Circle Pattern

Here is a developing circle pattern.

Here is one black circle.

[handwritten: $A = \pi r^2$]

[handwritten on black circle: 2, $A = 4\pi$]
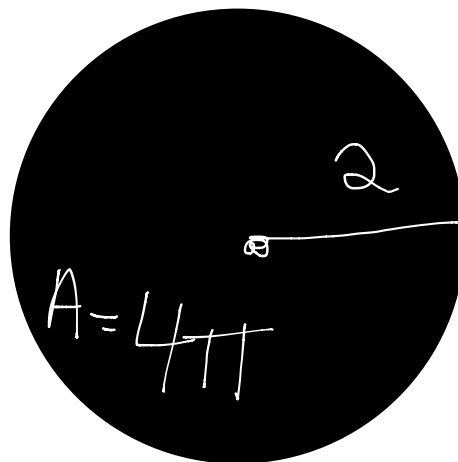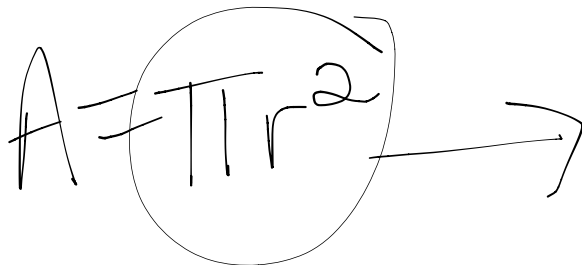
Two white circles of half the radius have been added to the diagram.

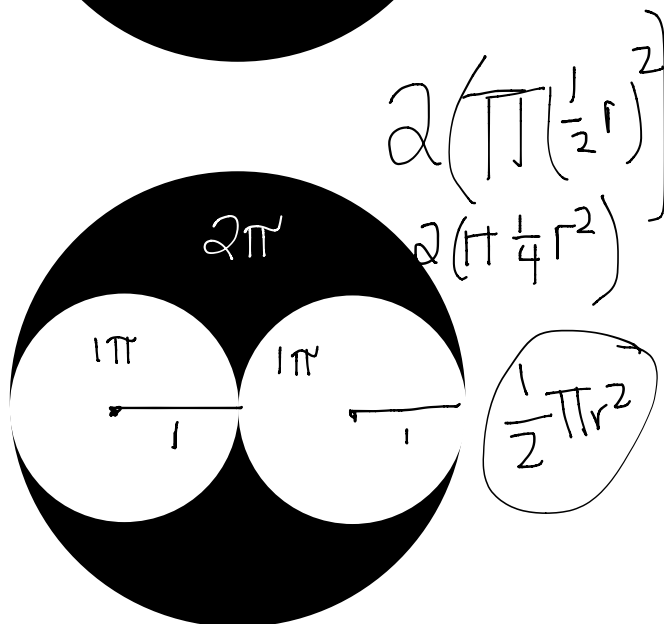1. Show that the fraction of the diagram that is now black is one half.

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[handwritten: $2\left(\pi\left(\frac{1}{2}r\right)^2\right)$]

[handwritten: $2\left(\pi \frac{1}{4}r^2\right)$]

[handwritten: $\frac{1}{2}\pi r^2$]

[handwritten on diagram: 2π, 1π, 1π, 1, 1]

Four black circles have now been added.

2. What fraction of the diagram is now black?

[handwritten circled: $\frac{3}{4}$]

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[handwritten on diagram: 2π, $\frac{1}{2}\pi$, $\frac{1}{2}\pi$, $\frac{1}{4}\pi$, $\frac{1}{2}$, $\frac{1}{4}\pi$, $\frac{1}{2}$, $\frac{1}{4}\pi$, $\frac{1}{4}\pi$]

[handwritten: 4π]
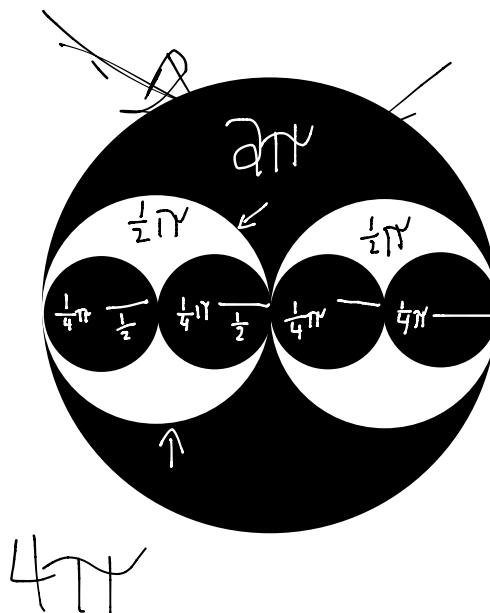
Circle Pattern

3. Fill in the table to show what happens as the pattern continues.
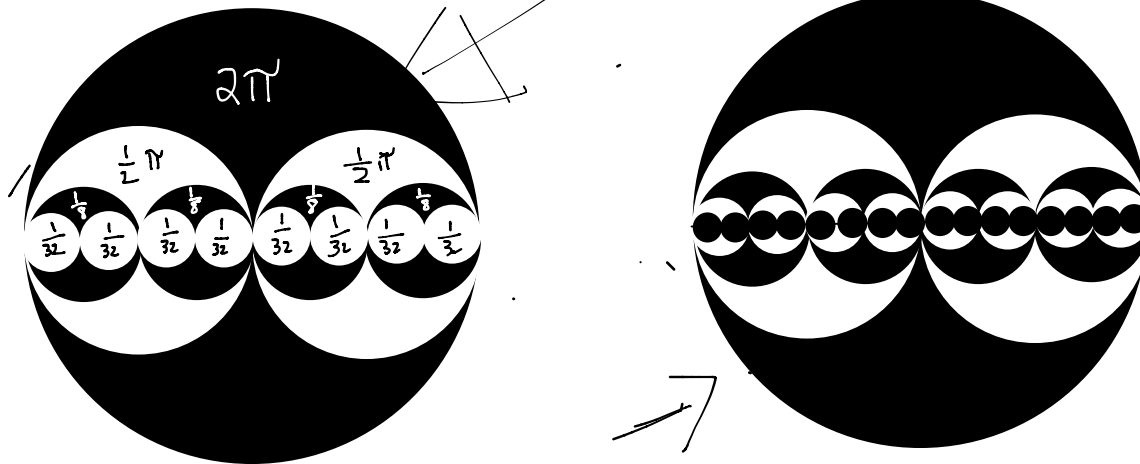
Pattern	Black fraction	White fraction
One black circle	1	0
Two white circles	$\frac{1}{2}$	$\frac{1}{2}$
Four black circles	3	$\frac{1}{4}$
Eight white circles	5	3
Sixteen black circles	11	5

(handwritten annotations: X2, $\frac{21}{32}$, $\frac{11}{32}$)

32 white

4. Write a description of what is happening to the black and white fractions as the pattern continues.

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