Math: The gateway to Great Careers

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What I’ll Talk About Today

• Why I think that math is important for everyone in this room
• “Common Denominators” of Great Careers
• An example of how I use math at NASA
Career versus Job

• **Career** is defined by the Oxford English Dictionary as an individual's "course or progress through life (or a distinct portion of life)". It is usually considered to pertain to remunerative work (and sometimes also formal education).

• A **job** is a regular activity performed in exchange for payment, usually as one's occupation. The duration of a job may range from an hour …to a lifetime …The series of jobs a person holds in their life is their career.

Career versus Job

• Most of us use the two terms interchangeably
  – But when you think about it, they are different

• Age relates to which you have and which you want to have

• My goal is to get you thinking about what Career you want to develop, and about charting your path
What makes a great career?

• It depends on what matters to you, but there are some common things that many people value…

• What are some things that YOU consider important in a career?
…Things to consider…

- Salary & Benefits
- Hours
- Physical Demands
- Mental Demands
- Skill Sets Required
- Education Required
- Work Environment
- Stress
- Hiring Outlook
- Sense of Worth
- Job Security
- Flexibility
- Predictability
- Travel Requirements
- Family-Friendly
- Prestige
- Opportunities for Advancement
- Interesting!
- Co-workers
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Many, MANY things contribute to Career Satisfaction!!
What are some great careers?

• Again, it depends on what matters to you, but when asked, many people rattle off the same short list…

• What do you think is on that list??
What are some great careers?

• JobsRated.com evaluated 200 jobs in 2010, considering five “Core Criteria”
  – Environment, Income, Outlook, Stress, Physical Demands
• Each of these criteria had several components to them (ex. “income” included salary data plus growth potential)
• 200 Jobs were rated in each Core Criteria, and an overall score was created so that jobs could be ranked.

http://www.careercast.com/jobs/content/jobs-rated-methodology-2010
“Top-10” Careers?

1. **Actuary** Interprets statistics to determine probabilities of accidents, sickness, and death, and loss of property from theft and natural disasters.

2. **Software Engineer** Researches, designs, develops and maintains software systems along with hardware development for medical, scientific, and industrial purposes.

3. **Computer Systems Analyst** Plans and develops computer systems for businesses and scientific institutions.

4. **Biologist** Studies the relationship of plants and animals to their environment.

5. **Historian** Analyzes and records historical information from a specific era or according to a particular area of expertise.

6. **Mathematician** Applies mathematical theories and formulas to teach or solve problems in a business, educational, or industrial climate.

7. **Paralegal Assistant** Assists attorneys in preparation of legal documents; collection of depositions and affidavits; and investigation, research and analysis of legal issues.

8. **Statistician** Tabulates, analyzes, and interprets the numeric results of experiments and surveys.

9. **Accountant** Prepares and analyzes financial reports to assist managers in business, industry and government.

10. **Dental Hygienist** Assists dentists in diagnostic and therapeutic aspects of a group or private dental practice.
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The Common Denominator:

• All of the “top ten” careers identified by JobsRated.com (Careercast.com) involve math

  ➢ Math is part of the job

  ➢ Knowledge of math is necessary to get the job
Do you agree with the list?

• This is one example of a “job survey”
• Other methods will shuffle the rankings, depending on how the survey was conducted, and how the data were analyzed (by statisticians!)

• But I would argue that the common denominators in “best” careers, regardless of how you do the math, hold true.
Math as a Gatekeeper

• Good Jobs Require…
• Good Careers Require…
• Great Careers Require…

• Most experts agree that education is a critical factor
Setting your Sights High!

- College is a no-brainer

- Graduate School is something to consider too

- What does it take to get into an excellent College or University? Graduate Program?
Admissions Offices use many criteria, but most emphasize:

- Your High School Performance
  - Cumulative GPA
  - GPA in specific courses
  - Other factors that separate you from “the pack”

- Standardized Test Scores
  - ACT
    - Math, English, Reading, Science, Optional Writing Test, Composite
  - SAT
    - Math
    - Writing
    - Critical Reading
Graduate School?

![](NASA.png)

- Admissions Offices & Disciplines for Graduate School mimic Undergrad:
  - Your Performance in College/University
    - Cumulative Undergraduate GPA
    - GPA in specific courses
    - Other factors
  - Standardized Test Scores
    - GRE
      - Quantitative Reasoning
      - Verbal Reasoning
      - Analytical Writing
    - MCAT or OTHER Discipline-Specific Tests
      - …have a **math** component!
What most applicants want?

• Opportunity
  – to highlight our strengths
  – to address our weaknesses
  – to learn what it takes to succeed

• …We need to get our foot in the door
What are the “gatekeepers?”

- Standardized Test Scores
  - SAT, ACT, GRE, etc.
- Cumulative GPA
Why is Math so Important as an Entrance Requirement?

• People with math skills typically learn other academic and career-related disciplines, so they are a good risk for colleges/universities

• People who have solid math skills are thought to be “smart people,” and thus are welcomed into college programs, training opportunities, and great careers

• Math is part of most careers at some level
Recent Example of NASA work

The Challenge?

• Need to be able to accurately predict when an astronaut will run out of “consumables” during Extra Vehicular Activities

• There are several ways to estimate this, but sometimes the estimates don’t match

• How best to combine predictions from multiple methods of estimating??
Oh, and one more thing…

• Find a method that works even when things go wrong!
  – Crazy readings from a sensor
  – Flaky sensor that goes in/out
  – Completely broken sensor

  – Combinations of the above
  – Other stuff that we’ll think of too!
What the data looks like?
Our “Best Estimate”

W4 Coefficients
O2: 0.52
CO2: 0.11
LCG: 0.11
HR: 0.26
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Estimated MetRate vs Hours
What if a sensor fails?
How did we do it??

With a little math!!
Problem Solved??
Final Remarks...
Take-Home Lesson #1?

• Math Matters
• Math can be a career in and of itself
• Applied math leads to many careers
• These careers tend to be highly praised, with attributes that most people value
For the Math Lovers…

• Good news for us!
• Jobs requiring what we like to think about and do are “out there!”
• All that “math stuff” that we learn in school really has a purpose in life and work!
• We can get *paid* to do stuff that we love to do anyway!!
• And we can make a difference in the world too.
Take-Home Lesson #2?

• Math Matters

• Math is a “gatekeeper” to great careers not typically thought of as “in the math field” because it is a key component to the entrance exams required for College, University, and Post-Graduate education
For everyone else??

- There are many great careers that don’t involve (as much) math as part of daily “work-life”
  - Historian
  - Dental Hygienist
  - Paralegal Assistant
  - Philosopher
  - Technical Writer
  - Web Developers
  - Pharmacist
  - ...many others

- With equal benefits to self and society

- Nevertheless, many of the jobs that people rate highly require knowledge of math
  - If for no other purpose, math serves as a “gate keeper” to great careers
Where will your career take you?

Go down deep enough into anything and you will find mathematics.

~Dean Schlicter