Level 2 Part 2

1- Count digits, there are $26 = 8 \cdot 3 + 2$. So this number is close to $10^{26} = 100^{13}$.
Experiment with calculator 89^{13}

$= 2.19821459173\,E25 =$

21,982,145,917,300,000,000,000,000 ← calculator

21,982,xxx xxx x08 330,487,013,369 ← test

2- $\Gamma(x+1) = x\Gamma(x)$ $\quad \Gamma(2) = \Gamma(1+1) = 1 \cdot \Gamma(1) = 1$

$\Gamma(3) = \Gamma(2+1) = 2\Gamma(2) = 2 \cdot 1 = 2$, $\Gamma(4) = \Gamma(3+1) = 3\Gamma(3)$

$= 3 \cdot 2 = 6$, $\Gamma(5) = \Gamma(4+1) = 4\Gamma(4) = 4 \cdot 6 = 24$.

In general,

$$\Gamma(n) = (n-1)(n-2) \cdot \cdots \cdot 2 \cdot 1 = (n-1)!$$

$\Gamma(\frac{1}{2}) = \sqrt{\pi}$. Note $\Gamma(\frac{1}{2}) = \Gamma(-\frac{1}{2}+1) = -\frac{1}{2}\Gamma(-\frac{1}{2})$

So $\sqrt{\pi} = -\frac{1}{2}\Gamma(-\frac{1}{2})$, $\Gamma(-\frac{1}{2}) = -2\sqrt{\pi}$

$\Gamma(-\frac{1}{2}) = \Gamma(-\frac{3}{2}+1) = -\frac{3}{2}\Gamma(-\frac{3}{2})$

$$\Gamma(-\tfrac{3}{2}) = -\frac{2}{3}\Gamma(-\tfrac{1}{2}) = -\frac{2}{3}(-2\sqrt{\pi})$$

$$= \frac{4}{3}\sqrt{\pi}$$

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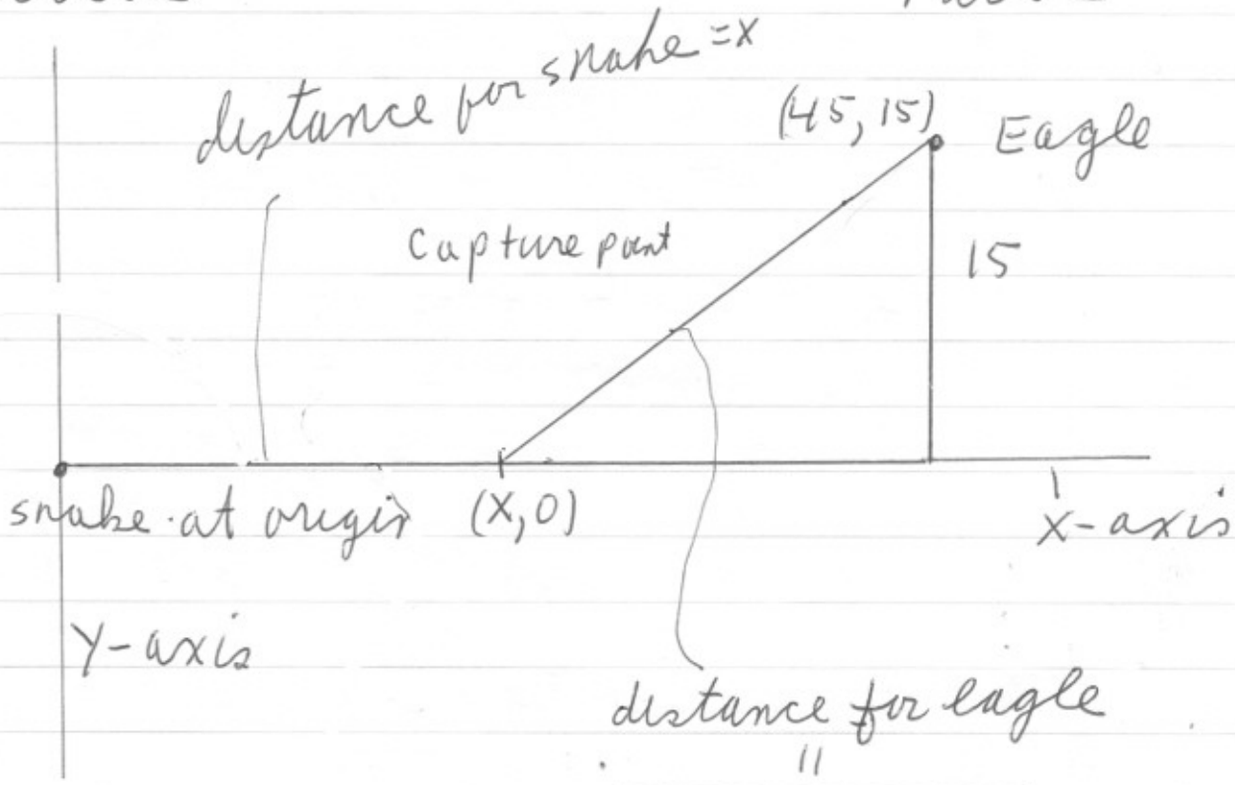

$$X = \sqrt{(X-45)^2 + 15^2}$$

So $X^2 = (X-45)^2 + 15^2 = X^2 - 90X + 45^2 + 15^2$

$$90X = 45^2 + 15^2 = 15^2(3^2+1)$$

$$X = \frac{15^2(10)}{15 \cdot 6} = 15 \cdot \frac{10}{6} =$$

$$= \frac{5 \cdot \cancel{3} \cdot \cancel{2} \cdot 5}{\cancel{2} \cdot \cancel{3}} = 25$$

Capture pt = (25, 0) snake & eagle travelled 25 ft.

4- 8 5. 2008, 2036, 2064, 2092.