

DRILL

① Multiply: $(3x+2)(2x-4)$ = $6x^2 - 12x + 4x - 8$
 = $6x^2 - 8x - 8$

4, 9, 16, 25, ...
 = = = = =

② Simplify: $\sqrt{32} = \sqrt{16} \sqrt{2}$
 = $4\sqrt{2}$

Imaginary #'s

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

$$i^4 = i^2 \cdot i^2$$
$$i^4 = (-1)(-1)$$
$$i^4 = 1$$

$i^1 = i$	← :
$i^2 = -1$	← :
$i^3 = -i$	← :
$i^4 = 1$	← :

Powers of "i"

$$i^9 = i^4 \cdot i^4 \cdot i^1$$
$$= (-1) \cdot (-1) \cdot i$$
$$i^9 = i$$

$i^5 = i^4 \cdot i$
 $i^6 = i^4 \cdot i^2$
 $i^7 = i^4 \cdot i^3$
 $i^8 = i^4 \cdot i^4$
 $i^9 = i^4 \cdot i^4 \cdot i$
 $i^{10} = i^4 \cdot i^4 \cdot i^2$
 $i^{11} = i^4 \cdot i^4 \cdot i^3$
 $i^{12} = i^4 \cdot i^4 \cdot i^4$
 $i^{13} = i^4 \cdot i^4 \cdot i^4 \cdot i$
 $i^{14} = i^4 \cdot i^4 \cdot i^4 \cdot i^2$
 $i^{15} = i^4 \cdot i^4 \cdot i^4 \cdot i^3$
 $i^{16} = i^4 \cdot i^4 \cdot i^4 \cdot i^4$
 $i^{17} = i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i$

$\sqrt{4} = 2$

$i^2 = (\sqrt{-1})^2$
 $i^2 = -1$

$i^3 = i^{\textcircled{1}} \cdot i^{\textcircled{2}}$
 $= (-1)(i)$

$$\begin{array}{l}
 .1 \\
 i = i \\
 .2 \\
 i = -1 \\
 .3 \\
 i = -i \\
 .4 \\
 i = 1
 \end{array}$$

* Any power of "i"

* Divide the exponent by 4 and make the remainder the new exponent.

Ex: ① $i^{15} = i^{\overset{.3}{3}} = \boxed{-i}$ ② $i^{42} = i^{\overset{.2}{2}} = \boxed{-1}$ ③ $i^{80} = i^{\overset{.0}{0}} = \boxed{1}$

4, 8, 12 ↗

$4 \overline{) 42} = 10 \text{ r } 2$

$$x^0 = 1$$

Simplify: $\sqrt{-9} = \sqrt{9} \sqrt{-1}$
 $= 3i$

4, 9, 16, 25, 36, ...

$$\begin{array}{l} \sqrt{32} \\ \uparrow \\ \sqrt{16} \sqrt{2} \\ \underline{\underline{4\sqrt{2}}} \end{array}$$

$$\begin{array}{l} \sqrt{-25} = \sqrt{25} \sqrt{-1} \\ = 5i \end{array}$$

$$\begin{array}{l} \sqrt{-32} = \sqrt{32} \sqrt{-1} \\ = 4i\sqrt{2} \end{array}$$

$$\begin{array}{l} i = \sqrt{-1} \\ (3i)(3i) = 9i^2 \\ = 9(-1) \\ = -9 \end{array}$$

Ex:
=

$$\begin{aligned}\sqrt{-8} &= \sqrt{8} \sqrt{-1} \\ &= \sqrt{4} \sqrt{2} \sqrt{-1} = 2i\sqrt{2}\end{aligned}$$

$$\begin{aligned}\sqrt{-50} &= \sqrt{50} \sqrt{-1} \\ &= \sqrt{25} \sqrt{2} \sqrt{-1} = 5i\sqrt{2}\end{aligned}$$

$$\begin{aligned}\sqrt{-27} &= \sqrt{27} \sqrt{-1} \\ &= \sqrt{9} \sqrt{3} \sqrt{-1} = 3i\sqrt{3}\end{aligned}$$

4, 9, 16, 25, ...
= =

Ex:

$$a) \sqrt{-45} = \sqrt{45} \sqrt{-1} = 3i\sqrt{5}$$
$$\sqrt{45} = \sqrt{9 \cdot 5} = \sqrt{9} \sqrt{5} = 3\sqrt{5}$$

$$b) \sqrt{-150} = \sqrt{150} \sqrt{-1} = 5i\sqrt{6}$$
$$\sqrt{150} = \sqrt{25 \cdot 6} = \sqrt{25} \sqrt{6} = 5\sqrt{6}$$

4.
9.
16.
25
36
:
:
:

$$\underline{\underline{\text{Ex:}}} \quad \underline{\underline{(4i^2)}} \underline{\underline{(2i)}} \underline{\underline{(2i)}} = 16i^4 = 16(1) = \boxed{16}$$

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

$$\underline{\underline{\text{Ex:}}} \quad \underline{\underline{(3i^3)}} \underline{\underline{(2i)^2}} = \underline{\underline{(3i^3)}} \underline{\underline{(4i^2)}} = 12i^5$$
$$= 12(i^1)$$
$$= \boxed{12i}$$

$$\underline{\underline{\text{Ex:}}} \quad (-\underline{\underline{3i}})(\underline{\underline{6i}}) = -18i^2 = -18(-1) = \boxed{18}$$

$$\underline{\underline{\text{Ex:}}} \quad (\underline{\underline{3i}})^2 (\underline{\underline{2i}}) =$$
$$(\underline{\underline{3i}})(\underline{\underline{3i}})(\underline{\underline{2i}}) = 18i^3 = 18(-i)$$
$$= \boxed{-18i}$$

DRILL

- ① What is the center and radius of the circle: $(x - \underline{3})^2 + (y + \underline{5})^2 = 36$
- center: $(3, -5)$ $r = 6$

- ② Complete the square to get the function into vertex form: $f(x) = x^2 + 8x + 3$
- $(\frac{b}{2})^2$ $(x^2 + 8x + 16) + 3 - 16$
- $f(x) = \underline{\underline{(x+4)^2 - 13}}$ vertex: $(\underline{-4}, \underline{-13})$

$$b=10$$

$$\left(\frac{10}{2}\right)^2 = 25$$

$$x^2 + 10x + 3 = 8$$

$-3 \quad -3$

$$x^2 + 10x + 25 = 5 + 25$$

$$\sqrt{(x+5)^2} = \sqrt{30}$$

$$x+5 = \pm\sqrt{30}$$

$-5 \quad -5$

$$x = -5 \pm \sqrt{30}$$

* Get all non-variable terms (constants) on one side.

* Complete the square
Add $\left(\frac{b}{2}\right)^2$ to both sides

* Factor

* Solve for x: ($\sqrt{\quad}$)

Ex:

$$2x^2 + 6x - 8 = 2$$

$+ 8$ $+ 8$

$$\frac{20}{4} + \frac{9}{4} = \frac{29}{4}$$

$$\left(\frac{b}{2}\right)^2 = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

$$\frac{2x^2}{2} + \frac{6x}{2} = \frac{10}{2}$$

(Make $a = 1$
by dividing)

$$x^2 + 3x + \frac{9}{4} = 5 + \frac{9}{4}$$

(Add $\left(\frac{b}{2}\right)^2$ to both sides)

$$\sqrt{\left(x + \frac{3}{2}\right)^2} = \sqrt{\frac{29}{4}}$$

(Factor: $\left(x + \frac{b}{2}\right)^2$)

$$x + \frac{3}{2} = \pm \frac{\sqrt{29}}{2}$$

$-\frac{3}{2}$ $-\frac{3}{2}$

$$x = -\frac{3}{2} \pm \frac{\sqrt{29}}{2} = \frac{-3 \pm \sqrt{29}}{2}$$