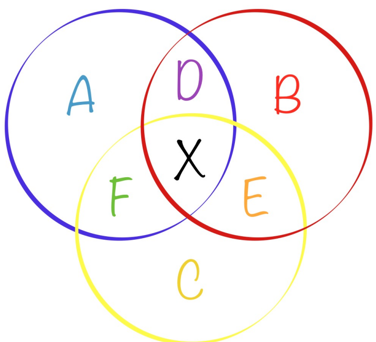
OverLaps

Task: Place the digits 1 - 7, one in each region, so that the circles all have the same total.



$y = 3x + 2(d+e+f) + a + b + c$ => sum of all circles

$3s = 28 \{1+2+3+4+5+6+7\} + d + e + f + 2x$

$s = 9\ 1/3 + \frac{d + e + f + 2x}{3}$ => sum of one circle

$s = 9 + \frac{d + e + f + 2x + 1}{3}$

Prove:

1. You cannot have a circle total of 16 with 4 in the center.

   Formula:

   $$s = 9 + \frac{d + e + f + 2x + 1}{3}$$

   Substitute x=4

   $$s = 9 + \frac{d + e + f + 8 + 1}{3}$$

   $$s = 9 + \frac{d + e + f + 9}{3}$$

   $$s = 9 + 3 + \frac{d + e + f}{3}$$

   $$s = 12+ \frac{d + e + f}{3}$$

   Substitute s=16

   $$16 = 12 + \frac{d + e + f}{3}$$

   $$4 = \underline{d + e + f}$$

d	e	f
7	3	2
6	5	1

Sum equals 12

$$12 = \overset{3}{d + e + f}$$

7 + 6 + 3 = 3 + 11 + 2 = 2 + 7 + 7

6 + 6 + 5 = 5 + 10 + 1 = 1 + 9 + 6

Double

Too big

This proves that a circle with 4 as x cannot have a circle total of 16.

Prove:

2. You cannot have circle totals greater than 19 or less than 13.

To have the smallest circle total, you have to use 1 as x because x is repeated the most. Then d, e and f have to be between 2 and 4, it doesn't matter in what order. If we use our formula, the circle total will equal 13.

$$s = 9 + \frac{2 + 3 + 4 + 2 + 1}{3}$$

$$s = 9 + \frac{12}{3}$$

$$s = 13$$

To get the greatest circle total you use the highest numbers: x=7 and d, e, f = 4, 5, 6

$$s = 9 + \frac{4 + 5 + 6 + 14 + 1}{3}$$

$$s = 9 + \frac{30}{3}$$

$$s = 19$$

Prove:

3. You cannot have anything other than 1 in the center for a circle total of 13.

If we use a number greater than 1 for x, we will get a circle total greater than 13.
See above...