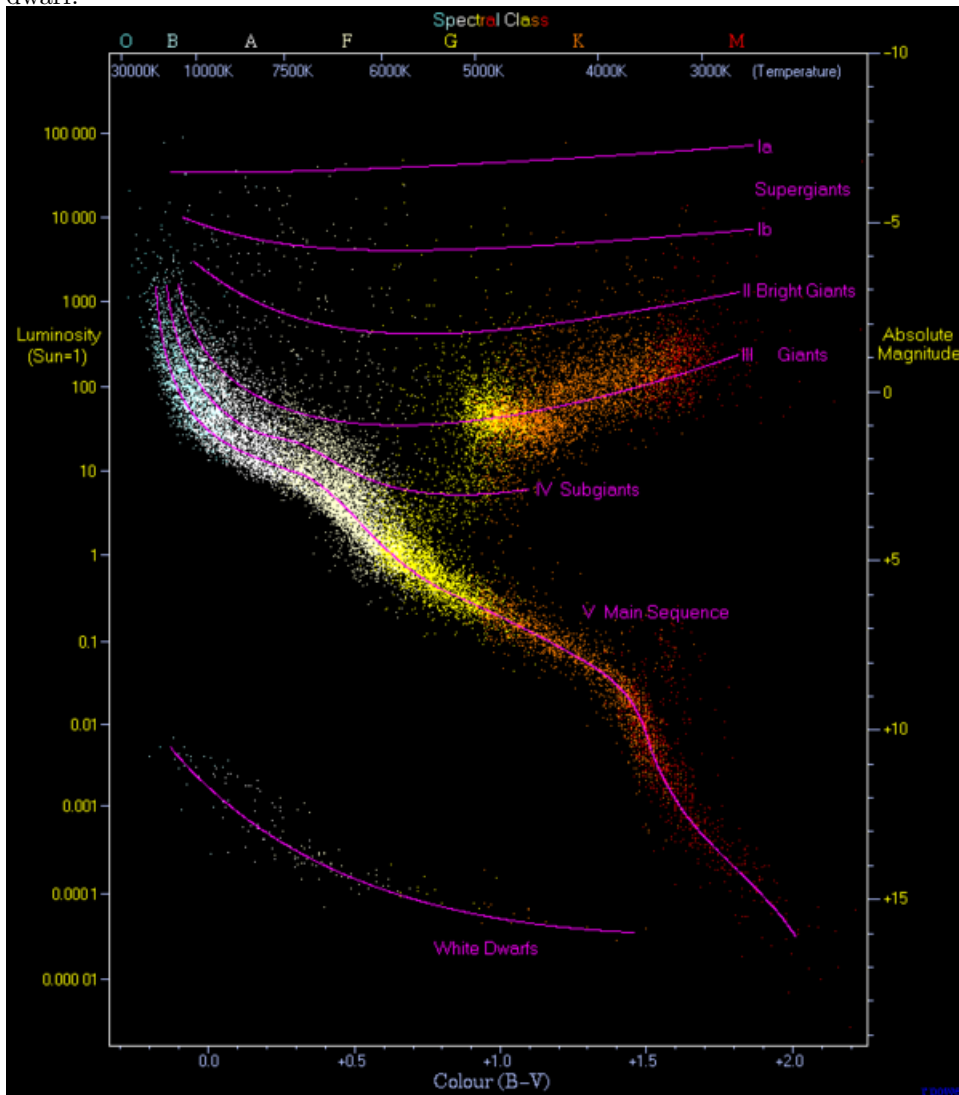


Worksheet 2

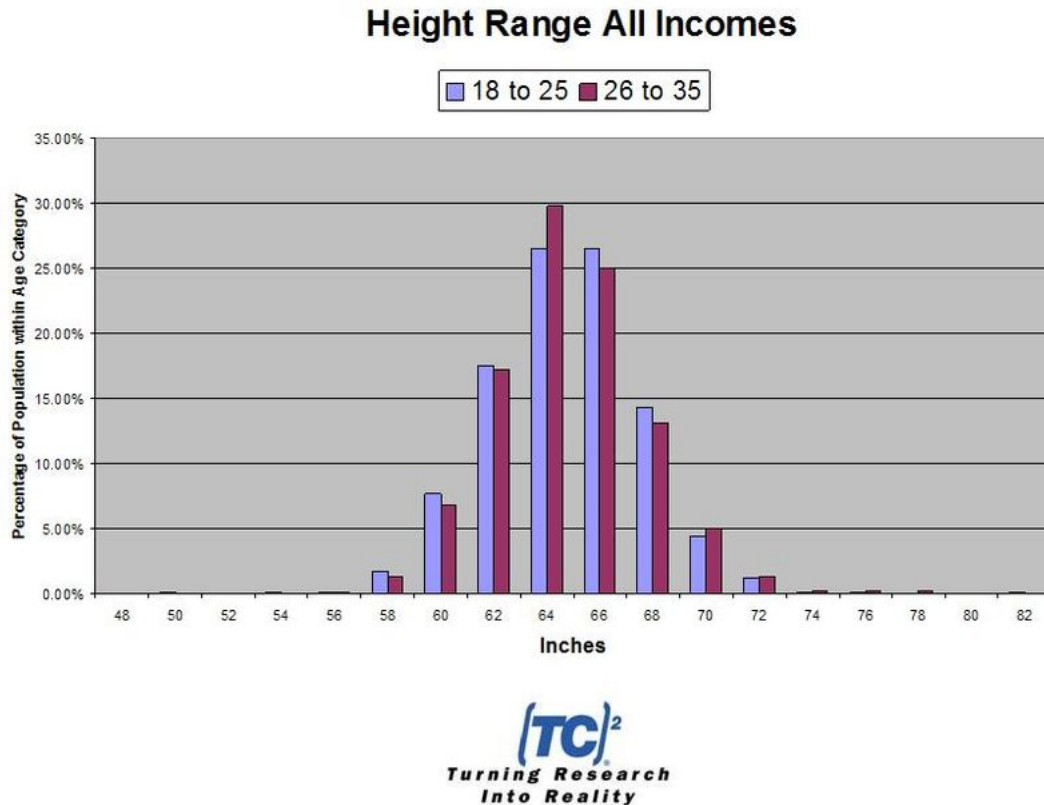
Remember, no credit will be given for answers without mathematical or logical justification.

- 1) If you flip a quarter 5 times in a row, what are the odds of getting *no* runs of any kind? That is, what are the odds that you never get 2 or more heads in a row or two or more tails in a row?
- 2) Consider the Hertzsprung-Russell diagram below, which charts observations of stars' luminosity against surface temperature and other variables. Most stars (our sun, for instance) spend most of their lives in the so-called main sequence; near the end of a star's life, it typically moves off the main sequence: some stars (like our sun) will go through a "giant" phase before spending the rest of eternity as a slowly cooling white dwarf.



- a) Given that our sun is on the main sequence, use the chart to determine approximately its surface temperature and its spectral class.
- b) For the main sequence stars, is luminosity correlated positively or negatively with respect to temperature?
- c) For stars in the "giant" category, how does this correlation change?

3) Consider the following chart of height distribution:



Ignoring heights on the “extremes” (heights below 58 inches or above 72 inches), the approximate distribution of heights for people in the 26-35 age range is:

Inches	Percentage of the population
58	2%
60	7%
62	17%
64	30%
66	25%
68	12%
70	5%
72	2%

What is the modal height? Compute the mean and the standard deviation. Is the distribution normal or skewed?

- 4) If you have money in the bank at a 6% rate of interest, what is your APR if interest is compounded a) yearly, b) monthly, c) daily, d) continuously?
- 5) You borrow \$1000 from your local loan shark to buy a new sound system for your apartment. He charges you a 50% annual rate of interest, and you are to pay him the money back in three equal installments 4 months apart. What is the amount of each installment? Would you rather take that deal, or take the deal where he offers you a loan at 45% that has to be paid back in one lump sum at the end of the year?
- 6) Assume a certain rare disease exists in 0.1% of the population, and assume the commercially available tests have a 99.1% accuracy rate.
 - a) If everyone in a population of 100 million individuals is tested, what proportion of positive test results will be false positives?
 - b) Answer question (a) if the accuracy of the test is improved to 99.99%.
 - c) Assume again the test has an accuracy of 99.1%, and assume that everyone who

tested positive gets tested again. What proportion of the people who got 2 positives are in fact still negative?

7) Read the “Farewell” section of the book.