Coláiste
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LEAVING CERTIFICATE FOUNDATION LEVEL SUMMARY NOTES

Contents

Topic 1: Arithmetic

1) The Basics:

a) Converting Units:

Steps:

1. Write the conversion with the unit you want on the right.
2. Get a 1 on the left-hand side, by dividing both sides.
3. Multiply both sides to get the value you want.

Example: If 1 inch = 2.54 cm, how many inches in 40cm?

Step 1: Put inches on the right

2.54cm = 1 inch

Step 2: Get a 1 on the left-hand side

1cm = $\frac{1}{2.54}$ inches (dividing both sides by 2.54)

Step 3: Multiply both sides

40cm = $\frac{1}{2.54} \times 40$ = 15.75 inches

b) Types of Numbers:

- **Natural (N)**: Positive Whole Numbers: e.g. 1, 2, 3, ...
- **Integers (Z)**: Positive and Negative Whole Numbers: e.g. -3, -2, -1, 0, 1, 2, 3,.....
- **Real (R):** All numbers: e.g.s -3, -1.4, 0.2, 6, 7/2, $\sqrt{8}$ .....
- **Rational (Q):** Numbers that **can** be written in the form $\frac{a}{b}$ e.g.s -5, 3, 1/2, -9/4.....
- **Irrational:** Numbers that **cannot** be written in the form $\frac{a}{b}$ e.g.s $\sqrt{3}$, $\sqrt{2}$, π .....
- **Prime:** A natural number bigger than 1 with only itself and 1 as divisors. e.g.s 2, 3, 5, 7, 11, 13, 17.....
- **Composite:** A number that is not prime. e.g.s., 6, 9, 15, 20

c) Rounding:

Rounding to Decimal Places:

- To round to 2 decimal places, we look at the 3rd number after the decimal point.
  - If it's 5 or more we round UP the 2nd number
  - If it's 4 or less we round DOWN the 2nd number
- Similar approach for rounding to other decimal places

Examples: i) 4.768 = 4.77 ii) 3.2745 = 3.27

Rounding to Significant Figures:

- To round to 3 significant figures, we look at the 4th significant figure.
  - If it's 5 or more we round UP the 3rd number and replace subsequent numbers with 0s
  - If it's 4 or less we round DOWN the 3rd number and replace subsequent numbers with 0s

Examples: i) 132,421 = 132,000 ii) 0.00472543 = 0.00473

d) Scientific Notation

Notes:

- A number is in scientific notation if it's in the form **a x 10^n**, where 'a' has to be between 1 and 10.
  Examples: i) 3400 = 3.4 x 10^3 ii) 0.004 = 4 x 10^{-3}
- On a Casio calculator the button you will need to type in numbers in scientific notation is:

- To type in 7 x 10^4, press "7" and the button above and then "4"
- To convert numbers into scientific notation on your calculator:
  - Type in the number and press = to enter it on the screen.
  - Press "Shift" + "Mode" and select "Sci" from the menu. Then press "0".

e) Speed, Distance and Time:

Notes:

- For all speed, distance and time calculations remember:

"Dads Silly Triangle"

If you want **Distance**, you cover the D in the triangle, so:

D = S x T (Units are usually m or km)

- If you want **Time**, you cover the T in the triangle, so:

T = D / S (Units are usually secs or hrs)

- If you want **Speed**, you cover the S in the triangle, so:

S = D / T (Units might be m/s or km/h)

- Average speed can be calculated using:

$$\text{Ave Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

Take care with units of time also. Remember 1hr 45mins = 1.75hrs and 90mins = 1.5hours.

i) Ratio

Notes:

- Ratio shows how to break up a quantity proportionally.
- When given a ratio, add the values in the ratio together to get the total number of parts the quantity is being broken into.
- Write down the fraction each person gets.

Example: Divide €200 between Alan and Brian in the ratio 3:2.

3:2 means there are 3 + 2 = 5 parts

=> Alan gets $\frac{3}{5}$ and Brian gets $\frac{2}{5}$

=> Alan gets $\frac{3}{5}$ of €200 = €120

and Brian gets $\frac{2}{5}$ of €200 = €80

j) Foreign Exchange

Steps:

1. Write the conversion with the currency you want on the right.
2. Get a 1 on the left-hand side, by dividing both sides.
3. Multiply both sides to get the value you want.

Example: If €1 = $1.32, how many euro would you get for $200?

Step 1: Put euro on the right

$1.32 = €1

Step 2: Get a 1 on the left-hand side

$1 = € $\frac{1}{1.32}$ (dividing both sides by 1.32)

Step 3: Multiply both sides

$200 = $\frac{1}{1.32} \times 200$ = €151.52

2) Percentages/Profit/Loss/VAT:

a) Percentages:

To find the percentage of a number:

Example: Find 24% of 250.

Method 1: Calculate $\frac{24}{100} x \frac{250}{1} = 60$

Method 2: Multiply 250 by 0.24 = 60

To find the total when given percentage:

Example: 25% of the marks in an exam are going for the practical part. If there are 50 marks for the practical, how many marks is the whole exam worth?

Steps:

1) Let % = value you're given
   25% = 50
2) Find what 1% represents by dividing both sides
   1% = $\frac{50}{25} = 2$
3) Find 100% by multiplying by 100:
   100% = 2 x 100 = 200marks

Note:

In this particular example, we could also have just multiplied 50 by 4, as 25% represents $^1/_4$ of the total marks

b) % Profit / Loss / Discount:

$$\% \text{ Profit or Mark-Up} = \frac{Profit}{Cost\ Price} x\ 100\ \%$$

$$\% \text{ Loss} = \frac{Loss}{Cost\ Price} x\ 100\ \%$$

c) VAT:

VAT excluded:

Example: Bill comes to €120. Find final bill with 13.5% VAT.

VAT = 13.5% of 120
= 120 x 0.0135 = €16.20
=> Final Bill = €120 + €16.20 = €136.20

VAT included:

Example: Bill including VAT comes to €340.50. Find bill without VAT, if VAT is 13.5%.

Bill + VAT = €340.50
=> 113.5% = €340.50
=> 1% = €3
=> 100% = €300

3) Income Tax:

a) Income Tax Terminology:

- **Gross Income:** total pay someone gets before any taxes or deductions are taken
- **Net Income:** Take home pay or pay that we get after all taxes and deductions
- Rate Of Tax: **Standard** Rate (usually about 20%)
- **Gross Tax:** Total tax owing to the government before credits are deducted
- **Tax Credits:** Money deducted from the gross tax
- **Tax Payable:** Tax that you actually pay after credits have been subtracted

b) Answering Questions:

- The questions are nearly always made up of 3 parts:
  - **Part 1:** Calculation of Gross Tax by….
    Tax @ Standard Rate
    e.g. 20% of Gross Income
  - **Part 2:** Calculation of Tax Payable using the equation
    Tax Paid = Gross Tax - Tax Credits
  - **Part 3:** Working out Net Income by taking off all deductions including Tax Paid and any other deductions.

4) Compound Interest:

a) Terminology:

- **Principal:** Amount of money invested or borrowed
- **Interest:** Money added by the bank
- **Rate:** what percentage the interest is added at
- **Amount or Final Value:** The value of money at the end of the term it has been borrowed or invested for.

b) Answering Compound Interest Questions:

Method 1: Used if rates change from year to year or payments/withdrawals are being made between years

- Lay out Year 1, Year 2, Year 3.
- Work out interest each year and add to Principal at start of the year

Method 2: Formula

$$F = P(1+i)^t$$

See Tables pg 30

where **F** is the Amount, **P** is the Principal, **i** is the Rate of Interest as a **decimal** (e.g. 3% = 0.03) and **t** is the time in years the money is invested/borrowed for.

5) Household Bills:

Notes:

- With utility bills (e.g.s. gas, electricity, water) there is usually a unit rate i.e. a charge per unit used
- To calculate the units used, subtract the previous units reading from the current units reading
- With many bills there is also a standing charge that has to be added on.
- VAT is also added to the bills.
- With Gas Bills, there is also a Carbon Tax that needs to be added on.

Example: Calculate the cost of electricity if the previous meter reading was 21310 and the current reading is 21836, with a standing charge of €21.60. The cost per unit is €0.15 and VAT of 13.5% is added on.

Units used = Current Reading - Previous Reading
= 21836 – 21310 = 526 units
Cost for electricity = 526 x €0.15 = €78.90
Standing Charge = €21.60
=> Total Before VAT = €78.90 + €21.60 = €100.50
VAT = 13.5% of €100.50 = €13.57
=> Final Bill = €100.50 + €13.57 = €114.07

Topic 2: Patterns/Sequences

1) Linear Sequences/Patterns:

a) Linear Sequences:

- A list of numbers where the **difference** between **each term** is the **same** every time.
  E.g. 3, 8, 13, 18, ……
- The **general term of a sequence** (T_n) is a formula that can be used to find the value of any term of the sequence.
- We can also find it by observing the sequence and figuring out the pattern.

Example: Find the general term for the sequence 3, 8, 13, 18…….

Common Difference = +5

Term Number	Pattern	Term Value
1	5(1)-2	3
2	5(2)-2	8
3	5(3)-2	13
4	5(4)-2	18
n	5(n)-2	5n-2

=> General Term: $T_n = 5n - 2$

- Once we have the General Term, we can find ANY term in the sequence.
  E.g. What is 50th term?
  $T_{50} = 5(50) - 2$
  $= 248$
- The general term also allows us to work back and find what term number a value would be.
  E.g. What term would 458 be?
  $T_n = 458$
  $5n - 2 = 458$
  $5n = 458 + 2$
  $5n = 460$
  $n = 92$ => 92nd term

Topic 3: Algebra

1) The Basics:

a) Adding / Subtracting Algebraic Expressions:

Notes:

- We can only add / subtract 'like terms'.
- 'Like terms' are terms that have the same letter part or the same variables
  e.g. 5d and -2d are 'like terms' but 5d and $5d^2$ are NOT 'like terms'

Example 1:

$4a + 5 + 2a - 3$
$= 6a + 2$

Example 2:

$3x^2y - 4y^2 - x^2y - 3y + 2y^2$
$= 2x^2y - 2y^2 - 3y$

b) Multiplying Expressions:

Notes:

- when multiplying we follow the order Signs, Numbers, Letters
- When multiplying the letters together we must remember the first law of indices…..$a^m \times a^n = a^{m+n}$ i.e. Add the Powers

Example 1: Multiplying Terms

$4a^2 \times 2a^5$ (Multiply signs…(+).(+) = +)
$= 8a^7$ (Multiply Numbers & Add Powers)

Example 2: Removing Brackets

$2(g + 4)$
$= 2g + 8$

Example 3: Removing Brackets

$(2x - 3)(x + 2)$ ("Split and Repeat")
$= 2x(x + 2) - 3(x + 2)$
$= 2x^2 + 4x - 3x - 6$
$= 2x^2 + x - 6$

2) Solving Equations:

a) Solving Linear Equations: (x only)

Steps:

1. Remove all brackets and any fractions
2. Bring all terms with an 'x' to one side and numbers to the other side
3. Tidy up both sides by putting together 'like terms'.
4. Solve the simple equation remaining.

Example: $2(x-3) = 4(x+1)$

$2x - 6 = 4x + 4$
$2x - 4x = 4 + 6$
$-2x = 10$
$x = \frac{10}{-2}$
=> $x = -5$

3) Simultaneous Equations:

a) Two Linear Equations:

Steps:

1. Choose a variable to eliminate e.g. 'y'
2. Multiply one or both equations to make no. in front of y the same
3. Multiply the 2nd equation by -1, if necessary, to make signs in front of 'y' different.
4. Add the two equations to eliminate 'y' and solve for 'x'.
5. Put x back into one of the equations to find y.

Example: Solve the equations below:

A: $2x - 3y = 7$

B: $3x + 2y = 4$

$Ax2$: $4x - 6y = 14$ (mult by 2 to get 6 in front of y)

$Bx3$: $9x + 6y = 12$ (mult by 3 to get 6 in front of y)

$13x = 26$ (adding both equations together)

$\Rightarrow x = \frac{26}{13}$ (dividing both sides by 13)

$\Rightarrow x = 2$

Putting x into A:

A: $2x - 3y = 7$

$\Rightarrow 2(2) - 3y = 7$

$\Rightarrow 4 - 3y = 7$

$\Rightarrow -3y = 7 - 4$

$\Rightarrow -3y = 3$

$\Rightarrow y = \frac{3}{-3}$ (dividing both sides by -3)

$\Rightarrow y = -1$

4) Inequalities:

Solving Inequalities:

Notes:

- Need to know the types of numbers (See Arithmetic 1b)
- Same rules as solving linear equations (See Algebra 4a)
- One difference: if you have to multiply/divide both sides of an inequality by a **NEGATIVE** number, we must **CHANGE THE DIRECTION** of the inequality.

Example 1: Graph the solution to $3 - 4x < 11$, $x \in Z$.

$3 - 4x < 11$

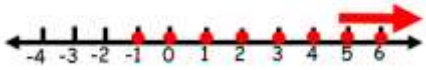
$-4x < 11 - 3$

$-4x < 8$

$\frac{-4x}{-4} < \frac{8}{-4}$ (dividing both sides by -4)

$x > -2$ (Note sign change because divided by -4)

For the number line, we're looking for all the Integers that are greater than -2.



Example 2: Graph the solution to $3(x - 2) \leq -3$, $x \in R$.

$3(x - 2) \leq -3$

$3x - 6 \leq -3$

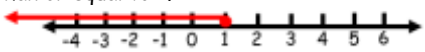
$3x \leq -3 + 6$ (adding 6 to both sides)

$3x \leq 3$

$\frac{3x}{3} \leq \frac{3}{3}$ (dividing both sides by 3)

$\Rightarrow x \leq 1$

For the number line, we're looking for all the Real numbers that are smaller than or equal to 1.



5) Indices and Surds:

a) The Laws of Indices:

$a^{\frac{1}{2}} = \sqrt{a}$ $\quad e.g.\ 9^{\frac{1}{2}} = \sqrt{9} = 3$

b) Surds:

Notes:

- A **surd** is a number in the form $\sqrt{\ }$ that **can't be written** as a **rational** number i.e. in the form $\frac{a}{b}$
  E.g. $\sqrt{2}$ and $\sqrt{3}$ are both surds but $\sqrt{9}$ is not as it can be written as $\frac{3}{1}$

Topic 4: Functions/Graphs

1) The Basics:

a) Terminology:

- **Domain** = the values that are put **into** a function.
- **Range** = the values that come **out** of a function.

b) Notation:

The different ways functions are written are:

- $f(x) = x^2 + 3x$
- $f: x \to x^2 + 3x$
- $y = x^2 + 3x$

c) Evaluating Functions:

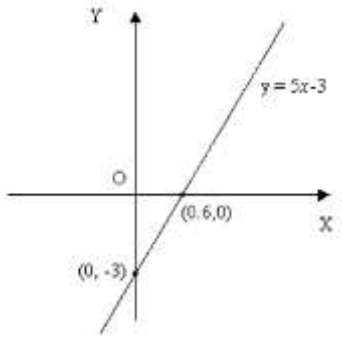
Example: If $f(x) = 2x^2 + 3$, find f(3) and f(-1).

$f(3) = 2(3)^2 + 3 = 21$

$f(-1) = 2(-1)^2 + 3 = 5$

2) Types of Graphs:

a) Linear: y = ax + b



a) Drawing Graphs:

- Just fill in the values from the domain and use calculator.

Example: Draw the graph of $3x - 4$, in the domain $-2 \leq x \leq 1$

$f(x) = 3x - 4$

$f(-2) = 3(-2) - 4 = -10$ (-2, -10)

$f(-1) = 3(-1) - 4 = -7$ (-1, -7)

$f(0) = 3(0) - 4 = -4$ (0, -4)

$f(1) = 3(1) - 4 = -1$ (1, -1)

Can plot these on graph paper. Shape should be a straight line

Topic 5: Statistics

1) The Basics:

a) Terminology:

- **Numerical:** data is numbers
  e.g.s shoe size, height, rainfall, number of kids in a family
- **Categorical:** data is text
  e.g.s favourite phone brand, tv programme, hair colour
- **Discrete:** numerical data that can only take on set values (generally whole numbers)
  e.g.s shoe size, number of kids in family
- **Continuous:** numerical data that can take on a range of values (can be decimals)
  e.g.s rainfall in mm, weight, height
- **Ordinal:** categorical data that can be put into order
  e.g. grades in an exam A, B, C….
- **Nominal:** categorical data that cannot be put into order
  e.g. phone brand
- **Primary Data**: data collected by person who's going to use it
- **Secondary Data:** data that's already available e.g. internet, magazines
- The **population** is the entire group being studied.
- A **sample** is a group that is selected from the population.
- A **census** is a survey of the whole population.
- An **outlier** is an extreme value that is not typical of other values in the data set.
- **Bias** can mean something which sways a respondent in a particular way or another, in a survey/questionnaire. The term bias can also be used if a sample doesn't reflect the population. E.g. selecting people coming out of Lidl and asking them their opinion on shopping in non-Irish owned retailers.

b) Collecting Data:

Notes: When selecting people to survey it is important that:

- the sample is selected randomly to avoid bias
- the sample represent the population
- the sample is sufficiently large

Methods of Collecting Data:

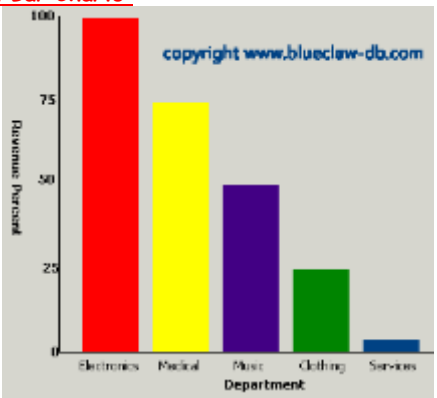
- **Phone Interview:**
  Advs: questions can be explained can select sample from entire population
  Disadvs: expensive compared to post or online
- **Online Questionnaire:**
  Advs: cheap, anonymous so answers are more honest
  Disadvs: people may not respond, not representative of entire population…only those that are online
- **Face to Face Interview:**
  Advs: questions can be explained
  Disadvs: people might not answer honestly when asked in person, expensive and not random
- **Postal Questionnaire:**
  Advs: not expensive
  Disadvs: people don't always respond
- **Observation:**
  Advs: low cost, easy to carry out
  Disadvs: not suitable for some surveys, questions can't be explained

Tips for designing a questionnaire:

- Use clear & simple language
- Begin with simple questions
- Accommodate all possible answers
- Contain no leading questions
- Be as brief as possible
- Be clear where answers should be recorded
- Avoid personal questions

2) Graphing Data from Junior Cert:

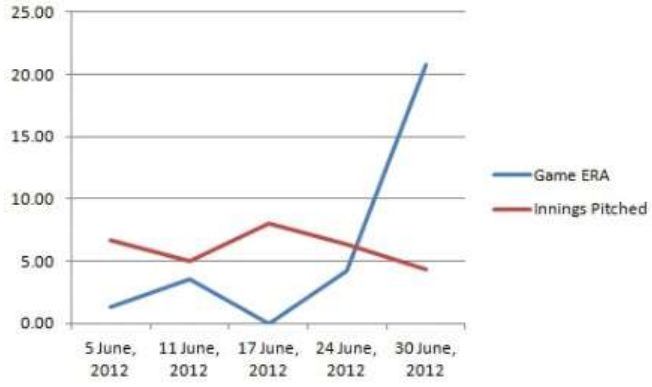
a) Bar Charts:



Notes:

- Individual bars must be labelled and axes labelled
- Must be an even scale on vertical (e.g. going up in 25s in example above)
- Bars and axes drawn with ruler
- Can be used for categorical data

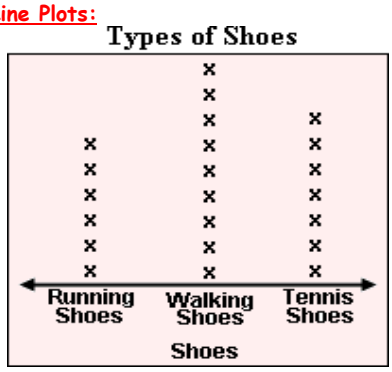
b) Trend Graphs:



Note:

- Axes labelled and scaled evenly

c) Line Plots:

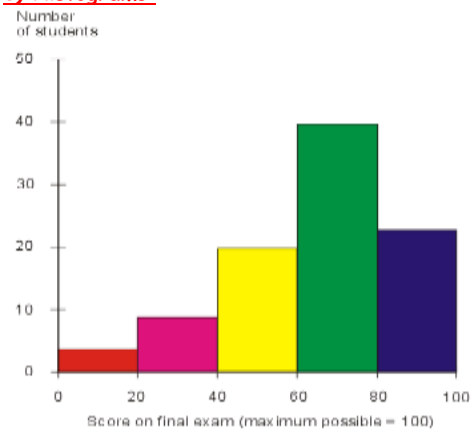


Notes:
- Clear columns and rows of 'x' (See Diagram)
- Each column labelled
- Can be used for categorical data

d) Pie Charts:

Notes:
- Circle drawn with compass
- Angles measured with protractor
- Label sectors and angles of the pie chart
- Can be used for categorical data

e) Histograms:



Notes:
- Different to bar chart as there is **a scale along the bottom** as well
- Axes labelled and evenly scaled
- Axes and bars drawn with ruler
- Can be used for continuous numerical data

f) Stem & Leaf Plots:

Stem	Leaf
5	2 3
6	5 7 8 9
7	0 2 2
8	3

Key: 5|2 = 52%

John: 46, 58, 78, 57, 79, 45 James: 40, 62, 71, 77, 52, 66

JAMES' MARKS	STEM	JOHN'S MARKS
0	4	5, 6
2	5	7, 8
6, 2	6	
7, 1	7	8, 9

Key: 1|7 = 71% Key: 5|7 = 57%

Notes:
- Clear columns and rows of numbers (see diagram)
- Key MUST be included (see diagram)
- Can use comma separated list for leaves also
- Can use back-to-back plots to compare two sets of data (**bivariate data**)

3) Analysing Data:

a) Measures of Centre:

1. **Mean:** the sum of all the values divided by the number of values
   e.g. Data: 1, 4, 3, 5, 4, 2, 1
   Mean = $\frac{1+4+3+5+4+2+1}{7} = 2.86$
- Only used with numerical data
- **Advs:** uses all the data
- **Disadvs:** affected by outliers

2. **Mode:** the value that appears the most often
   e.g. Data: 2, 3, 1, 2, 5, 4, 2, 1, 2
   Mode = 2 (as it appears 4 times)
- Can be used for numerical but the only one that can be used for categorical data
- **Advs:** Not affected by outliers, can be used for any data
- **Disadvs:** There is not always a mode, does not use all the data

3. **Median:** the middle value (list must be in ascending order)
   e.g. Data: 2, 1, 3, 3, 2, 5, 3, 2, 1
   Rearrange in order first: 1, 1, 2, 2, 2, 3, 3, 3, 5
   => Median = 2
- Used only with numerical data
- **Advs:** Easy to calculate, not heavily affected by outliers
- **Disadvs:** Does not use all the data

b) Measures of Spread:

Note: For the following, the list of values should be in ascending order

Range: the difference between the max and the min value
e.g. Data: 20, 40, 40, 45, 60 => Range = 60 – 20 = 40

Topic 6: Probability

1) The Basics of Counting:

a) Fundamental Principle Of Counting:

If one event has **m** possible outcomes and a second event has **n** possible outcomes, then there are **m** x **n** total possible outcomes for the two events together.

e.g. 2 starters and 5 main courses

=> 10 possible dinner options

b) A Deck Of Cards:

- 52 Cards in a deck
- 4 suits: Spades (black), Clubs (black), Hearts (red) and Diamonds (red)
- Picture Cards: Jack, Queen and King in each suit (12 in total)

c) Different Strategies:

1) We can simply list all possible outcomes.

2) We can make out a **two-way table**, if there are more than two trials.

e.g. tossing a coin two or more times

3) Sometimes it can be useful to make out a **tree diagram**, for showing all possible outcomes of two or more trials.

e.g. chance of picking one yellow and a blue bead from a bag of 6 yellow, 5 blue

2) Basics of Probability:

a) Definition of Probability:

- The probability of an event occurring is:

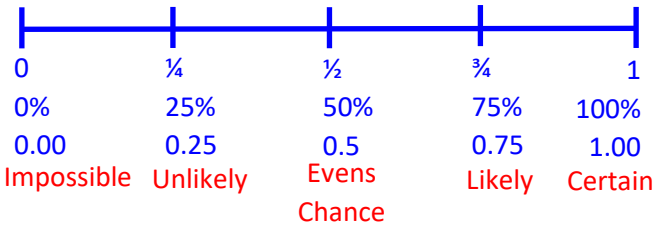
$$\frac{number\ of\ successful\ outcomes}{total\ number\ of\ outcomes}$$

e.g. bag with 5 red and 4 green beads

P(Green) = $\frac{4}{9}$

Note:

➢ Probability values must be between 0 and 1 (see scale below)



b) Terminology:

1. A **trial** is an act of doing an experiment in probability e.g. tossing a coin
2. An **outcome** is one of the possible results of the trial e.g. a 6 when throwing a die
3. A **sample space** is the set of all possible outcomes in a trial.
4. An **event** is the occurrence of one or more specific outcomes.
5. **Probability** is the measure of the chance of an event happening.

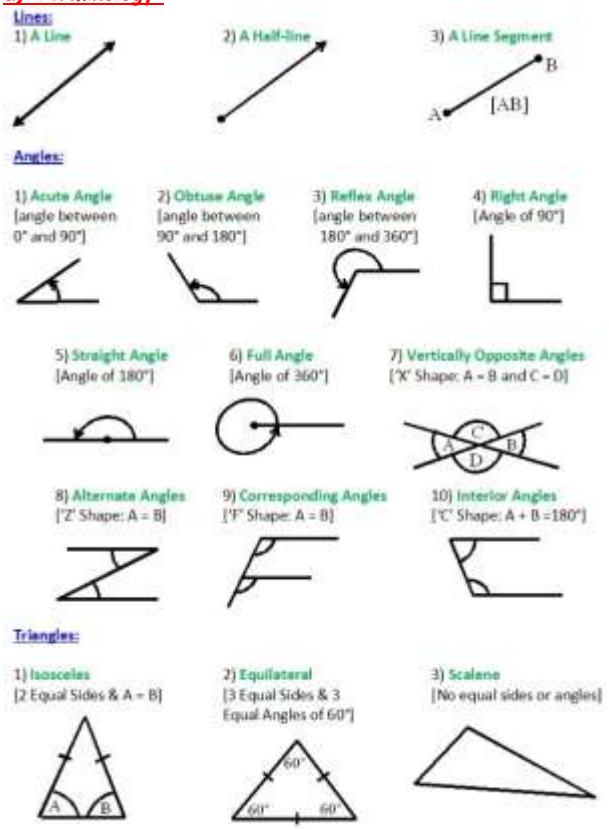
c) Relative Frequency and Carrying Out Experiments:

- We can carry out an experiment or trials to estimate the probability of an event occurring.
  e.g. throwing a die to see how many 6's we get
- If you throw a die 20 times and a 6 comes up 3 times we could estimate the probability of throwing a 6 to be $\frac{3}{20}$.
- This estimate we get from carrying out trials, is called the **Relative Frequency**.
- The more trials that are done, the closer the relative frequency gets to the actual probability.

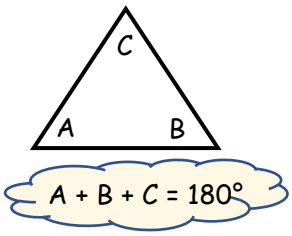
Topic 7: Geometry

1) The Basics:

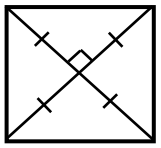
a) Terminology:



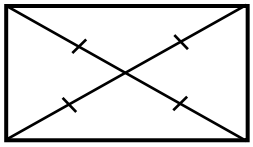
b) Triangles:



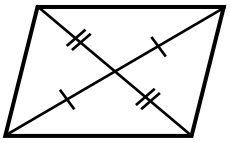
c) Quadrilaterals:



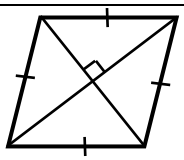
Square
- 4 equal sides
- 4 equal angles of 90°
- Opp sides are parallel
- Diagonals bisect at 90° angles



Rectangle
- Opp sides are equal & parallel
- 4 equal angles of 90°
- Diagonals bisect each other



Parallelogram
- Opp sides are equal & parallel
- Opp angles are equal
- Diagonals bisect each other



Rhombus
- 4 equal sides & opp sides are parallel
- Opp angles are equal
- Diagonals bisect at 90° angles

2) Constructions:

General Tips:

1. Keep your work neat and tidy.
2. Choose an appropriate pencil to draw the construction, not too dark and not too light.
3. Draw rough sketches of construction first, especially for triangles and rectangles.
4. Show all your construction lines & label your construction.

- There are 5 constructions on the course for Leaving Cert Foundation Level that we revisit and look at real life applications of them

Constructions List:

4. Line perpendicular to a given line l, passing through a given point on l.
5. Line parallel to a given line, through a given point.
10. Triangle, given SSS data
13. Right-angled triangle, given the length of the hypotenuse and one other side.
15. Rectangle, given side lengths.

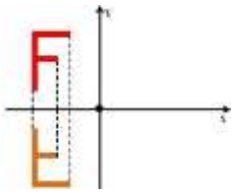
3) Transformations/Symmetries/Enlargements:

a) Transformations:

Note: In each of the pictures below, the red shape is the **object** and the second coloured shape is the **image**.

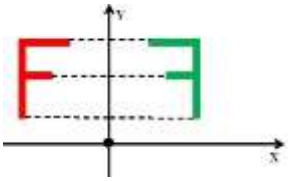
Axial Symmetry in the X-axis: (S_x)

- Shapes are mirrored/reflected in the X-axis. See example below.



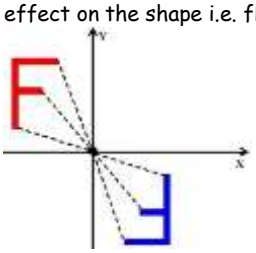
Axial Symmetry in the Y-axis: (S_y)

- Shapes are mirrored / reflected in the Y-axis. See example below.



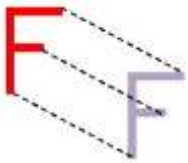
Central Symmetry in the Origin: (S_o)

- Shapes end up flipped and rotated as shown below.
- Central symmetry in a point other than the origin would have the same effect on the shape i.e. flipped and rotated



Translation:

- Note that shapes don't change when translated as the shape just '**slides**' to another position

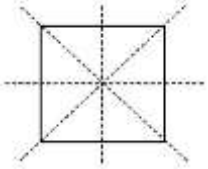


Rotations:

- The shape in blue below is a rotation of the red shape 90° clockwise. The green is a rotation of 180°. Note that it looks similar to the central symmetry in a point image from above. The orange is a rotation of 270° clockwise.

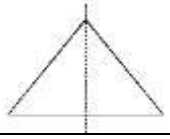
b) Axes of Symmetries of Shapes:

Square:
A square has 4 axes of symmetry, as shown below.

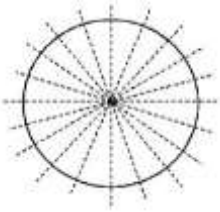


Rectangle:
A rectangle has 2 axes of symmetry, as shown below.

Triangle:
An isosceles triangle has 1 axis of symmetry, as shown below. If the triangle was an equilateral triangle it would have two more axes of symmetry from the other two vertices of the triangle.



Circle:
A circle has an infinite number of axes of symmetry, as shown below.



Enlargements:

Notes:

- An **enlargement** is a scaled up/down version of an object.
- The **scale factor 'k'** tells by how much the image has been scaled.
  - If $k > 1$ => scaled up
  - If $0 < k < 1$ = > scaled down
- To find the scale factor from a given enlargement, divide a side of the image by its corresponding side in the object.
- The area of the image can be found by using:

$$Area\ Image = k^2 \times Area\ of\ Object$$

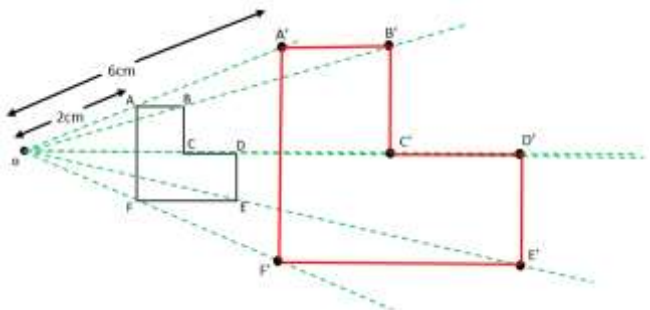
Not in Tables

- The **centre of enlargement** is the point where the object is being enlarged from.

Steps for constructing an enlargement:

1. Using a ruler, draw dashed construction lines from the centre of enlargement o, out through some of the main points of the object.
2. Measure the length of |OA|.
3. Multiply |OA| by the scale factor k and then measure out that distance from o along the dashed line to find location of A'.
4. Repeat for the other key points B, C, D, E etc.
5. Join up A', B', C', D' etc. to form image.
6. Check |A'B'| ÷ |AB| should be = the scale factor k.

Example: Enlargement for k = 3 of small L shape is shown below.



Topic 8: Trigonometry

1) The Basics:

a) Solving Problems:

Steps when answering questions

1. Draw a good-sized diagram.
2. Label the sides of the triangle
3. Label what you're looking for.

b) Calculator Use:

Notes:

- Make sure your calculator is in 'Degree' mode i.e. there is a 'DEG' or a 'D' on the top of your screen.
- If you know the angle, and you want to find Sin, Cos or Tan of it, you can just type it in straight.
  e.g. sin52 = [SIN] [52] [=] 0.788
- When looking for an angle, then you need to use the SHIFT or 2ndF button in the top left corner of the calculator.
  e.g. Cos A = 0.4534
  => A = [SHIFT] [COS] [0.4534] [=] 63.04°

c) Clinometer

- We can measure angles of elevation / depression using a **clinometer**, as shown below:

2) Right Angled Triangles:

a) Pythagoras' Theorem:

Notes:

- We can use **Pythagoras' Theorem** if we know two sides of a right-angled triangle and we want to find the third side i.e.

$$H^2 = O^2 + A^2$$

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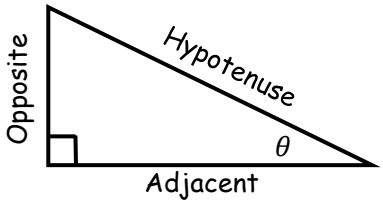
- Make sure and label the hypotenuse correctly when using this theorem.



b) Sine, Cosine, Tan Ratios:

Notes:

- 'θ' is a Greek letter called 'theta'. It is often used to represent angles.
- Another way to remember the sin, cos and tan ratios is Silly Old Harry, Caught A Herring, Trawling Off America (SOHCAHTOA)

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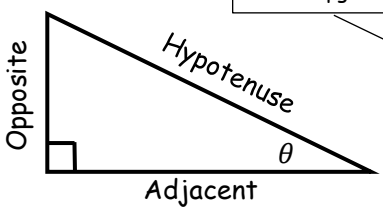


$$sin\theta = \frac{OPP}{HYP}$$

$$cos\theta = \frac{ADJ}{HYP}$$

$$tan\theta = \frac{OPP}{ADJ}$$

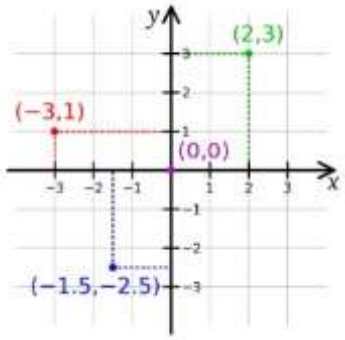
Topic 9: Coordinate Geometry

1) The Basics:

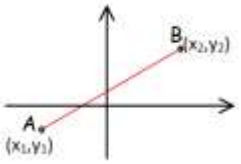
a) Cartesian Plane/Coordinates:

Notes:

- Coordinates must be listed in brackets with a comma in between the two numbers
- We always list the X value first and the Y value second…see examples in diagram above.
- The point (0,0), shown in purple, is also called the ***Origin***.
- The X and Y axes divides the plane up into 4 **quadrants**
  - Quadrant 1 is top right of the plane and they are numbered in an anti-clockwise direction



b) Distance/Midpoint Formula:



Tables pg 18

Distance |AB|

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

Midpoint of AB

$$\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$$

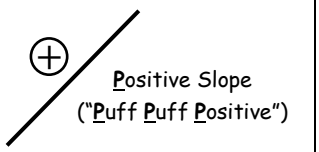
e) Intersecting Lines:

We can find where two lines meet by solving the equations simultaneously. See Algebra – Section 5a

c) Slope:

Notes:

- Slope is a measure of the steepness of a line.
- Slopes can be negative or positive:



- There are three different ways we can find it:

Formula when we know **2 points**:

Slope |AB|

$$\frac{y_2-y_1}{x_2-x_1}$$

Tables pg 18

When given **diagram**:

Slope = $\frac{\text{RISE}}{RUN}$

Not in Tables

d) Equation of a line:

Notes:

- A unique licence plate that identifies a particular line.
- To use the formula, we have to know:
  - A **point on the line**
  - The **slope** of the line (See section above)
- Once we know the two things above we use the formula:

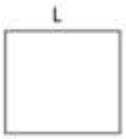
$$y-y_1=m(x-x_1)$$

Tables pg 18

Topic 10: Area/Volume

1) The Formulae: (Note the ones with an asterisk next to them are **NOT** in the Tables)

Square:



Area = L^2 *

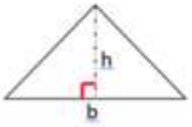
Per = 4L *

Rectangle:

Area = L x W *

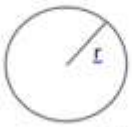
Per = 2L + 2W *

Triangle:



Area = ½ b x h

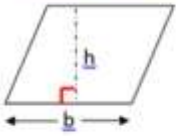
Circle:



Area = πr^2

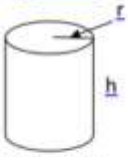
Circum = $2\pi r$

Parallelogram:



Area = b x h

Cylinder:



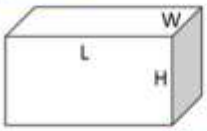
Vol = $\pi r^2 h$

CSA = $2\pi rh$

Cube / Cuboid:

Vol = L^3 *

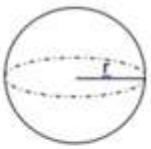
TSA = $6L^2$ *



Vol = L x W x H *

TSA = 2LW + 2WH + 2HL *

Sphere:



Vol = $\frac{4}{3}\pi r^3$

CSA = $4\pi r^2$

2) Solving Problems:

a) Tips for solving Area/Volume problems:

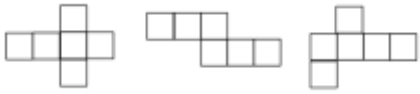
1. Draw a good-sized diagram.
2. Label and fill in all information given.
3. Identify the shapes in the question.
4. Write down relevant formulae for those shapes.

3) Nets:

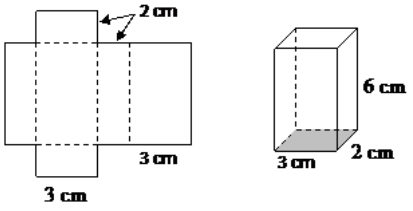
- The **net**, of a particular shape, is a flat surface that, when folded, can be made into that shape.

a) Nets of Cubes:

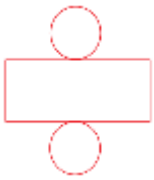
- There are 11 nets for a cube. Some are shown below.



b) Net of a Cuboid:



c) Net of a Cylinder:



Exam Tips:

1) You don't have to start with Q1……quickly scan through the paper and pick something that looks okay, that your familiar with, to start with. Work through the paper in order of familiarity then.
2) Watch your time……remember divide the marks by 2 and subtract 2 to get a rough idea of how long to spend on a question.
3) If you need an answer from a part of a question for a subsequent part, just write "Let answer to part (i) = ???" and proceed to the next part using that answer.
4) Don't use Tippex……just put one line through any work that's wrong and move on.
5) It's important to lay out your work clearly so it's easy to follow……work down the page and then from left to right.
6) Make sure and do a quick check at the end of a question to see that you answered exactly what was asked.
7) NEVER leave a blank space for a question as it's worth zero marks. If you can think of anything that might be relevant to the question, write it down. It might be worth a low partial mark. Examples: i) if a question involves a right angled triangle, write down Pythagoras Theorem ii) if a question involves compound interest, write down the Compound Interest formula iii) if a question mentions "maximum" or "minimum", write down dy/dx = 0
8) Finally……any time you have remaining should be spent checking for calculation errors with the calculator.