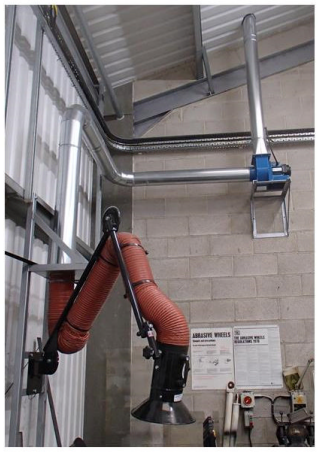
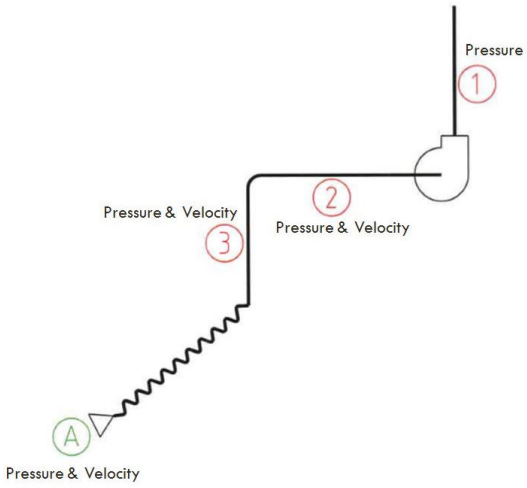
Homework Part 2

This is more focused around the very basic maths that we have learnt. Towards the end you will find some maths that we haven't gone over but feel free to have ago.

WELDING FUME EXTRACTION SYSTEM





We have been to site and assessed this Welding fume extraction system.

1. The duct diameter at TP's 1, 2 & 3 are all the same at 150mmØ (Ø is the symbol for diameter).

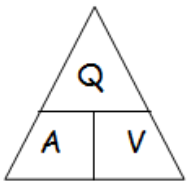
    a. Memorise this equation for finding the area of a circle:

    $$\pi D^2/4$$

    b. Calculate the area for the duct – put your answers in the table below:

TP	Size (mm)	Area **A** (m2)	Velocity **V** (m/s)	Volume **Q** (m3/s)	Volume **Q** (m3/h)	Static Pressure (Pa)
TP1	150mmØ		10.73m/s		683	3
TP2	150mmØ		11.36m/s			487
TP3	150mmØ		10.15m/s	0.18		435
HA	300mmØ			0.18	646	19

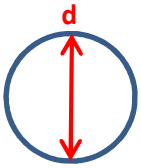
Using the triangle calculate the volume in m3/s & also m3h, also calculate the velocity for the hood:



This triangle is a simple way of remembering the calculations. Cover the symbol which indicates the answer you want to find. Imagine the line that is between Q and the lower A & V is a mathematical divide. Imagine a 'x' multiply symbol between A & V.

Where: V = velocity in m/s
A = area in m
Q = m^3/s

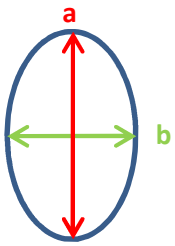
Area of circular duct:



3.142 x d x d / 4

Duct Size	Area
55mmØ	
100mmØ	
150mmØ	
180mmØ	
200mmØ	
300mmØ	
400mmØ	

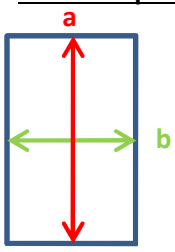
Area of oval duct:



3.142 x a x b / 4

Duct Size	Area
100x250mm	
300x125mm	
110x180mm	
100x150mm	
120x185mm	

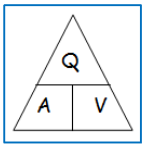
Area of square duct:



a x b

Duct Size	Area
100x200mm	
350x150mm	
500x400mm	
100x100mm	
250x550mm	

Calculating Volume flowrate:

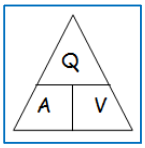


Volume flowrate **Q** (M3/s)	Velocity **V** (m/s)	Area **A** (m2)
	4	0.002
	10	0.008
	12	0.018
	16	0.031
	22	0.071

Now practice converting Volume Flowrate from M3/second to M3/hour. To do this with times the **m3/s** figure by **3600** (this is 60 seconds x 60 minutes)

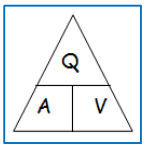
Volume flowrate **Q** (M3/s)	Volume flowrate **Q** (M3/h)
0.12	
0.20	
0.51	
1.71	

Calculating Velocity:



Volume flowrate **Q** (M3/s)	Velocity **V** (m/s)	Area **A** (m2)
0.03		0.005
0.08		0.008
0.33		0.018
0.52		0.031
0.98		0.071

Calculating Area:



Volume flowrate **Q** (M3/s)	Velocity **V** (m/s)	Area **A** (m2)
0.05	10.02	
0.12	14.98	
0.29	16.32	
0.39	12.44	
0.95	13.50	

Maths we haven't done yet:

There is an equation for calculating Velocity Pressure **(VP)** from Velocity **(V)**

$$VP = (V/1.29)^2$$

Example:
We need to figure out the sum in the brackets:

10/1.29 = 7.75

We then square the sum in the brackets:

7.75^2 or 7.75*7.75 = 60 Pa

Answer: $(10/1.29)^2 = 60.04Pa$

The above equation is only good for air density of 1.29Kg/m3 (ie Standard/Ambient Conditions at 20□C and 1013 mb)

Practice:

Velocity **V** (m/s)	Velocity Pressure **VP** (Pa)
4m/s	
11m/s	
15m/s	

We can also calculate Velocity **(V)** from Velocity Pressure **(VP)**

$$V = 1.29\sqrt{VP}$$

Example:
First we calculate **√VP**: √60.04 = **7.74**
Velocity = 1.29 * 7.74
10m/s = 1.29 / 7.74

Practice:

Velocity **V** (m/s)	Velocity Pressure **VP** (Pa)
	38.45
	86.53
	153.83