



Maths Points

Junior and Leaving Cert

LCOL BASIC SKILLS PACK 4

LEAVING CERT ORDINARY LEVEL



Topic, Year and Level

- 1 ► Algebra : 2011 Paper 1 – Q3 (c)
- 2 ► Differentiation : 2003 Paper 1 – Q8 (c)
- 3 ► Sequences and Series (Patterns) : 2011 Paper 1 – Q5 (b)
- 4 ► Coordinate Geometry : 2010 Paper 2 – Q3 (a)
- 5 ► Statistics: 2015 LCOL Strand 1 Supplementary Paper – Q1 (a)



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Solve for x

$$\frac{x-1}{x} + \frac{x}{x+1} = \frac{1}{2} \quad x \neq 0, x \neq -1.$$

$$\frac{x-1}{x} + \frac{x}{x+1} = \frac{1}{2}$$

$$\frac{2(x+1)(x-1) + 2(x)(x)}{2x(x+1)} = \frac{1(x)(x+1)}{2}$$

$$2(x^2 - 1) + 2x^2 = x^2 + x$$

$$2x^2 - 2 + 2x^2 = x^2 + x$$

$$3x^2 - x - 2 = 0$$

$$(3x + 2)(x - 1) = 0$$

$$3x + 2 = 0$$

$$3x = -2$$

$$x = -\frac{2}{3}$$

$$x - 1 = 0$$

$$x = 1$$

Note:

Numerator – top of fraction

Denominator – bottom of fraction

The common denominator is the product of the denominators of each term. Multiply each numerator by the denominators of the other terms. We can remove the denominator because there is an equals on top.

Solve the quadratic equation by factorising or the $-b$ formula.

Let $f(x) = x^3 + 2x^2 - 1$.

L is the tangent to the curve $y = f(x)$ at $x = \frac{-2}{3}$.

Find the slope of L

$$f(x) = x^3 + 2x^2 - 1$$

$$f'(x) = 3x^2 + 4x$$

← Slope

$$f'\left(\frac{-2}{3}\right)$$

$$= 3\left(\frac{-2}{3}\right)^2 + 4\left(\frac{-2}{3}\right)$$

← $x = \frac{-2}{3}$

$$= \frac{4}{3} - \frac{8}{3}$$

$$= -\frac{4}{3}$$

When you differentiate a function, you get the **slope** of that function.

To get a numerical value for the slope we must specify a value for x , in this case $x = \frac{-2}{3}$.

The slope of the tangent to the curve at $x = \frac{-2}{3}$ is $-\frac{4}{3}$.

The first three terms of an arithmetic series are $7 + 4 + 1 + \dots$.
Find S_{15} , the sum of the first fifteen term of the series.

The formula for the **Sum of an Arithmetic Series** is on **page 22** of the Maths Formulae Book.

Sum of an Arithmetic Series

$$S_n = \frac{n}{2}(2a + (n - 1)d)$$

$$a = 7$$

$$d = -3$$

$$S_n = \frac{n}{2}(2a + (n - 1)d)$$

$$S_{15} = \frac{15}{2}(2(7) + (15 - 1)(-3))$$

$$S_{15} = 7.5(14 + 14(-3))$$

$$S_{15} = 7.5(14 - 42)$$

$$S_{15} = 7.5(-28)$$

$$S_{15} = -210$$

The sum of the first fifteen term of the series is -210 .

A circle with centre $(0, 0)$ passes through the point $(5, -12)$.

- (i) Find the radius of the circle.
 (ii) Write down the equation of the circle.

(i)

Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$(0, 0)$	$(5, -12)$
(x_1, y_1)	(x_2, y_2)

$$r = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$r = \sqrt{(5 - 0)^2 + (-12 - 0)^2}$$

$$r = \sqrt{(5)^2 + (-12)^2}$$

$$r = \sqrt{25 + 144}$$

$$r = \sqrt{169}$$

$$r = 13$$

The Equation of a Circle formula is on page 19 of the Maths Formulae Book.

(ii)

Standard Equation of a Circle

$$(x - h)^2 + (y - k)^2 = r^2$$

Centre, (h, k) Radius, r

$(h, k) = (0, 0)$
$r = 13$

$$(x - h)^2 + (y - k)^2 = r^2$$

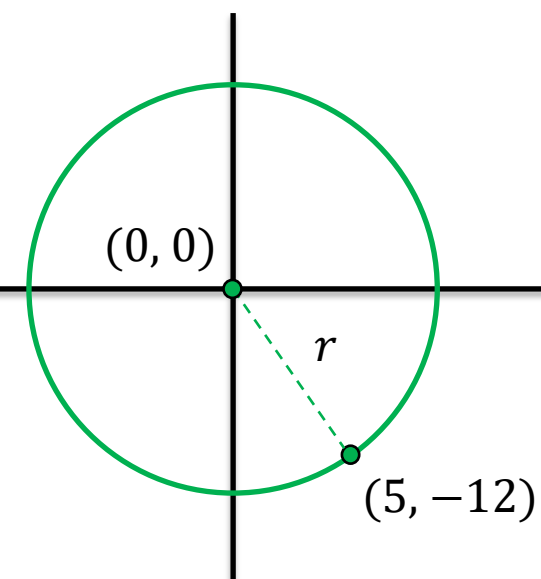
$$(x - 0)^2 + (y - 0)^2 = 13^2$$

$$x^2 + y^2 = 169$$

Alternately

Equation of a Circle with centre $(0, 0)$ and radius, r .

$$x^2 + y^2 = r^2$$



$$x^2 + y^2 = r^2$$

$$x^2 + y^2 = 13^2$$

$$x^2 + y^2 = 169$$

A survey is being conducted of voters' opinions on several different issues. What is the overall margin of error of the survey, at 95% confidence, if it is based on a simple random sample of 1111 voters?

Margin of Error

$$E = \frac{1}{\sqrt{n}}$$

where n is the sample size.

$$n = 1111$$

$$E = \frac{1}{\sqrt{n}}$$

$$E = \frac{1}{\sqrt{1111}}$$

$$E \approx 0.03$$

$$E \approx 3\%$$



Continued

A political party had claimed that it has the support of 24% of the electorate. Of the voters in the sample above, 243 stated that they support the party. Is this sufficient evidence to reject the party's claim, at the 5% level of significance?

Null Hypothesis:

$H_0: p = 0.24$, the percentage of people who support the political party is 24%.

Alternate Hypothesis:

$H_1: p \neq 0.24$, the percentage of people who support the political party is **NOT** 24%.

Sample Proportion

$$\hat{p} = \frac{243}{1111}$$

$$\hat{p} = 0.2187$$

$$\hat{p} - \frac{1}{\sqrt{n}} < p < \hat{p} + \frac{1}{\sqrt{n}}$$

$$0.2187 - 0.03 < p < 0.2187 + 0.03$$

$$0.1887 < p < 0.2487$$

Margin of Error

$$E = 0.03$$

Confidence Interval

$$\hat{p} \pm \frac{1}{\sqrt{n}}$$

We are 95% confident that between 18.87% and 24.87% of the electorate support the political party.

As 24% lies within this confidence interval there is insufficient evidence to reject the party's claim.





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