Welcome to MATH E-3!

Quantitative Reasoning: Practical Math

Spring 2016

HARVARD UNIVERSITY EXTENSION SCHOOL
Math E-3 Quantitative Reasoning: Practical Math
Spring 2016 Syllabus v. 3.0

Course Description and Goals: If you have read the online description of this course, you may be mildly apprehensive about some of the terms used there. We shall indeed be covering topics in statistics, such as standard deviation and confidence intervals, but we shall be doing so in a manner that will be both informative and fun! We will also spend time using the computer for spreadsheets and for creating rather interesting graphs and charts. The course is geared towards achieving a clearer understanding of how math is used in the everyday world. In addition, there will be extra practice in basic arithmetic concepts such as integers, fractions, decimals, and percents, certainly everyday occurrences! So if you feel a bit shaky in any of these areas, you are in the right place. If you are a "math whiz," you are not in the right place!

Instructor: Graeme Bird	**e-mail:**	**phone:**
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Teaching Assistants:

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Graders:

Nina DeLuca	nina_deluca@harvard.edu
Lori Normil	lnormil@g.harvard.edu

MATH E-3 course info

MATH E-3 is offered with an online option. Students can attend classes in person, watch lectures live via the internet, and/or watch online videos of lectures.

All course materials, including homework assignments, solutions, videotaped lectures, practice exams, as well as class announcements will be posted to the course website.

You must LOG IN to the course website to have full access to the course materials: https://canvas.harvard.edu/courses/8413

You MUST check the website often.

Lecture: Tuesdays, 7:40 – 9:40 p.m. in Maxwell Dworkin 115. Live chat will be available.

Lecture videos will be available for online viewing within 48 hours. For more information on course format, system requirements and help: http://www.extension.harvard.edu/academics/courses/types-courses/video-course-guidelines

MATH E-3 course info

TA sections (optional):

Online: with Jessica (via "Conferences" on course website): Wednesdays 7:30 – 9:00 pm (ET)
On campus with Sue: Tuesdays, 5:30-7:00 pm, Sever Hall 104.

These optional sections will present opportunities to ask questions about the lecture material and homework problem sets.

Additional help: *The Math Question Center*. http://www.extension.harvard.edu/resources-policies/resources/math-question-center

Required Materials:

- **Texts:** No required text; all materials will be posted on the course website.
- **Calculators** - You will need a calculator – with exponents. The **TI 30Xa** and **TI 30X IIS** are recommended. In addition, there is a listing of acceptable calculators posted in the Homework Help Center module on the course site. Smartphone calculators and calculators with internet access ability are not acceptable.
- A **ruler** will be useful when drawing graphs – no crooked lines please!

Computers and more
Needless to say, we expect you to have access to a computer. You must also have access to a scanner or smartphone.

Math Question Center

The best way to learn math is to do math. Although you are expected to do your best to complete course assignments yourself, there is a difference between wrestling with a math problem to reach new levels of understanding and struggling to the point of frustration and increased confusion. The Extension School offers the Math Question Center to help you out.

To use the center, you must be currently registered in one of the following Harvard Extension School courses:

- All math classes up through calculus
- Introductory statistics (Stats 100 through 104)
- ECON 10a or ECON 1010 (tutoring is just for the math requirements, not economics content)

If you are registered for one of the above courses, you are invited to use the center as much as you would like during the semester.

The center meets both on campus in Sever Hall, room 215, and online for distance students. It is open Monday evenings from 5:30 to 7:30 pm and Tuesdays from 7:40 to 9:40 pm. You can take advantage of the center's online service by logging in during the same times (see directions below).

Please note that the tutors in the center are not there to do your homework. Their aim is to help you achieve your longer-term goals: a deeper understanding of math and greater self-confidence.

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MATH E-3 course info

E-mail communication:
We must be able to reach all of you via e-mail. One of us will be regularly sending out class-wide e-mails – these will automatically go to whichever e-mail address you included when you registered for the course. If you prefer to use a different e-mail address, you'll need to contact the Extension School yourself to have your address changed.

MATH E-3 course info

QUIZZES and FINAL EXAM

Quiz 1: online – **March 8**
Quiz 2: online – **April 5**
There are no make-ups for the two quizzes.

Final Exam:
Students who reside within the six New England states - Maxwell Dworkin 115, **May 10.**

Students who reside outside the six New England states must arrange for a proctor for the final exam. Click on the following link for information about the procedure for taking proctored exams:

http://www.extension.harvard.edu/resources-policies/exams-grades-transcripts/exams-online-courses

The date of the final exam is fixed by the Extension school. If you cannot take the Final Exam at the scheduled time and date, YOU MUST contact the Extension School Registrar. The Registrar will determine if you are eligible for a make-up exam.

MATH E-3 course info

Grading: The following is the grading scheme for the course. It is set up so that if you miss a Quiz 1 or Quiz 2, you will not be penalized with a zero grade. Your final exam will account for the missed Quiz. You MUST take the final exam even if all your other grades are 100%. Otherwise, the final exam will be counted as a zero.

Homework-	25% the two lowest grades will be dropped
Quiz 1 -	25% if better than the final grade
Quiz 2 -	25% if better than the final grade
Final Exam -	Minimum of 25%, Maximum 75% depending on midterms.

Example:

	Homework	**Quiz 1**	**Quiz 2**	**Final Exam**	**Course Grade**
Student #1	90%	68%	78%	75%	Grade = .25*90% + .25*78% + .5*75% = 79.5% Rounds to 80% = B–

COURSE INFORMATION

Class Meetings

On campus

Tuesdays, 7:40-9:40 pm
Maxwell-Dworkin G115

Online option available

Optional sections to be arranged.

Course Tuition

Undergraduate credit: $1,350

Course Credit

4 credits

Enrollment Status

- Limited to 150 students
- Current enrollment: 72

Start Date

Tuesday, January 26

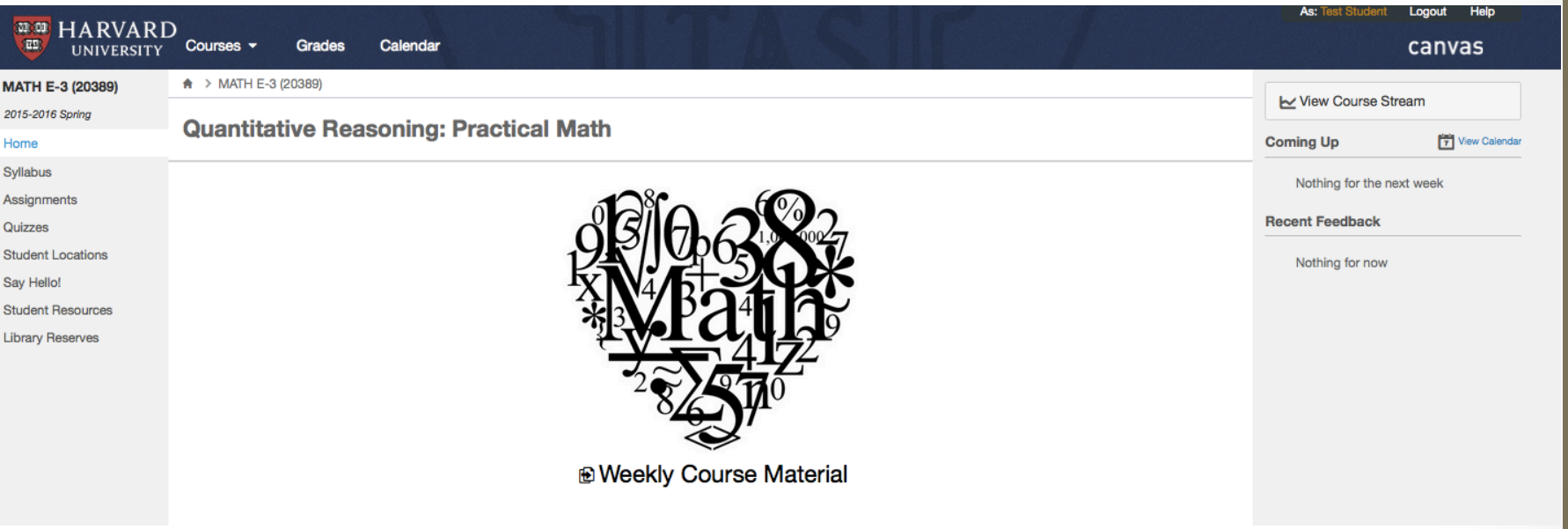
Prerequisites

A willingness to (re)discover math and to use a calculator.

Syllabus

http://canvas.harvard.edu/courses/8413/assignments/syllabus

The view from Canvas . . .



https://canvas.harvard.edu/courses/8413

Homework schedule

Class Date	Lecture/Assignment	Topic	Due/Solutions posted	Grades Release Date
1/26	1	Introduction	2/6	2/13
2/2	2	Operations with Numbers	2/13	2/20
2/9	3	Percents	2/20	2/27
2/16	4	Summary Statistics	2/27	3/5
2/23	5	Probability	3/5	3/12
3/1	6	Normal Curve/Confidence Intervals	3/26	4/2
3/4	**Quiz 1 review session**	**N/A**	N/A	N/A
3/8	**Online Quiz 1 (covers lectures 1-5)**	**NO CLASS**	**N/A**	**N/A**
3/15	**SPRING BREAK**	**NO CLASS**	**N/A**	**N/A**
3/22	7	Hypothesis Testing	4/2	4/9
3/29	8	Hypothesis Review/Excel	Optional, Extra Credit EXCEL Assignment due 4/9	4/16
4/1	**Quiz 2 review session**	**N/A**	**N/A**	**N/A**
4/5	**Online Quiz 2 – no class (covers lectures 6-8)**	**NO CLASS**	N/A	N/A
4/12	9	Linear Growth	4/23	4/30
4/19	10	Applications of Linear Growth	4/30	5/7
4/26	11	Exponential Growth	**5/7 – this is your last homework assignment**	5/14
5/3	Online live-streamed Final Exam review	**NO CLASS**		
5/10	In class/proctored Final Exam			

WELCOME TO MATH E-3!

Homework Assignments

- Assignments will be posted on Wednesday.
- All assignments are due by 11:59 am (Eastern Time) Saturday of the following week, unless otherwise stated. **Assignment upload closes at noon on Saturday, Eastern Time.**
- Example:
  - Assignment 1 will be posted 1/27
  - It will be due before noon (Eastern Time), Saturday 2/6

Assignments

- We will post a PDF version
- Print the assignment from the website, write your work and answers by hand, scan the document, and upload.
- All homework must be uploaded in **PDF** format (one single document not to exceed 4 mb). Multiple-file submissions will not be accepted.
- Tips for creating, merging and sizing a PDF documents are posted on the course website under Homework Help Center.
- Uploaded assignments will be graded, so do not upload draft assignments.

Assignments

- Assignments will be graded electronically by the following Saturday.
- Assignment 1 will not be graded, however, we strongly recommend that you submit the assignment, as it will get you accustomed to the proper submission of homework. All remaining assignments will be graded.
- Assignment 1 grades will be released Saturday, 2/13 with comments and an introduction from your assigned grader.

Assignments

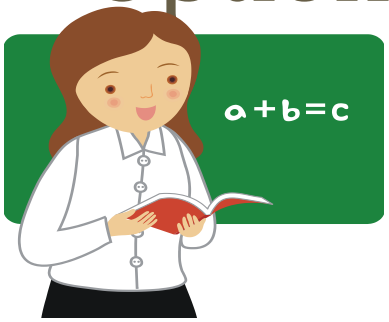
- Assignments submitted via email or paper will not be accepted – uploaded assignments only.
- **Late assignments will not be accepted.**
- We'll drop your 2 lowest assignment grades, so don't panic if you are unable to submit an assignment on time because of a particularly hectic week due to personal or work issues, or have technical problems.
- **TIP:** Do not wait until the last minute to upload your assignment.

Assignments

- A schedule of the homework due dates is posted in the Homework Help Center module on the course site home page.

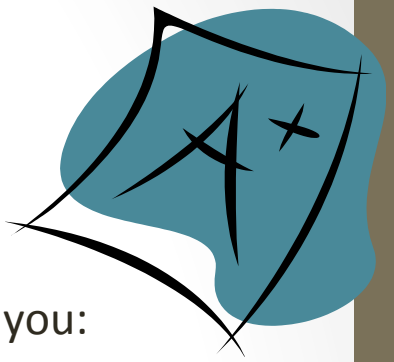
- Review carefully the Homework Policies section outlined in the syllabus.

Optional TA Sections/Resources



- Online (via Conferences on the course website): Wednesday, 7:30-9:00 pm (Eastern Time) with Jessica.
  - First online section will be February 10
- On campus: Tuesdays from 5:30-7:00 pm, Sever 104, with Sue
  - First on campus section will be February 16
- The Math Question Center: http://www.extension.harvard.edu/resources-policies/resources/math-question-center

To help you succeed



To help ensure success in the course, we strongly recommend that you:

- Do the assigned reading
- Attend and/or watch the lecture videos
- Do the homework assignments and upload by the deadline
- *Math is a subject that requires consistent attention to homework* - review your work and compare to the posted solutions
- Utilize resources, such as on-campus and/or online homework help sections, if needed
- Attend and/or watch quiz and final review sections
- Visit the course website often and become familiar with its content

MATH E-3 COMMUNITY

- **Say Hello!**
- **Student Locations**
- **Discussion Board** – solely for community building. Collaboration policy outlined in syllabus must be followed. Will not be monitored regularly.

Resources

Video Course Guidelines and Technical Requirements:

http://www.extension.harvard.edu/academics/courses/types-courses/video-course-guidelines

Resources

CANVAS HELP: you may refer to the **"Help"** button on the course website, which includes the **CANVAS STUDENT GUIDE:** https://community.canvaslms.com/community/answers/guides/

WELCOME
and

HAVE A GREAT SPRING TERM!

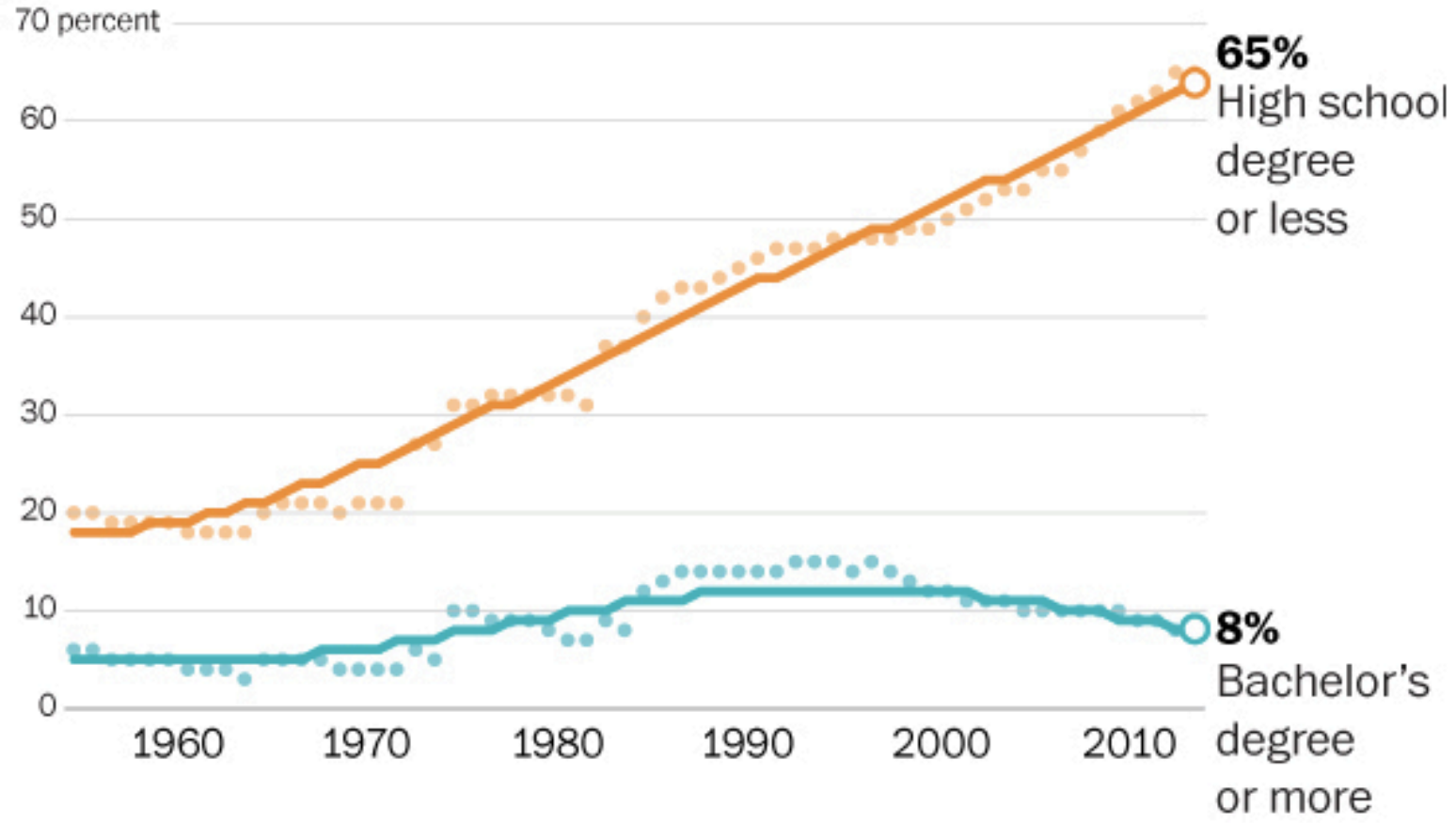
The MATH E-3 Team

Why would anyone take a math course??

- Math is useful
- Math is interesting
- Math is fun
- The requirement . . .

Children living in a single-parent home

In 2012, 65 percent of children whose mothers never made it past high school spent at least part of their early childhood in a single-parent household, up from 20 percent in 1953.



Sources: Robert Putnam and U.S. Census Bureau

THE WASHINGTON POST

62 people have as much wealth as world's 3.6B poorest, Oxfam finds ahead of Davos

Sunday, 17 Jan 2016 | 11:21 PM ET

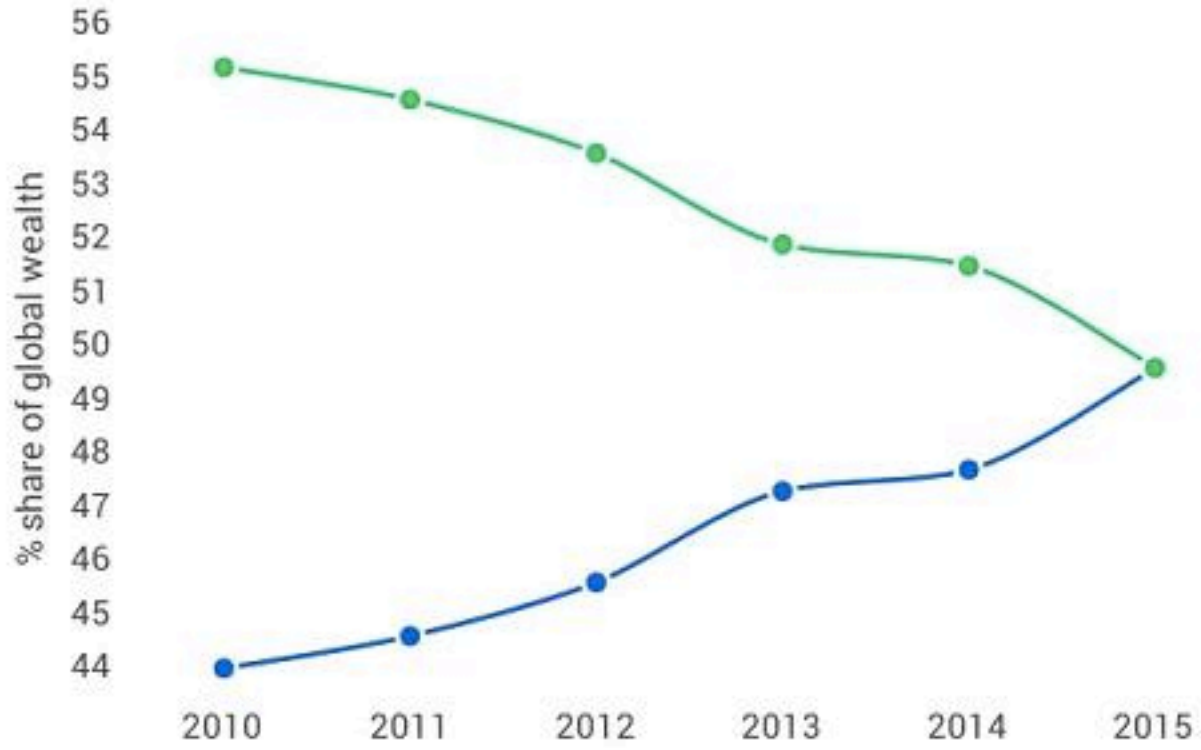
REUTERS

http://www.cnbc.com/2016/01/17/62-people-have-as-much-wealth-as-worlds-36b-poorest-oxfam-finds-ahead-of-davos.html

Getty Images

The Davos mountains in Switzerland where the annual World Economic Forum is held.

Just 62 people, 53 of them men, own as much wealth as the poorest half of the entire world population - or 3.6 billion people - according to a report released by anti-poverty charity Oxfam.



Oxfam

And the richest 1 percent own more than the other 99 percent put together.

Grades received in class:

73	47	71	65	85	61	74	80	65	67
62	84	71	99	70	88	69	83	81	71
80	68	26	58	71	90	58	64	70	95
91	67	48	41	62	75	66	77	78	66
50	52	83	58	50	87	91	60	78	67

* Information and Graphs on the next few slides are taken from the Core Curriculum Quantitative Reasoning Requirement Data Text, © President and Fellows of Harvard College, 1991.

Histogram of grades

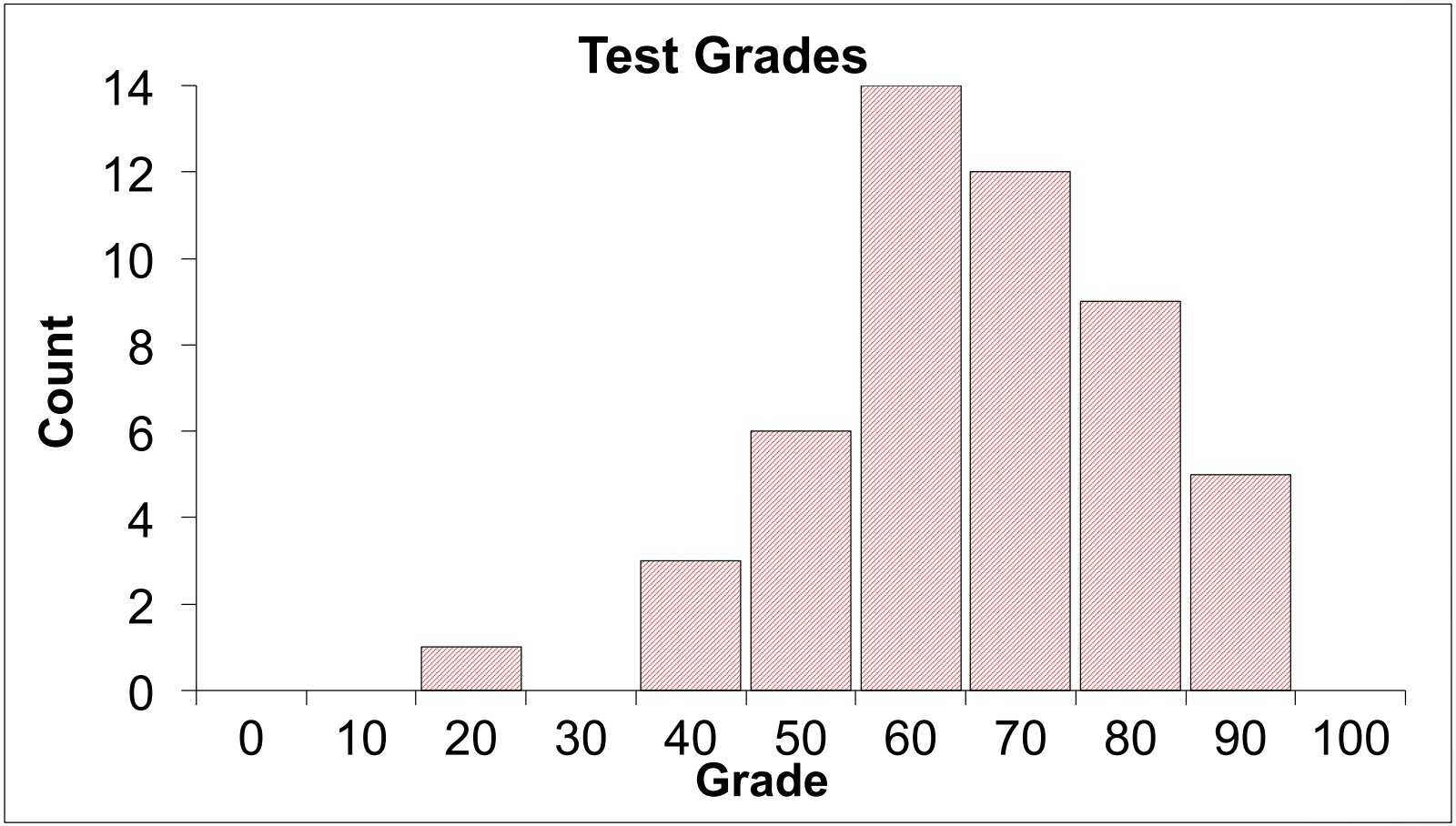
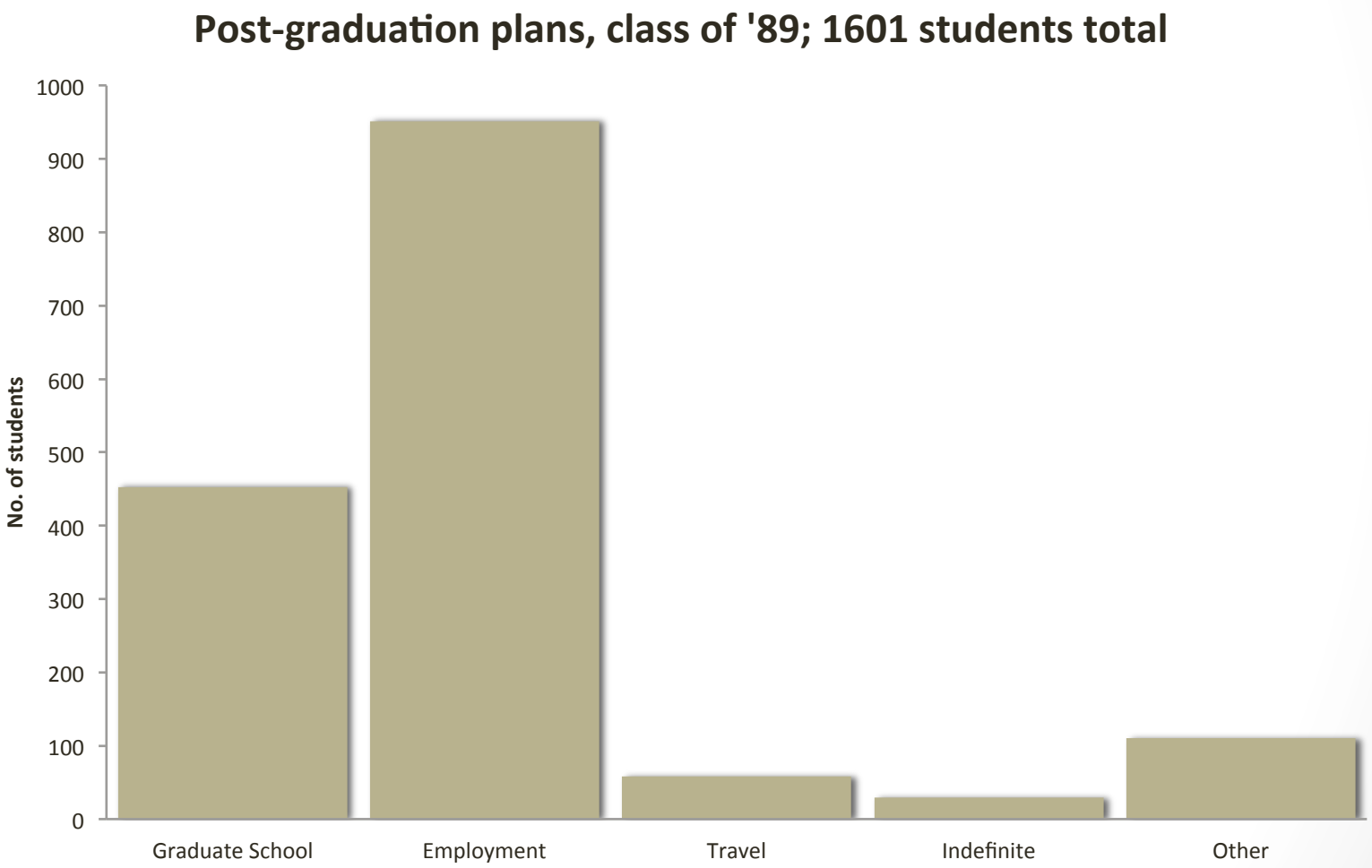


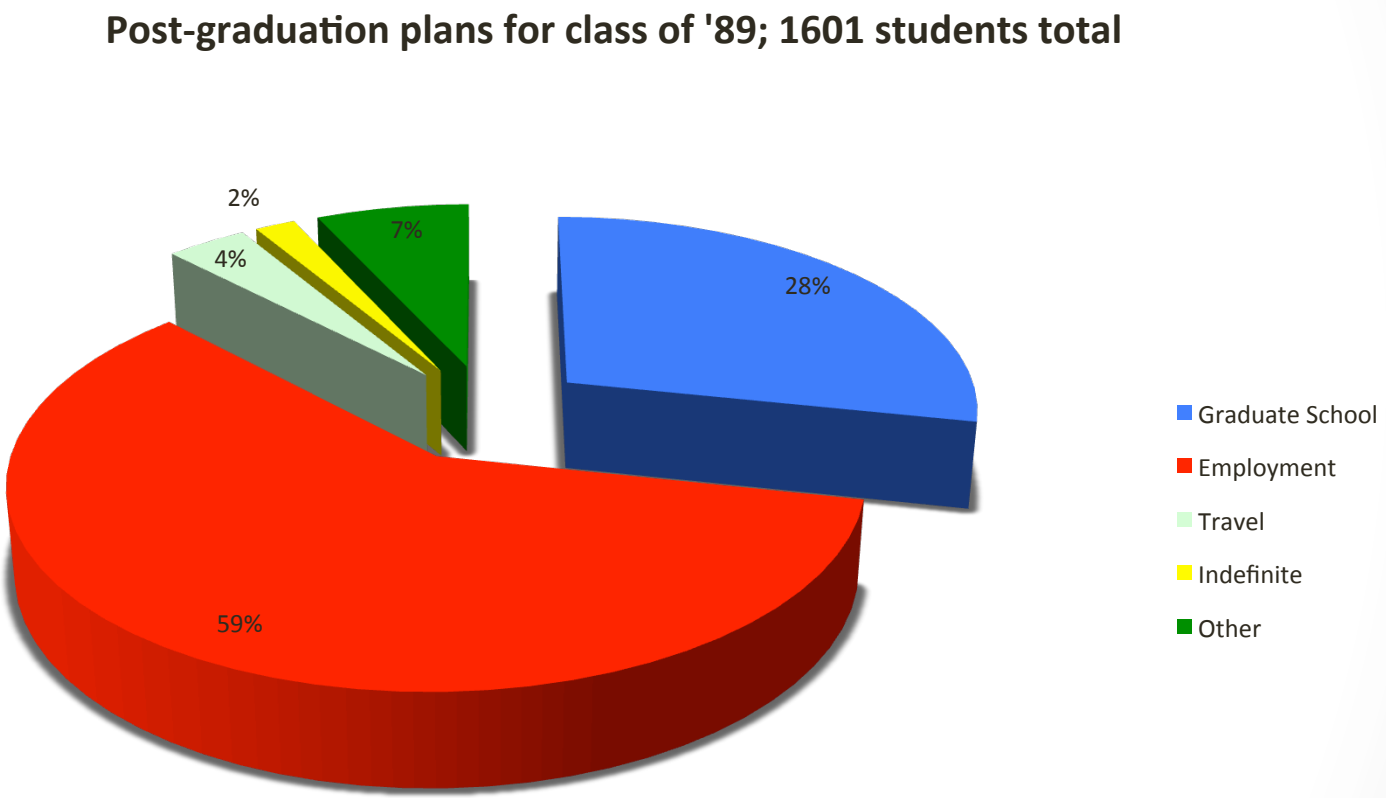
Table: where graduating students from the class of 1989 planned to go after graduating.

453	Graduate School
951	Employment
58	Travel
29	Indefinite
110	Other
1601	

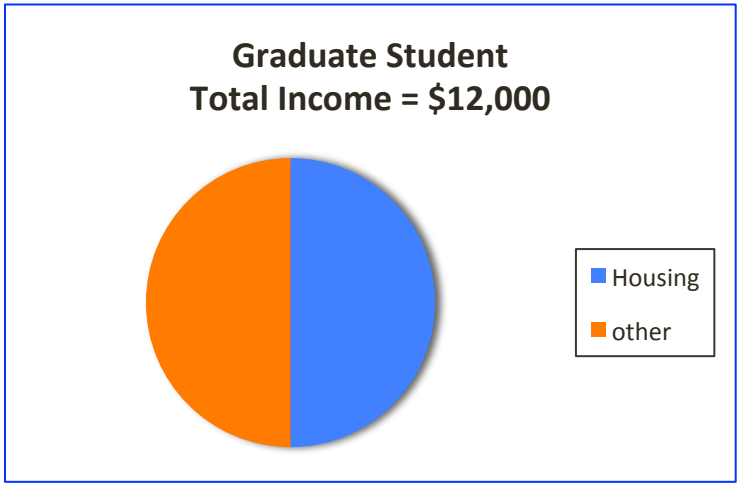
Histogram

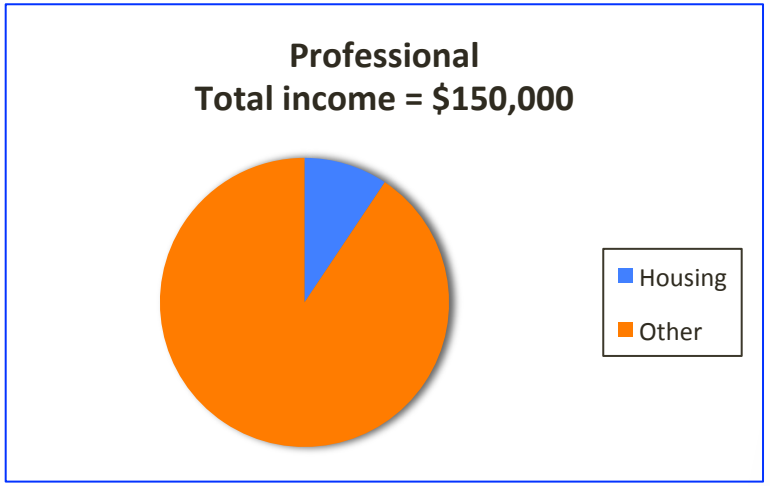

Post-graduation plans, class of '89; 1601 students total
No. of students
1000
900
800
700
600
500
400
300
200
100
0
Graduate School
Employment
Travel
Indefinite
Other

Pie Chart


Post-graduation plans for class of '89; 1601 students total
2%
4%
7%
28%
59%
Graduate School
Employment
Travel
Indefinite
Other

Comparing Pie Charts





Column chart

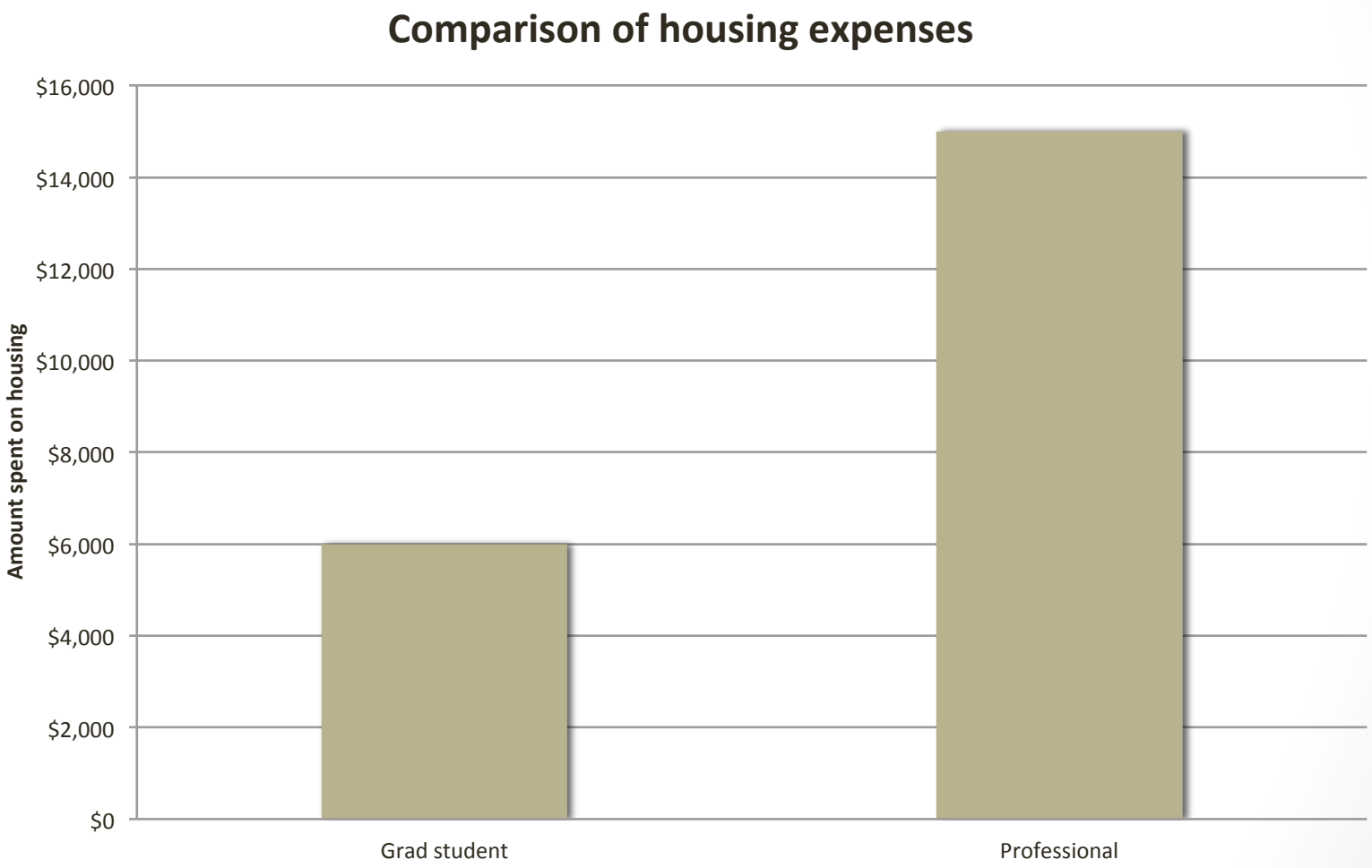
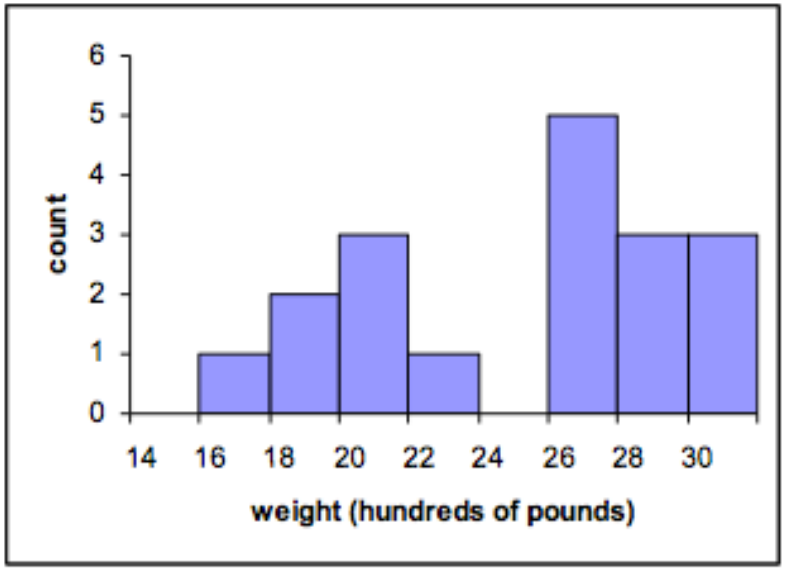
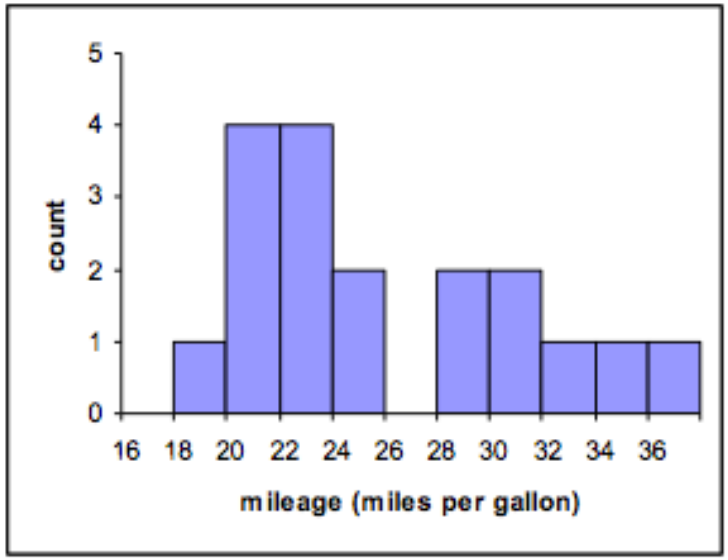


Table of weight and fuel efficiency data

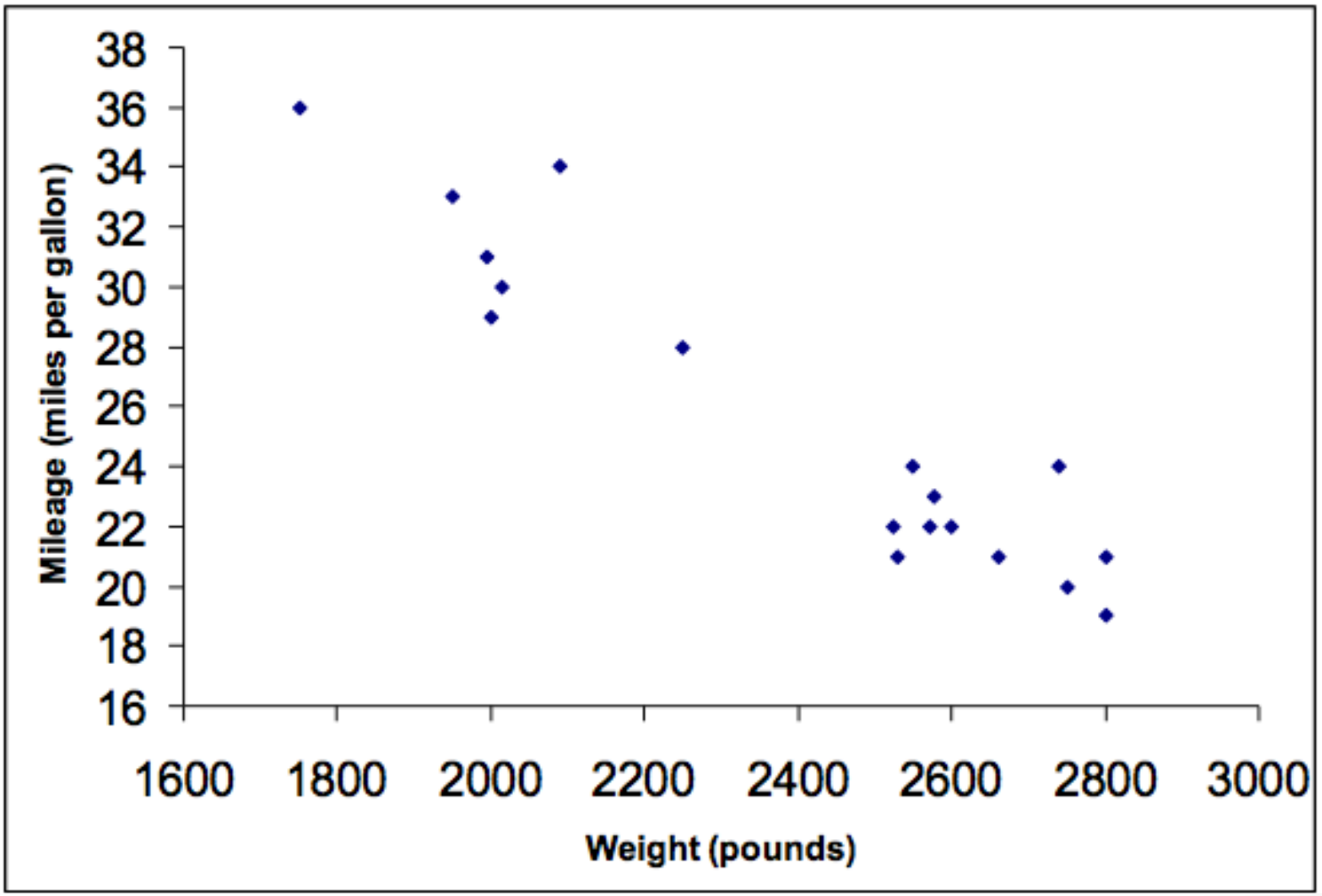
Car Model	Weight (pounds)	Miles per gallon
Honda Civic	1750	36
Datsun 310	1995	31
Honda Accord	2090	34
Mazda GLC	2000	29
Plymouth Champ	1950	33
Subaru	2015	30
Audi 4000	2250	28
Pontiac Phoenix	2550	24
Chevy Citation	2740	24
Saab 99	2530	21
Datsun 810	2660	21
Ford Pinto	2525	22
Mercury Bobcat	2600	22
Toyota Corona	2576	23
AMC Concord	2750	20
Buick Skyhawk	2800	19
Olds Starfire	2571	22
Plymouth Sapparo	2800	21

2 separate histograms

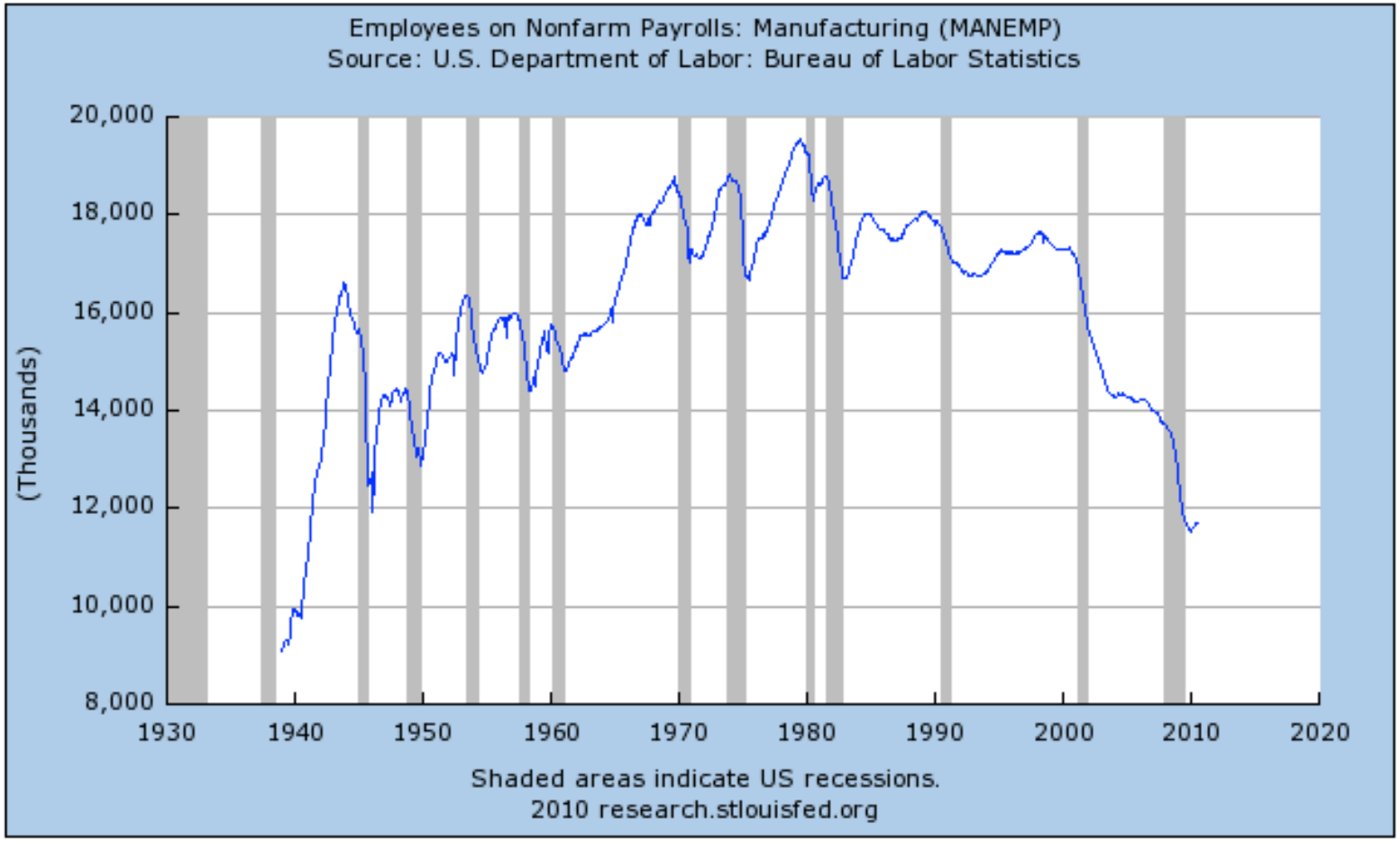




Scatterplot



Line graph

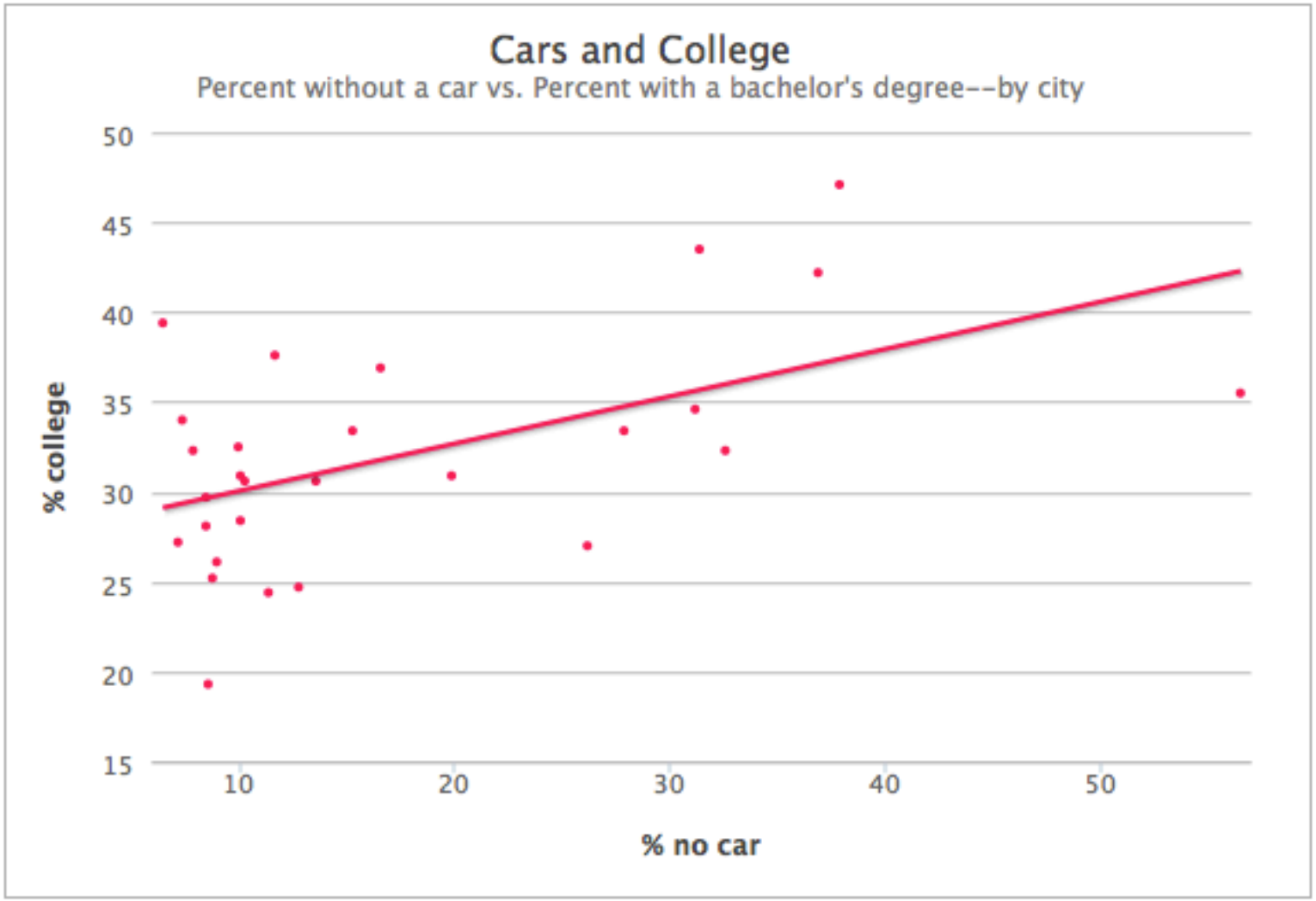


The Graph above was taken from the Federal Reserve Bank of St. Louis on Economic Research. (http://research.stlouisfed.org/fred2/series/MANEMP?cid=11 . Last Updated on Aug. 6, 2010.) Basically, it depicts the manufacturing production in the US and as you can see, we have dropped backed to 1941-2 figures.

Which way is the trend going?

http://blogs.wsj.com/moneybeat/2014/01/03/the-bearish-call-to-end-all-bearish-calls/?mod=WSJ_hpp_MIDDLENexttoWhatsNewsFifth

What causes what . . .??

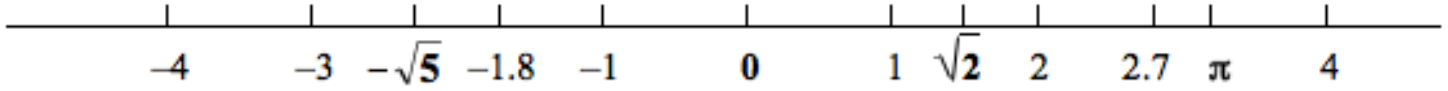


http://www.theatlantic.com/business/archive/2014/01/why-do-the-smartest-cities-have-the-smallest-share-of-cars/283234/

Types of numbers

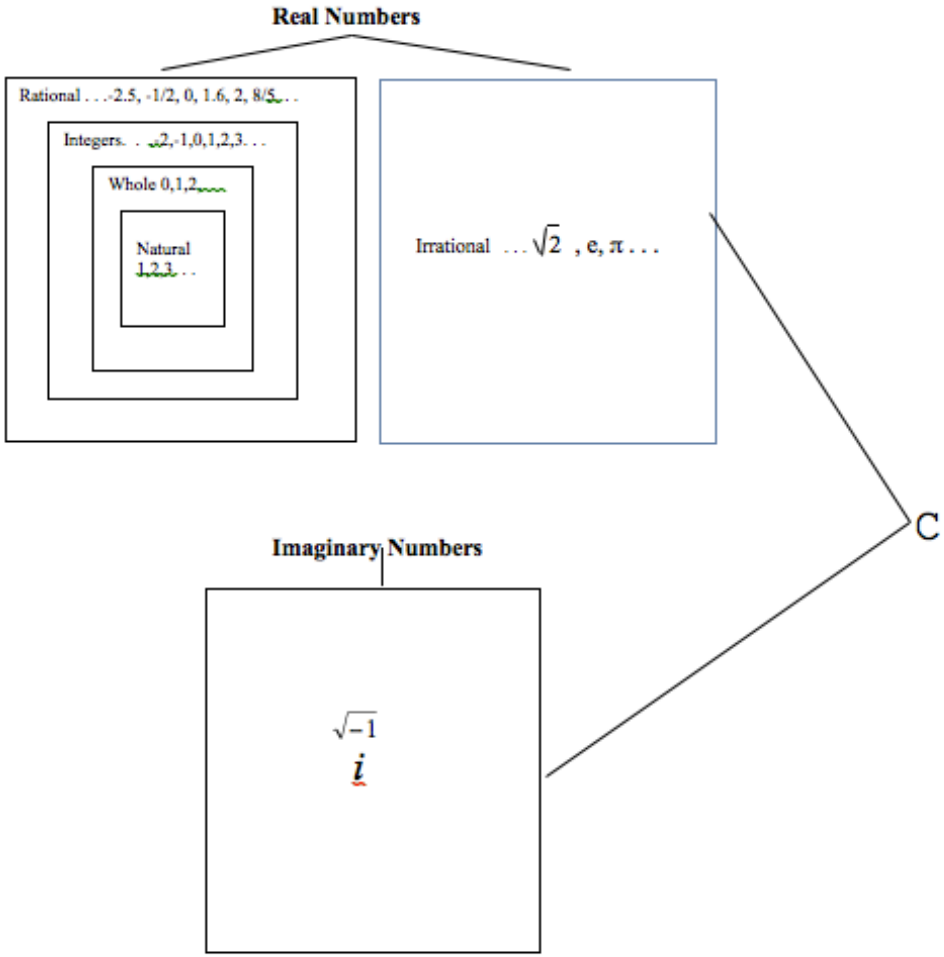
- **The Real Number System (R) consists of 'SETS' of numbers as follows:**
- **(N)** **Natural** Numbers – Counting No's
- **(W)** **Whole** Numbers – Natural No's and Zero
- **(Z)** **Integers** – Whole No's and Negatives
- **(Q)** **Rational** Numbers–Integers and Fractions
- **(H)** **Irrational** Numbers
- **Thus, the real numbers consists of all the Rational and Irrational numbers.**
- **(R) Real Numbers** = **Rational and Irrationals**

The Real Number Line:



Note: Negative numbers are to the left of zero on the number line and positive numbers are to the right of zero.

The Complex Number System



Important Mathematical Notations and Symbols #1

Inequalities

"greater than"

$8 > 5$ $0 > -4$ watch the negative sign!

"less than"

$3 < 7$ $-6 < -2$

more examples:

$\frac{2}{3} > \frac{1}{2}$ $-2.75 < 0.1$ $1.25\% > 0.3\%$ $\sqrt{2} < \pi$

"less than or equal to" **English: "AT MOST"**

a number, x, that is less than **or** equal to 5 is written $x \leq 5$

"greater than or equal to" **English: "AT LEAST"**

a number, x, that is greater than **or** equal to 3 is written $x \geq 3$