

# CRTICAL QUESTIONS PROSPECTIVE OR CURRENT ENGINEERING STUDENTS NEED ANSWERS TO

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## **OVERVIEW**

As a prospective or current engineering student, there are many questions that you should seek answers to. Below, we provide a partial list of important questions that you will need answers to.

As you examine the list of questions, please think of the following:

How many individuals do you know that “tried” to pursue a career (a class or something) they thought they liked, had an “unpleasant” or “bad” experience, didn’t ask enough questions or the correct questions to properly analyze their chosen “situation/path,” gave up prematurely, and now have significant (long-standing) regrets?

...individuals that “strived” (somewhat) to find something they “really like,” but are now “stuck” doing something they really dislike with little to no chances of advancement?

Think of this hard. If you did not know many individuals (e.g. friends or members of your extended family) that have experienced or are experiencing the above, we’d be very surprised. There are tens of millions across our nation whose lives have been drastically impacted for the worse because of the above; i.e. because they gave up far too soon without deeply understanding the long-term consequences!

In an effort to help you avoid the above “life-damaging fate,” we provide a partial list of critical questions – a list that is intended to help you navigate the maze that awaits you.

Make sure that you get your questions answered as soon as possible. What is at stake here is your career ...and the rest of your life. Do NOT procrastinate. Work hard. Finally, plan your work and work your plan.

GOOD LUCK!

### **GROUP I: BS IN ENGINEERING**

- 1) Why should I pursue a BS? What will a BS degree offer over a 2 year degree? Over a BA degree? What advancement Opportunities? Flexibility? Responsibilities? Salary?
- 2) I have a spouse and a child. I have a job. How can I make time for a 4 year degree? Why should I? **Is it true that the long-term benefits are significant?**
- 3) I did poorly in one of my math classes. Engineering scares me. What do you suggest? **Is withdrawing from a class bad? When should one do so? Is taking a class over a bad thing? When should one do so? What are the short- and long-term consequences of giving up? How important are grades? Is it true that I can get by with (and what matters most is) having a good understanding of the fundamental concepts?**
- 4) I prefer to build stuff. Do I need to “love math” or be a “math guru” to become an engineer?
- 5) I have heard that engineering is very hard. Is it? How hard is it? How good do I have to be at math? physics? chemistry? biology?

### **GROUP II: WHY ENGINEERING**

- 6) Why should I consider engineering? Will it be boring or exciting?
- 7) How is engineering viewed on Capital Hill? around the world?  
<http://www.whitehouse.gov/administration/eop/ostp>
- 8) What exciting problems are engineers currently working on?
- 9) What are the following all about?

early disease diagnosis, genetic engineering, personalized medicine. cognitive radio, super computers, handheld multi-purpose computers, massive storage, brain-powered prosthetics, advanced robotic systems, asynchronous interactive learning environments, rapid language translation systems, renewable fuels, biofuels, energy efficient and self-sufficient buildings, electric vehicles, smart energy grid, fuel cells, smart materials, DNA sequencing, cell targeting medicine, nanotechnology, fission

Visit our web site: <http://aar.faculty.asu.edu/lapdp.html>

- 10) Will there be a job for me when I graduate? Will it pay well? Will it be challenging/boring? Will it require traveling?
- 11) What is the engineering work environment like?
- 12) What is outsourcing? Why does it occur? How can it be prevented? What engineering jobs might be outsourced?
- 13) How can continued innovation help our Nation address outsourcing and global competition? **How can an individual protect herself or himself from outsourcing?**

### **GROUP III: CHOOSING AN ENGINEERING DISCIPLINE**

- 14) What are the different engineering disciplines?
- 15) What do each of the following do: <http://aar.faculty.asu.edu/whatengrdo5.html>

Aerospace Engineers?

Bioengineers?

Electrical Engineers?

Chemical Engineers?

Civil, Environmental and Sustainability Engineers?

Computer Scientists?

Computer Systems Engineers?

Industrial Engineers?

Mechanical Engineers?

Materials Engineers?

Material Scientists?

- 16) What do each of the above create? **Is it true that the overlap between engineering disciplines is significantly increasing? Why?**
- 17) How do I choose an engineering discipline?
- 18) When do I need to choose a discipline? **Is switching majors bad? (e.g. CS to CSE, BE to EE, etc.) How does one decide to switch? What is involved? Is it true that I should NOT let one or a few “bad experiences” in classes be the impetus for changing fields?**
- 19) What do engineers do? Compared with technicians?
- 20) What is the difference between an engineering degree and a technology degree?
- 21) What are typical salaries for someone possessing a BS in engineering? How does this compare with other types of bachelor’s degrees?
- 22) What engineering disciplines are hot? Will be hot in the future?  
<http://boftheday2.blogspot.com/2011/03/obama-25-ways-to-rebuild-america.html>

What are employers of engineering students looking for? ability to learn, break down and solve problems, work individually and in teams, etc.?

- 23) I would like to be a doctor. Why should I consider a BS in engineering rather than pre-medicine?
- 24) I would like to be a lawyer. Why should I consider a BS in engineering rather than pre-law?
- 25) I would like to be a pharmacist. Why should I consider a BS in engineering rather than pre-pharmacy?
- 26) I would like to go to business school to get an MBA. Why should I consider a BS in engineering rather than a BA in business? **What is the purpose of programs such as the ASU 4 + 1 program?**

#### **GROUP IV: FINANCING MY BS IN ENGINEERING**

- 27) What expenses will I have? tuition, fees, room, board, books, and other living expenses? <http://students.asu.edu/costs>
- 28) Where will I live? What options are available to me? Who can help me with housing questions? (How does this change if I am married? Have a child?)
- 29) What financial aid exists if I pursue engineering? Who can I contact?
- 30) Does there exist more financial support if I pursue engineering vis-à-vis other disciplines?
- 31) What scholarship opportunities exist if I pursue engineering?
- 32) Are there specific engineering scholarships that I can apply for? How and when do I apply? **Tell me about the following scholarships: SMART, Goldwater, etc.**
- 33) What is ASU's METS-STEP scholarship? <http://mets.engineering.asu.edu/>
- 34) Are there other good ways to help me finance my education? Is it true that I can get paid to work on research projects **(during fall, spring, and summers)?**

#### **GROUP V: WHY PURSUE A BS IN ENGINEERING AT ASU**

- 35) How do I pick a 4 year engineering school?

<http://grad-schools.usnews.rankingsandreviews.com/best-graduate-schools/top-engineering-schools>

36) Why should I consider ASU for engineering? disciplines? faculty? research/project/industry opportunities? resources? academic and professional development support programs?

[http://aar.faculty.asu.edu/AAR\\_WHY-ASU-ENGINEERING\\_10\\_5\\_11.pdf](http://aar.faculty.asu.edu/AAR_WHY-ASU-ENGINEERING_10_5_11.pdf)

<http://engineering.asu.edu/>

37) How is the ASU Ira Fulton School of Engineering Ranked?

38) How is the ASU Ira Fulton School of Engineering viewed by industry?

39) I am currently at a community college. When should I transfer to ASU? Is it true that I should save some liberal arts classes to take while at ASU (so that I do not have to load up on the “tougher technical classes”)?

40) Which of my classes will transfer to ASU? Does ASU have a transfer agreement with my school? Where do I find it? (NOTE: ASU is developing detailed transfer agreements and transfer maps with CCs across the state of Arizona.)

41) What resources at ASU should I be aware of? e.g. libraries, computer rooms, tutoring centers, career services, ASU’s/METS-STEP academic and professional development classes, etc.

42) What unique support programs does ASU offer that I might not be able to get elsewhere?

43) What is the METS-STEP program? <http://mets.engineering.asu.edu/>

44) What topics are covered within the METS-STEP’s academic and professional development classes? studying, note taking, strategic reading, outlining, and time management? comprehensive career planning? getting involved in projects? choosing a project topic? finding internships? importance of graduate school? writing a statement of purpose? writing a technical paper? writing a proposal?

45) Why should the vast industry surrounding ASU impact where I choose to go to school? Is it true that having industry close by can open up many “life-changing” industrial internship and project opportunities?

46) What exciting research efforts are being pursued at ASU? How do I learn about these efforts? How can I participate in them?

<http://asuresearch.asu.edu/home>

<http://www.biodesign.asu.edu/>

<http://sustainability.asu.edu/index.php>

<http://flexdisplay.asu.edu/>

<http://lsi.asu.edu/home>

<http://skysong.asu.edu/>

<http://uresearch.asu.edu/home>

<http://www.azte.com/>

<http://mtbi.asu.edu/>

47) I like where I live. I do not want to leave. **Can I take most of my classes via the internet? What about laboratory classes?** Why should I consider moving to the Phoenix metropolitan area?

48) How long will it take me to complete my BS in engineering? **What are the National Science Foundation's Science and Engineering Indicators?**

<http://www.nsf.gov/statistics/seind10/>

**These Science and Engineering Indicators are used for national planning purposes.**

49) What is an academic advisor? **How do I find my academic advisor? What type of questions do I ask her/him? Whom do I discuss non-course related questions with?**

50) What does the ASU Barrett Honors College at ASU offer?

<http://barrethonors.asu.edu/>

51) What is an undergraduate honors thesis? Why should I try to pursue one?

52) How does a thesis help me when I am applying for a job and/or graduate school? How can it help me figure out what I want to do in the future? How can it help me prepare for more advanced work in the future?

53) How do I pick an honors thesis topic? **Can my senior design project be related to my honors thesis?**

54) How do I pick an honors thesis advisor?

55) Will I get help in picking my classes each semester?

56) How many credits should I take each semester?

57) Will I be able to go to school and work?

58) Will I be able to “play” on weekends? Will I have a life?

59) Why are study groups useful?

60) Can I get help with studying? Time management?

61) What is the Guaranteed 4.0 Learning System (by Donna O. Johnson)?

<http://www.guaranteed4.com/aboutus.html>

**What are each of the following about:**

daily list making and prioritizing? use of outlines for lectures, reading and studying? “strategic or big picture” reading for getting “big picture” and main points versus details?

Is it true that all professionals must use the above tools in order to suitably pre-process information before dedicating lots of precious time to deeply understand details?

## GROUP VI: IMPORTANCE OF A MENTOR

- 62) How do I get my short-term and long-term questions answered? e.g. questions related to classes, career, job, graduate school, personal life, family, financial planning, etc.
- 63) Who can help me negotiate the many hurdles that I will need to negotiate throughout my career? **What is a career fair? Job fair?**
- 64) What is a mentor?
- 65) How do I find a mentor?

<http://aar.faculty.asu.edu/lapdp.html>

[http://aar.faculty.asu.edu/AAR\\_Finding\\_a\\_Mentor.pdf](http://aar.faculty.asu.edu/AAR_Finding_a_Mentor.pdf)

<http://gradschool.about.com/od/admissionsadvice/a/choosementor.htm>

<http://www.rackham.umich.edu/downloads/publications/Fmentoring.pdf>

[http://www.une.edu.au/od/files/mentoring\\_made\\_easy.pdf](http://www.une.edu.au/od/files/mentoring_made_easy.pdf)

- 66) Why do I need several mentors?
- 67) What should I do during summers? take classes to reduce my course load during subsequent semesters? find any job? work on a paid research project? pursue a paid engineering internship? **(NOTE: Projects/internships can significantly help you determine what you are truly passionate about.)**

## GROUP VII: THE IMPORTANCE OF RESEARCH: FIGURING OUT WHAT I WANT TO DO

- 68) What is research? Why should I consider it? Is research mainly for PhDs?
- 69) How will getting involved in research help me figure out what it is that I am truly passionate about and what I really want to pursue in the future? **(NOTE: It is**

**VERY important that you do your VERY best to try to identify something that you are interested in that offers long-term opportunities?)**

70) How do I pick a research topic?

71) What are critical areas of research that are receiving national and international attention?

[http://images.businessweek.com/ss/09/10/1014\\_obamas\\_25\\_ways\\_to\\_rebuild\\_america/1.htm](http://images.businessweek.com/ss/09/10/1014_obamas_25_ways_to_rebuild_america/1.htm)

72) Why is research important if I want to do applied stuff in the future?

73) How do I get involved in research?

<http://aar.faculty.asu.edu/lapdp.html>

<http://aar.faculty.asu.edu/lapdp.html>

74) How does one learn to break down a complex problem into a set of simpler manageable problems? **classes? projects/internships? senior design projects? theses? research?**

75) What is an REU (Research Experience for Undergraduates)?

76) While at ASU, how can I get involved in exciting research projects?

77) What is the Fulton Undergraduate Research Initiative (FURI)?

<http://engineering.asu.edu/furi/program>

[http://aar.faculty.asu.edu/AAR\\_SAMPLE-FURI-PROPOSAL-TIMELINE-PERSONAL-STATEMENT-10\\_14\\_11.pdf](http://aar.faculty.asu.edu/AAR_SAMPLE-FURI-PROPOSAL-TIMELINE-PERSONAL-STATEMENT-10_14_11.pdf)

78) What is the Western Alliance to Expand Student Opportunities (WAESO)?

79) If I am a student at ASU, is it true that I can still apply for REUs across the country?

80) Is it true that there are many paid REUs at ASU and at schools across the country?

81) **How do I convince people, companies, organizations, venture capitalists to invest in/support my ideas?** What is a research proposal? How do I write a research proposal?

[http://aar.faculty.asu.edu/AAR\\_RESEARCH-PROPOSAL-GUIDELINES-10\\_14\\_11.pdf](http://aar.faculty.asu.edu/AAR_RESEARCH-PROPOSAL-GUIDELINES-10_14_11.pdf)

[http://aar.faculty.asu.edu/AAR\\_Getting\\_Involved\\_In\\_Research.pdf](http://aar.faculty.asu.edu/AAR_Getting_Involved_In_Research.pdf)



## **GROUP VIII: IMPORTANT SKILLS**

- 82) What are useful problem solving skills?
- 83) What computer skills should I learn? What is C++?  
<http://en.wikipedia.org/wiki/C%2B%2B>
- 84) What is MATLAB? <http://www.mathworks.com/products/matlab/>
- 85) What is Computer Aided Design (CAD)?
- 86) What is virtual prototyping?
- 87) How are computers being used to design systems/products before an actual physical prototype is built? Why is mathematical modeling important? Why is its importance increasing?
- 88) How do engineers (and other professionals) exchange ideas? e.g. papers, reports, presentations, conferences, teleconferences, proposals, etc.
- 89) Why do I need to learn to write?
- 90) What is publishing all about? Is it true that all professionals should concern themselves with this to some extent?
- 91) What is a technical paper? How does it differ from a report? Why do I need to learn to write a technical paper? How do I write a technical paper?  
[http://aar.faculty.asu.edu/AAR\\_Writing\\_a\\_Technical\\_Paper.pdf](http://aar.faculty.asu.edu/AAR_Writing_a_Technical_Paper.pdf)
- 92) Why is it important for me to develop public speaking skills?
- 93) How do I develop a good presentation?

### **Outline**

**Overview: Motivation and Problem**

**Status of Field**

**Contributions of Work**

**Approach to Problem**

**Main Results**

**Comparisons to Other Approaches**

**Summary and Conclusions**

**Directions for Future Research**

- 94) Why do I need to learn to work in teams?
- 95) Why should I prepare a comprehensive career plan? Who may want to see it? How do I prepare a career plan? How often should it be revised?

<http://aar.faculty.asu.edu/lapdp.html>

[http://aar.faculty.asu.edu/AAR\\_COMPREHENSIVE-CAREER-PLAN-10\\_17\\_11.pdf](http://aar.faculty.asu.edu/AAR_COMPREHENSIVE-CAREER-PLAN-10_17_11.pdf)

96) What is a resume? How long should it be? 1-2 pages What do I put in a resume?

e.g. **Goals and Objectives**  
**Education**  
**Relevant Classes**  
**Special Skills**  
**Special Projects**  
**Work Experience**  
**Community Service**  
**Honors and Awards**  
**Publications**  
**Patents**  
**Presentations**  
**Professional Organizations**  
**Other Interests**  
**References**

**Who will want to see my resume? employers? project supervisors? professors? investors? scholarship/fellowship committees? university admissions? How often should it be revised?**

**What is the difference between a resume and a curriculum vitae?**  
<http://jobsearch.about.com/cs/curriculumvitae/f/cvresume.htm>

97) What is a cover letter? How long should it be? What do I put in a cover letter?

**From**

**To**

**Purpose of Letter: Interested in a Specific Job or Area**

**Summarize why you should be considered**

**Refer to resume**

**Who will want to see my cover letter?**

## **GROUP IX: LEADERSHIP, SERVICE, AND PROFESSIONAL NETWORKING**

- 98) **Why are leadership skills important?** How does one develop leadership skills?
- 99) Why is community service important?
- 100) Are there student organizations that I can join to help me develop leadership skills and pursue community service?
- 101) Why should I mentor others? **How can it help me professionally?**
  
- 102) Why should I try to get involved in tutoring?
- 103) How will tutoring help me deeply understand coursework? Communicate with others? How can it help me when I am applying for jobs, graduate school, scholarships, or fellowships?
  
- 104) What professional organizations should I join? What do they offer?

[http://en.wikipedia.org/wiki/Category:Engineering\\_societies](http://en.wikipedia.org/wiki/Category:Engineering_societies)

<http://www.ieee.org/index.html>

[http://en.wikipedia.org/wiki/Institute\\_of\\_Electrical\\_and\\_Electronics\\_Engineers](http://en.wikipedia.org/wiki/Institute_of_Electrical_and_Electronics_Engineers)

<http://www.aiaa.org/>

[http://en.wikipedia.org/wiki/American\\_Institute\\_of\\_Aeronautics\\_and\\_Astronautics](http://en.wikipedia.org/wiki/American_Institute_of_Aeronautics_and_Astronautics)

[http://en.wikipedia.org/wiki/Institute\\_of\\_Biological\\_Engineering](http://en.wikipedia.org/wiki/Institute_of_Biological_Engineering)

[http://en.wikipedia.org/wiki/American\\_Institute\\_of\\_Chemical\\_Engineers](http://en.wikipedia.org/wiki/American_Institute_of_Chemical_Engineers)

[http://en.wikipedia.org/wiki/Institution\\_of\\_Chemical\\_Engineers](http://en.wikipedia.org/wiki/Institution_of_Chemical_Engineers)

[http://en.wikipedia.org/wiki/Institute\\_of\\_Industrial\\_Engineers](http://en.wikipedia.org/wiki/Institute_of_Industrial_Engineers)

<http://en.wikipedia.org/wiki/ASME>

[http://en.wikipedia.org/wiki/Institute\\_of\\_Materials,\\_Minerals\\_and\\_Mining](http://en.wikipedia.org/wiki/Institute_of_Materials,_Minerals_and_Mining)

<http://www.asce.org/>

<http://www.computer.org/portal/web/guest/home>

[http://en.wikipedia.org/wiki/Society\\_of\\_Manufacturing\\_Engineers](http://en.wikipedia.org/wiki/Society_of_Manufacturing_Engineers)

[http://en.wikipedia.org/wiki/Society\\_of\\_Petroleum\\_Engineers](http://en.wikipedia.org/wiki/Society_of_Petroleum_Engineers)

<http://www.asee.org/>

<http://societyofwomenengineers.swe.org/>

[http://en.wikipedia.org/wiki/Society\\_of\\_Women\\_Engineers](http://en.wikipedia.org/wiki/Society_of_Women_Engineers)

<http://www.nsbe.org/>

[http://en.wikipedia.org/wiki/National\\_Society\\_of\\_Black\\_Engineers](http://en.wikipedia.org/wiki/National_Society_of_Black_Engineers)

<http://oneshpe.shpe.org/wps/portal/national>

[http://en.wikipedia.org/wiki/Society\\_of\\_Hispanic\\_Professional\\_Engineers](http://en.wikipedia.org/wiki/Society_of_Hispanic_Professional_Engineers)

<http://www.maes-natl.org/>

<http://www.nspe.org/index.html>

[http://en.wikipedia.org/wiki/Tau\\_Beta\\_Pi](http://en.wikipedia.org/wiki/Tau_Beta_Pi)

- 105) What is a professional conference? Why should I attend professional conferences? How can they help me pick a research topic/project? How can they help me meet potential employers? potential partners/investors?

How can I present my work at a professional conference? How do I submit a paper to a conference? Why are these important for career advancement?

#### **GROUP X: IMPORTANCE OF GRADUATE SCHOOL**

- 106) Why is graduate school important? What exciting doors will it open for me?  
107) Why should I consider getting an MS degree in engineering? What will it offer me over a BS in engineering? Advancement Opportunities? Flexibility? Responsibilities? Salary?  
108) How do I apply to graduate school? Is there assistance for application fees?  
109) What is a statement of purpose? Who may want to see my statement of purpose?

[http://aar.faculty.asu.edu/AAR\\_WRITING-A-STATEMENT-OF-PURPOSE-10\\_14\\_11.pdf](http://aar.faculty.asu.edu/AAR_WRITING-A-STATEMENT-OF-PURPOSE-10_14_11.pdf)

- 110) What are the GREs? MCATs? LSATs? GMAT? PCAT? Are these exams difficult? How do I prepare?

[http://en.wikipedia.org/wiki/Graduate\\_Record\\_Examinations](http://en.wikipedia.org/wiki/Graduate_Record_Examinations)

#### **GROUP XI: FINANCING MY MS/PhD IN ENGINEERING**

- 111) How do I pay for graduate school?  
112) Is it true that there is more funding for those interested in pursuing an engineering MS degree? What is a research assistantship (RA)? What is a teaching assistantship (TA)? How can I prepare myself so that I can get one of these?  
113) What is a fellowship? Is it true that they typically pay monthly living stipends as well as tuition?  
114) What is an NSF Graduate fellowship? <http://www.nsfgrfp.org/>

## **GROUP XII: THE MS THESIS**

- 115) What is a masters thesis?
- 116) How do I pick an MS thesis topic? How can the topic help me prepare for more advanced work or help me figure out what I would like to do in the future?
- 117) Should I pursue a masters thesis or take the comprehensive exam route? What are the pros and cons of each?
- 118) What is an MS thesis committee?
- 119) Who should be on my MS committee? **How are the members of the committee selected?**
- 120) What is an MS defense?

## **GROUP XIII: GETTING A PhD**

- 121) Why should I consider getting a PhD degree in engineering? What will it offer me over an MS in engineering? Advancement Opportunities? Flexibility? Responsibilities? Salary?
- 122) What is a PhD qualifying exam?
- 123) What is a doctoral dissertation (PhD thesis)?
- 124) How do I pick a PhD thesis topic? How can the topic help me prepare for more advanced work or help me figure out what I would like to do in the future?
- 125) What is a comprehensive exam?
- 126) What is a PhD thesis committee?
- 127) Who should be on my PhD committee? **How are the members of the committee selected?**
- 128) What is a PhD defense?

## **GROUP XIV: STARTING A COMPANY**

- 129) How do I start a company?
- 130) What is venture capital? **What is a proposal?**

- 131) How do I get venture capital support for my ideas?
- 132) What is intellectual property? How do I protect it?
- 133) What are patents? trademarks?
- 134) What is consulting? How can I do it?

#### **GROUP XV: CHOOSING A JOB AND JOB ADVANCEMENT**

- 135) How do I choose a job?
- 136) How should I weigh each of the following:

engineering/technical responsibilities? flexibility? choosing what you work on? flexible work hours? working from home? day care? work conditions? work group dynamics? opportunities for advancement? location? traveling? benefits? retirement plans? bonuses? salary?

- 137) What are reasons for wanting to advance in a job? work/time flexibility? work environment? learning opportunities? workload? support? resources? colleagues? travel? salary? other benefits?
- 138) How do I advance in a job? patents? publishing? presenting? teamwork? leading/managing? advanced education? conferences? establish/build partnerships?
- 139) When should I consider switching jobs? companies? How do I prepare for this? How often should expect to switch jobs?

## FALL 2011 NSF S-STEM CLASS RANKINGS

1  
Anngela\_Adams = [ 31 32 34 33 70 73 71 10 8 13 100 111 22 23 24 55 65 69 135 136];

2  
Javier\_Baez = [ 10 62 63 64 65 67 68 70 80 86 90 94 101 108 120 121 122 129 135 136];

3  
Billy\_Bui = [ 10 11 14 19 20 38 51 52 53 54 64 68 106 107 108 110 111 112 113 121];

4  
Nicholas\_Charles\_Clermont = [ 0];

5  
Enrique\_Collazo = [ 31 10 111 129 131 38 32 34 70 11 51 88 65 66 76 117 132 135 133 134];

6  
Floyd\_Christopher = [ 0];

7  
Alex\_Gale = [ 73 70 111 114 121 124 17 23 34 33 32 29 53 51 54 58 56 67 91 7];

8  
Zachary\_Gordon = [ 90 94 68 70 73 22 34 120 124 125 76 87 107 81 83 111 8 10 114 117];

9  
Alexa\_Gripp = [ 6 15 10 11 21 67 31 23 51 68 19 36 34 52 47 38 53 42 54 8];

10  
Rosa\_Holguin = [ 0];

11  
Pimwadee\_Limsirichai = [ 8 13 22 29 32 33 53 75 78 81 83 93 97 107 108 110 112 113 114 117];

12  
Min\_Lin = [ 3 4 5 9 10 11 12 35 41 42 46 51 52 59 62 68 70 73 90 106];

13  
Adrian\_Maranon = [ 121 106 112 73 58 65 27 34 6 21 32 62 68 135 136 115 108 104 98 101];

14  
Jordan\_Nguyen = [ 32 50 54 66 81 105 108 109 111 113 117 118 120 121 123 129 130 131 134 136];

15  
ShihLing\_Phuong = [ 10 35 46 51 53 70 11 67 29 36 63 66 65 54 38 22 37 41 48 47];

16  
Adam\_Polak = [ 129 107 121 112 69 29 117 132 131 130 136 108 113 106 100 81 91 90 101 125];

17  
Ellen\_Qin = [ 71 121 54 93 80 46 106 9 83 98 67 26 42 31 38 25 45 15 90 7 ];

18  
Devinne\_Ramirez = [ 121 111 51 52 29 78 104 106 107 110 112 114 122 136 10 18 20 21 47 48 ];

19  
Lauren\_Rigg = [ 7 10 12 21 31 32 33 38 75 113 115 117 129 130 132 133 134 0 0 0 ];

20  
Jacqueline\_Sanchez = [ 7 8 9 38 53 54 72 75 83 112 115 116 117 118 119 120 124 130 131 135 ];

21  
Riha\_Sha = [ 1 7 12 18 33 43 46 62 75 77 85 97 101 110 112 115 121 122 132 135 ];

22  
Nicholas\_Szwed = [ 15 16 21 32 22 23 24 26 43 107 121 129 136 9 10 14 19 31 33 34 ];

23  
Barbara\_Urena = [ 121 122 120 131 136 134 129 11 20 86 85 70 87 90 93 103 107 108 115 12 ];

24  
Johnathan\_Vo = [ 46 65 70 73 76 8 74 82 67 10 17 31 32 42 33 11 19 30 56 55 ];

25  
Jesse\_White = [ 72 67 97 55 82 58 60 73 79 78 99 103 104 105 111 106 112 136 135 69 ];

26  
Joseph\_Donald\_Robert\_Williams = [ 51 52 83 118 119 129 43 74 41 120 75 70 65 86 42 37 87 93 78 66 ];

27  
Mikias\_Eskender\_Wodeneh = [ 5 7 8 9 10 11 12 13 2 8 22 23 24 25 29 30 31 32 33 39 41 ];

28  
Quannah\_Yazzie = [ 5 15 13 26 49 50 38 22 10 65 83 92 98 103 134 71 79 93 58 43 ];

29  
Alejandra\_Zazueta = [ 3 11 31 51 53 54 17 63 42 10 65 97 104 33 109 112 118 120 126 128 ];



## **Cursory Analysis of Data Yields the Following**

### **RANK = 1**

3-5

6-8

10

31-32

71-73

121

### **RANK = 2**

10

11

15-16

### **RANK = 3**

10-14

12

54

111-112

120-121

### **RANK = 4**

18-21

51-52

70-73

### **RANK = 5**

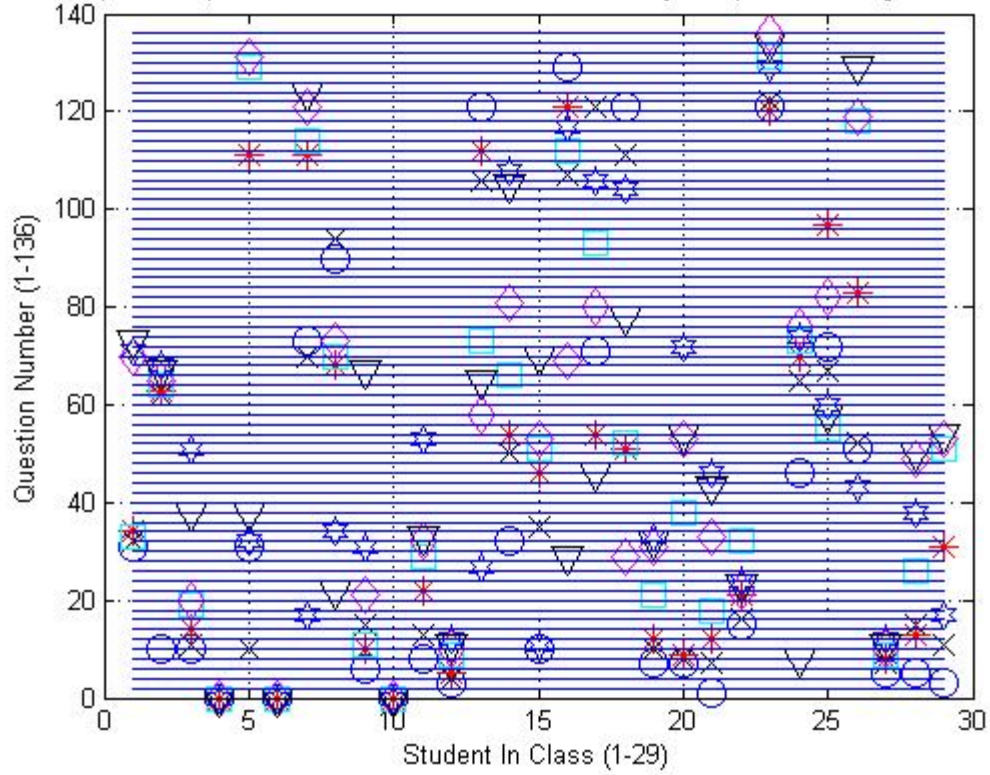
20-22

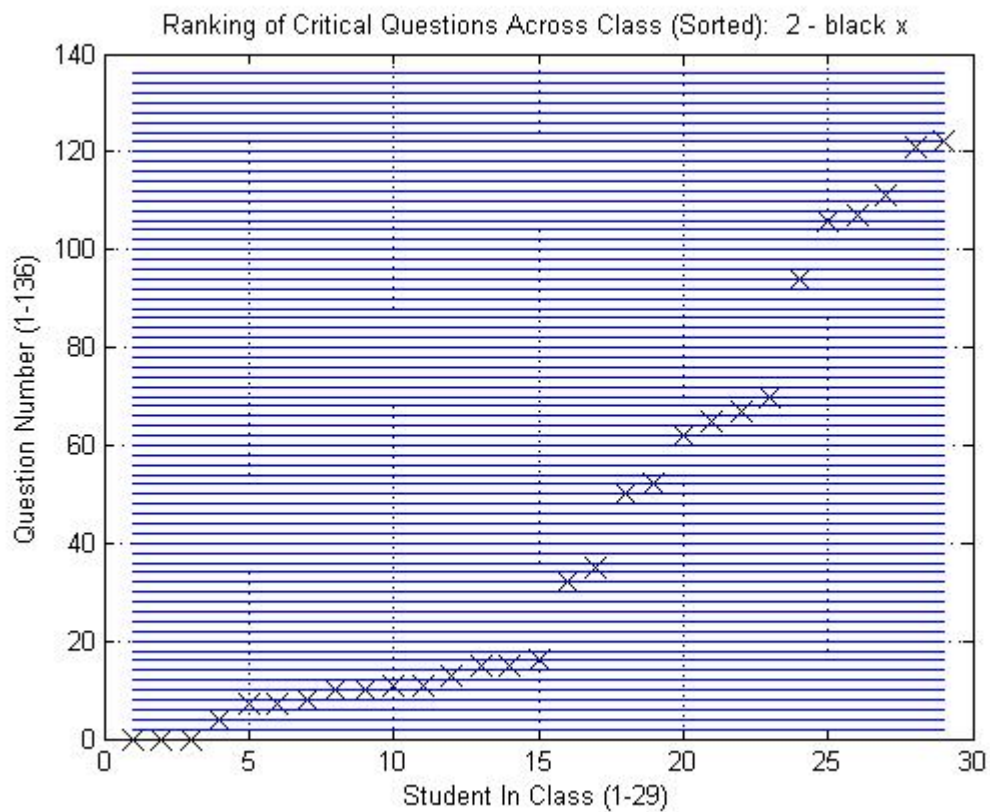
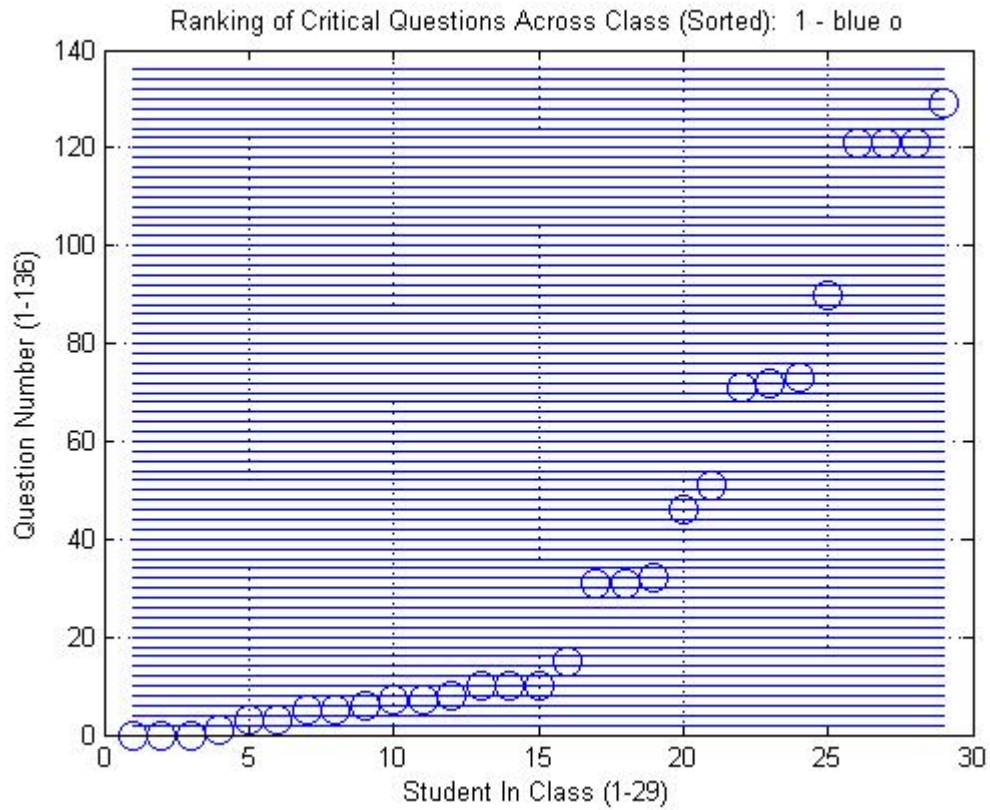
31-33

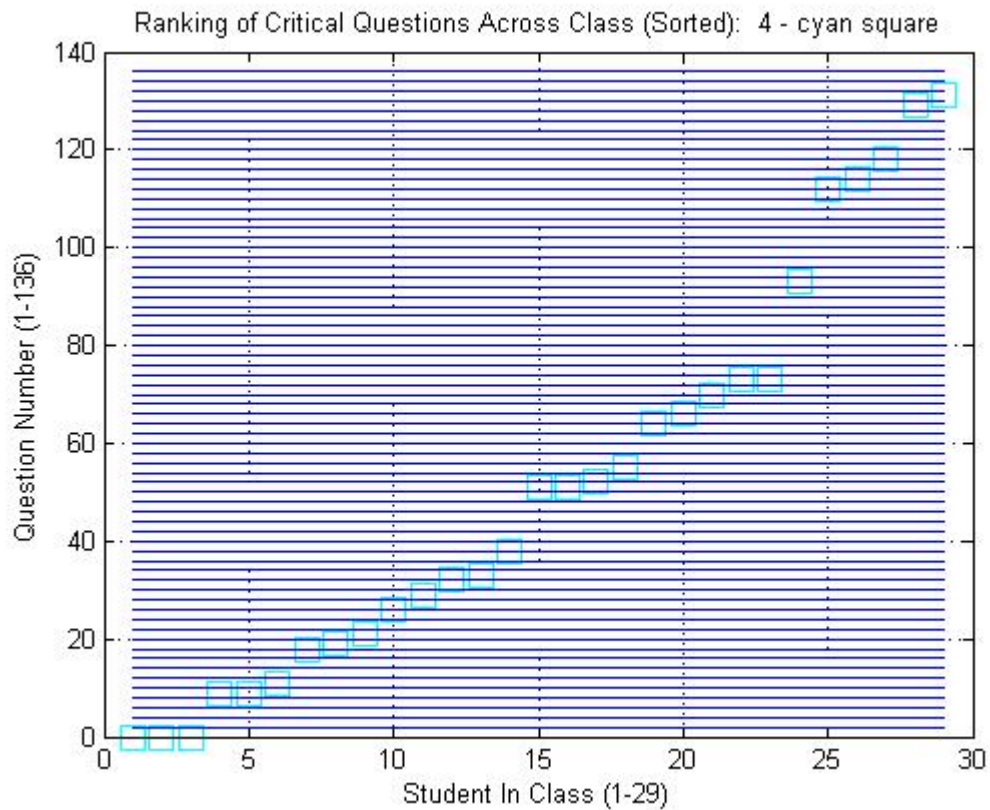
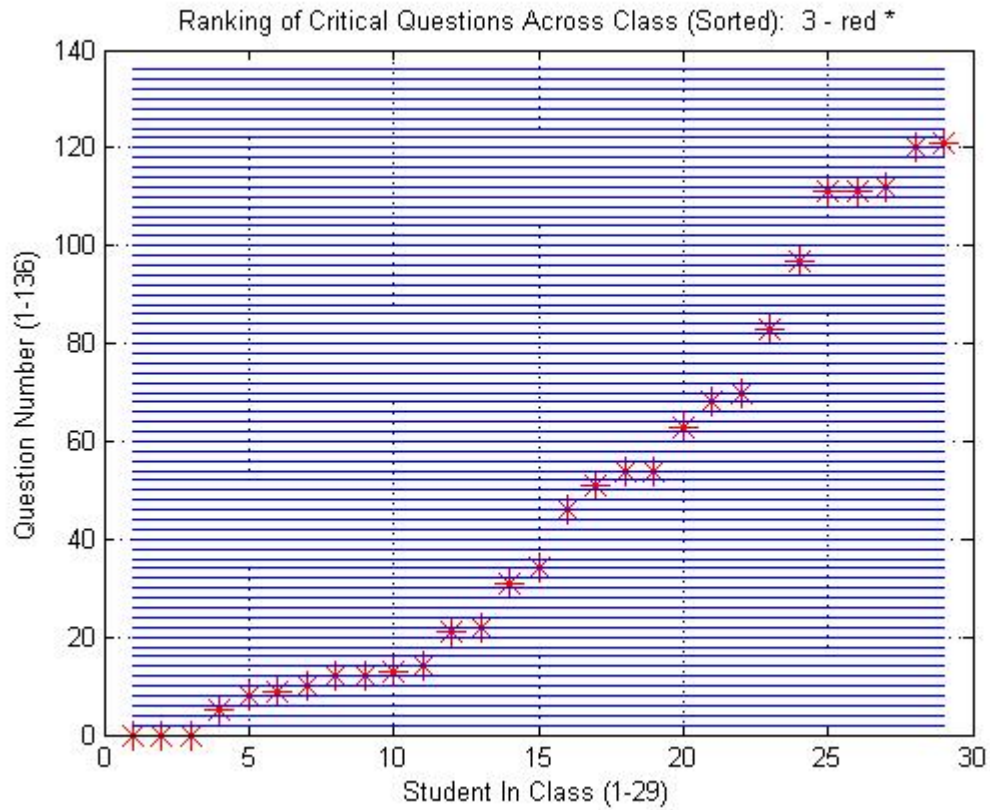
80-82

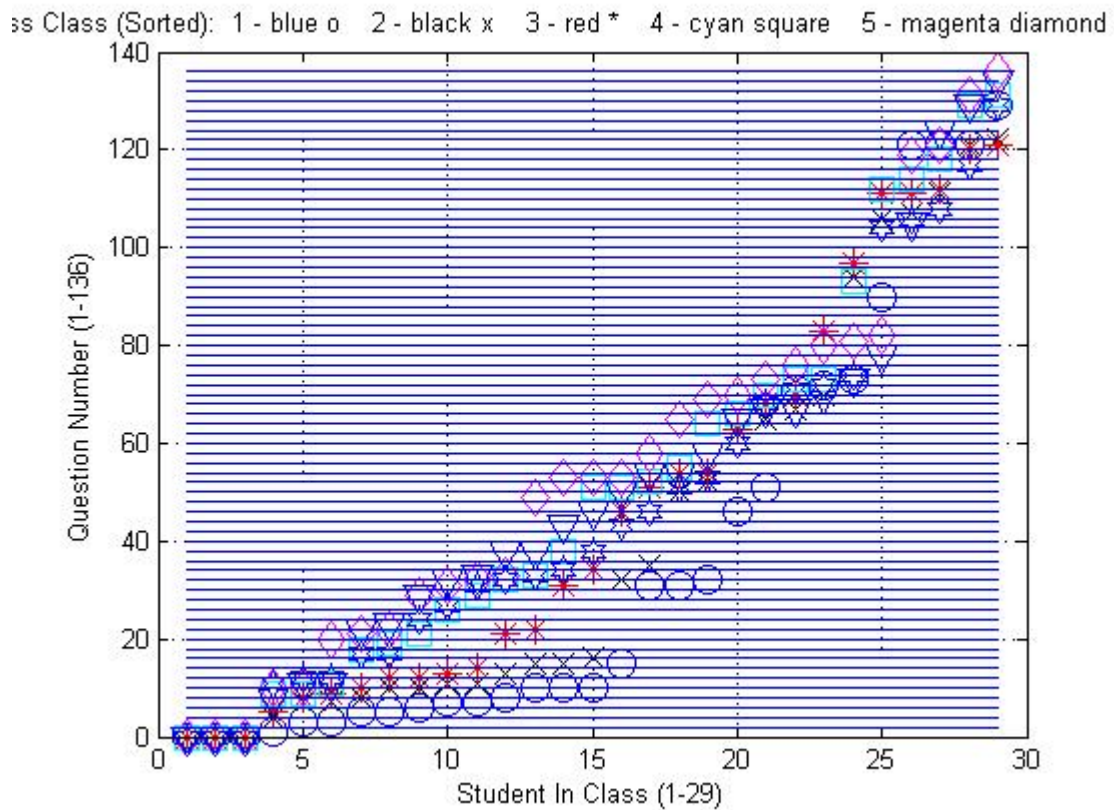
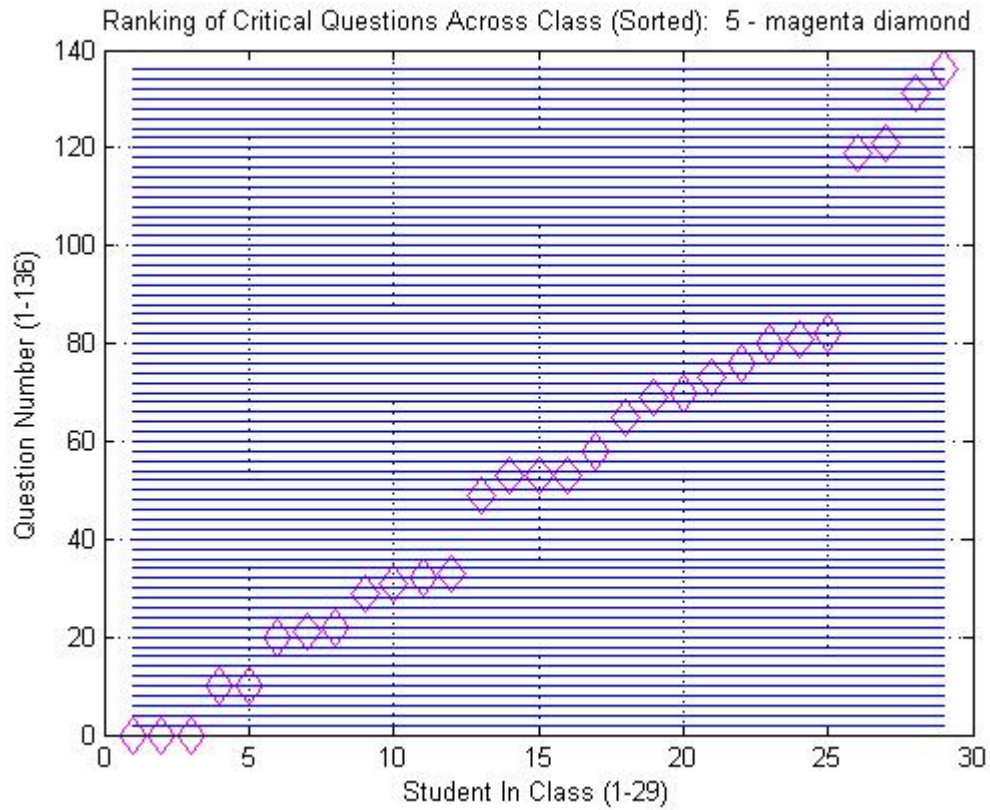
# ALL DATA – UNSORTED

Cross Class (Unsorted): 1-blue o 2-black x 3-red \* 4-cyan square 5-magenta diamond









**num1\_sort**

0 0 0 1 3 3 5 5 6 7 7 8 10 10 10 15 31 31 32 46 51 71  
72 73 90 121 121 121 129

**num2\_sort**

0 0 0 4 7 7 8 10 10 11 11 13 15 15 16 32 35 50 52 62 65  
67 70 94 106 107 111 121 122

**num3\_sort**

0 0 0 5 8 9 10 12 12 13 14 21 22 31 34 46 51 54 54 63 68  
70 83 97 111 111 112 120 121

**num4\_sort**

0 0 0 9 9 11 18 19 21 26 29 32 33 38 51 51 52 55 64 66 70  
73 73 93 112 114 118 129 131

**num5\_sort**

0 0 0 10 10 20 21 22 29 31 32 33 49 53 53 53 58 65 69 70 73  
76 80 81 82 119 121 131 136

**num6\_sort**

0 0 0 8 11 11 22 23 29 32 33 38 38 43 46 50 54 54 58 65 67  
67 70 73 78 105 124 129 134

**num7\_sort**

0 0 0 11 12 12 17 17 24 27 31 32 33 34 38 43 46 51 53 60 68  
71 72 74 104 106 108 117 129