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 Comprehension: 76 marks** | | | | | | | | | | | | | | | | | |
| **Section A: 61 marks** | | | | | | | | | | | | | | | | | |
| **1** | Cosine, sine rules | 8 | 8 |  | |  | |  | |  | |  | |  | |  |  |
| **2** | Functions (inverse, range, composition, sketch) | 8 | 4 |  | |  | |  | | X | |  | |  | |  |  |
| **3** | Trigonometric identity | 3 | 3 |  | |  | |  | |  | |  | |  | |  |  |
| **4** | Exponential modelling | 8 | 8 |  | |  | |  | |  | |  | |  | |  |  |
| **5** | Trigonometric equations | 10 | 8 |  | |  | |  | |  | |  | | X | |  |  |
| **6** | Implicit differentiation | 10 | \*8 |  | |  | | X | |  | |  | |  | |  |  |
| **7** | Differentiation (product rule) | 5 | 0 |  | |  | |  | | X | |  | |  | |  |  |
| **8** | Trigonometric equation | 4 | 3 |  | | X | |  | |  | |  | |  | |  |  |
| **9** | Linearised model for data | 5 | 4 |  | |  | |  | |  | |  | | X | |  |  |
| **Section B: 15 marks** | | | | | | | | | | | | | | | | | |
| **10** | Right-angled triangle trigonometry | 2 | 2 |  | |  | |  | |  | |  | |  | |  |  |
| **11** | Using points to identify a linear relationship | 2 | 2 |  | |  | |  | |  | |  | |  | |  |  |
| **12** | Eliminating variables from an equation | 3 | 1 |  | |  | |  | | X | |  | |  | |  |  |
| **13** | Geometrical calculations | 4 | 0 |  | |  | |  | | X | |  | |  | |  |  |
| **14** | Finding equations | 4 | 0 |  | |  | |  | | X | |  | |  | |  |  |
| **TOTAL** | | **76** | 51 |  |  | |  | |  | |  | |  | |  | |  |

Mean percentage per question achieved across the cohort:  


EoY12 Pure and Comprehension

General comments

The following general tips will greatly help you:

* Reading the question thoroughly. This means carefully **taking in the information** you’ve been given, as well as carefully **following the instructions** you’re given.
* Being careful in your written answers, so that your work can be followed by someone else who can’t read what was going through your mind at the time. This means putting those helpful little **labels** in, being precise in your use of mathematical **notation** so it really does look like you know what you’re doing and providing a complete **justification** for your line of reasoning.

Comments about individual questions

**Q1:** **(b)** Read carefully and draw yourself a diagram to help out. Lots of people overcomplicated this: it’s far easier to find the other missing angle in the triangle via the sine rule then use the angle sum in a triangle.

Think about your notation here: is a function, so it only has one output. Therefore writing “ or ” doesn’t make sense (but “ or ” is true and to be encouraged!).

**Q2:** **(a) i.** The simplest explanation for why this isn’t an invertible function is that it isn’t one-to-one.

**ii.** Make sure you describe the range correctly, i.e. in terms of or even (NOT ).

**(b) i.** Make sure that you actually answer the question: you need to have written in your answer.

**ii.** Be very careful with the gradient of your curve at the -intercepts – it should be visibly (approaching) .

**Q3:** Most people had the correct idea here; the most common mark lost was for not actually working through from LHS to RHS sufficiently clearly.

**Q4:** **(a)** Calculations alone aren’t enough here: you need to write a sentence with a comparison. It is a really helpful habit to label your work so it’s clear which concentration you’re calculating.

**(b)** Your time axis doesn’t need an even scale, but should have some indication, especially showing an awareness that your graphs will intersect before . Part (a) is there to help you with part (b)!

**(c)** Beware rounding errors.

**Q5:** **(a)** You should still show your *method* for finding the roots of the quadratic here.

**(b)** Expanding using isn’t helpful here – remember that we use to *help* solve equations! Show your working along the way: there is a mark available for sight of , don’t miss this!

It is helpful to adapt the range you’re solving for here: if , then . Many people missed the solution arising from ; there are indeed two solutions in this range so if you’ve rejected the solution from then you should stop, think and keep looking.

**Q6:** **(a)** Be careful with what you write: avoid shorthand like by itself or to indicate the derivative of a function that’s not just ! If you want a shorthand way of writing “the derivative of ”, use …

**(c)** In terms of clear notation, it’s probably best to say that a vertical tangent occurs when .

**Q7:** The differentiation was generally done well here; for writing it in the given form, you need to substitute .   
(Personally I always start from and divide through, rather than remembering this form; it’s more important to remember that you have an identity linking and and be prepared to use it!)

**Q8:** The modal mark here was 3 out of 4 by a long way; remember that dividing by a variable can lose you solutions! If , then EITHER OR . You *must* include the solutions from the case .

**Q9:** Reading the question is key here: you’re given a graph of against , so that means that the point represents the data point such that when , (in that order, not ).

Most people linearised the given equation sensibly and marks were mainly lost through careless mistakes.

**Q10:** You need to demonstrate what you know about the triangle really clearly here. The easiest way to do this is to draw a diagram (surprise surprise!) and label and the known side length of on it.

**Q11:** You don’t need to do much original thinking here: the method is the one described in lines 24-5, just applied to a different set of points/line.

**Q12:** Think about the order of your substitutions: you want to be left with something in terms of , so it’s preferable to replace each instance of with rather than the other way around.

Furthermore, think about the efficiency of your substitutions: you have two “smaller” equations and one more complicated one; it’s clearer to substitute the simpler ones into the longer one (which makes for easier reading but also, hopefully, allows fewer opportunities for mistakes to slip in).

**Q13:** This was not a nice question! I think this may have been a case of it’s-hard-but-if-you-don’t-get-it-at-least-you-won’t-lose-many-marks.

**(a)** You could use the equation from Q12 to calculate the exact co-ordinates of a pair of adjacent points and then find the distance between them. This works but it’s not pretty! Personally, I think it’s more straightforward to draw clear diagrams with right-angled triangles that you can chase down (but being careful not to assume there are right angles where there aren’t any!).

**(b)** Remember that the distance between two parallel lines means the shortest distance, and hence is perpendicular to both; this means that it’s *not* the distance between intersection points on adjacent lines.

**Q14:** Even though Q14 is the last of the comprehension section questions, it’s independent of the others. So if the distances have got you down, it’s still worth having a look at this one!

**(a)** Vertical lines should have equations of the form =. This should have been a fairly simple mark to gain! For the shadows’ lines, the angle is no longer a helpful measure; their gradient is. It’s simplest to give the gradient in terms of the -intercept, but other approaches would be equally valid (they may just make it harder to find the relationship between your parameters and further down the line).

**(b)** This depended on setting up the equations in (a) correctly; then it was a case of adapting Q11/12.

**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?

Funtions and inverses

Everything to do with comprehension

productrule

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)

Cut out silly mistakes and make sure everything is covered and rounded/simplified correctly