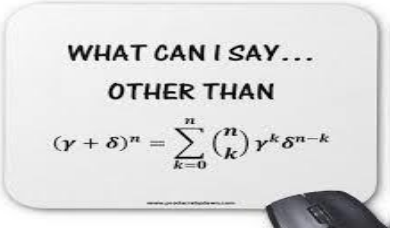
Week 12
Term 4
2015

Learning Brief

SM4
Probability and Statistics

Goals



By the end of this week, you should be able to:

- understand probability distributions for discrete random variables
- understand Binomial theorem and Binomial Probability Distribution
- recognise situations when the Binomial distribution applies and learn how to solve problems involving the Binomial Distribution
- recognise and use the formula AND CAS for binomial probabilities
- understand the assumptions on which the binomial model is based

Theoretical Components

BINOMIAL DISTRIBUTION

PART A:
Reasoning and Data (Fitzpatrick et. al.):
- Read Section 4.1 on Binomial Theorem
- Read Section 4.2 on Binomial Probability Distribution

PART B:
You will require Chapter 11 of Quest Mathematical Methods 12 (Jacplus e-text):
- Read through Section 11A & 11B on Binomial Distributions.

Study and make notes on Examples 1-5.

Binomial Theorem:

$$(x+y)^n = x^n + nx^{n-1}y + \ldots + \binom{n}{r}x^{n-r}y^r + \ldots + nxy^{n-1} + y^n$$

Practical Components

Do the following questions. Organise your solution neatly in your exercise book:

PART A:
Reasoning and Data (Fitzpatrick et. al.):
EX 4A: Questions 6 (a, c), 7(a, c), 8a, 9a, 10.
EX 4B: 3, 5, 12, 22, 26, 35, 36

PART B:
Maths Quest 12 Methods:
EX 11A: 3,5,7,11,14,15, 23, 29.
EX 11B: 2,4,7, 9,11,13, 21, 22, 28

Investigation

No new investigation for this week. Work on your assignment instead.

See the following page for information on random samples.

QFO

Quiz/Forum/Other

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The assignment requires you to learn about hypothesis testing and to conduct your own research. The poster of your inferential statistics investigation is due on Tuesday in Week 14.

Please ensure that your one sample and two sample studies contain **random** samples.

A Random Sample is a sample that is chosen so that each member of the population has the same chance of being selected for the sample. (Don't just ask your friends!)

Research Random Sample, Systematic Random Sample and Stratified Random Sample. You need to use a sample that is representative of the population.

http://www.youtube.com/watch?v=hsPCte_PcVA

http://www.bbc.co.uk/schools/gcsebitesize/maths/statistics/samplinghirev2.shtml

It needs to be clear how your sample data were obtained.

Binomial Theorem:

$$(x+y)^n =$$
$$x^n + nx^{n-1}y + \ldots + \binom{n}{r}x^{n-r}y^r + \ldots + nxy^{n-1} + y^n$$

PART A:
In the expansion of $(2 + 3x)^n$ the coefficients of x^3 and x^4 are in the ratio 8: 15. Find n.

PART B:
Sixty-eight percent of all scheduled trains through Westbourne station arrive on time. If 20 trains go through the station every day, calculate the probability, correct to 4 decimal places, that:
(a) no more than 10 trains are on time
(b) at least 12 trains are on time
(c) at least 12 trains are on time for 9 out of the next 10 days.

PART C:
Show that the sum of the binomial probabilities is equal to 1. Hint: Use Binomial Theorem.

$(x+y)^0 = 1$ — 0th row

$(x+y)^1 = 1x + 1y$ — 1st row

$(x+y)^2 = 1x^2 + 2xy + 1y^2$ — 2nd row

$(x+y)^3 = 1x^3 + 3x^2y + 3xy^2 + 1y^2$ — 3rd row

$(x+y)^4 = 1x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + 1y^4$ — 4th row

$(x+y)^5 = 1x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + 1y^5$ — 5th row