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Algebra / Simplifying a power of i

Simplifying a power of i

Simplify the complex number i^{49} as much as possible.



$$\frac{49}{4} = 12 \text{ r } 1$$
$$4 \times 12 = 48$$

Whole number

$$i^0 = 1$$
$$i^{.25} = i$$
$$i^{.50} = -1$$
$$i^{.75} = -i$$

Divide by 4
the remainder
is your
new exponent

$$i = \sqrt{-1}$$
$$\sqrt{-25}$$
$$\sqrt{25} \sqrt{-1}$$
$$5i$$

$$i^3 = i^2 \cdot i^1$$
$$-1 \cdot i = -i$$
$$i^4 = i^2 \cdot i^2$$
$$-1 \cdot -1 = 1$$

Note: The Solve feature is not available to students.

$$i^{26}$$
$$\frac{26}{4} = 6 \text{ r } 2$$
$$i^2 = -1$$
$$\frac{26}{4} = 6.5 \text{ r } 2$$
$$4 \times 6 = 24$$

$$i^0 = 1$$
$$i^1 = i$$
$$i^2 = -1$$
$$i^3 = -i$$

$$i^{75}$$

$$i^3 = -i$$

$$4 \times 18 = 72 \text{ r } 3$$

$$\frac{75}{4} = 18.75 \text{ r } 3$$
$$-75 = \frac{3}{4}$$

$$i^{36}$$

$$\frac{36}{4} = 9 \text{ r } 0$$

$$i^0 = 1$$

OTHER WAY:

$$i^{50} = (i^2)^{25}$$
$$(-1)^{25} = -1$$

$$i^{19} = (i^2)^9 i^1$$
$$(-1)^9 i$$
$$-i$$

$$i^{17} = i$$

$$\frac{17}{4} = 4 \text{ r } 1$$
$$i^1 = i$$
$$4 \times 4 = 16$$
$$17 - 16 = 1$$

$$i^{54} = -1$$

$$\frac{54}{4} = 13 \text{ r } 2$$
$$i^2 = -1$$
$$\frac{13}{4}$$
$$\frac{13}{4}$$