End of Year 12 Test analysis Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| Question number | Topic | Marks out of: | My mark | Reasons for not achieving full marks (tick applicable) | | | | | | | | | | | | | |
| RTQ! | | Calculation errors / accuracy | | Lack of full/ correct labelling or “detailed reasoning” | | Problem understand-ing the topic | | Lack of revision | | Failing to simplify answers | | Misreading numbers (e.g. from previous answers) | Other (give details) |
| **Pure and Statistics: 103 marks** | | | | | | | | | | | | | | | | | |
| **1** | Sequences and series | 10 | 8 |  | |  | | X | |  | |  | |  | |  |  |
| **2** | Probability (union) | 6 | 3 |  | |  | |  | | X | |  | |  | |  |  |
| **3** | Generalised binomial expansion | 5 | 5 | X | |  | |  | |  | |  | |  | |  |  |
| **4** | Differentiation (quotient/ product rules) | 4 | 4 |  | |  | |  | |  | |  | |  | |  |  |
| **5** | Circle coordinate geometry | 7 | 7 |  | |  | |  | |  | |  | |  | |  |  |
| **6** | Integration (by parts; trig identity) | 8 | 4 |  | |  | |  | |  | | X | |  | |  |  |
| **7** | Integration (reverse chain rule) | 2 | 2 |  | |  | |  | |  | |  | |  | |  |  |
| **8** | Geometric series | 9 | 9 |  | |  | |  | |  | |  | |  | |  |  |
| **9** | Tangent to a curve | 5 | 4 |  | | X | |  | |  | |  | |  | |  |  |
| **10** | Differentiation from first principles | 6 | 6 |  | |  | |  | |  | |  | |  | |  |  |
| **11** | Histogram, random sampling | 9 | 4 | X | | X | |  | |  | |  | |  | |  |  |
| **12** | Binomial distribution, hypothesis testing | 15 | 4 | X | | X | | X | | X | | X | | X | |  |  |
| **13** | Integration (partial fractions) | 7 | 5 |  | | X | |  | |  | |  | |  | |  | ++++++++ CCCCCCCCCC |
| **14** | Large data set; boxplots | 10 | 5 |  | | X | |  | |  | | X | |  | |  |  |
| **TOTAL** | | **103** | 69 |  |  | |  | |  | |  | |  | |  | |  |

Mean percentage per question achieved across the cohort:  


EoY12 Pure and Statistics

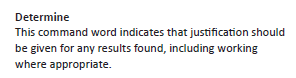
Comments about individual questions

**Q1:** **(a)** For a periodic sequence, also say what the period is.

**(b)** Not all sequences are arithmetic or geometric!

**(d)** If in doubt about how much detail to show on a sketch, put on ALL the information you have.

**Q2:** **(a)** Label your answers, don’t just put a number. You should show what you added to what.

**(b)**  so marks should not be given if a correct answer is not justified clearly. Use probability notation, not just numbers. We have marked kindly this time, but in the actual exams you do get penalised for incorrect (or missing) notation and unclear justifications.

**(c)** Few people realised that if A is a subset of B then the probability of either of them happening is the probability of B happening

**Q3:** **(a)** Many students did not give the range of values of x for which the expansion is valid.

**(b)** Many students had a final answer of , which is , not

**Q4:** **(a)** Note that you should do basic simplification i.e. combine fractions/collect like terms. Leaving the denominator of the fraction factorised is better, as it saves work and allows you to check for common factors.

**Q5:** **(b)** Some students used implicit differentiation and some used the fact that the tangent is perpendicular to the radius. It was worth drawing a sketch for this question to check the answer was sensible.

**Q6:** **(b)**  Hence means use this! Some students went wrong due to bad notation and not opening brackets correctly.

**Q7:** Use  
… you don’t need to do full integration by subs! Also remember to include the and modulus (the straight brackets) for the argument of the logarithm.

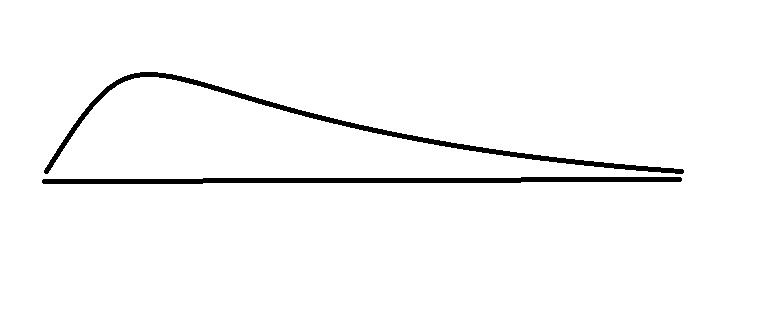
**Q8:** **(a)** Once you have two equations in two unknowns, remember that you are trying to eliminate one of the variables, not just combine the two equations into one. The neatest method was , so and then to the quadratic. It was possible to find a and r by using and but gave a lot more work and many students who started like this did not get through to the end.

**(b)** so there must be evidence of how you solved the quadratic equation to gain full marks, and you must show both solutions and explain WHY you reject the solution .

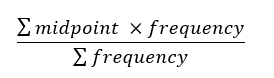
**Q9:** You were asked to give the final answer in a particular form with numbers to 3 s.f. so the final mark could only be given for this form.

**Q10:** Many students spent quite a bit of time multiplying out rather than using the binomial expansion and writing the expansion straight down. Notice that . You do not need to talk about h being zero h tending to zero. That is already there in the notation.

**Q11:** **(a)** Positive skew means the ‘tail’ is in the positive direction:

It is not a right skew or a left skew or a left distribution.

**(b)** Here you need to comment on WHY you are rounding to an integer.

**(c)** Mean is . We were aware that it was difficult for some students to read the graph accurately and took this into account. Once you had noted down what the midpoints and frequencies were you were expected to use a calculator to find the mean and standard deviation. No working was required.

When you have a mean, look at the histogram and decide if it is a sensible value. Is 245 students a sensible mean for data ranging from 0 to 30000?  
**(d)** Outliers are more than 2 standard deviations above or below the mean. You needed to use your answer to c to show whether outliers might exist and it was necessary to explain that   
**(e)** The phrase to remember here is “it allows statistical inferences about population parameters to be made”.

**Q12:** **(a)** “Show that” so you need to show that you are using

**(b)** This did not say “show” but “calculate” so it could be put straight into the calculator and just needed to be labelled.

**(c)** Where you will get marks in a binomial hypothesis test:

\*Stating what the test statistic is (I.e. here say p=propotion of voters in the population intending to vote for Margaret.)

\*Stating H0 and H1 in terms of the test statistic

\*Stating the distribution under H0 (i.e. X~B(50,0.4)

\*Finding the probability of the result or a more extreme result(i.e. here find)

\*Clearly compare the probability with the significance level (i.e. here say 0.0978 > 0.05)

\*State whether you reject H0, or “fail to reject H0.” (At this stage it is acceptable to say “accept H0” rather than “fail to reject H0” but be aware that this is not to say that you think there is any evidence to suggest it is true)

\*Give a non assertive, in context, final statement, e.g. “there is insufficient evidence to suggest that more that 40% of voters choose Margaret”

**(d)** Critical region is the region (i.e. values of X) that would cause us to reject H0, this can be found simply by trying values until you get the ‘boundary.’ You must show the probabilities either side of 5%.

Notation must be internationally accepted mathematical notation, NOT calculator notation.

i.e. and NOT BinomialCD(176,400,400,0.4)

**Q13:** **(a)** Some students did not realise that partial fractions could be used here since . There were marks here for combining the logarithms together using , and also “folding in” the integrating constant: where .

**(b)** You cannot break an algebraic fraction into partial fractions unless the degree of the polynomial on the bottom is greater than the degree of the polynomial on the top. In this question there is a quadratic on the top and on the bottom, so it must be rewritten before you can use partial fractions.

**Q14:** **(a)** Look at the amount of marks available here and make sure you make that amount of comments. We cannot give marks for comments we cannot read. If you know you have bad hand writing consider printing or writing slowly when you come to questions where the phrasing of your comment will matter for the allocation of marks, such as this one. Try reading your comments aloud in your head after you have written them.

Note that the median is shown on a box plot NOT the mean.

**(b)** In order to show that is equal to you need to mention both results and link them with “=” signs. Expressions left floating on the page which happen to belong to the route from one of these to the other will not be enough to gain full marks. You need to tell the full story.

**(c)** Some people excluded the 4 never married people, due to them being outliers, but there was no reason to believe they were not genuine results, and so they should have been included; remember identifying outliers is a way of flagging up potentially unusual results, not an automatic reason to exclude them from analysis. (Some people may not have seen the four dots on a bad print out)

**(d)** Some students did not realise that this was a conditional probability.

**Good examples from 14(a)**

* *The median age for people who have never been married was 29.5 whereas the median age for people who have been widowed is 74.5 which is 54 years older.* (actual numbers have been quoted and the statement is clear)
* *The majority of people who are never married are not in the same age range as those who are widowed, aside from four outliers.* (this would be even better with some numbers.)
* *While the range of the lowest 25% in never married people is very small (1 year), the lowest 25% range is very high for widowed people (16 years)*  (Nice. Would be even better if it was made clear that we are talking about ages)
* *Widows are on average older than people who have never been married (median of 74 vs 21)* (Statement followed by evidence to support the statement. Very nice!)
* *The ages of those widowed starts around the middle of the ages in the data set and extends to the eldest age whereas the ages of those never married starts at the lowest age and extends to almost the middle age, aside from the four outliers.* (again, this would be even better with numbers quoted)
* *The data for never married has a strong positive skew whereas the data for widowed has a bit of a negative skew*  (This would be even better if there was a comment on what that means for the ages of the two groups)

**Bad examples from 14(a)**

* *Widowed people’s ages are more evenly distributed within the interquartile range than those who have never been married are.* (I think they mean the median is central in the box, but we know nothing about how the data is distributed between the LQ and the median or between the median and the UQ)
* *Married people have no skew* (Um! I don’t know what this means. We were looking at the ages of people)
* *Those never married are positively skewed* (the words “the ages of” would help here. These two ‘skew’ quotes are from different students.)
* *The IQR of the widowed is greater than those who never married, showing that those who widowed have less density of age* (not sure I have transcribed that correctly. I almost feel I understand it, but not quite)
* *The distribution within the box plot for never married shows median of 20.5 but most of the data lies between the median and upper quartile*  (No, 25% of the data lies between the median and the upper quartile, by definition. Think about what this student is seeing and try to rephrase it in terms of the ages of the never married group)
* *The median and the IQR of never married is very low, meaning the majority of the never married category is under 30* (the first half of this sentence does not imply the second, but the student has seen something interesting. It could be better phrased as “75% of those who have never married are under 30 years of age”)
* *The interquartile ranges are similar (12 for never married, 15 for widowed) meaning the range of ages within the categories are similar.*  (No. The range for never married is 65 years and the range for widowed is 35 years. The similarity of the interquartile range tells us nothing about the range)

**Use the above to help you reflect on how your assessments went and set yourself targets below:**

What topics do I need to concentrate on in my revision?

Integrating trig methods

Binomial distribution

Reread and remove silly mistakes and watch out for small details

What can I do when completing my exam to ensure that I get maximum marks for each question? (e.g. highlighting key words, labelling calculations)

Reread and remove silly mistakes and watch out for small details