

**AP Statistics Investigative Task**  
**Project #2: Auto Safety**

**DUE: October 10,  
2013 (8:10 am)**

## Auto Safety

You work for an automobile insurance company. Your boss has assigned you the task of reviewing recent auto safety records and thinking about how that information may be relevant to your company. You found these data on the web.

**HIGHWAY LOSS DATA INSTITUTE (www.hwysafety.org)**  
**AUTOMOBILE INSURANCE INJURY LOSSES (2000-01)**

SMALL CARS		MID-SIZE CARS		LARGE CARS	
Model	Rating	Model	Rating	Model	Rating
A4 Quattro	63	Saab 9-3	58	Buick LeSabre	39
Audi A4	67	Buick Century	63	Bonneville	53
VW Beetle	69	Toyota Avalon	66	Grand Marquis	53
Volvo S40	82	Volvo S70	72	Buick Regal	57
VW Golf	91	Lexus ES 300	75	Olds Intrigue	58
Impreza	98	Saturn LS	76	Crown Victoria	63
Subaru G20	104	Acura	78	Concorde	66
Saturn SL	104	VW Passat	80	Chrysler LHS	66
Honda Civic	105	Infiniti I30	82	Chrysler 300M	70
VW Jetta	107	Maxima	94	Chevy Impala	73
Chevy Prizm	118	Chevy Malibu	97	Chevy Lumina	73
Ford Focus	120	Olds Alero	97	Grand Prix	74
Acura Integra	133	Cirrus	98	Mercury Sable	80
Nissan Sentra	134	Honda Accord	102	Monte Carlo	85
Eclipse	136	Toyota Camry	102	Ford Taurus	88
Chevy Metro	138	Grand Am	105	Dodge Intrepid	92
Ford Escort	141	Mystique	108		
Civic Coupe	143	Diamante	109		
Proton	144	Millenia	114		
Corolla	147	Ford Contour	118		
Dodge Neon	167	Dodge Stratus	122		
Accent	181	Breeze	128		
Elantra	190	Cavalier	134		
Kia Sephia	221	Mazda 626	135		
Mirage	246	Sunfire	140		
Esteem	247	Nissan Altima	144		
		Galant	164		
		Sonata	169		

Insurance injury loss results are stated in relative terms. 100 represents average result for all cars.  
Lower numbers are better. For example, a rating of 122 means 22% worse than average.

*Write a report to your boss, including:*

- appropriate comparative plots and summary statistics;
- descriptions of the injury ratings for each group of cars;
- a comparison of injury ratings for the three sizes of cars;
- your recommendation to your boss about your company's insurance policies.

**AP Statistics Investigative Task****Project #2: Auto Safety**

	Components	Comments
<b>Think</b>	Demonstrates clear understanding of statistical concepts and techniques in comparing the three distributions	
<b>Show</b>	<ul style="list-style-type: none"> <li>• uses parallel boxplots</li> <li>• has consistent scale (any kind of graphs)</li> <li>• graphs are correct and clearly labeled</li> <li>• 5 # summaries and IQR's are correct</li> </ul>	
<b>Tell</b>	<p>Compares <b>centers</b>:</p> <ul style="list-style-type: none"> <li>• numerically (probably medians)</li> <li>• compares groups to each other</li> <li>• compares each group to average (100)</li> <li>• discusses all three groups</li> </ul> <p>Compares <b>variability</b>:</p> <ul style="list-style-type: none"> <li>• notes differences in IQR's</li> <li>• correctly interprets those differences</li> <li>• notes outliers</li> <li>• notes that groups overlap (ex: ??% of small cars safer than median of midsize)</li> </ul> <p>States <b>conclusion</b>:</p> <ul style="list-style-type: none"> <li>• in context (W's, insurance co. memo)</li> <li>• interprets the ratings properly</li> <li>• makes a recommendation</li> <li>• avoids speculation (drivers, accidents, etc)</li> </ul>	

**4 Components are scored as Essentially correct, Partially correct, or Incorrect**

**1: Graph.** Boxplots, on the same scale, clearly labeled with correct numerical summaries.

E – All four requirements.

P – Only 2 or 3.

I – Fewer than 2

**2: Compare the centers.** Correctly compares all three groups to each other and to the overall average (100), with proper use of numerical summaries (medians).

E – All four requirements.

P – Only 2 or 3.

I – Fewer than 2

**3: Compare the spreads.** Compares variability within groups (IQRs), noting consistent safety in large cars and greater variability elsewhere. Notes outliers. Discusses overlap between groups, probably using medians and quartiles.

E – All four requirements.

P – Only 2 or 3.

I – Fewer than 2

**AP Statistics Investigative Task**

**Project #2: Auto Safety**

**4: General conclusion.** Clearly written, in the proper context, the general conclusion correctly interprets the ratings and recommends some course of action (perhaps lower premiums for large cars).

E – All four requirements.

P – Only 2 or 3.

I – Fewer than 2

**Scoring:**

- E’s count 10 points, P’s are 6 points

Name & Partner: \_\_\_\_\_ Score: \_\_\_\_\_

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**“SAMPLE REPORT”**

**To:** Boss (Name)  
**From:** Employee (Name)  
**Re:** Automobile insurance injury losses and rates.

The Highway Data Institute has collected data on automobile insurance injury losses for 2000-2001. These losses are reported in relative terms, with a rating of 100 being average for all cars. For instance, ...

The summary statistics for the insurance injury losses are organized in the table below. I have chosen to use ....

<i>Group</i>	<b>Count</b>	<b>Min</b>	<b>Q1</b>	<b>Med</b>	<b>Q3</b>	<b>Max</b>	<b>IQR</b>
<b>small</b>							
<b>mid-size</b>							
<b>large</b>							

The median of the distribution of large car ratings is .... When comparing the cars by median rating, \_\_\_ cars are safest, followed by \_\_\_ cars. \_\_\_ cars are the least safe.

In addition to being safer in general ...

Our company can expect to pay more in claims for cars with ...