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I. Model Problems.
II. Practice
III. Challenge Problems
IV. Answer Key

Web Resources

Complex Numbers
www.mathwarehouse.com/algebra/complex-number/home.php

YouTube Multiply Compex Numbers
www.mathwarehouse.com/algebra/complex-number/multiply-complex-number.php

Graph Paper Maker (free): www.mathworksheetsgo.com/paper/

Online Graphing Calculator(free): www.mathworksheetsgo.com/calculator/

Multiplying Complex Numbers

Recall FOIL: $(a+b)(c+d) = ac + ad + bc + bd$

$i^2 = -1$

I. Model Problems

In these examples we will multiply complex numbers

Example 1: Simplify $\boldsymbol{2i(3+7i)}$

Distribute $2i$.

$$2i(3+7i)$$
$$2i(3) + 2i(7i)$$
$$6i + 14i^2$$

Substitute -1 for i^2. Simplify.

$$6i + 14(-1)$$
$$6i - 14$$

Rewrite in standard form.

$$-14 + 6i$$

Answer: $\boldsymbol{2i(3+7i) = -14 + 6i}$

Example 2: Simplify $\boldsymbol{(5+2i)(6-4i)}$

Multiply with the FOIL method.

$$(5+2i)(6-4i)$$
$$5(6) + 5(-4i) + 2i(6) + 2i(-4i)$$
$$30 - 20i + 12i - 8i^2$$
$$30 - 8i - 8i^2$$

Substitute -1 for i^2. Simplify.

$$30 - 8i - 8(-1)$$
$$30 - 8i + 8$$
$$38 - 8i$$

Answer: $\boldsymbol{(5+2i)(6-4i) = 38 - 8i}$

II. Practice Problems

Simplify.

1. $6i(4-12i)$
2. $-3i(9-6i)$
3. $-11i(3+9i)$
4. $2.4i(18+12i)$
5. $-0.2i(16+8i)$
6. $(2+4i)(3+3i)$
7. $(3+5i)(4+4i)$
8. $(2-4i)(3+5i)$
9. $(-3+2i)(-3-4i)$
10. $(5-10i)(3+5i)$
11. $(-3-7i)(-12-2i)$
12. $(15+3i)(4-15i)$
13. $3i(4+2i)(2+5i)$
14. $-2i(3-7i)(4+2i)$
15. $2i(4-5i)(4+5i)$
16. $10(3-2i)(4+3i)$
17. $6i(7-10i)(7+10i)$
18. $(3+2i)^2$
19. $-(2+2i)^2$
20. $i(4+3i)^2$

III. Recognizing a Pattern

Multiply the next few complex number pairs and try to recognize a pattern

21) $(3+2\boldsymbol{i})(3-2\boldsymbol{i})$

22) $(4+5\boldsymbol{i})(4-5\boldsymbol{i})$

23) $(7-3\boldsymbol{i})(7+3\boldsymbol{i})$

24) Look carefully at questions 21-23. These complex numbers are known as complex conjugates. Explain why complex conjugates do **not** have an "i" term

Challenge Problems

1. Simplify $(\boldsymbol{a}-\boldsymbol{bi})(\boldsymbol{a}+\boldsymbol{bi})$
2. Find the error in the student's work.

$$(6-2i)(8+4i)$$
$$48+24i-16i-8i^2$$
$$48+8i-8$$
$$40+8i$$

3. If $(4+ai)(4-bi)=16+ab$ what must be true of *a* and *b*.
4. Find *a* if $(1+ai)(1-ai)=2$.
5. Find the error in the student's work.

$$(3+6i)(2-5i)$$
$$6-30i$$

IV. Answer Key

1. $72 + 24i$
2. $-18 - 27i$
3. $99 - 33i$
4. $-28.8 + 43.2i$
5. $1.6 - 3.2i$
6. $-6 + 18i$
7. $-8 + 32i$
8. $26 - 6i$
9. $17 + 6i$
10. $65 - 5i$
11. $22 + 90i$
12. $105 - 213i$
13. $-72 - 6i$
14. $-44 - 52i$
15. $82i$
16. $180 + 10i$
17. $894i$
18. $5 + 12i$
19. $-8i$
20. $24 + 7i$

Recognizing a pattern

21. 13
22. 41
23. 58
24. Complex conjugates do not have an 'i' term because the 'i' terms are additive inverse and always sum to zero much like there is no 'x' term when you multiply (x - 3)(x + 3) or (x-5)(x+5)

Challenge Problems

1. $(a - bi)(a + bi) = a^2 - abi + abi - b^2 i^2$
   $= a^2 + b^2(-1) = a^2 + b^2$
2. $i^2 = -1; -8(-1) = 8$
2. $a = b$
3. $a = 1$
4. Forgot to multiply outside times outside and inside times inside