mocks

real exam as having once being caught in the mock, you are unlikely to make the same mistake in the Leaving Cert . Get your teacher to go through the paper and explain the marking scheme.

Make sure that you have received all the marks you are entitled to. It is often very surprising how easy it is to get attempt marks . Discuss the result with your teacher. Do not decide to switch from Higher to Ordinary level just on the result of your mock exam.

It is my experience that most students tend to increase their mock result by 10-15 per cent in the Leaving Cert. I came across a situation in a particular school where there were 10 students doing Higher maths in the mock. Their results varied from 35 to 58 per cent. Three of the students who got the higher results gave up higher maths and went to ordinary maths. It is interesting to note that all the students who stayed with the higher maths got more points (for maths) in the Leaving Cert than those who had switched to pass.

My advice is that if you get 35 per cent or more in your mock exam, then you that you are likely to get at least a C in the Leaving Cert.

2007 Question 2 – Higher Level Paper 1 Solution

(a) Solve $x+y+z=2$ (1) Eliminate z using (2) – (1)
$2x+y+z=3$ (2) and (3) – 2(2)
$x-2y+2z=15$ (3)

(2) – (1): $x=1$

$4x+2y+2z=6$ (2)×2

(2) × 2 – (3): $x-2y+2z=15$ (3)

$3x+4y=-9$

But $x=1 \Rightarrow 3(1)+4y=-9 \Rightarrow 4y=-12 \Rightarrow y=-3$

Now find z: $x+y+z=2 \Rightarrow 1+-3+z=2 \Rightarrow z=4$

Solution: $x=1,\ y=-3,\ z=4$ **(10 marks)**

(b) Given $x^2-4x+6=0$ has roots $\alpha,\beta \Rightarrow \alpha+\beta=4,\ \alpha\beta=6$

(i) $\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\beta+\alpha}{\alpha\beta}=\frac{4}{6}=\frac{2}{3}$ $\left(\alpha+\beta=\frac{-b}{a},\ \alpha\beta=c/a\right)$ **(10 marks)**

(ii) The new equation is $ax^2+bx+c=0 \Rightarrow x^2+\frac{b}{a}x+\frac{c}{a}=0$

$\therefore \frac{1}{\alpha}+\frac{1}{\beta}=(\text{new})-\frac{b}{a}$ and $\frac{1}{\alpha}\cdot\frac{1}{\beta}=\left(\text{new } \frac{c}{a}\right)$

$\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\frac{2}{3}=-\frac{b}{a},\quad \frac{1}{\alpha\beta}=\frac{c}{a}=\frac{1}{6}$

$\therefore$ new equation is $x^2-\frac{2x}{3}+\frac{1}{6}=0 \Rightarrow 6x^2-4x+1=0$ **(10 marks)**

(c) (i) $x+\frac{9}{x+2}\geq 4$. Given $x+2>0$, there is no problem multiplying both sides by $x+2$

$\Rightarrow x(x+2)+9\geq 4(x+2) \Rightarrow x^2+2x+9\geq 4x+8$

$\Rightarrow x^2-2x+1\geq 0 \Rightarrow (x-1)^2\geq 0$. True. Perfect squares are always ≥ 0

$\Rightarrow x+\frac{9}{x+2}\geq 4$ (This type of question has been asked many times) **(10 marks)**

(ii) $x+\frac{9}{x+a}\geq 6-a$. Again $x+a>0$ so multiply both sides by $(x+a)$

$x(x+a)+9\geq(6-a)(x+a)$

$x^2+ax+9\geq 6x+6a-ax-a^2$ (K)

$x^2+2ax-6x+9-6a+a^2\geq 0$ (tidy this up)

$x^2+x(2a-6)+(a-3)^2\geq 0 \Rightarrow (x+(a-3))^2\geq 0$

Again a perfect square ≥ 0

Many students did not spot that K was a perfect square so some showed that

$b^2-4ac=0$ (an equation with equal roots is a perfect square)

$(2a-b)^2-4(9-6a+a^2) \Rightarrow 4a^2-24a+36-36+24a-4a^2=0$

$\therefore$ K is a perfect square $\Rightarrow x+\frac{9}{x+a}\geq 6-a$ **(10 marks)**

Comment: *Lovely question although in part (c) many students multiplied both sides by (x + 2)² or (x + a)². Parts (a) and (b) were particularly easy.*

2007 Question 4 – Higher Level Paper 2 Solution

(a) $(\cos A+\sin A)^2=\cos^2 A+\sin^2 A+2\sin A\cos A$

From page 9, $\cos^2 A+\sin^2 A=1$ and $2\sin A\cos A=\sin 2A$

$\therefore (\cos A+\sin A)^2=1+\sin 2A$ **(10 marks)**

(b) $6\cos^2 x+\sin x-5=0$ replace $\cos^2 x$ by $1-\sin^2 x$

(must change into a quadratic equation in one step)

$6(1-\sin^2 x)+\sin x-5=0 \Rightarrow 6-6\sin^2 x+\sin x-5=0$

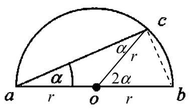
$\Rightarrow -6\sin^2 x+\sin x+1=0 \Rightarrow 6\sin^2 x-\sin x-1=0$

$\Rightarrow (3\sin x+1)(2\sin x-1)=0 \Rightarrow \sin x=-\frac{1}{3}$ and $\sin x=\frac{1}{2}$

$\rightarrow x=199^\circ,\ x=341^\circ \quad x=30^\circ,\ x=150^\circ$ **(20 marks)**

(c) (i) (a) $\angle acb=90^\circ$ (angle in a semicircle is 90°)

(b) $\frac{|ac|}{2r}=\cos\alpha \Rightarrow |ac|=2r\cos\alpha$



(10 marks)

(ii) If ac bisects the area. Total area is $\frac{1}{2}\pi r^2 \therefore \frac{1}{2}$ total area is $\frac{\pi r^2}{4}$

The area of the triangle aoc using $\frac{1}{2}ab\sin c$ is $\frac{1}{2}r\cdot r\sin(180-2\alpha)$

The area of the sector cob is $\frac{1}{2}r^2 2\alpha$ $\left(\frac{1}{2}r^2\theta=\text{area of sector}\right)$

$\therefore \frac{1}{2}r^2\sin(180-2\alpha)+\frac{1}{2}r^2 2\alpha=\frac{\pi r^2}{4}$

Divide by $\frac{1}{2}r^2$ and note $\sin(180-2\alpha)=\sin 2\alpha$

to get $\sin 2\alpha+2\alpha=\frac{\pi}{2}$ **(10 marks)**

Comment: *Parts (a), (b) very nice. Part (c) was easy if you did it the right way. All the information was in the tables.*

The A1 student

Cornelia Carey attended Dominican College, Galway

A lot of work is involved in the Leaving, but don't over do it, because that totally inhibits performance. You get more stressed, tired and you really need your brain on form when you get to the exam, especially with something like maths. You need to be able to use your own logic when you're in there.

I'm always nervous before an exam and I tend to examine every part of it to find out if I made any mistakes, even if it's only one point. There was one question in paper one that was meant to be a definite, but I'm always into having a safety. Have a backup because you never know if something is going to go wrong on the day.

Knowing the paper is important. But some people put as much effort into figuring out patterns in the paper as they do studying. I wouldn't say you should rely on them too much. If your teacher gives you something, go with that, but don't do it yourself. Go back on the papers, but make sure you know the stuff in the book first.

One thing that our teacher did that was great was to give us past mock papers, which was very useful.

I had a study routine for everything. I didn't do anything specific for a particular subject. But I think, if you can keep in contact with it regularly, that's essential. Maths is one of those things where if you don't do it often, you'll lose it a little, so you really have to keep up with it.

I studied in different ways through the year. In the first half, if there was a question that I was stuck on or wasn't sure of, I'd go over it until I knew it. But in the second, I'd be concentrating more on timing. But that first method was so important. You really need to get the understanding of the questions most of all. Towards the end I found it handy to do a whole paper to see if I could bring it in under the time limit, but I wouldn't be worrying about that at this stage of the year. If you have that kind of time near the end that can be great.

I was really relying on maths, so even though I was fairly happy with the result in my mocks (and we'd been told it would increase in the exam) I felt I had to keep working to bring it up as high as possible. So every question I found that was weak I'd go over.

Ordinary Level Maths – formulae needed for paper two

Question 1 – Volume and areas

(a) There is always a question on Area Formulae needed.
(i) Area of a square $A=x^2$.
(ii) Area of a rectangle (and the length of the perimeter) $A=lxb....P=2l+2b$
(iii) Area of a triangle $A=\frac{1}{2}b.\perp h$
(iv) Area of a Circle πr^2
(v) Circumference of a circle $2\pi r$

(b) Simpson's Rule – the formula needed is $\frac{h}{3}\{F+L+2(odds)+4(evens)\}$

This formula is in the tables on page 42 right at the bottom of the page, but you may have trouble interpreting it, so it is probably better to stick to the one above. There are five marks for writing down the formula, 10 marks for filling it in, and five marks for working it out.

(c) Surface area of a Cone, πrl.
Volume of a cone $\frac{1}{3}\pi r^2 h$
Volume of a cylinder, $\pi r^2 h$
Volume of a sphere, and $\frac{4}{3}\pi r^3$
Volume of a hemisphere $\frac{2}{3}\pi r^3$

All formulae needed are in the tables on pages seven and eight, except for the hemisphere (just divide the formula for a sphere by two). In the marking scheme, all formulae are worth the attempt mark, usually 3 marks. Filling them in is worth another 4 marks.

Question 2 – Coordinate geometry of the line

None of the formulae for this question are in the tables, they must all be learned off by heart. The formulae required are as follows:

Given $a=(x_1,y_1), b=(x_2,y_2)$

(i) $|ab|=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ Distance formula

(ii) $\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}$ Mid point of [ab] formula

(iii) $\frac{y_2-y_1}{x_2-x_1}=m$ Slope of [ab] formula

(iv) $y-y_1=m(x-x_1)$ Equation of line ab

(v) $A=\frac{1}{2}|x_1y_2-y_1x_2|$ Area of the Triangle oab o = (0,0)

(vi) The slope of the line $ax+by+c=0$ is $\frac{-a}{b}$

The marking scheme works as follows:
(i) Any correct relevant formula written down is worth three marks, correctly filling in the formula is worth another four marks, and working out the information is worth another three marks.
So (i) always write out the formula, (ii) fill in the formula, (iii) then tidy it up.

Question 3 - Coordinate geometry of the circle

Formulae required for the question are:

(i) $x^2+y^2=R^2$ The equation of a circle centre (0,0) radius R

(ii) $(x-a)^2+(y-b)^2=R^2$ The equation of a circle centre (a, b) radius R

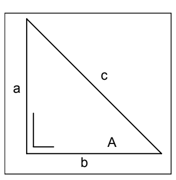
(iii) $xx_1+yy_1=R^2$ The equation of the tangent at (x_1,y_1) on the circle $x^2+y^2=R^2$ This is not usually shown to Ordinary level students but it can be useful. Again, writing out each formula is worth three marks, filling it in four marks, and the tidy up is worth three marks.
None of the above are in the tables.

Question 4 – Geometry

There are no Formulae. Learn your theorems if you have nothing better to do.

Question 5 – Trigonometry.

The formulae needed for part (a) are:

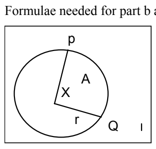


$SinA=\frac{a}{c}, CosA=\frac{b}{c}, TanA=\frac{a}{b}$

$a^2+b^2=c^2$

None of the above are in the tables and must be learned off by heart.

Formulae needed for part b are:



$|PQ|=\frac{X}{360}.2\pi r$ Length of arc PQ

$A=\frac{X}{360}\pi r^2$ Area of sector A

The formulae for the length of an arc and the area of a sector are on Page 8 of the tables but are in a slightly different format

The length of an arc is given as $r\theta$. The area of a sector is $\frac{1}{2}r^2\theta$ where θ is the angle at the centre written in radians. To change angles from degrees to radians divide by 360 and multiply by π. (It is better using the formulae in the box above.)

The formulae needed in part c are:

Area of a triangle $\frac{1}{2}abSinC$, Sine Rule $\frac{a}{SinA}=\frac{b}{SinB}=\frac{c}{SinC}$

Cosine Rule $a^2=b^2+c^2-2bcCosA$.

The marking scheme works as follows:
Any of the above formulae filled in correctly is worth seven marks, the same rules as for coordinate geometry.

Question 6 – Permutations, combinations and probability

(i) Permutations (arrangements) need n! (factorial n) for all at a time.

Need ${}^nP_r$ for arrangements some at a time

(ii) Combinations (selections, choose) need ${}^nc_r=\binom{n}{r}$

All of the above can be found on your calculator.

(iii) Probability
You need to know the following rule:

The probability that you will get the answer you want to a particular question is:

Number of right answers / Total number of answers	Probability of A and B = P (A) x P (B) Probability of A or B = P (A) + P (B)

The marking scheme is as follows. They will accept correct answers with no work shown.
They will accept answers in the form $n!, {}^np_r, {}^nc_r$ but to get full marks you will have to work them out.
For Probability it is very important to tell the examiner what you are doing ie

Tell them the number of "right answers" (four marks)
Tell them "the total number of answers" (three marks)
Then write as a fraction (three marks).
Note, there are no formulae for this section section in the tables.

Question 7 – Statistics
The formulae needed in this question are:

(i) The Formula for the mean $\bar{x}$ of a frequency distribution

The mean $\bar{x}=\frac{\Sigma fx}{\Sigma f}$

Multiply each number by it's frequency, add up the results and divide your answer by the sum of the frequencies.

The standard Deviation $\partial=\sqrt{\frac{\sum f(x)^2}{\sum f}-(\bar{x})^2}$

This is the square root of the mean of the squares minus the mean squared. This is not the usual definition of the Standard deviation but it avoids the box. The formulae are on page 34 of the tables but you may not recognise them.

Marking scheme
They will give full marks for answers which are found using the calculator where no work is shown; it might be worthwhile becoming familiar with the following keys on your calculator.

$\bar{x}, \partial, \partial_x, STO, RCL, M+$

(i) $\vec{ab}=\vec{b}-\vec{a}$

(ii) $\vec{p}=\frac{s\vec{a}+r\vec{b}}{r+s}$

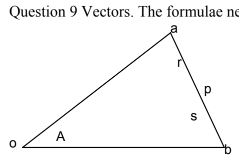
(iii) $\vec{a}.\vec{b}=|a||b|CosA$

(iv) If
$\vec{a}=p\vec{i}+q\vec{j}, \vec{b}=c\vec{i}+d\vec{j}$
$\vec{a}.\vec{b}=pc+qd$

(v) $CosA=\frac{\vec{a}.\vec{b}}{|\vec{a}||\vec{b}|}$

Question 8 – Further geometry
No Formulae needed

Question 9 Vectors. The formulae needed



(i) $\vec{ab}=\vec{b}-\vec{a}$

(ii) $\vec{p}=\frac{s\vec{a}+r\vec{b}}{r+s}$

(iii) $\vec{a}.\vec{b}=|a||b|CosA$

(iv) If
$\vec{a}=p\vec{i}+q\vec{j}, \vec{b}=c\vec{i}+d\vec{j}$
$\vec{a}.\vec{b}=pc+qd$

(v) $CosA=\frac{\vec{a}.\vec{b}}{|\vec{a}||\vec{b}|}$

None of the above formulae are in the tables they must be learned off by heart.

Question 10 – Binomial theorem and further series
Formulas needed:
(i) Binomial expansion of $(1+x)^n={}^nc_0+{}^nc_1x+{}^nc_2x^2+{}^nc_3x^3+{}^nc_4x^4+{}^nc_5x^5+{}^nc_6x^6$

(ii) S_α of a GP where $a=T_1, r=\frac{T_2}{T_1}, S_\alpha=\frac{a}{1-r}$

(iii) The formula for the sum of the first n terms of a GP $Sn=\frac{a(r^n-1)}{r-1}$

None of the above formulae are in the tables. They must be learned off by heart.

Question 11 – Linear Programming.
No formulae to learn.