

## John Brennan's Leaving Cert Ordinary Maths Paper 2

### The formulae Paper

The following is a list of Formulae that are required to answer questions on the leaving cert Ordinary level maths Paper 2

#### **Question 1 Volume and Areas**

(a) 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)  $A = lxb \dots P = 2l + 2b$

(iii) Area of a triangle  $A = \frac{1}{2}b \cdot \perp h$

(iv) Area of a Circle  $\pi r^2$

(v) Circumference of a circle  $2\pi r$

(b) **Simpsons 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 better to stick to the one above. There are 5 marks for writing down the formula, 10 marks for filling it in, 5 marks for working it out.

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(vi) Surface area of a Cone,  $\pi r l$ . 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 7 and 8** except for the Hemisphere (just divide the formula for a sphere by 2). 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 Formula for this question are in the tables they must all be learned off by heart.** The Formula required are as follows

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

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

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

(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 like this (i) Any correct relevant formula written down is worth 3 marks, correctly filling in the formula is worth another 4 marks, working out the information worth another 3 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

(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  $x^2 + y^2 = R^2$  not usually shown to Ordinary level students but can be useful!

Again writing out each formula is worth 3 marks, filling it in 4 marks, tidy up 3 marks.

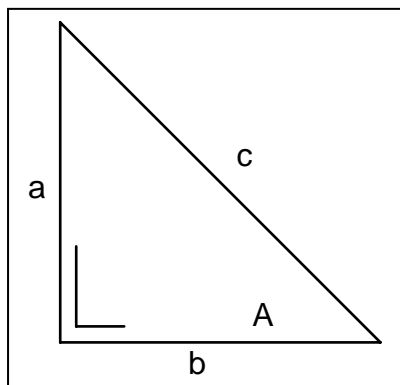
None of the above are in the tables .

### Question 4. Geometry

No Formulae. Learn your theorems if you have nothing better to do.

### Question 5 Trigonometry.

**Formulae needed for part (a) are.**

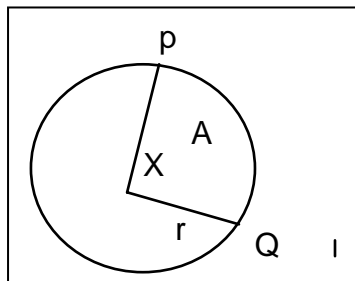


$$\sin A = \frac{a}{c}, \cos A = \frac{b}{c}, \tan A = \frac{a}{b}$$

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

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

**Formulae needed for part b.**



$$|PQ| = \frac{X}{360} \cdot 2\pi r$$

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

Length of arc PQ

Area of sector A.

The formula 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  $r\theta$ . Area of a sector is  $\frac{1}{2}r^2\theta$  where  $\theta$  is the angle at the centre written in radians. To change angles from degrees to radians divide by 360 and multiply by  $\pi$ . (Better of using the formulae in the box above)

Formulae needed in part c.

**Area of a triangle**  $\frac{1}{2}ab\sin C$ , **Sine Rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine Rule**  $a^2 = b^2 + c^2 - 2bc\cos A$ .

The marking scheme works like this any of the above formula filled in correctly is worth 7 marks The same rules as for coordinate geometry.

**Question 6 Permutations Combinations Probability**

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

Need  ${}^n p_r$  for arrangements some at a time

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

All of the above can be found on your calculator.

(iii) Probability Need to know the rule

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

Is

$$\frac{\text{Number of right answers}}{\text{Total number of answers}}$$

Probability of A and B =  $P(A) \times P(B)$

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  $n!, {}^n P_r, {}^n C_r$  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” (4 marks)

Tell them “the total number of answers”(3 marks)

Then write as a fraction. (3 marks)

**Note no formulae for this 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  $\bar{x} = \frac{\sum fx}{\sum f}$  (multiply each number by its frequency add up the results

divide your answer by the sum of the frequencies).

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

$\bar{x}, \sigma, \sigma_x, STO, RCL, M +$

### Question 8 Further Geometry.

No Formulae needed

### Question 9 Vectors. The formulae needed

$$(i) \vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{a}$$

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

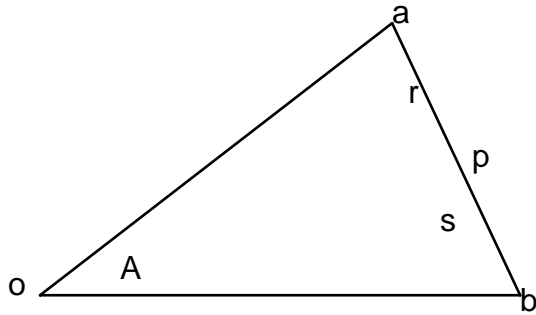
$$(iii) \vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos A$$

(iv) If

$$\vec{a} = p\vec{i} + q\vec{j}, \vec{b} = c\vec{i} + d\vec{j}$$

$$\vec{a} \cdot \vec{b} = pc + qd$$

$$(v) \cos A = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|}$$



**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  $(1+x)^n = {}^n C_0 + {}^n C_1 x + {}^n C_2 x^2 + {}^n C_3 x^3 + {}^n C_4 x^4 + {}^n C_5 x^5 + {}^n C_6 x^6$

(ii)  $S_n$  of a GP where  $a = T_1, r = \frac{T_2}{T_1}, S_n = \frac{a(1-r^{n+1})}{1-r}$

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

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

**Question 11 Linear Programming.**No formulae to learn.