**Ski to Sea: Which sport leg is most important?**

The Ski to Sea race is a multi-sport relay race held annually in Whatcom County, Washington. The race consists of seven legs in the order: cross-country skiing, downhill skiing or snowboarding, running, road biking, canoeing, mountain biking, and kayaking, with each leg representing a different outdoor sport. A team will consist of one person for each leg of the race, except for the canoe leg which has two paddlers per canoe. Racers are allowed to compete in multiple legs of the race. A team must have a minimum of three racers and a maximum of eight, with a maximum of three legs per individual. The canoe leg must have two participants regardless of the number or racers per team. The Ski to Sea Race does not allow individuals to complete all legs of the race.

The following matrix reports the correlation between the completion time in minutes for each leg of the race and the overall competition time in minutes:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Overall | Canoe | XC Ski | Downhill Ski | Kayak | Road Bike | Run | XC Bike |
| Overall | 1 | 0.237 | 0.21 | 0.439 | 0.464 | 0.189 | 0.015 | 0.378 |
| Canoe | 0.237 | 1 | 0.361 | -0.186 | 0.428 | -0.126 | -0.587 | -0.055 |
| XC Ski | 0.21 | 0.361 | 1 | 0.184 | 0.357 | 0.226 | 0.034 | 0.193 |
| Downhill | 0.439 | -0.186 | 0.184 | 1 | 0.273 | 0.459 | 0.505 | 0.432 |
| Kayak | 0.464 | 0.428 | 0.357 | 0.273 | 1 | 0.12 | -0.079 | 0.504 |
| Road Bike | 0.189 | -0.126 | 0.226 | 0.459 | 0.12 | 1 | 0.563 | 0.294 |
| Run | 0.015 | -0.587 | 0.034 | 0.505 | -0.079 | 0.563 | 1 | 0.345 |
| XC Bike | 0.378 | -0.055 | 0.193 | 0.432 | 0.504 | 0.294 | 0.345 | 1 |

1. Identify and interpret the correlation between the Road Biking leg and the Overall time?
2. What is the correlation between the Road Bike leg and the XC Bike leg? Is the coefficient lower or higher than you expected? Why?
3. How does the correlation between the running leg and the overall competition time compare to the correlation between the Downhill Ski leg and the overall time?
4. Why might running have such a low correlation with overall time?
5. If a team wants to improve their performance in the running leg, which other leg should they focus on based on the correlation data?
6. Which leg of the race shows the strongest positive correlation with the kayaking leg?
7. Why might similar disciplines like XC and Downhill Skiing, and XC and Road biking not be very strongly correlated?
8. Which leg of the Ski to Sea race shows the strongest correlation with the overall competition time? Why might this be the case?