

Notes # 5 Powers of i

$$i^1 = \sqrt{-1}$$

$$i^2 = -1$$

$$i^3 = -i$$

$$i^4 = 1$$

$$i \cdot i = i^2$$

$$\sqrt{-1} \cdot \sqrt{-1} = \sqrt{-1 \cdot -1} = -1$$

PAIR

$$i \cdot i \cdot i = i^3$$

$$\sqrt{-1} \cdot \sqrt{-1} \cdot \sqrt{-1} = \sqrt{\boxed{-1 \cdot -1}} \cdot \sqrt{-1} = -1 \cdot \sqrt{-1} = -i$$

Pair

$$i \cdot i \cdot i \cdot i = i^4$$

$$\sqrt{-1} \cdot \sqrt{-1} \cdot \sqrt{-1} \cdot \sqrt{-1} = \sqrt{\boxed{-1 \cdot -1} \cdot \boxed{-1 \cdot -1}} = \boxed{-1} \cdot \boxed{-1} = \boxed{1}$$

Ex 1.

$$i^{10}$$

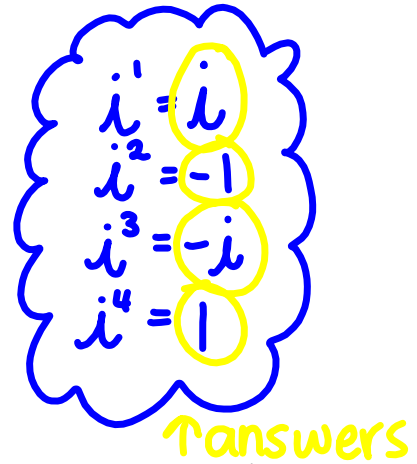
Since there is a Pattern
There are 4 answer possibilities

We will \div the exponent by 4

$$\begin{array}{r} 2 \\ 4 \overline{) 10} \\ \underline{-8} \end{array}$$

i^2 remainder is my new exponent to get the ANSWER

$$\textcircled{-1}$$



Ex 2.

$$i^{27}$$

$$\begin{array}{r} 6 \\ 4 \overline{) 27} \\ \underline{-24} \end{array}$$

$$i^3$$

$$\textcircled{-i}$$

always $\div 4$
b/c there are 4 answer options

try this:

$$i^{18}$$

$$\begin{array}{r} 4 \\ 4 \overline{) 18} \\ \underline{-16} \end{array}$$

$$i^2 = \textcircled{-1}$$

Powers of i

$i^1 = i$
 $i^2 = -1$
 $i^3 = -i$
 $i^4 = 1 \quad i^0 = 1$

answers

divide the exponent by

4

Ex 3.

i^{21}

$$\begin{array}{r}
 5 \\
 4 \overline{) 21} \\
 \underline{-20} \\
 \hline
 \end{array}$$

i^1 remainder new exponent

Ex 4. i^{19}

i

$$\begin{array}{r}
 4 \\
 4 \overline{) 19} \\
 \underline{-16} \\
 \hline
 \end{array}$$

$i^3 = -i$

Practice:

① i^{20}

$$\begin{array}{r} 4 \overline{) 20} \\ \underline{20} \\ 0 \end{array}$$

$$i^0 = 1$$

② i^{26}

$$\begin{array}{r} 4 \overline{) 26} \\ \underline{-24} \\ 2 \end{array}$$

$$i^2 = -1$$

answer

③ i^{31}

$$\begin{array}{r} 4 \overline{) 31} \\ \underline{-28} \\ 3 \end{array}$$

$$i^3 = -i$$

④ i^{36}

$$\begin{array}{r} 4 \overline{) 36} \\ \underline{-36} \\ 0 \end{array}$$

$$i^0 = 1$$

⑤ i^{55}

$$\begin{array}{r} 4 \overline{) 55} \\ \underline{-4} \\ 15 \\ \underline{-12} \\ 3 \end{array}$$

$$i^3 = -i$$

⑥ i^{22}

$$\begin{array}{r} 4 \overline{) 22} \\ \underline{-20} \\ 2 \end{array}$$

$$i^2 = -1$$