



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

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Project Title Factors that Affect the Strength of Concrete	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Based on my literature research, I believe that the more water added relative to the amount of cement will decrease the compressive strength of the concrete. I also believe that larger aggregate will result in stronger concrete. Lastly, I believe that commercial grade bag mixes will be stronger than my own mixes.</p> <p>Methods/Materials Materials used include: cement, sand, two sizes of rock, water, and two commercially available concrete bag mixes. The concrete mixtures were made with water/cement ratios from 0.6 to 1.1 all with 1/2" rock. To investigate the effect of aggregate size, I also made two different 0.8 water/cement ratio mixtures with 3/4" rock and all sand. Lastly, two mixtures were made with the commercial bag mixes for comparison. For each of the concrete mixtures, strength test samples and slump test samples were made. The strength test samples were allowed to cure for twenty-eight days, then they were taken to a materials testing lab for compressive strength testing.</p> <p>Results In the water/cement ratio range of 0.6 to 1.1, compressive strength decreased as the water/cement ratio increased. The size of the aggregate did not appear to affect the compressive strength of the concrete. For the commercially available concrete bag mixes, one mixture was considerably stronger than my comparable 0.8 water/cement ratio mix, and the other bag mixture was about the same strength as my mixture. One of my two 0.6 water/cement ratio samples had voids, which resulted in the compressive strength being about half of the sample without voids.</p> <p>Conclusions/Discussion The results of my experiment confirm that the more water added relative to the amount of cement decreases the compressive strength of the concrete. The size of the aggregate did not seem to affect the strength of the concrete. Voids in the concrete dramatically reduce its compressive strength. Bag mixes can be stronger or about the same as mixtures made from scratch.</p>	
Summary Statement In this experiment I determined how the water/cement ratio and the size of aggregate affect the compressive strength of concrete.	
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