools and document sources



Extend the research question

Figure out what questions need to be answered in order to answer the central research question

Conduct research

Use (online, if available) resources to find the answers to these questions

Evaluate and document sources

Decide which sources to use, and keep track of them so that others can replicate results

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Research

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Anatomy of a research question

Each research question generates a series of second- and third-order questions

Central Research Question:

How much gasoline was consumed by Dodge vehicles in Fayette County?

DODGE

How many Dodge vehicles are in Fayette County?

How far did they drive?

How much gasoline would that require?

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Research

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Anatomy of a research question

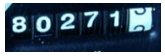
Each research question generates a series of second- and third-order questions

Central Research Question:

How much gasoline was consumed by Dodge vehicles in Fayette County?

DODGE

How many Dodge vehicles are in Fayette County?



How far did they drive?

→ *How many miles do (Dodge?) vehicle owners drive (weekly / monthly / annually)?*

How much gasoline would that require?

→ *How many miles per gallon does the average (Dodge?) vehicle get?*

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Research

Conduct research

Use (online, if available) resources to find the answers to these questions

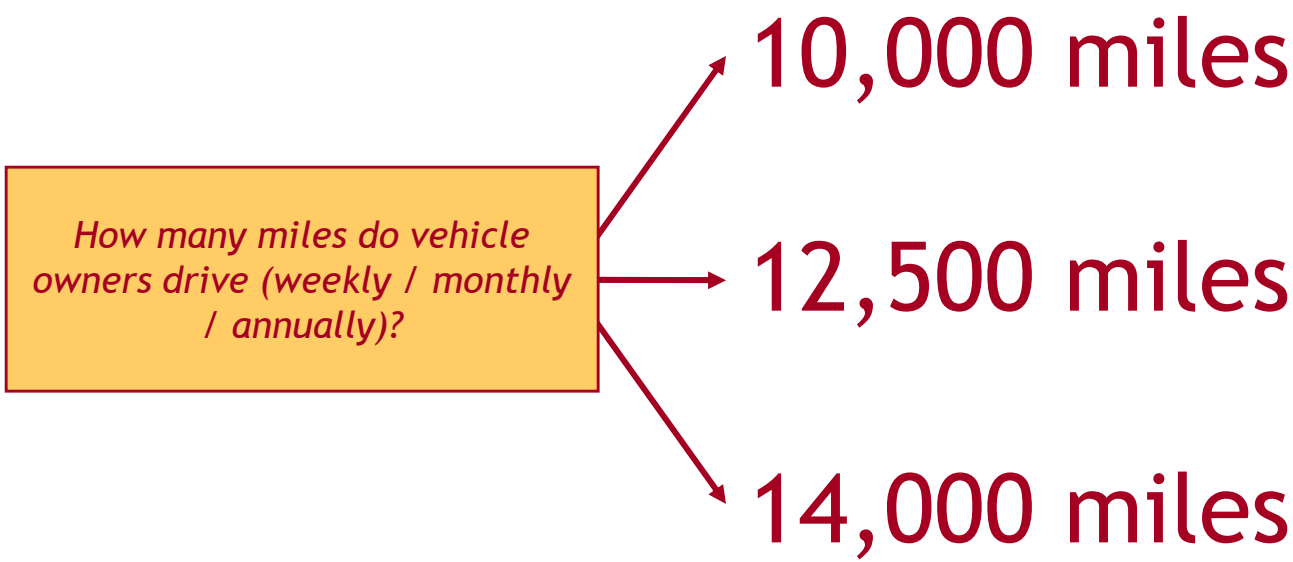
Questions	Resource Examples
How many Dodge vehicles are in Fayette County?	Bluegrass Vehicle Report 2009
How many miles do vehicle owners drive (weekly / monthly / annually)?	U.S. Department of Transportation – Bureau of Transportation Statistics (www.bts.gov)
How many miles per gallon does the average vehicle get?	Same as Above AND / OR U.S. Department of Energy (www.fueleconomy.gov)

NOTE: These are just examples - your students may find other sources they prefer to use

Research

Conflicting answers

Your students likely will find conflicting answers to some of their questions



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Research

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Conflicting answers

Your students likely will find conflicting answers to some of their questions

What should you / they do?

*Our opinion: For this exercise, **precision** matters less than **magnitude**.*

Precision:
Is it 10, 12, or 14 thousand miles?

Magnitude:
Is it 1, 10, or 100 thousand miles?

Focus on the approximate measure rather than whether it is exactly right. That way, the student gets a good idea of the scale of the issue.

(Another idea: Have students produce a range of results based on their findings.)

10,000 miles

12,500 miles

14,000 miles

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Evaluate and document sources

Decide which resources to use, and keep track of them

Research

How many Dodge vehicles are in Fayette County?

Bluegrass Vehicle Report 2009

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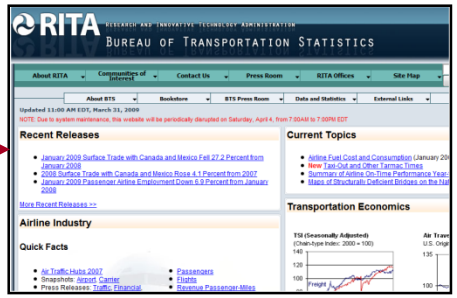
How many miles do vehicle owners drive (weekly / monthly / annually)?



How many miles per gallon does the average vehicle get?

Evaluate and document sources

Decide which resources to use, and keep track of them

Bluegrass Vehicle Report 2009

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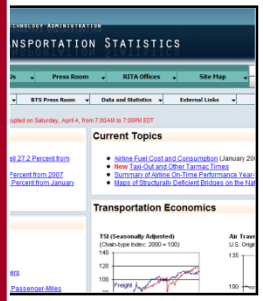
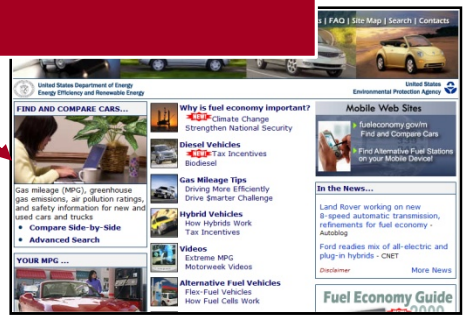
the average vehicle get?

Keeping track of which resources were used is important if you (or your students) want to be able to reproduce their results and / or understand their assumptions





Research

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Calculate

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Calculate

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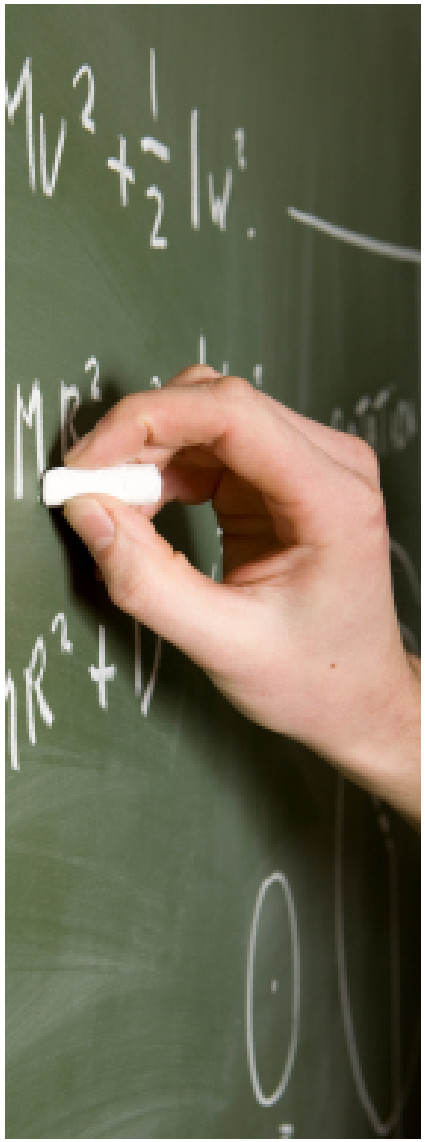
Figure out "how much that is"

Once students have research results, perform calculations and conversions



How many Dodge vehicles are in Fayette County? → **11,848** Dodge vehicles

How many miles do vehicle owners drive (weekly / monthly / annually)? → **12,500** miles per year

How many miles per gallon does the average vehicle get? → **17.5** miles per gallon

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Calculate

Figure out "how much that is"

Once students have research results, perform calculations and conversions

Central Research Question:

How much gasoline was consumed by Dodge vehicles in Fayette County?

$$\underset{\text{Dodge vehicles}}{11{,}848} \times \underset{\text{miles per year}}{12{,}500} = \underset{\text{miles driven by Dodge owners per year}}{148{,}100{,}000}$$

$$\underset{\text{miles driven by Dodge owners per year}}{148{,}100{,}000} \times \frac{1 \text{ gallon}}{17.5 \text{ miles}} = \underset{\text{gallons consumed by Dodge owners per year}}{8{,}462{,}857}$$

about
Answer: 8.5 million
gallons consumed by
Dodge owners per year

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Visualize

Visualization

Put really big numbers into terms anyone can picture in their minds

Our opinion:

Visualization is probably the most fun part of this process for students (it was a lot of fun for us) – they get to create a mental picture of a very large measurement

This is also the part of the process where both teachers and students can exercise the most creativity. Have fun with it!

Visualize

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Visualize

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Visualization process

Put really big numbers into terms anyone can picture in their minds

Select a landmark

Choose an appropriate landmark based on your type of measure

Volume

A prominent building
A local park
A tanker truck
etc.

Length

A familiar road
A distant place
etc.

Height

A tall building
A mountain or hill
etc.

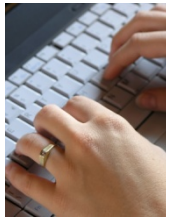
Finish visualization

Conduct additional research and calculations based on landmark

Additional Research

How big is a tanker truck?
How long is that road?
etc.

Additional Calculation



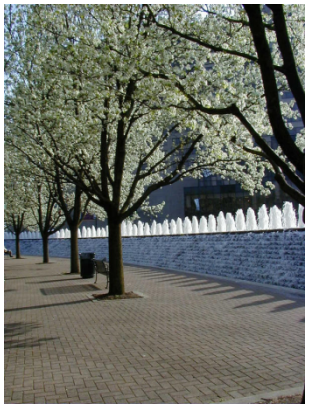
Gallons ➔ tanker trucks
Feet ➔ length of road
etc.

Visualization example

What does 8.5 million gallons look like?

Landmark

Lexington's Triangle Park



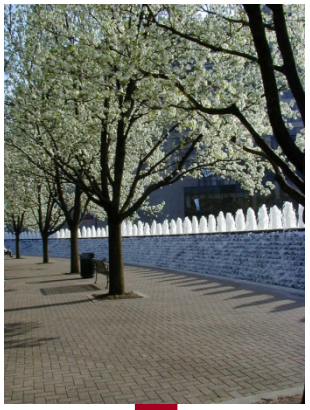
Visualize

Visualize

Visualization example

What does 8.5 million gallons look like?

Landmark
Lexington's Triangle Park



Using Google Planimeter (http://www.acme.com/planimeter/), we can estimate that Triangle Park occupies about 1.5 acres

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Visualize

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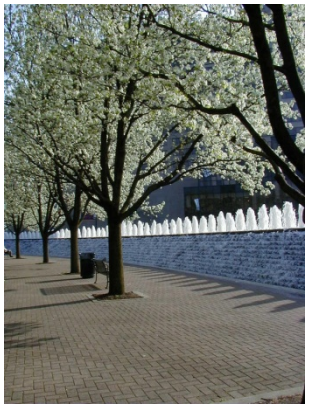
Visualization example

What does 8.5 million gallons look like?

Landmark
Lexington's Triangle Park



Convert Triangle Park to square feet

1.5 acres in Triangle Park **x** 43,560 square feet per acre **=** 65,340 square feet in Triangle Park

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Visualize

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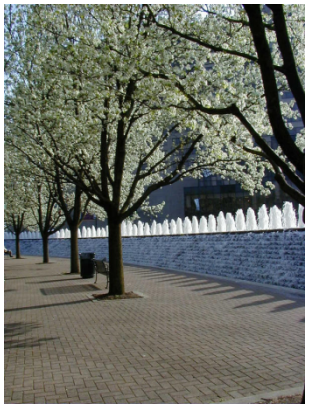
Visualization example

What does 8.5 million gallons look like?

Landmark
Lexington's Triangle Park



Convert Triangle Park to square feet

1.5 acres in Triangle Park x 43,560 square feet per acre = 65,340 square feet in Triangle Park

Convert gasoline to cubic feet

$$8{,}462{,}857 \text{ gallons consumed by Dodge owners per year} \times \frac{1 \text{ cubic foot}}{7.48 \text{ gallons}} = 1{,}131{,}398 \text{ cubic feet of gasoline consumed by Dodge owners per year}$$

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Visualize

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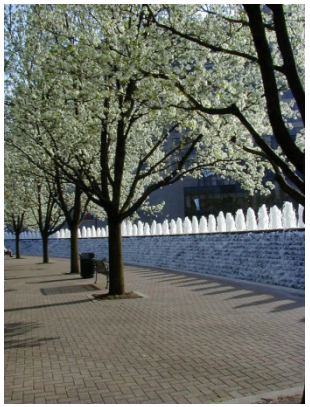
Visualization example

What does 8.5 million gallons look like?

Landmark
Lexington's Triangle Park



Convert cubic feet into depth for Triangle Park

$$\frac{1{,}131{,}398 \text{ cubic feet of gasoline consumed by Dodge owners per year}}{65{,}340 \text{ square feet in Triangle Park}} = 17.3 \text{ feet of gasoline covering Triangle Park}$$

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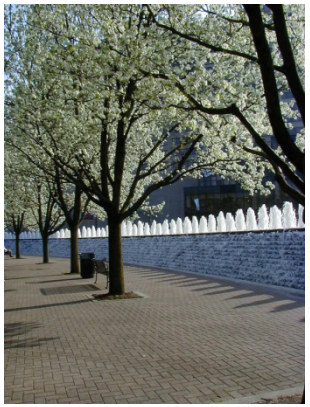
Visualize

Visualization example

What does 8.5 million gallons look like?

Landmark
Lexington's Triangle Park



Convert cubic feet into depth for Triangle Park

$$\frac{\text{1,131,398 cubic feet of gasoline consumed by Dodge owners per year}}{\text{65,340 square feet in Triangle Park}} = \text{17.3 feet of gasoline covering Triangle Park}$$

Visualization

"The owners of Dodge vehicles in Fayette county consume 8.5 million gallons of gasoline.

That is enough to submerge Triangle Park in over 17 feet of gas!"

Bluegrass Vehicle Report 2009

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Background Information

Lowell's

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About Lowell's

Lowell's :: Best Mechanic in Lexington

- Lowell's has been selected **7 times** by Ace Weekly readers as **Best Mechanic in Lexington**
- Lowell's won the Herald-Leader's 2007 **Readers' Choice Award** for **Best Repair Shop**
- "*The place is almost **legendary for its customer service**.*" Herald-Leader columnist Jim Jordan

Lowell's Independent Automotive is an award-winning automotive maintenance and repair shop which exclusively services Toyota, Lexus, and Scion vehicles. Lowell's is located at 111 Mechanic Street in Lexington, Kentucky.

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Lowell's was founded by Lowell and Betty Nigoff in October of 1979 as a general automotive repair shop. In 1982, we determined the need to specialize and turned all of our efforts to Toyota repair and maintenance. When Lexus debuted in 1989, we extended our coverage to them, and in 2005 we added the new Scion to our list.

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In July 2008, Rob and Suzanne Morris purchased Lowell's from the Nigoffs. While the ownership changed, all of the staff have stayed on, and we will continue to deliver the great customer service Lowell's is known for.

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Lowell's is Kentucky's only independent repair shop servicing only Toyota-branded vehicles.

Contact: Rob Morris
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Blog: http://lowells.typepad.com
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Our Request

April 2009

Please Share

Feel free to update / alter School Tools as you see fit, and please share School Tools with others.

Please share with us what you do with School Tools, whether you found the package helpful (or frustrating), and whether you have suggestions for improvement.

Also, please tell us what your students did with this package.

We can't wait to see what you do with it!

The Staff at Lowell's