Problem 64. Continued fractions [2, 1, 3, 1, 2, 8]

| **Finding...** | **Step 1** | **Step 2** | **Step 3** | |
|---|---|---|---|---|
| $\sqrt{19}:$ | $\sqrt{19} = 4 + \frac{1}{x_1}$ | $x_1 = \frac{1}{\sqrt{19}-4}$ | $= \frac{1}{\sqrt{19}-4}\frac{\sqrt{19}+4}{\sqrt{19}+4} = \frac{\sqrt{19}+4}{19-16} = \frac{\sqrt{19}+4}{3}$ | |
| $x_1 =$ | $\frac{\sqrt{19}+4}{3} = 2 + \frac{1}{x_2}$ | $x_2 = \frac{6}{\sqrt{19}-2}$ | $= \frac{3}{\sqrt{19}-2}\frac{\sqrt{19}+2}{\sqrt{19}+2} = \frac{3(\sqrt{19}+2)}{19-4} = \frac{\sqrt{19}+2}{5}$ | |
| $x_2 =$ | $\frac{\sqrt{19}+2}{5} = 1 + \frac{1}{x_3}$ | $x_3 = \frac{5}{\sqrt{19}-3}$ | $= \frac{5}{\sqrt{19}-3}\frac{\sqrt{19}+3}{\sqrt{19}+3} = \frac{5(\sqrt{19}+3)}{19-9} = \frac{\sqrt{19}+3}{2}$ | |
| $x_3 =$ | $\frac{\sqrt{19}+3}{2} = 3 + \frac{1}{x_4}$ | $x_4 = \frac{2}{\sqrt{19}-3}$ | $= \frac{2}{\sqrt{19}-3}\frac{\sqrt{19}+3}{\sqrt{19}+3} = \frac{2(\sqrt{19}+3)}{19-9} = \frac{\sqrt{19}+3}{5}$ | |
| $x_4 =$ | $\frac{\sqrt{19}+3}{5} = 1 + \frac{1}{x_5}$ | $x_5 = \frac{5}{\sqrt{19}-2}$ | $= \frac{5}{\sqrt{19}-2}\frac{\sqrt{19}+2}{\sqrt{19}+2} = \frac{5(\sqrt{19}+2)}{19-4} = \frac{\sqrt{19}+2}{3}$ | |
| $x_5 =$ | $\frac{\sqrt{19}+2}{3} = 2 + \frac{1}{x_6}$ | $x_6 = \frac{5}{\sqrt{19}-3}$ | $= \frac{3}{\sqrt{19}-4}\frac{\sqrt{19}+4}{\sqrt{19}+4} = \frac{3(\sqrt{19}+4)}{19-16} = \sqrt{19}+4$ | |

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Problem 44.
Pentagon number. Given a number, is it a pentagon ?

$$P_n = \frac{n(3n-1)}{2}, \tag{2}$$

$$2 * P_n = n(3n-1), \tag{3}$$

$$2 * P_n = 3n^2 - n, \tag{4}$$

$$0 = 3n^2 - n - 2 * P_n, \tag{5}$$

$$\frac{1 + \sqrt{1^2 - 4 * 3 * -2 * P_n}}{2 * 3}, \tag{6}$$

$$\frac{1 + \sqrt{1^2 + 24P_n}}{6} \tag{7}$$

Problem 50.

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| Prev | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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Then loop through each prime starting at lowest. 2 Only update if it is a new maximum. Keep old array

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Prev | 0 | -1 | 0 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 |

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3

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Prev | 0 | -1 | 0 | 0 | -1 | 2 | -1 | -1 | -1 | -1 | -1 | -1 |

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5

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 2 | 2 | 0 | 3 | 0 |
| Prev | 0 | -1 | 0 | 0 | -1 | 2 | -1 | 2 | 3 | -1 | 5 | -1 |

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