

Welcome back!

- **New lecture time:** Friday **12 noon**, Bedson Building LT1
- **New workshop times:** including some computer practical sessions in the CHART cluster (every third week, you'll be reminded when it's a computer week)
- Your **marked case studies** will be returned soon, with feedback

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■ This semester:

- Two more CBAs – deadlines: **1st March, 10th May**
- One more case study – deadline: **8th May**
- Computer practical work – deadline: **13th March**

■ This week:

- We will probably finish Chapter 4 in this Friday's lecture
- Please collect your notes for Chapter 5 from the Maths General Office at some point this week – any time from Wednesday lunchtime onwards

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Recap: The binomial distribution

If, for our discrete random variable X , we have:

- A **finite number of "trials"**;
[e.g. roll a fair die three times – number of trials $n = 3$]
- and each trial has **two outcomes** – "success" and "failure";
[e.g. "get a six" and "do not get a six"]
- if we know the **probability of "success"**;
[e.g. here, $p = 1/6$]
- and if the outcome of each trial is **independent** of every other trial...
[e.g. the outcome of each roll has no influence over all the other outcomes]

... then we can say that

$$X \sim \text{Bin}(n, p)$$

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Recap: The binomial distribution

In the last lecture, we "derived" the following key formula for a binomial random variable, where $X \sim \text{Bin}(n, p)$:

- $P(X = r) = {}^nC_r \times p^r \times (1 - p)^{n-r}$

- $E[X] = n \times p$

- $\text{Var}(X) = n \times p \times (1 - p)$

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Recap: The binomial distribution

Example from last lecture: Suppose

X : Number of sixes on three rolls of a die.

You should see that we can say:

$$X \sim \text{Bin}(3, 1/6),$$

and that, for example,

$$P(X = 2) = {}^3C_2 \times \left(\frac{1}{6}\right)^2 \times \left(\frac{5}{6}\right) = 0.069.$$

Also,

$$E[X] = 3 \times \frac{1}{6} = 0.5 \quad \text{and}$$

$$\text{Var}(X) = 3 \times \frac{1}{6} \times \frac{5}{6} = 0.417.$$

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Your turn...

Now try

- **Question 6** – think carefully about part (d)
- **Question 8** (Alicia, Robyn, Josh – sorry if you don't like McDonald's!)
- **Question 9** – think carefully about part (c)
- **Question 11** – hard!

Don't forget to ask if you have any questions, and please sign the attendance list!

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