

MEI Conference

Errors in S1 and S2 and advising students how to avoid them.

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Change a grade C to a grade B?
Change a grade E to a grade C?

- In January 2007 there was just a 6 mark difference between the grades for S1
- Grade E 26
- Grade D 32
- Grade C 38
- Grade B 44

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How can students gain these marks?

- Do not lose the marks they can get.
- Students are careful to avoid common errors highlighted by teachers.

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More confidence on Venn Diagrams

- Jan 2007 Question 5
- To calculate $P(T \cap J)$ use
$$P(T|J) = \frac{P(T \cap J)}{P(J)}$$
- But students calculated 0.4×0.2 or 0.3×0.2

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More confidence on Venn Diagrams

- Students must label the correct section.
- Can they distinguish between J and $J \cap T'$?
- Can they label each part of the diagram? Even the outer section?

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Measures of spread

- Can year 12 students remember 4 formulae?
Probably not, so get them to remember only 2 but test them on recall and which uses $\sqrt{\quad}$

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Measures of spread 2

Errors on root mean square deviation included:

- Confused $\sum x^2$ and $(\sum x)^2$
 $\sum fx^2$ by calculating $(\sum fx)^2$ or even $\sum xf^2$
- Forgetting to multiply by f
- Forgot to square root
- Divided by $n-1$ rather than n

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Outliers

- Errors when using IQR
Highlight by use of boxplot

- Errors included
Median $\pm 2 \times$ IQR
Median $\pm 1.5 \times$ IQR
UQ $+ 2 \times$ IQR
UQ $+ 1 \times$ IQR

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When do you ignore an outlier?

- Has the data handling coursework helped students get an awareness of outliers?
- Are they familiar with the chances of getting an unusual value from a large data set?

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Scales

- Heavy penalty if misread scales
- Some students choose a non-linear scale when plotting a histogram
- Some students label the x-axis
 $t < 5$
 $5 \leq t < 10$

.....



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Simple combinations

- How many ways can you get a total score of 16 throwing 3 ordinary dice?
- Answers included 2 ways or 12

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Why does it take so long for an A level Maths student to order a meal?

- 4 starters 5 main courses 3 sweets
- Calculate the number of ways in which Peter may choose his 3 course meal.
- Worrying that some students put 12
- Worrying that some students calculated
 $4! \times 5! \times 3! = 17280$ If each selection took 2 seconds to consider it would take
9 hours 48 seconds to consider all options

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Why does it take so long for an A level Maths student to order a meal? (2)

- Peter and Esther now decide to choose different dishes from each other (still 4 starters 5 main courses 3 sweets). Show that the number of starters is 6.
- Instead of 4C_2 the following were attempted:
 $3!$ or ${}^3C_1 \times {}^2C_1$ Well they do get 6

Why does it take so long for an A level Maths student to order a meal? (3)

- Peter and Esther now decide to choose different dishes from each other (still 4 starters 5 main courses 3 sweets) Calculate the number of possible combinations of 6 dishes for both meals.
- Some students followed on from earlier part and used ${}^{12}C_6$ a logical progression but wrong of course
- or tried ${}^4C_2 + {}^5C_2 + {}^3C_2$

Hypothesis Testing Notation

Good or bad?

- $H_0 = 0.1$
- $H_0 : p = 0.1$
- $H_0 : P(X = 0.1)$
- $H_0 : P(X) = 0.1$

- But even if correct did they define p?

Hypothesis Testing Using tables

- Do not use tables when $p=0.12$ by rounding to 0.1
- Use tables when $p=0.1$ and need to find $P(X < 4)$ rather than do 4 binomial calculations

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Hypothesis Testing Calculating Binomials

Check the use of inequalities
 $P(X < 4)$ is not the same as
 $P(X \leq 4)$
or $P(X=4)$
or $1 - P(X \leq 3)$

and $P(X > 2)$ is not the same as
 $1 - P(X=0) - P(X=1)$
 $1 - P(X=1) - P(X=2)$

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Hypothesis Testing Writing a conclusion

- Accept H_0 is not sufficient
- Improve by
There is insufficient evidence to claim that there has been a reduction.

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In S2

- Using a Poisson approximation to the Binomial when the exact answer can be calculated.
- (even when the next part of the question says using a Poisson approximation)
- Missing out a continuity correction.
- Inappropriate use of continuity correction.
- Not defining μ as the population mean or ρ as the population correlation coefficient.

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In S2

- Not working to a suitable degree of accuracy especially in questions where there is a degree of approximation in the modelling
- Over reliance on a calculator and not interpreting answers correctly, eg on lines of regression
- When given a probability corresponding to a value k for a Normal distribution confusion over whether to use a positive or negative value with the tabulated value.

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In S2

- Poor work with inequalities, sometimes heavily penalised at this level.
 $P(X > 2)$ is not the same as $1 - P(X = 0) - P(X = 1)$

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In S2

- Relate the conclusion to the context of the question
There is no evidence of association between the 2 variables does not get credit

But there is no evidence to conclude that there is association between home location and ambition gets the mark.

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