

Preparing College Applications Jisan Research Institute

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Introduction

Preparing college applications is one of the most demanding single tasks most high school students will undertake. This task requires one to prepare information which will result in the creation of the perception that one can successfully attend a given university, and is more fit to attend the university in question than most competitors. In the next few pages, we will give you, the student, a few pointers which will help you to prepare your college portfolio in a more rigorous fashion, putting you in a stronger competitive position when approaching a college or university.

As this text is intended for JRI students and graduates, we will assume that all people reading this are engaged in some form of high level research, and are competent and capable of discussing this work in great detail. This will make a rather large component of your college application.

As you will see, the correct preparation of a college application requires a great deal of work. Remember that the choice of a college has as much to do with the personality of the school as with its academic prowess. Your decisions will shape your next four years and the rest of your life. Correctly leveraging your personality traits that match those of a given school can be both beneficial in terms of getting into a school and in terms of choosing a good school for you.

Outline of a College Application

There are several components to a good college application. We list these here, and defer their explanation to later pages. The reader may wish to use this page as a checklist when completing their applications.

Application–Specific

1. Personal data (name, SSN, address, etc.)
2. Short answers and essays.
3. Any requested financial information.

General

1. Transcript
2. SAT I / SAT II scores

Supplementary

1. College Resume
2. Statement of Purpose (school–specific)
3. Discussion of Research
4. Independent Evaluation of Research (if possible).

Formal Application Preparation

In a college application, a student has two main goals. The first is to demonstrate that he/she has the capacity to carry out the work required at a given university correctly. This requires a student to have performed above a certain minimum level in classwork and on standardized tests. In making this determination, many elements are important. Classwork grades are extremely important. Typically, students at top schools will have a grade point average of 3.8 (unweighted) or better, though there are exceptional cases in which lower grade point averages are not sufficiently penalized as to exclude the student. SAT scores, both on part I and part II are important as well. Top universities currently require scores in the neighborhood of 1500–1550 on Part I, while 750 or above are generally required for the math and science portions of Part II. Scoring above 700 on the Verbal SAT II is typical and recommended. All JRI students are expected (by JRI) to obtain an 800 on the math portion and at least a 700 on the verbal portion. A student meeting all of these requirements, and having been enrolled in a college preparatory program in high school, will typically have demonstrated the basic ability to successfully study at any university.

The second part of the application is generally the part of the application in which a student actively *competes* with all other students. In this portion of the application, a student must illustrate why he or she is sufficiently different from other students to warrant admission in the place of other qualified candidates. A number of things may make a student stand out above and beyond their competition. These can range from expertise on a particular instrument, prowess in a given type of writing, mastery of a field of scientific or mathematical research, superior ability in debate competitions at the national level, exceptional athletic ability, or the like. All of these things make the student valuable to the school, and demonstrate a capability that may be fostered at the school for the benefit not only of the student, but also of the institution. Sports stars can bring glory to their school by successful competition, while exceptional scientific ability may bring glory to the school sometime down the pike when the student achieves his or her perceived potential.

The third part of the application, the recommendations, are meant to communicate to the school why you are an important candidate, and what you can bring with you to the school. They must have something to say about you, the student, which is somehow indicative of what you've meant to them, and why they think this indicates that you should be a student at the school. They must indicate what you can bring with you to the school that will add to the school's community, as well as why they think you can succeed at the school. The choice of people to give you recommendations can have a very strong impact on the strength of your application.

Finally, your interviews represent another opportunity to obtain a recommendation from someone whose opinion the university has already accepted in some way. Your interviews will help you to further improve your competitive edge, though it will require some measure of intentional guidance.

College Resume

A college resume is a one- to two-page summary of the important points in a student's academic and professional life. This will concisely state the highlights of a student's life up to the present moment. A college resume consists of six sections: personal data, personal statement, education, extracurricular activities and work experience, additional skills, and awards. Typically, the college resume will be built on a 9 point font, allowing ample room for everything.

The first section is centered at the top of the resume. This section consists of a the student's name, address, and contact information. Many students have web pages, email, etc. This is the appropriate place to put it. However, most schools will not visit the students' web sites, and so the website is not necessarily useful. Email is sometimes a convenient way of an admissions staff requesting more information, if some information hasn't arrived.

The second section is justified, and titled "Purpose". This section consists of a one or two sentence statement indicating the student's intended long term goals. A student should indicate here what he or she intends to major in, and whether or not he or she is planning to continue on in graduate school.

The third section entitled "Education" should list the student's last two schools in inverse order – most recent first. The years attended should appear on the left, with the school name on the right. Above the schools, the student's current unweighted (and make sure you make it clear that it's unweighted!) GPA should appear. No listing of the courses you took are necessary. These are given in the transcript.

The next section entitled "Extracurricular Activities and Work Experience" is a key element. This is the most important part of your application. In this section, all of your high school extracurricular activities and all of the jobs you have held during high school will be listed. On the left of each topic the years during which the activity was undertaken should be listed. On the right should be the **boldfaced** topic title under which is a one to two sentence description of your part in the activity. Examples appear on the sample resume later in this packet. Make sure that all topics are in inverse chronological order, and that each one explains what you specifically did. If you were leading scorer on your high school soccer team, mention it. This is where you have the ability and right to brag.

The next section should list any special skills you have. These will include any computer programming languages known, platforms you can work on, uncommon office skills, sport skills, etc. This will help to identify those skills which make you a valuable asset to different research groups, etc. Yes, some scientists will be sitting on your admissions committee, so this is an important element.

Finally, the next section entitled "Awards and Honors" should list all awards or honors you've received during high school. Again, this is a bragging opportunity, so take advantage of it and let everybody know just how good you are. Do not put down awards earned before high school. Nobody cares about those awards.

Finally, make sure that your college resume is two pages ***at most***. If it is possible to fit everything in one page, this is definitely better. Printing the resume on both sides of one paper is helpful, as it seems to be one page, though it is two.

Make sure that you do not put down activities that say nothing about you. Too many activities demonstrates that you are too spread out, a practice that will lead to disaster in college. Also, make sure that your resume is a coherent statement about the state of your preparation for college. No important details that cannot be obtained from your transcript should be missing.

SAMPLE COLLEGE RESUME

Sanza Kazadi
1107 Augustana Ct.
Naperville, IL 60565
(708) 416-0525

Purpose

My intention is to study physics in college, with a specialization in gravitation. I intend to continue my studies of gravitation in graduate school after completion of an undergraduate degree.

Education

1987-1990 Illinois Mathematics and Science Academy GPA:3.87
1986-1987 Bolingbrook High School
1983-1986 Jane Adams Middle School

Extracurricular Activities and Work Experience

1989-1990 **Illinois Mathematics and Science Academy**
Organized and coached the Superquest team at the Illinois Mathematics and Science Academy

1987-1990 **Fermilab National Accelerator**
Conducted research in high energy physics with Dr. Drasko Jovanovich and Dr. Joel Butler

1989 **Superquest National Supercomputing Contest**
Conducted research stemming from the unification of special and general relativity. Attended summer camp during which computational models of this unification were ported to a supercomputer.

1989 **NAACP National Science Competition**
Conducted research during which a theory of fluid dynamics was generated. This theory correctly described the boundary layer, an as of yet unsolved problem.

1989 **IMSA Soccer**
Junior Varsity soccer team member, leading striker.

1988 **Illinois Mathematics and Science Academy**
Generated a database data management system for the computer center.

1988 **Joliet Junior College**
Generated a database data management system for the central administrative office.

1988 **Chicago Metropolitan History Fair**
Participated in the CMHF, producing a video reenacting an inquiry into the tragedy. Project was disqualified for exceeding the expected quality of a high school student. Shown on cable television subsequently.

Special Skills:

Computer Literate (DOS, Windows, MAC OS, Fortran, Pascal, dBase)

Awards and Honors:

1989 National Merit Recipient
1989 National Achievement Honored Student
1988 Winner, Superquest National Supercomputing Contest
1986 First Place, State Science Fair

Statement of Purpose

A statement of purpose is a $\frac{3}{4}$ -page to one-page long statement about what it is you intend to do in college. This should include both your goals in terms of the coursework you intend to undertake as well as the research or extracurricular work you intend to do. This consists of a number of key points.

The first point you must make is what it is you intend to do in your coursework. You must be direct and specific. Your major should be specific, as well as your specialty. It is not sufficient to simply state what your major will be. For instance, there are many people working in electrical engineering. It is important to state that you wish to work on visual recognition systems, if that's your interest. If you do not know what to state here, simply make sure that you stick with your research topics.

The second point to make is that you wish to work with someone in a particular field. This field should be the natural extension of your research. You should make it clear why this is a natural move for you, and what you bring with you in terms of your expertise and training. It is preferable to choose a specific person at the university to work with. This will serve two purposes. First, if the person can be persuaded to review your application, including your previous work, this can be most beneficial. Second, it demonstrates that you understand your topic enough to find an appropriate home on campus, and illustrates your ability to contribute to the university's research efforts.

SAMPLE STATEMENT OF PURPOSE
(TO CALTECH)

Statement of Purpose

Over the past few years, I have had an opportunity to learn a great deal. I have been exposed to a number of exciting topics, including electronics, physics, chemistry, mathematics, and biology. Each of these topics is an interesting one, and I have had a great deal of fun learning them. I intend to learn more in each of these topics. However, after having tried each one, I am certain that my interest lies in physics. It is this field which I intend to major in.

I intend also to specialize in gravitation. This requires a great deal of mathematics in order to be done correctly. As such, I intend to major also in mathematics. I expect these majors to be complementary, so that it will be both feasible and helpful to do both.

I intend to continue my research on the fusion of special and general relativity. This is an interesting extension of the standard special relativistic paradigms, and can yield detailed maps of the acceleration patterns of spacetime around massive bodies. It may even be able to help predict the curvature of spacetime, a possibility I wish to explore.

Personal Statement

The personal statement is the opportunity you have to demonstrate not what you are capable of doing, but rather who you are. In the personal statement, you write something near and dear to your heart. This statement can be any format, and on any topic.

One interesting format that can be used is a short story in which the protagonist is in a situation you wish to comment on. It is permitted to pause the story at some point in order to make some statement about the situation. This allows one to make the point they are making without making the delivery boring. Often times it is easier to show a point rather than telling it. If you are a good writer, this may be a good way to go.

On the other hand, you may have some personal experience which you wish to relay and then talk about. Make sure that you tell the experience as correctly as possible, but take time out to give your insights, experiences, and reactions to it.

Another way is to simply discuss, as in a debate, a topic of interest and import. This is the most direct way in which to give a personal statement. In this method you will need to make and support your points directly. Make sure all of your statements make sense. Offer no contradictory statements, as these will strongly detract from the strength of your statements.

Finishing Up

By now, you should have all parts of your application done, including the extra parts introduced here. Before sending them, be sure to have someone you know go over them and make sure that what you've said in your essays, statements, resume, etc. make sense and are not contradictory. Check the spelling and word choice for your essays and statements. Make sure all the reports, transcripts, etc. are in the application.

If you've done your job right, you should have a very good chance to join the college of choice. Now that you have done your job right, relax and forget about the applications. You will get into one of your schools, and you will have a good shot at your first choice. Confidence in that fact will help to pass the time between now and the answers, hopefully with very little worry!

Sample College Application

This section will contain different parts of a college application and point out how these things should be altered in order to have an application that is as strong as it can be. As we have seen, the first part of the application is the resume.

Joe Student
1234 Jose St.
Joe City, ST 12345
(234)567-8901
joejoe@hotmail.com

Purpose

I plan to study electrical engineering, with emphasis on control, and to continue in graduate school studying control and dynamic systems.

Education

1998.2001	Joe City High School	Unweighted Academic GPA: 3.71
1999, 2001	Joe City College	
1995-1998	Joe Middle School	

Extracurricular Activities

2000.2001	Jisan Research Institute I have been group head of the Joe research group and I completed a research paper, <i>Joe in Science</i> .
2001	Teaching AP Calculus I teach two AP Calculus classes at my high school while the teacher is recovering from illness.
1998.2001	Math Club I have attended almost all math competitions offered by the math club, and I am the main organizer of the club.
1998.2001	Tennis I played both doubles and singles for the junior varsity and varsity teams.
2000	Mathcamp A five-week summer camp held at the University of British Columbia. This was a camp where some of the brightest math students in the U.S. and Canada could study advanced topics such as number theory.
1999.2000	Tutoring I have tutored students at my high school in subjects such as algebra, geometry, physics, and chemistry.

Awards and Honors

2001	National Merit Scholarship Semifinalist
2001	Caltech Signature Award
2001	AMC 12 School Top Scorer
2001	USA Mathematical Talent Search Prize Winner
2000	National Chemistry Olympiad School Top Scorer

Improvements:

1. The explanations of the activities are too long. These should be short and sweet. There should be no explanations more than one sentence long, and this sentence should state everything that needs to be stated.
2. Extraneous information should not be offered in this part of the paper. Outcomes or awards shouldn't appear here. Other sections will suffice for

this.

3. There should be a separate section for papers.

The improvements have been applied to this resume to yield a more complete, yet concise resume.

Joe Student
1234 Jose St.
Joe City, ST 12345
(234)567-8901
joejoe@hotmail.com

Purpose

I plan to study electrical engineering, with emphasis on control, and to continue in graduate school studying control and dynamic systems.

Education

1999-2001	Joe City High School	Unweighted Academic GPA: 3.71
1999, 2001	Pasadena City College	
1995-1998	Joe City Middle School	

Extracurricular Activities

2000-2001	Jisan Research Institute I have been group head of the Joe research group.
2001	Teaching AP Calculus I teach two AP Calculus classes at my high school while the teacher is recovering from illness.
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2001	National Merit Scholarship Semifinalist
2001	Caltech Signature Award
2001	AMC 12 School Top Scorer
2001	USA Mathematical Talent Search Prize Winner
2000	National Chemistry Olympiad School Top Scorer

Papers

2001	J. Joe et. al. <i>Joe in Science</i> . Submitted 2001. (attached)
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Of course, any publications should be attached to your applications.

Each college you apply to will be unique in some way. Just as when you apply for a job, you should make it your business to understand a lot about the company to which you are applying, you should know a lot about the school to which you are applying. This means that you should know what goes on at that school. Who is doing what in the departments in which you are interested? Where can you see yourself fitting in and becoming part of the community? Many students who do not ask these questions get to school and find that they either made a bad choice, or have no idea what to do in order to be involved in something that will help them become a more complete person. In order to avoid this, you need to thoroughly go through the website, sending emails to people whenever you don't know something you need to know, and getting a complete understanding of the school, its parts, and your place in it. Don't be afraid to send emails to professors and to administrators. These are important in understanding whether or not you will become part of a community or simply be one of the crowd.

When evaluating the school, have in mind what you want to do research on in the next four years. If you're planning to become an MD, keep in mind that you need good grades, time to work in a hospital, and perhaps time to do research. Don't neglect these parts in your quest to become this year's Harvard kid! Once you've looked at the school and found out what you see as your place in it, write it out. This is your Statement of Purpose, and of course, you *need* one per school. This is your way of telling the admissions staff that you know more than a little about the school, have found a place in it, and have an idea about what you will do and contribute once there. Your statement of purpose should be concise, to the point, and clear. You should clearly state what it is you want to do, where you see yourself, who you want to work with, and what your contribution can be.

Have a look at the statement of purpose (single spaced here) that was prepared by a JRI student.

Statement of Purpose

I would like to study electrical engineering at Caltech, with special concentration in control. The interests that I have developed match this field of study. My abilities and experiences in mathematics and swarm engineering research also direct me towards this field, and qualify me for it.

If I attend Caltech, I would like to conduct research as an undergraduate in the Engineering and Applied Science division. I hope to be able to obtain a research position with Professor Richard Murray of Control and Dynamic Systems, or with Professor Joel Burdick of Mechanical Engineering. Professor Burdick's study of autonomous robotic systems and Professor Murray's study of the control of mechanical and information systems are both very interesting topics to me. In addition, I may be able to contribute to these projects, since I have had research experience in swarm robotics.

This statement of purpose is lacking in several ways. Clearly it states what the student wants to do. But then it discusses interests that have been developed

and abilities that have come about without *telling what these are*. It goes on to state some interesting labs, but doesn't tell what the student's place is in it, what the reason would be for the school to want the student, or what the contribution might be. Since the idea of this statement is to give an idea of what the student wants to do at the school, and what his or her place is, this one clearly falls short. It fails to give a good idea of what the school's stake in this partnership might be, how the student might be part of the school, and where the mutual benefit is. In fact, it simply discusses vague abilities and interests, and tells Caltech what is interesting about one of its own groups.

Have a look at the next, corrected Statement of Purpose.

Statement of Purpose

I would like to study electrical engineering at Caltech, specializing in control. I wish to enter this field because I am interested in the theory of control of robotic systems, and knowledge of electronics will enable me to apply theory to realistic problems.

Over the past year, I have had the opportunity to carry out research in swarm engineering. I have investigated the theory of puck clustering systems. Puck clustering involves using swarms of robots with little processing power to move building blocks into clusters. The theory I studied and extended dealt with the control of cluster sizes. In order to confirm my theoretical findings, I designed and used both non-embodied simulations and embodied simulations. The non-embodied experiment is a probability based simulation of puck clustering systems, while the embodied experiment is a two-dimensional simulation of the systems. My research resulted in a conference paper, *Variance in Converging Puck Cluster Sizes*, which discusses the theory of stabilizing the cluster sizes in a system that generates multiple clusters. This paper is currently being reviewed by the First International Joint Conference on Autonomous Agents and Multi-Agent Systems.

Upon entering Caltech, I intend to continue my research. The most natural matches between my experience and interest and a Caltech lab are the labs of Professor Richard Murray of Control and Dynamic Systems and Professor Joel Burdick of Mechanical Engineering. Professor Burdick's study of autonomous robotic systems and Professor Murray's study of the control of mechanical and information systems are both very interesting topics. My research would fit nicely with Professor Burdick's research because my experience in simulating robot swarms will contribute to Professor Burdick's research in autonomous robots. Alternatively, I am prepared for work with Professor Murray because my knowledge of the theory of puck clustering systems relates to the control of distributed systems.

This one clearly states the student's experience, strengths, interests, and proposed home at Caltech. The reader has a clear idea of the academic interests of the student, the history of the student including his professional experience and abilities, and the place on campus where he sees himself becoming part of the group. The University can then judge impartially whether or not the student will be a benefit, and can leverage this judgment against all other candidates for spots at the school.

Short Answers or Essays

When answering essay questions or writing essays, it is important to make sure that the question you are attempting gets answered and it does so completely and concisely. It is very easy to start off answering a question, get sidetracked, and answer another question or simply not answer the first. Consider the following answer to a question about a student's interests.

Response to Question 1

I am deeply interested in science and scientific research. My mother is a computer engineer, and her work has always interested me. She has also helped to develop my abilities in logic, mathematics, and problem solving. With this foundation, I continued to pursue my interest and to increase my knowledge in mathematics. Early in my 11th grade year, my experience in scientific research began with a program offered at the Jisan Research Institute. Currently, I wish to study electrical engineering at Caltech, with emphasis on control.

My understanding of mathematics is very advanced. I entered middle school in the accelerated math program, studying pre-algebra in 6th grade. In middle school, I also entered my first math competitions. During this time, I studied more mathematics than was offered to me at school. In addition to learning from math books on my own, I also attended summer camps, where I learned mathematical reasoning and game theory. In high school, I completed calculus in 11th grade, and I am currently taking calculus at Pasadena City College. As before, I studied beyond the curriculum, on my own and at Mathcamp. I have acquired enough knowledge and understanding in mathematics that I am able to serve as a calculus teacher at my high school. To me, mathematics is interesting because it is logical, creative, and stimulating. It is important because it will serve as a basis for my success in any career that I may have.

The opportunity for me to participate in scientific research came in 11th grade when I first learned about the Jisan Research Institute. I immediately applied and started participating in the program. My abilities in mathematics proved to be useful in accelerating me through the basic learning process in the program. I then became the head of the swarm engineering group, which studies puck clustering systems. In this project, I have completed my first conference paper, *Variance in Converging Puck Cluster Sizes*. JRI has shown me the procedures of scientific research, and it has given me the desire to continue to participate in scientific research. I have also been introduced to a topic of research, swarm engineering, which I am interested in and would like to further conduct research.

At Caltech, I will be able to pursue my interests in studying math and science, and in participating in scientific research. I plan to study electrical engineering and specialize in control. This field fits my interests and is related to my experiences in swarm engineering. I also plan to find a research position in a project in, or similar to, swarm engineering. Caltech is the perfect place for me to continue my education.

In this question, the student was asked to answer a question about his interests and ambitions. Some of the problems are the same as the previous ones. The reasons for stating things are not clear, and he seems not to have considered his audience well. In paragraphs two and three, he states that his math skill is "very advanced", apparently forgetting that his audience is college professors. Much of the answer is a history, but doesn't really make a point. Finally, he indicates that he will be able to continue to pursue these interests at Caltech, and that his chosen field fits his interests. The problem is that Caltech already knows that he can continue in this area, and that he can look into his interests while there. This just doesn't tell them anything about him aside from the history, and the missing stuff is what is needed here.

Consider now the corrected version.

Response to Question 1

I am deeply interested in science and scientific research. My mother is a computer engineer, and her work has always interested me. She helped me to develop my abilities in logic, mathematics, and problem solving. This foundation gave me a strong starting point from which I now strive to increase my knowledge in mathematics. Early in my 11th grade year, my experience in scientific research began with a program offered at the Jisan Research Institute. Currently, I wish to study electrical engineering at Caltech, with emphasis on control.

I have always had a strong interest in mathematics. I entered middle school in the accelerated math program, studying pre-algebra in 6th grade. In middle school, I also entered my first math competitions, which required me to study more mathematics than was offered to me at school. In addition to learning from math books on my own, I attended summer camps, where I learned mathematical reasoning and game theory. I completed my high school's calculus course in 11th grade, and I am currently taking calculus at Pasadena City College. So far, I have acquired enough knowledge and understanding in mathematics that I am able to serve as a calculus teacher at my high school. To me, mathematics is interesting because it is creative and stimulating. It is important because it will serve as a basis for my success in any career.

The opportunity for me to participate in scientific research came in 11th grade when I first learned about the Jisan Research Institute. I immediately applied and started participating in the program. My abilities in mathematics proved to be useful in accelerating me when I studied programming. I then became the head of the Swarm Engineering group, which studies puck clustering systems. Puck clustering investigates the use of swarms of simple robots to create clusters of building blocks. This project led to my first conference paper, *Variance in Converging Puck Cluster Sizes*. In this paper, I demonstrated the necessary conditions to stabilize the sizes of multiple clusters. My work at JRI allowed me to learn the process of scientific research, and it has given me the desire to continue participating in research, preferably in swarm engineering.

At Caltech, I intend to pursue my interests math and science, and in scientific research. I plan to study electrical engineering and specialize in control. This field fits my interests in robotics and relates to my experiences in swarm engineering. I also plan to find a research position examining systems in swarm engineering. There are a few people at Caltech who are working in this area. Among them are Professor Richard Murray, who studies the control of distributed systems, and Professor Joel Burdick, who studies autonomous robots.

This is an improvement over the last answer (though it still could use some work!). Most notably, it still has a history, but also it has a list of the pertinent skills and accomplishments. The overall feel is a narrative at the end of which a clear set of goals and ambitions are outlined.