

Lab Worksheet INTERMEDIATE STUDENTS

BACKGROUND

Oil and natural gas are widely used as transportation fuels. Most of our cars run on petroleum. Some vehicles are more efficient than others and allow us to go farther with less fuel while being kind to the environment.

QUESTION

Why is the miles per gallon (mpg) rating of a car important?

MATERIALS

- ☐ 3" x 5" Cards
- ☐ Internet access for students (see "optional" note below)
- ☐ Bag of pretzels (or alternative food item)
- Plastic sandwich bags
- ☐ Three signs (Home, Near Town, Far Town)



PREPARATION

- 1. Prepare a plastic bag with ten pretzels or an alternative for each student.
- 2. Make three signs, one labeled "Home", one labeled "Near Town", and one labeled "Far Town."
- **3.** The signs should be large enough to see from across the room.
- **4.** Select a large area and place the Home, Near Town, and Far Town signs on poles or walls. The distance from Home to Near Town should be 50 steps. The distance from Home to Far Town should be 100 steps. (Do not give these distances to students.)

PROCEDURE

1. Have students look up a car they would like to drive on www.fueleconomy.gov. On 3" x 5" cards, students should record the car's name, model year, miles per gallon, and the number of passengers the car holds. It may be helpful if students have chosen an FFV (flex fuel vehicle), that they choose which fuel they will use—gasoline or E85—before recording mileage.

OPTIONAL: Depending on the age and independence of your students, you may wish to use the information on pages 3–15 to print pre-made automobile cards. If you would like to print the cards on adhesive labels (Avery 5392). When handing out cards for vehicles using Flex Fuel, assign the fuel choice to students.

- 2. Distribute a bag of pretzels to each student. Tell students not to eat the pretzels until they are instructed to begin.
- **3.** Explain to the students that each pretzel represents one gallon of gasoline, and each step (heel-to-toe) the student takes represents one mile traveled.
- **4.** Students eat a pretzel and take the appropriate number of steps before eating the next pretzel. All steps are heel-to-toe



ROUND ONE

Use only five pretzels for this round. Each person will drive his/her car to work in Near Town and return Home. If anyone runs out of fuel (pretzels), he/she must stay at that point until round one is over. Line up at Home and start stepping!

■ Discuss:

- Which cars got you to work and home? Which didn't?
- Did anyone have extra fuel remaining?
- What alternatives to driving your own car are there?

ROUND TWO

■ Use the remaining five pretzels and try some of the alternative suggestions discussed above. Everyone will travel to Far Town and return Home. Expect "negotiations". Suggest students carpool to work. Drivers may eat each passenger's pretzels as fuel. Line up at Home and start stepping!

■ Discuss:

- Who made it to Far Town and back? How did you do this?
- Who did not make it to Far Town and back? Why not?



2008 BMW 335ci Manual Convertible

CLASS Subcompact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 20 MAXIMUM RANGE 322

2008 Volvo V50 AWD

CLASS Small Station Wagon

NUMBER OF PASSENGERS 5

FUEL Premium Gasoline

COMBINED MPG 21 MAXIMUM RANGE 332

2009 Jeep Liberty 2WD

CLASS SUV 2WD

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 18 MAXIMUM RANGE 351

2009 Dodge Caliber

CLASS Small Station Wagon

NUMBER OF PASSENGERS 5

FUEL Premium Gasoline

COMBINED MPG 22 MAXIMUM RANGE 299

2009 Saturn Vue Hybrid

CLASS SUV 2WD

NUMBER OF PASSENGERS 5

FUEL Hybrid

COMBINED MPG 28 MAXIMUM RANGE 504

2009 Nissan Xterra 4WD

CLASS SUV 4WD

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 17 MAXIMUM RANGE 359

2009 Aston Martin DBS Coupe - Manual

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 13 MAXIMUM RANGE 266

2010 Acura RL

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 18 MAXIMUM RANGE 349

2010 Dodge Viper Coupe

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 16 MAXIMUM RANGE 256

2010 Bentley Continental GT

CLASS Luxury Compact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 13 MAXIMUM RANGE 309

2010 Ford Taurus FWD

CLASS Large Sedan

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 22 MAXIMUM RANGE 418

2010 Buick Lucerne FFV

CLASS Large Sedan

NUMBER OF PASSENGERS 5

FUEL Gasoline/E85

COMBINED MPG 20 (gas)/15 (E85)

MAXIMUM RANGE 370/278

2010 Hummer H3T4WD

CLASS Pickup 4WD

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 16 MAXIMUM RANGE 432

2010 Chevrolet HHR FFV

CLASS SUV 2WD

NUMBER OF PASSENGERS 5

FUEL Gasoline/E85 **COMBINED MPG** 25 (gas)/17 (E85)

MAXIMUM RANGE 400/272

2010 Hyundai Elantra

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 29 MAXIMUM RANGE 406

2010 Mazda 6

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 24 MAXIMUM RANGE 444



2011 Chevrolet Malibu FFV

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Gasoline/E85 **COMBINED MPG** 26 (gas)/18 (E85)

MAXIMUM RANGE 416/288

2010 Toyota Prius

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Hybrid

COMBINED MPG 50

MAXIMUM RANGE 595

2011 Honda Fit

CLASS Small Station Wagon

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 30 MAXIMUM RANGE 318

2011 Audi S5 Cabriolet

CLASS Subcompact

NUMBER OF PASSENGERS 4

FUEL Premium Gasoline

COMBINED MPG 20 MAXIMUM RANGE 338

2011 Kia Forte Eco

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 3 MAXIMUM RANGE 411

2011 Bugatti Veyron

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 10 MAXIMUM RANGE 264

2011 Lexus RX 450h

CLASS SUV

NUMBER OF PASSENGERS 5

FUEL Hybrid

COMBINED MPG 30 MAXIMUM RANGE 516

2011 Mini Cooper Convertible

CLASS Subcompact

NUMBER OF PASSENGERS 4

FUEL Premium Gasoline

COMBINED MPG 30 MAXIMUM RANGE 396



2012 Azure Dynamic Transit Connect

CLASS Van, Special Purpose

NUMBER OF PASSENGERS 2

FUEL Electric
COMBINED MPG 62e
MAXIMUM RANGE 56

2011 Porsche 911 Carrera 45 Targa

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 20 MAXIMUM RANGE 354

2012 BMW Active Hybrid 7

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Hybrid

COMBINED MPG 20 MAXIMUM RANGE 434

2011 Subaru Outback AWD

CLASS SUV 4WD

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 24 MAXIMUM RANGE 444

2012 Cadillac CTS Supercharger

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Premium Gasoline

COMBINED MPG 14 MAXIMUM RANGE 252

2011 Toyota Yaris

CLASS Subcompact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 31 MAXIMUM RANGE 344

2012 Coda

CLASS Subcompact

NUMBER OF PASSENGERS 4

FUEL Electric

COMBINED MPG 73e
MAXIMUM RANGE 88

2012 Ferrari 458 Italia Spider

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 14 MAXIMUM RANGE 318

2012 Land Rover Range Rover Sport

CLASS SUV 4WD

NUMBER OF PASSENGERS 5

FUEL Premium Gasoline

COMBINED MPG 15 MAXIMUM RANGE 345

2012 Fiat 500 Abarth

CLASS Minicompact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 31 MAXIMUM RANGE 326

2012 Lincoln MKT FWD

CLASS SUV 2WD

NUMBER OF PASSENGERS 7

FUEL Gasoline

COMBINED MPG 20 MAXIMUM RANGE 372

2012 GMC Acadia AWD

CLASS SUV 4WD

NUMBER OF PASSENGERS 8

FUEL Gasoline

COMBINED MPG 19 MAXIMUM RANGE 418

2012 Maserati Quattroporte

CLASS Large Luxury Sedan

NUMBER OF PASSENGERS 5

FUEL Premium Gasoline

COMBINED MPG 15 MAXIMUM RANGE 357

2012 Jaguar XJ LWB

CLASS Large Luxury Sedan

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 18 MAXIMUM RANGE 391

2012 Mitsubishi i-MiEV

CLASS Subcompact

NUMBER OF PASSENGERS 4

FUEL Electric
COMBINED MPG 112e
MAXIMUM RANGE 52

2012 Rolls-Royce Phantom Coupe

CLASS Compact

NUMBER OF PASSENGERS 4

FUEL Premium Gasoline

COMBINED MPG 14 MAXIMUM RANGE 369

2013 BYD e6

CLASS Small SUV

NUMBER OF PASSENGERS 5

FUEL Electric

COMBINED MPG 63e

MAXIMUM RANGE 127

2012 Scion XD

CLASS Subcompact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 29

MAXIMUM RANGE 322

2013 Chevrolet Volt

CLASS Compact

NUMBER OF PASSENGERS 5

FUEL Plug-in Hybrid

COMBINED MPG 98e/37 (gas)

MAXIMUM RANGE 38e/380

2013 Honda Civic CNG

CLASS Compact

NUMBER OF PASSENGERS 4

FUEL CNG

COMBINED MPG 31e

MAXIMUM RANGE 193

2013 Dodge Charger FFV

CLASS Large Sedan

NUMBER OF PASSENGERS 5

FUEL Gasoline/E85

COMBINED MPG 23 (gas)/17 (E85)

MAXIMUM RANGE 439/325

2013 Nissan Leaf

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Electric

COMBINED MPG 115e

MAXIMUM RANGE 75

2013 Ford E350 Wagon

CLASS Van, Passenger

NUMBER OF PASSENGERS 12

FUEL Gasoline

COMBINED MPG 11
MAXIMUM RANGE 396

2013 GMC Sierra C15 XFE

CLASS Standard Pickup

NUMBER OF PASSENGERS 3

FUEL Gasoline/E85

COMBINED MPG 18 (gas)/13 (E85)

MAXIMUM RANGE 468/338

2013 smart fortwo Coupe Electric

CLASS Minicompact

NUMBER OF PASSENGERS 2

FUEL Electric
COMBINED MPG 107e
MAXIMUM RANGE 68

2013 Jeep Wrangler Unlimited

CLASS Small SUV

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 18
MAXIMUM RANGE 405

2013 Toyota Rav 4

CLASS Small SUV

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 26 MAXIMUM RANGE 413

2013 Mercedes-Benz S400 Hybrid

CLASS Large Sedan

NUMBER OF PASSENGERS 5

FUEL Hybrid

COMBINED MPG 21 MAXIMUM RANGE 500

2014 Audi Q5

CLASS Small SUV

NUMBER OF PASSENGERS 5

FUEL Diesel COMBINED MPG 27

MAXIMUM RANGE 535

2013 Ram 1500 4WD

CLASS Standard Pickup

NUMBER OF PASSENGERS 3

FUEL Gasoline/E85

COMBINED MPG 19 (gas)/13 (E85)

MAXIMUM RANGE 494/338

2014 Buick LaCrosse eAssist

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Hybrid

COMBINED MPG 29

MAXIMUM RANGE 458

2014 Chrysler 300 FFV

CLASS Large Sedan

NUMBER OF PASSENGERS 5

FUEL Gasoline/E85

COMBINED MPG 23 (gas)/17 (E85)

MAXIMUM RANGE 439/325

2014 Mini JCW Countryman

CLASS Compact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 26 MAXIMUM RANGE 322

2014 Ford Edge

CLASS Small SUV

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 22 MAXIMUM RANGE 403

2014 Ford C-max Energy Plug-in

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Plug-in Hybrid

COMBINED MPG 88e/38 (gas)

MAXIMUM RANGE 20e/550

2014 Honda Accord

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Plug-in Hybrid

COMBINED MPG 115e/46 (gas)

MAXIMUM RANGE 13e/570

2014 Pagani Huayra Coupe

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 13 MAXIMUM RANGE 250

2014 McLaren MP4-12C Spider

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 18
MAXIMUM RANGE 250

2014 Subaru Forester AWD

CLASS Small SUV

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 27
MAXIMUM RANGE 429

2014 Kia Soul

CLASS Small Station Wagon

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 26
MAXIMUM RANGE 369

2015 Chevrolet Impala bi-fuel

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Gasoline/CNG

COMBINED MPG 20 (gas)/19 (CNG)

MAXIMUM RANGE 368/119

2014 Volkswagon Passat

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Diesel

COMBINED MPG 34

MAXIMUM RANGE 629

2015 Chrysler Town & Country FFV

CLASS Minivan

NUMBER OF PASSENGERS 7

FUEL Gasoline/E85

COMBINED MPG 20 (gas)/14 (E85)

MAXIMUM RANGE 400/280

2014 Volvo XC60

CLASS Small SUV

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 21 MAXIMUM RANGE 388

2015 Dodge Viper SRT

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 15 MAXIMUM RANGE 240

2015 Acura TLX

CLASS Compact

NUMBER OF PASSENGERS 4

FUEL Premium Gasoline

COMBINED MPG 28 MAXIMUM RANGE 482

2015 Fiat 500e

FUEL

CLASS Minicompact

NUMBER OF PASSENGERS 5

Electric

COMBINED MPG 116e

MAXIMUM RANGE 87

2015 GMC Sierra K15 FFV

CLASS Standard Pickup 4WD

NUMBER OF PASSENGERS 4

FUEL Gasoline/E85

COMBINED MPG 17 (gas)/12 (E85)

MAXIMUM RANGE 442/312

2015 Lincoln MKS

Large Sedan **CLASS**

NUMBER OF PASSENGERS

FUEL Gasoline

COMBINED MPG 22 **MAXIMUM RANGE** 418

2015 Hyundai Veloster

CLASS Compact

NUMBER OF PASSENGERS

FUEL Gasoline

COMBINED MPG 30 **MAXIMUM RANGE** 396

2015 Mazda MX-5

CLASS **Sports Car**

NUMBER OF PASSENGERS

Premium Gasoline **FUEL**

COMBINED MPG 23 **MAXIMUM RANGE** 292

2015 Infiniti Q50 Hybrid

CLASS Compact

NUMBER OF PASSENGERS

FUEL Hybrid

COMBINED MPG 31 **MAXIMUM RANGE** 552

2015 Nissan Juke

Small Station Wagon CLASS

NUMBER OF PASSENGERS

Gasoline **FUEL**

COMBINED MPG 30 **MAXIMUM RANGE** 396

2015 Jeep Grand Cherokee

SUV 4WD **CLASS**

NUMBER OF PASSENGERS 5

Gasoline/E85 **FUEL**

COMBINED MPG 19 (gas)/15 (E85)

MAXIMUM RANGE 467/369

2015 Tesla Model S 90 kWh

CLASS Large Sedan

NUMBER OF PASSENGERS

FUEL Electric

COMBINED MPG 89e **MAXIMUM RANGE**

265

2015 Toyota Prius Plug-in

CLASS Midsize

5 **NUMBER OF PASSENGERS**

FUEL Plug-in Hybrid

COMBINED MPG 95e/50 (gas)

MAXIMUM RANGE 11e/450

2016 Chevrolet Corvette

CLASS Sports Car

NUMBER OF PASSENGERS 2

FUEL Premium Gasoline

COMBINED MPG 21 Maximum range 388

2015 Volkswagon Jetta

CLASS Compact

NUMBER OF PASSENGERS 4

FUEL Diesel

COMBINED MPG 36

MAXIMUM RANGE 522

2016 Ford Mustang Convertible

CLASS Subcompact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 24 MAXIMUM RANGE 372

2016 Audi S4

CLASS Compact

NUMBER OF PASSENGERS 4

FUEL Premium Gasoline

COMBINED MPG 21 MAXIMUM RANGE 338

2016 Kia Optima Hybrid

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Hybrid

COMBINED MPG 38
MAXIMUM RANGE 703

2016 BMW 328i XDrive Sports Wagon

CLASS Small Station Wagon

NUMBER OF PASSENGERS 4

FUEL Premium Gasoline

COMBINED MPG 26 MAXIMUM RANGE 411

2016 Porsche Cayenne Diesel

CLASS SUV NUMBER OF PASSENGERS 5

FUEL Diesel

COMBINED MPG 23 MAXIMUM RANGE 607

2016 smart fortwo Coupe Electric

CLASS Minicompact

NUMBER OF PASSENGERS 2

FUEL Gasoline

COMBINED MPG 36
MAXIMUM RANGE 277

2016 Ford Escape Hybrid 4WD

CLASS Small SUV

NUMBER OF PASSENGERS

Gasoline **FUEL**

COMBINED MPG 26 **MAXIMUM RANGE** 403

2016 Toyota Sienna

CLASS Minivan

NUMBER OF PASSENGERS

FUEL Gasoline

COMBINED MPG 21 **MAXIMUM RANGE** 420

2016 Volvo XC90 PHEV

CLASS SUV **NUMBER OF PASSENGERS** 5

FUEL Plug-in Hybrid **COMBINED MPG** 53e/25 (gas)

MAXIMUM RANGE 14e/350

2017 Nissan Altima

CLASS Midsize

NUMBER OF PASSENGERS

FUEL Gasoline

COMBINED MPG 31 **MAXIMUM RANGE** 588

2017 Buick Encore

SUV **CLASS**

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 30

MAXIMUM RANGE 420

2017 Audi A5 Quattro

CLASS Sports Car

5 NUMBER OF PASSENGERS

Gasoline **FUEL**

COMBINED MPG 26 **MAXIMUM RANGE** 390

2017 Tesla Model S AWD – 90D

CLASS Luxury Sedan

NUMBER OF PASSENGERS

Electric **FUEL COMBINED MPG** 104e **MAXIMUM RANGE** 294

2018 GMC Sierra K15 4WD

Standard Pickup CLASS

NUMBER OF PASSENGERS

FUEL Gasoline

COMBINED MPG 18 **MAXIMUM RANGE** 540

2018 Chevrolet Cruze Premier

CLASS Compact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 33 MAXIMUM RANGE 452

2018 MINI Cooper Hardtop 4 door

CLASS Compact

NUMBER OF PASSENGERS 4

FUEL Gasoline

COMBINED MPG 32 MAXIMUM RANGE 371

2018 Mercedes-Benz GLC350e 4matic

CLASS Plug-in Hybrid

NUMBER OF PASSENGERS 5

FUEL Electric/Gas **COMBINED MPG** 56e/25 (gas)

MAXIMUM RANGE 10 mi electric/350 total

2019 Cadillac Escalade AWD

CLASS SUV 4WD

NUMBER OF PASSENGERS 8

FUEL Gasoline

COMBINED MPG 17 MAXIMUM RANGE 442

2018 Tesla Model 3 Long Range

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Electric
COMBINED MPG 130e
MAXIMUM RANGE 310

2019 Volkswagon Beetle

CLASS Compact

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 29 MAXIMUM RANGE 420

2019 Honda Accord 6 Speed Turbo

CLASS Large Sedan

NUMBER OF PASSENGERS 5

FUEL Gasoline

COMBINED MPG 30 MAXIMUM RANGE 444

2019 Hyundai Sonata Hybrid

CLASS Midsize

NUMBER OF PASSENGERS 5

FUEL Hybrid

COMBINED MPG 41

MAXIMUM RANGE 652