Maths & Stats Pre-Sessional Tutorial

Additional Exercises for topics 2 and 3

Exercise 1

The Mutual Fund manager manages a pool of investments made on behalf of people who share similar objectives. The manager makes the decision to buy and sell individual stocks and bonds in accordance with specific investment philosophy.

Why are some mutual fund managers more successful than others? One possible factor is the university, where the manager earned their Master of Business Administration (MBA).

Suppose that a potential investor examined the relationship between how well the mutual fund performance and where the fund manager earned their NBA.

After the analysis, a table of joint probabilities was developed.

	Mutual fund outperforms market (Y1)	Mutual fund does not outperform market (Y2)
Top-20 MBA programme (X1)	0.11	0.29
Not top-20 MBA programme (X2)	0.06	0.54

a) What is the probability that the mutual fund outperforms the market, and its manager did not graduate from a top 20 MBA programme?
b) What is the probability that a mutual fund does not outperform the market and its manager graduated from a top 20 MBA programme?
c) Calculate the marginal probabilities.
d) What is the probability that mutual fund managers did not graduate from a top 20 MBA programme?
e) Suppose now that we select one mutual fund at random and discover that it did not outperform the market. What is the probability that a graduate of a top 20 MB a programmer manages it?

Exercise 2

Suppose you start up a company that has developed a drug that is supposed to increase IQ. You know that the standard deviation of IQ in the general population is 15. You test your drug on 36 patients and obtain a mean IQ of 95.54.

a) Using a significance level of 0.01, is this IQ significantly different than the population mean of 100?
b) Using a significance level of 0.1, is this IQ significantly different than the population mean of 100?

Exercise 3

The population of GRE scores are known to have a standard deviation of 8.5. The UW Psychology department hopes to receive applicants with a GRE score over 210. This year, the average GRE scores for the 42 applicants was 212.79.

a) Using a value of $\alpha = 0.05$ is this new mean significantly greater than the desired mean of 210?
b) Using the z-statistic calculated in part a), what is P(Z > z_statistic)? Is this probability greater than 0.05?

Exercise 4

Consider a random variable X. X is normally distributed, $X \sim N(\mu, \sigma^2) = N(40, 36)$

a) Find $P(X > 50)$
b) Find $P(X < 45)$
c) Find $P(31 < X < 45)$