4.

Basis step: $n=0$

$3.5^0 = \frac{3.(5-1)}{4} = 3$

$P(0)$ is true.

Induction Step

Let $P(k)$ is true

for $P(k+1)$:

$$\underbrace{3.+3.5+3.5^2+\ldots+3.5^k}_{P(k)}+3.5^{(k+1)} = \frac{3.(5^{(k+1)}-1)}{4}+3.5^{(k+1)}$$

$$= \frac{3}{4}\left((5^{(k+1)}-1)+4.5^{(k+1)}\right)$$

$$= \frac{3}{4}\left(5.5^{(k+1)}-1\right)$$

$$= \frac{3}{4}\left(5^{(k+2)}-1\right)$$

$$= \frac{3.(5^{(k+1+1)}-1)}{4}$$

Let $p=k+1$

$$= \frac{3.(5^{p+1}-1)}{4}$$

//

So $P(k+1)$ is also true.

Statement is true by induction.

5

Basis step: $n=1$

$1^2-1 \pmod 8 \equiv 0$

$P(0)$ is true.

Induction step:

Let $P(k)$ is true.

For $P(k+2)$;

$(k+2)^2-1 = k^2+4k+4-1$

$= (k^2-1) + 4.(k+1)$

-> We assume (k^2-1) is divisible by 8.

-> Since $(k+1)$ is an even number, $4(k+1)$ is divisible by 8.

So $P(k+2) \pmod 8 \equiv 0$ is also true

The statement is true by induction.

6

a. $x^2 - 6x + 8 = (x-2)(x-4) = 0$

$x = 2$
$x = 4$

$A = \{2, 4\}$

b. $B = \{2, 3\}$

c. $C = \{4, 2, 5\}$

d. $D = \{4, 5, 7, 2\} - \{5, 7\} = \{2, 4\}$

then $A = D$