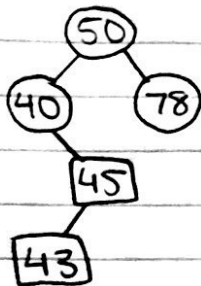


I pledge my honor that I have abided by the Stevens Honor System.

Susmitha Shailesh

HW 5

1a.



* \bigcirc = black \square = red

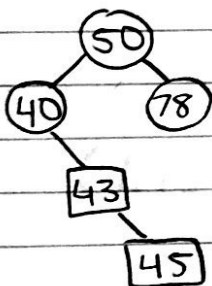
1b.

violation: The child of a red node must be black.
45 is red and its child, 43, is also red.

The height of the tree is also greater than $\lg(n) + 1$.

case: 2b

steps: $z = 45 \rightarrow$ right-rotate [45]



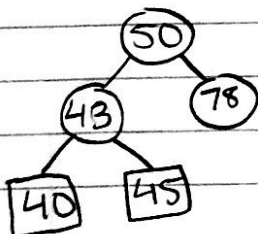
1c.

violation: The child of a red node must be black.
43 is red and its child, 45, is also red.

The height of the tree is also greater than $\lg(n) + 1$.

case: 3b

steps: $43 = \text{black} \rightarrow 40 = \text{red} \rightarrow$ left-rotate [40]



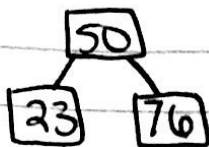
2a.

50

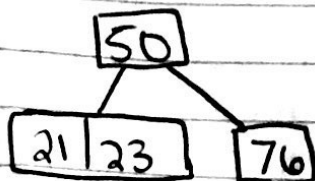
b.

50 76

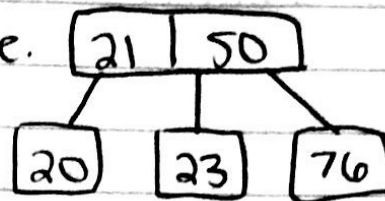
c.



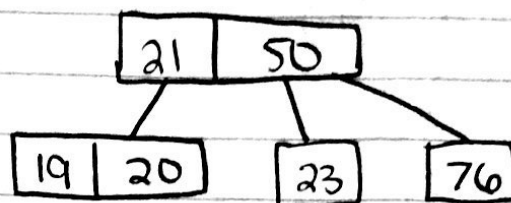
d.



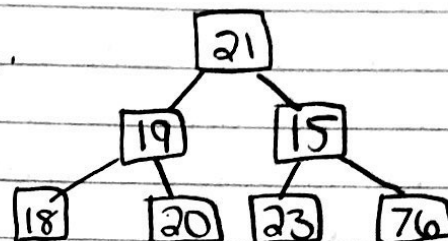
e.



f.



g.

3. LCM ($A[1...n]$): $x = A[1]$ for($i = 2; i \leq n; i++$) $x = (x * A[i]) / \text{gcd}(x, A[i])$

return x

4a.

$$P(x) = 4x^4 + 5x^3 - 2x^2 - 4x + 7$$

$$= x(4x^3 + 5x^2 - 2x - 4) + 7$$

$$= x(x(4x^2 + 5x - 2) - 4) + 7$$

$$= x(x(x(4x + 5) - 2) - 4) + 7$$

b.

$$P[0...n] = [4, 5, -2, -4, 7]$$

c.

| x | p | n | i |
|---|----|----|---|
| 2 | 4 | 5 | 3 |
| 2 | 13 | -2 | 2 |
| 2 | 24 | -4 | 1 |
| 2 | 44 | 7 | 0 |
| | 95 | | |

$$P(2) = 95$$

d.
$$\frac{4x^4 + 5x^3 - 2x^2 - 4x + 7}{x-2} = 4x^3 + 13x^2 + 24x + 44 + \frac{95}{x-2}$$

| | | | | | |
|---|---|----|----|----|----|
| 2 | 4 | 5 | -2 | -4 | 7 |
| | | 8 | 26 | 48 | 88 |
| | 4 | 13 | 24 | 44 | 95 |

5. Left Right Binary Exponentiation ($a, b(n)$):

product $\leftarrow a$

$i \leftarrow \text{length}(b)$

While $i > 0$ do

product $\leftarrow \text{product} * \text{product}$

if $b[i-1]$

product $\leftarrow \text{product} * a$

return product