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Q 3.1

P then Q

If $3n+2$ is even, then n is Even

Assuming P is true

Direct Proof:

$$3n+2 = 2k$$

$$n = 2k \quad \text{for some int } k$$

$$3(2k)+2 = 6k+2$$

$$6K+2 = 2(3k+1)$$

$\therefore$ by direct proof, we have shown that for every even integer n, $3n+2$ is also even

Q.E.D

Q 3.2

Prove that $2+6+10+\dots+(4n-2) = 2\cdot n^2$
for $n \in 1, 2, 3, 4, \dots$

Proof by Induction
Let $P(k) = 2+6+10+\dots+(4n-2) = 2\cdot n^2$

~~Show that $P(k) \Rightarrow P(k+1)$~~
Basis step $P(1) = 4(1)-2 = 2$, $2\cdot 1^2 = 2$
$2 = 2$ True

Induction step $P(k) \Rightarrow P(k+1)$

$$P(k) = \underbrace{2+6+10+\dots+(4n-2)} = 2\cdot n^2$$

$$P(k+1) = \underbrace{2+6+10+\dots+(4n-2)} + 4(n+1)-2 = 2\cdot(n+1)^2$$

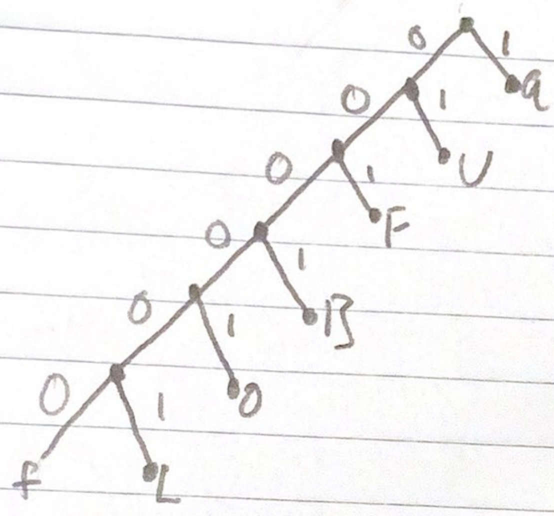
We can substitute the formula for $P(k)$ into $P(k+1)$
$\therefore$

$$2\cdot n^2 + 4(n+1) - 2 = 2\cdot(n+1)^2$$
$$2\cdot(n^2 + 2(n+1) - 1) = 2\cdot(n+1)^2$$
$$2\cdot(n^2 + 2n + 2 - 1) = 2\cdot(n+1)^2$$
$$2\cdot(n + 2n + 1) = 2\cdot(n+1)^2$$
$$2\cdot(n+1)^2 = 2\cdot(n+1)^2$$

Because $P(1)$ is true, and $P(a) \Rightarrow P(a+1)$, we have shown, using weak induction, that $2+6+10+\ldots+4n-2 = 2n^2$ is true for any positive integer n

Q3.3

4	6	2	5
B = 0.11	U: 0.22	f = .07	F: 0.14
a: 0.31	L: .06	O: .09	
7	1	3	



$$(1 \cdot .31) + (2 \cdot .22) + (3 \cdot .14) + (4 \cdot .11) + (5 \cdot .09) + (6 \cdot .07) + (6 \cdot .06)$$

$= 2.84$ average bits