Sec 1 Math: Basic Geometry

A) Angle Types

Angles	Definition	**How to Remember?
Acute Angle	$0^o < x < 90^o$	**Acute** angles are small. So it is **A "Cute"** angle.
Obtuse Angle	$90^o < x < 180^o$	**Obtuse** angles are fat and wide. They are the **Obese** angles.
Reflex Angle	$180^o < x < 360^o$	**Reflex** angles occur on the **Reverse** side of any acute or obtuse angles.

Acute Angle

Obtuse Angle

Reflex Angle   Reflex Angle
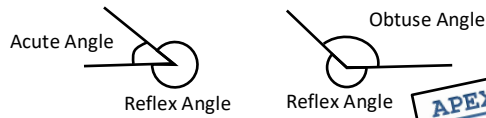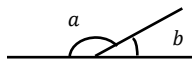
B) Complementary and Supplementary Angles

Complementary Angles: Two angles that adds up to 90° are complementary angles.
Angles x and y are complementary angles.
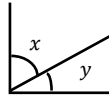
Supplementary Angles: Two angles that add up to 180° are supplementary angles.
Angles a and b are supplementary angles.

How to Remember?
Complementary ➔ **C**orner (90°)
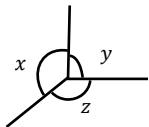**S**upplementary ➔ **S**traight Line (180°)

C) Recap of Basic Angle Properties

Angles at a Point
The sum of angles at a point is 360°.
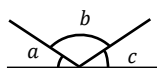$x + y + z = 360^o$ (*Angles at a Point*)

Adj Angles on a Straight Line
Sum of adjacent angles on a str line is 180°
$a + b + c = 180^o$ (*Adj Angles on a str line*)
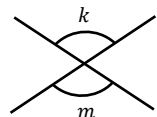

Vertically Opposite Angles
Given two straight lines that intersects.
The opposite angles are equal
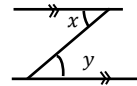$\angle k = \angle m$ (*Vert. Opp. Angles*)

D) Parallel Lines and Transversal

When there are two parallel lines and a straight transversal line intersects with both parallel lines, the following properties can be applied:

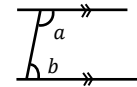Alternate Angles (Z)
*Learned in primary school as the Z-shape
$\angle x = \angle y$ (*Alt. angles*)

Interior Angles (C)
*Learned in primary school as the C-shape
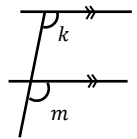$\angle a + \angle b = 180^o$ (*Int. angles*)

Corresponding Angles (F)
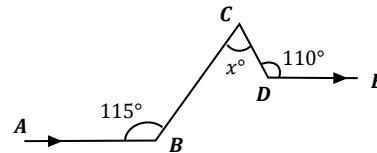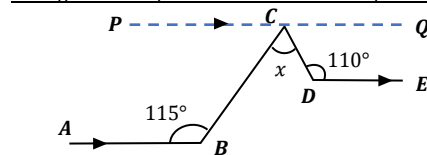*Learned in primary school as the F-shape
$\angle k = \angle m$ (*Corr. angles*)

***Note: We have learned most of these angle properties in primary school. In secondary school, we need to learn the names of each property and present our work properly.**

E) Worked Example (Basic)

In the above diagram, AB is parallel to DE. Find the value of x.

*Note: To solve this question, we have to draw a line that passes through C and is parallel to the other two parallel lines.

$\angle PCB = 180^o - 115^o$ (Int. angles, AB//PC)
$= 65^o$
$\angle QCD = 180^o - 110^o$ (Int. angles, DE//CQ)
$= 70^o$
$x = 180^o - 65^o - 70^o$ (Adj. angles on a str. Line)
$= 45^o$

**Note: Presentation and Property names are very Important!
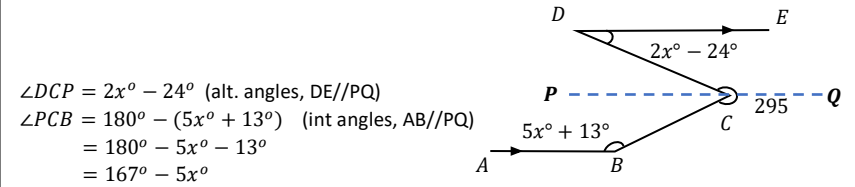
F) Worked Example (Intermediate)
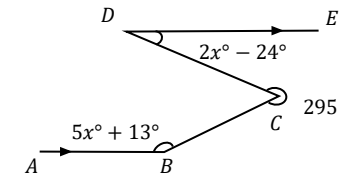
In the diagram, AB is parallel to DE.
Find the value of x.

*Note: To solve this question, we have to draw a line that passes through C and is parallel to the other two parallel lines.
*Note: We will also need to form algebraic equations to solve the problem easily.

$\angle DCP = 2x^o - 24^o$ (alt. angles, DE//PQ)
$\angle PCB = 180^o - (5x^o + 13^o)$ (int angles, AB//PQ)
$= 180^o - 5x^o - 13^o$
$= 167^o - 5x^o$
$(2x^o - 24^o) + (167^o - 5x^o) + 295^o = 360^o$ (Angles at a Point)
$2x^o - 5x^o = 360^o + 24^o - 167^o - 295^o$
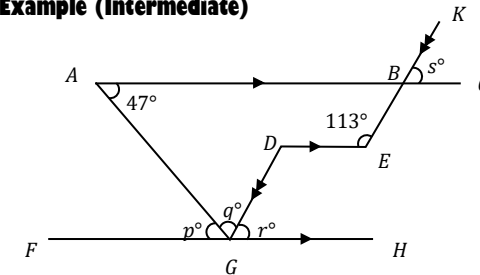$-3x^o = -78^o$
$x = 26$

Note: $\angle DCP$ is NOT equals to $\angle PCB$!!!

G) Worked Example (Intermediate)

In the diagram, AC, DE and FH are parallel. $DG//KE$, $\angle BAG = 47°$ and $\angle DEB = 113°$.
Find the values of $p°$, $q°$, $r°$ and $s°$.

$p^o = 47^o$ (alt. angles, AC//FH)
$\angle EDG = 113^o$ (alt. angles, DG//BE)
$r^o = 180^o - 113^o$ (int. angles, DE//GH)
$= 67^o$
$q^o = 180^o - 47^o - 67^o$ (adj. angles on a str. Line)
$= 66^o$
$\angle ABE = 180^o - 113^o$ (int. angles, DE//AC)
$= 67^o$
$s^o = 67^o$ (Vert. Opp. Angles)

Note: Some questions have more than one pair of parallel lines. Do make sure to consider properties of every pair parallel lines. Rotate the paper if you have difficulty identifying.
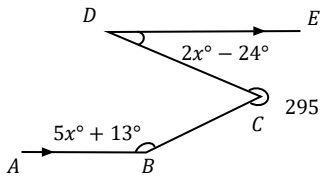
Self Practice

Worked Example (Basic)

In the above diagram, AB is parallel to DE. Find the value of x.

Worked Example (Intermediate)

In the diagram, AB is parallel to DE. Find the value of x.

Worked Example (Intermediate)

In the diagram, AC, DE and FH are parallel. $DG // KE$, $\angle BAG = 47°$ and $\angle DEB = 113°$. Find the values of $p°$, $q°$, $r°$ and $s°$.