

7 P180

$$2^n < 3^{20} < 2^{n+1}$$

各辺に常用対数をとる

$$\log_{10} 2^n < \log_{10} 3^{20} < \log_{10} 2^{n+1}$$

$$n \log_{10} 2 < 20 \log_{10} 3 < (n+1) \log_{10} 2$$

$$n \times 0.3010 < 20 \times 0.4771 < (n+1) \times 0.3010$$

連立不等式をとる

$$\begin{cases} n \times 0.3010 < 20 \times 0.4771 & \dots \textcircled{1} \\ 20 \times 0.4771 < (n+1) \times 0.3010 & \dots \textcircled{2} \end{cases}$$

①より

$$0.301n < 20 \times 0.4771$$

$$n < \frac{20 \times 0.4771}{0.301} = 31.7 \dots$$

$$n < 31.7 \dots$$

②より

$$20 \times 0.4771 < (n+1) \times 0.3010$$

$$\frac{20 \times 0.4771}{0.301} < n+1$$

$$31.7 \dots < n+1$$

$$30.7 \dots < n$$

①, ②より

$$30.7 < n < 31.7$$

$$\therefore n = 31$$

