



Master Coaching
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Year 12 2 Unit Advanced

Test #3

Trial HSC

MATHEMATICS Year 12 2 unit

Time allowed - two hours *(Plus 5 minutes reading time)*

Directions to candidates :

- * Attempt ALL questions.
- * ALL questions are of equal value.
- * All necessary working should be shown in every question.
Marks will be deducted for careless or badly arranged work.
- * Board approved calculators may be used.
- * Each question attempted is to be returned on a separate sheet of paper clearly marked question 1, question 2, etc. at the top of the page.



QUESTION 1 (start a new page)

- a Find the value of $\frac{13 \cdot 4}{\sqrt{23 \cdot 6 - 0 \cdot 78}}$ Give your answer correct to two decimal places.
- b Solve $4 - 2x > x - 2$
- c Given $\frac{\sqrt{3}-1}{2\sqrt{3}}$ and $\frac{1}{3-\sqrt{3}}$ i Simplify u and v ii Prove that uv is rational
- d Find the sum of all the positive multiples of three which are less than 200

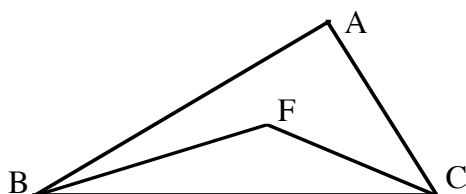
QUESTION 2 (start a new page)

The vertices of $\triangle OAB$ are $O(0, 0)$, $A(0, 5)$ and $B(6, 3)$ Plot these points on a number plane.

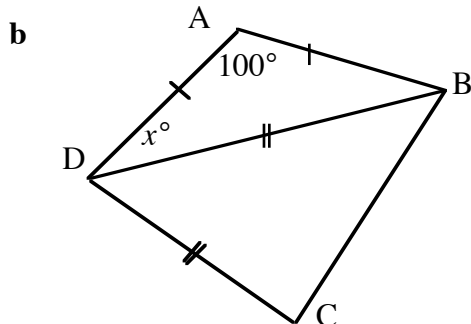
- a Find the equation of the line through O , perpendicular to AB .
- b What is the equation of the line through B , perpendicular to OA ?
- c Find the co-ordinates of H , the point of intersection of the lines in (a) and (b).
- d Show that the lines AH and OB are perpendicular.
- e Find the co-ordinates of D , the point of intersection of the lines AH and OB .
- f Find the area of triangle OHB

QUESTION 3 (start a new page)

- a Copy the drawn diagram marking on it all the given data.



$\angle BAC = 90^\circ$,
BF and CF bisect $\angle ABC$ and $\angle ACB$ respectively
Prove that $\angle BFC = 135^\circ$



Copy this diagram into your workbook.

Given $AD = AB$, and $DB = DC$ and $AD \parallel BC$

find $\angle BDC$

c Find the size of each internal angle in a regular hexagon.

QUESTION 4 (start a new page)

- a Solve $(k - 1)(k + 4) < 0$
- b Find the values of k for which $kx^2 + (k + 3)x + 4$ is positive definite and explain why there are no values of k for which it is negative definite.
- c One root of the equation $2x^2 - 15x + c = 0$ is four times the other. Find the roots and the value of c .

QUESTION 5 (start a new page)

- a Differentiate with respect to x : i $\frac{4}{\sqrt{x}}$ ii $\frac{3+x}{4+x^2}$
- b i Find the equation of the tangent to the curve $y = x^2 - 3x$ at the point $(2, -2)$
ii Prove that this line is also a tangent to the circle $x^2 - y^2 = 8$

QUESTION 6 (start a new page)

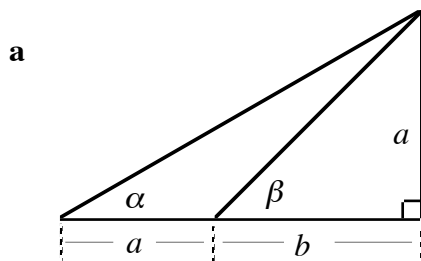
Consider $f(x) = 3 - 3x^2 - x^3$

- a Find the co-ordinates of the stationary points on the graph $y = f(x)$
- b Establish the nature of these points.
- c Locate the point of inflexion.



- d** Sketch the graph.
- e** Explain how the graph shows that the equation $3 - 3x^2 - x^3 = 0$ has three real roots and state the pairs of consecutive integers between which these roots lie.

QUESTION 7 (start a new page)



- i** Copy this diagram into your workbook.
- ii** Write down expressions for $\cot \alpha$ and $\cot \beta$ and prove that $\cot \alpha - \cot \beta = 1$
- iii** Find α to the nearest degree when $\beta = 57^\circ$

b Use the Cosine rule to :

- i** find the value of $\cos \angle BAC$
- ii** prove that BA is parallel to CD

