TWO CIRCLES IN A RECTANGLE DERIVE THE TRUE π (2542nd Paper)

1. Rectangle

   $AB = 20,\ BC = 13 + 2\sqrt{30}$

   Area $= 20 \times \left(13 + 2\sqrt{30}\right) = 260 + 40\sqrt{30}$

2. Small circle

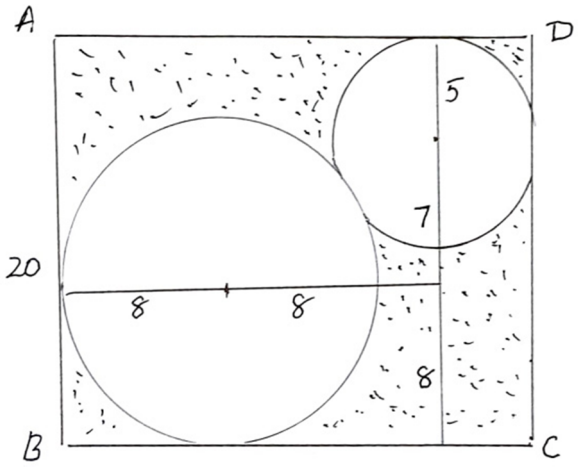
   Radius = 5

   Area $= \pi r^2 = \pi \times (5)^2 = 25\pi$

3. Big Circle

   Radius = 8

   Area $= \pi r^2 = \pi \times (8)^2 = 64\pi$



4. Let the shaded area is equal to $= \dfrac{1040 + 160\sqrt{30} - 1246 + 89\sqrt{2}}{4}$

5. Finally

   Small circle + Big circle + Shaded area = Rectangle

   $$25\pi + 64\pi + \frac{1040 + 160\sqrt{30} - 1246 + 89\sqrt{2}}{4} = 260 + 40\sqrt{30}$$

   $$\frac{100\pi + 256\pi + 1040 + 160\sqrt{30} - 1246 + 89\sqrt{2}}{4} = 260 + 40\sqrt{30}$$

$$\frac{356\pi + 1040 + 160\sqrt{30} - 1246 + 89\sqrt{2}}{4} = 260 + 40\sqrt{30}$$

$$356\pi + 1040 + 160\sqrt{30} - 1246 + 89\sqrt{2} = 1040 + 160\sqrt{30}$$

$$356\pi = \cancel{1040} + \cancel{160\sqrt{30}} - \cancel{1040} - \cancel{160\sqrt{30}} + 1246 - 89\sqrt{2}$$

$$356\pi = 1246 - 89\sqrt{2}$$

$$\pi = \frac{1246 - 89\sqrt{2}}{356}$$

$$\pi = \frac{14 - \sqrt{2}}{4}$$

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