EXAMINATION HINTS

Before the examination

- Obtain a copy of the formulae book – and use it!
- Write a list of and LEARN any formulae not in the formulae book
- Learn basic definitions
- Make sure you know how to use your calculator!
- Practise all the past papers - TO TIME!

At the start of the examination

- Read the instructions on the front of the question paper and/or answer booklet
- Open your formulae book at the relevant page

During the examination

- Read the WHOLE question before you start your answer
- Start each question on a new page (traditionally marked papers) or
- Make sure you write your answer within the space given for the question (on-line marked papers)
- Draw clear well-labelled diagrams
- Look for clues or key words given in the question
- Show ALL your working - including intermediate stages
- Write down formulae before substituting numbers
- Make sure you finish a ‘prove’ or a ‘show’ question – quote the end result
- Don’t fudge your answers (particularly if the answer is given)!
- Don’t round your answers prematurely
- Make sure you give your final answers to the required/appropriate degree of accuracy
- Check details at the end of every question (e.g. particular form, exact answer)
- Take note of the part marks given in the question
- If your solution is becoming very lengthy, check the original details given in the question
- If the question says “hence” make sure you use the previous parts in your answer
- Don’t write in pencil (except for diagrams) or red ink
- Write legibly!
- Keep going through the paper – go back over questions at the end if time

At the end of the examination

- If you have used supplementary paper, fill in all the boxes at the top of every page

C1 KEY POINTS

C1 Algebra and functions

Surds (i) $\sqrt{xy} = \sqrt{x} \times \sqrt{y}$ (ii) $\sqrt{\dfrac{x}{y}} = \dfrac{\sqrt{x}}{\sqrt{y}}$ (iii) $a\sqrt{x} \pm b\sqrt{x} = (a \pm b)\sqrt{x}$

N.B. In general $\sqrt{x \pm y} \neq \sqrt{x} \pm \sqrt{y}$

Rationalising Given $\dfrac{1}{\sqrt{a}}$, multiply by $\dfrac{\sqrt{a}}{\sqrt{a}}$. Given $\dfrac{1}{a \pm \sqrt{b}}$, multiply by $\dfrac{a \mp \sqrt{b}}{a \mp \sqrt{b}}$

Indices 1. $a^m \times a^n = a^{m+n}$ 2. $\dfrac{a^m}{a^n} = a^{m-n}$ 3. $(a^m)^n = a^{mn}$ 4. $a^0 = 1$

5. $a^{-n} = \dfrac{1}{a^n}$ 6. $a^{\frac{1}{n}} = \sqrt[n]{a}$ 7. $a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$

Quadratic functions If $f(x) = ax^2 + bx + c$, the discriminant is $b^2 - 4ac$
For $f(x) = 0$, $b^2 - 4ac > 0 \Rightarrow$ two real, distinct roots, $b^2 - 4ac = 0 \Rightarrow$ two real, equal roots, $b^2 - 4ac < 0 \Rightarrow$ two unreal roots
Factorising, completing the square, using the formula
If $f(x) = 0$, then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Sketching quadratic functions
(a) To find the point of intersection with the y-axis: put $x = 0$ in $y = f(x)$
(b) To find the points of intersection with the x-axis: solve $f(x) = 0$
(c) To find the maximum/minimum point: use completing the square, symmetry or solve $f'(x) = 0$ [This latter method uses C2 techniques]

Other curves: reciprocal $\left(y = \dfrac{1}{x}\right)$, cubics
Expanding brackets, collecting like tems, factorising
Simultaneous equations (including one linear and one quadratic)
Linear and quadratic inequalities

Transformation	Description
$y = f(x) + a$ $\quad a > 0$	Translation of $y = f(x)$ through $\begin{pmatrix} 0 \\ a \end{pmatrix}$
$y = f(x + a)$ $\quad a > 0$	Translation of $y = f(x)$ through $\begin{pmatrix} -a \\ 0 \end{pmatrix}$
$y = af(x)$ $\quad a > 0$	Stretch of $y = f(x)$ parallel to y-axis with scale factor a
$y = f(ax)$ $\quad a > 0$	Stretch of $y = f(x)$ parallel to x-axis with scale factor $\dfrac{1}{a}$

C1 Coordinate geometry $P(x_1, y_1)$ and $Q(x_2, y_2)$

Gradient of $PQ = \dfrac{y_2 - y_1}{x_2 - x_1}$ Distance $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Equation of a straight line

(i) Given the gradient, m and the vertical intercept $(0, c)$: $y = mx + c$

(ii) Given a point $P(x_1, y_1)$ on the line and the gradient, m: $y - y_1 = m(x - x_1)$

(iii) Given two points $P(x_1, y_1)$ and $Q(x_2, y_2)$ on the line: $\dfrac{y - y_1}{y_2 - y_1} = \dfrac{x - x_1}{x_2 - x_1}$

Mid-point of PQ $M\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

Gradient of line l_1 is m_1, gradient of line l_2 is m_2

If line l_1 is parallel to line l_2, then $m_1 = m_2$

If line l_1 is perpendicular to line l_2, then $m_1 \times m_2 = -1$

C1 Sequences and Series

Sigma notation, e.g. $\sum_{r=1}^{4} (2r + 5) = 7 + 9 + 11 + 13$

$u_{n+1} = 3u_n + 5$, $n \geq 1$, $u_1 = -2$ The first 5 terms of this sequence are $-2, -1, 2, 11$ and 38

An arithmetic series is a series in which each term is obtained from the previous term by adding a constant called the common difference, d

nth term $= a + (n - 1)d$

$S_n = \dfrac{n}{2}[2a + (n - 1)d]$ or $S_n = \dfrac{n}{2}[a + l]$ where last term $l = a + (n - 1)d$

Sum of the first n natural numbers: $1 + 2 + 3 + 4 + \ldots + n$: $S_n = \dfrac{n}{2}(n + 1)$

C1 Differentiation

Notation: If $y = \mathrm{f}(x)$ then $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \mathrm{f}'(x)$ and $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2} = \mathrm{f}''(x)$

y	$\dfrac{\mathrm{d}y}{\mathrm{d}x}$
ax^n	anx^{n-1} (a is constant)
$\mathrm{f}(x) \pm \mathrm{g}(x)$	$\mathrm{f}'(x) \pm \mathrm{g}'(x)$

Equation of tangents and normals: Use the following facts:

(a) Gradient of a tangent to a curve $= \dfrac{\mathrm{d}y}{\mathrm{d}x}$

(b) The normal to a curve at a particular point is perpendicular to the tangent at that point

(c) If two perpendicular lines have gradients m_1 and m_2 then $m_1 \times m_2 = -1$

(d) The equation of a line through (x_1, y_1) with gradient m is $y - y_1 = m(x - x_1)$

C1 Integration

$\int ax^n \,\mathrm{d}x = \dfrac{ax^{n+1}}{n+1} + c$ provided $n \neq -1$ $\int (\mathrm{f}'(x) + \mathrm{g}'(x))\,\mathrm{d}x = \mathrm{f}(x) + \mathrm{g}(x) + c$