



**CALIFORNIA STATE SCIENCE FAIR  
2003 PROJECT SUMMARY**

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| <b>Name(s)</b><br><b>Courtney Carrell; Krystina Meier</b> | <b>Project Number</b><br><b>S0202</b> |
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| <b>Project Title</b><br><b>Cleats: The Traction Action</b> |
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| <p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b><br/>Which number and length of cleats provide the ideal amount of friction to maximize athletic performance?</p> <p><b>Methods/Materials</b><br/>Materials:<br/>Wooden block (25cmx8cmx5cm), 5 wooden dowels (1m long x .5cm diameter), drill and .5 cm drill bit, safety goggles and aprons, spring scale, ruler, grass-dirt surfaces</p> <p>Methods:</p> <ol style="list-style-type: none"><li>1. On underside of block, drill as many holes as the block can fit.</li><li>2. Cut as many 1 cm pieces of dowel as holes on the block.</li><li>3. Place one dowel piece in one hole.</li><li>4. Drag at constant velocity at measured distance while attached to spring scale.</li><li>5. Record spring scale reading; repeat two more times; average.</li><li>6. Repeat steps 3-5 adding one more dowel piece each time.</li><li>7. Graph results and conclude ideal number of cleats.</li><li>8. Cut the ideal number of dowel pieces at .5, .75, 1, 1.25, and 1.5 cm lengths.</li><li>9. Place the dowel pieces of one length in the block.</li><li>10. Drag block at constant velocity for measured distance while attached to spring scale.</li><li>11. Record scale reading, repeat two more times, average.</li><li>12. Repeat steps 9-11 for each dowel length.</li><li>13. Graph and conclude the ideal length of cleats.</li></ol> <p><b>Results</b><br/># of cleats/coefficient of friction<br/>1/.745<br/>2/.864<br/>3/.852<br/>4/.852<br/>5/.913<br/>6/1.017<br/>7/.962</p> |
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| <b>Summary Statement</b><br>We determined the ideal cleat number and length of an athletic cleat through a series of friction measurements. |
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| <b>Help Received</b><br>Courtney's father cut the wood, Courtney's grandfather drilled the holes, Mrs. Dimas (physics teacher and project advisor) mentored us, monitored our progress, and gave us the guidelines of a good, winning project. |
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