Mid-Unit 1 Review

Here are examples that show how to solve all of the problems on this worksheet:

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| **Example:** Fill in the table.$$x^{4}-6x+9$$

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1st | 2nd | 3rd |
| Term | $$x^{4}$$ | $$-6x$$ | $$+9$$ |
| *Terms are the added/subtracted parts written separately.* |
| Coeff. | 1$$(1x^{4})$$ | -6 | 9$$(9x^{0})$$ |
| *Coefficients are numbers multiplied in front of variables.* |
| Power | $$x^{4}$$ | $$x^{1}$$ | $$x^{0}$$ |
| *Powers are the variables with their exponents showing.* |
| Exp. | 4 | 1 | 0 |
| *Exponents are the little numbers in the upper-right on the powers.* |

 | **Example:** Write the polynomial in standard form and identify the degree.$$4x^{2}-6x^{5}+3x-6+x^{3}$$*Standard form puts the exponents in order from biggest to smallest. When the terms move, they keep their signs.*$$$$*The standard form is:*$$-6x^{5}+x^{3}+4x^{2}+3x-6$$*The degree is the highest exponent:* **5***.* | **Example:** Write in standard form.$$\left(-2x^{2}+4\right)+(3x-6)$$*We* ***don’t change addition****, we just organize them into like terms:*

|  |
| --- |
| $x^{2}$ *terms can only add with* $x^{2}$*’s.* |
| $-2x^{2}$*is the only* $x^{2}$ *term* |
| $x$ *terms can only add with* $x$*’s.* |
| $3x$*is the only* $x$ *term* |
| *# terms can only add with #’s.* |
| $+4$ ***&*** $-6$*One is positive and one negative, so there are zero pairs that will cancel.* | $$+4$$ | $$-6$$ |
|  |  |
| $$-6+4=-2$$ |

$$\left(-2x^{2}+4\right)+\left(3x-6\right)$$$$=-2x^{2}+3x-2$$ | **Example:** Write in standard form.$$\left(-2x^{2}+4\right)-(3x-6)$$*First, we need to change* ***subtraction to adding the opposites:***$$\left(-2x^{2}+4\right)\left(\right)$$$$\left(-2x^{2}+4\right)()$$*Now, organize into like terms:*

|  |
| --- |
| $-2x^{2}$*is the only* $x^{2}$ *term* |
| $-3x$*is the only* $x$ *term* |
| $+4$ ***&*** $+6$*Both are positive, so they won’t cancel* | $$+4$$ | $$+6$$ |
|  |  |
| $$+4+6=10$$ |

$$\left(-2x^{2}+4\right)-\left(3x-6\right)$$$$=-2x^{2}-3x+10$$ |
| **Example:** Write in standard form.$$\left(6x^{2}-3\right)-(-x^{2}-9)$$*First, we need to change* ***subtraction to adding the opposites:***$$\left(6x^{2}-3\right)\left(\right)$$$$\left(6x^{2}-3\right)()$$*Now, organize into like terms:*

|  |  |  |
| --- | --- | --- |
| $6x^{2} $***&*** $+x^{2}$*Both are positive, so they won’t cancel.* | $$6x^{2}$$ | $$+x^{2}$$ |
|  |  |
| $6x^{2}+x^{2}$=$ 7x^{2}$ |
| $-3$ ***&*** $+9$*They’re positive and negative, so the zero pairs will cancel.* | $$-3$$ | $$+9$$ |
|  |  |
| $$-3+9=6$$ |

$$\left(6x^{2}-3\right)-(-x^{2}-9)=7x^{2}+6$$ | **Example:** Write in standard form.$$\left(6x^{2}-3\right)+(-x^{2}-9)$$*We* ***don’t change addition****, we just organize them into like terms:*

|  |  |  |
| --- | --- | --- |
| $6x^{2} $***&*** $-x^{2}$*They’re positive and negative, so the zero pairs will cancel.* | $$6x^{2}$$ | $$-x^{2}$$ |
|  |  |
| $6x^{2}-x^{2}$=$ 5x^{2}$ |
| $-3$ ***&*** $-9$*Both are negative, so they won’t cancel.* | $$-3$$ | $$-9$$ |
|  |  |
| $-3-9 $=$-12$ |

$\left(6x^{2}-3\right)+(-x^{2}-9)$ = $5x^{2}-12$ | **Example:**  Multiply.$$(3x+11)(4x-1)$$*Multiplication Sign Rules:**2 of different signs multiply to +**2 of same signs multiply to -**You can set up a generic rectangle by writing each (group) on its own side.*

|  |  |  |
| --- | --- | --- |
|  | $$3x$$ | $$+11$$ |
| $$4x$$ | $\left(3x^{1}\right)\left(4x^{1}\right) $= $+12x^{2}$ | $\left(11x^{0}\right)\left(4x^{1}\right)$= $+44x^{1}$ |
| $$-1$$ | $\left(3x^{1}\right)\left(-1x^{0}\right)$= $-3x^{1}$ | $\left(11x^{0}\right)\left(-1x^{0}\right)$= $-11x^{0}$ |

*Simpler version:*

|  |  |  |
| --- | --- | --- |
|  | $$3x$$ | $$+11$$ |
| $$4x$$ | $$+12x^{2}$$ | $$+44x$$ |
| $$-1$$ | $$-3x$$ | $$-11$$ |

*Now, combine like terms from inside. Remember that positives cancel out zero pair negatives.*$$12x^{2}-11$$$$12x^{2}+41x-11$$*Or, you can do this visually, using algebra tiles:*$$12x^{2}+41x-11$$ | **Example:** Multiply.$$\left(-7x^{2}+7x+2\right)\left(-4x-5\right)$$*Multiplication Sign Rules:**2 of different signs multiply to +**2 of same signs multiply to -**You can set up a generic rectangle by writing each (group) on its own side.*

|  |  |  |
| --- | --- | --- |
|  | $$-4x$$ | $$-5$$ |
| $$-7x^{2}$$ | $$\left(-7x^{2}\right)$$$$∙\left(-4x^{1}\right)$$$$+28x^{3}$$ | $$\left(-7x^{2}\right)$$$$∙\left(-5x^{0}\right)$$$$+35x^{2}$$ |
| $$+6x$$ | $$\left(6x^{1}\right)$$$$∙\left(-4x^{1}\right)$$$$-24x^{2}$$ | $$\left(6x^{1}\right)$$$$∙\left(-5x^{0}\right)$$$$-30x^{1}$$ |
| $$+2$$ | $$\left(2x^{0}\right)$$$$∙\left(-4x^{1}\right)$$$$-8x^{1}$$ | $$\left(2x^{0}\right)$$$$∙\left(-5x^{0}\right)$$$$-10x^{0}$$ |

*Simpler version:*

|  |  |  |
| --- | --- | --- |
|  | $$-4x$$ | $$-5$$ |
| $$-7x^{2}$$ | $$+28x^{3}$$ | $$+35x^{2}$$ |
| $$+6x$$ | $$-24x^{2}$$ | $$-30x$$ |
| $$+2$$ | $$-8x$$ | $$-10$$ |

*Now, combine like terms from inside. Remember that opposite signs form zero pairs in addition, and cancel each other. Same signs just get bigger.* $$28x^{3}-10$$$$28x^{3}+11x^{2}-38x-10$$ |
| **Example:** $$(8x^{2}+1)(2x-3)$$*Generic Rectangle:*

|  |  |  |
| --- | --- | --- |
|  | $$8x^{2}$$ | $$+1$$ |
| $$2x$$ | $$+16x^{3}$$ | $$+2x$$ |
| $$-3$$ | $$-24x^{2}$$ | $$-3$$ |

*Combine like terms:*$$16x^{3}+2x-24x^{2}-3$$*None of the terms are “like” (have the same variable exponent), so I can’t combine them. All you can do is write the polynomial in standard form.*$$16x^{3}-24x^{2}+2x-3$$ | **Example:** $$\left(-x^{2}-2x+3\right)\left(9x^{2}+x+8\right)$$

|  |  |  |  |
| --- | --- | --- | --- |
|  | $$9x^{2}$$ | $$+x$$ | $$+8$$ |
| $$-x^{2}$$ | $$-9x^{4}$$ | $$-x^{3}$$ | $$-8x^{2}$$ |
| $$-2x$$ | $$-18x^{3}$$ | $$-2x^{2}$$ | $$-16x$$ |
| $$+3$$ | $$+27x^{2}$$ | $$+3x$$ | $$+24$$ |

Like terms from inside the table:$$ -9x^{4}=-9x^{4}$$$$ -x^{3}-18x^{3}=-19x^{3}$$$$-8x^{2}-2x^{2}+27x^{2}=17x^{2}$$$$ -16x+3x=-13x$$$$ +24=+24$$**Answer:**$$-9x^{4}-19x^{3}+17x^{2}-13x+24$$ | **Example:** Factor.$$x^{2}+2x+5x+10$$*First, we are going to split the polynomial into 2 groups:*

|  |  |
| --- | --- |
| $$x^{2}+2x$$ | $$+5x+10$$ |
| *First group:**What can be backwards distributed (taken out of both)?*$x^{2}+2x\leftarrow $*both have*$ x$$$x(x)+x(2) $$$x(x+2)\leftarrow $*take x out* |
| *Second group:**What can be backwards distributed (taken out of both)?**both have* $+$*5* $\rightarrow +5x+10$$$+5(x)+5(2)$$*take* $+$*5 out* $\rightarrow +5(x+2)$ |

*So…*

|  |  |
| --- | --- |
| $$x^{2}+2x$$ | $$+5x+10$$ |
| $$x(x+2)$$ | $$+5(x+2)$$ |
| *Now, we can put them back together and backwards distribute from the whole thing:*$$x\left(x+2\right)+5\left(x+2\right)$$*Both have* $(x+2)$*, so take it out*$$\left(x+2\right)\left(x+5\right)$$ |

The factored form of $$x^{2}+2x+5x+10$$is$$(x+2)(x+5)$$ | **Example:** Factor.$$x^{2}-6x-3x+18$$*First, we are going to split the polynomial into 2 groups:*

|  |  |
| --- | --- |
| $$x^{2}-6x$$ | $$-3x+18$$ |
| *First group:**What can be backwards distributed (taken out of both)?*$x^{2}-6x\leftarrow $*both have*$ x$$$x(x)+x(-6) $$$x(x-6)\leftarrow $*take x out* |
| *Second group:**What can be backwards distributed (taken out of both)?**both have*$ $*-3* $\rightarrow -3x+18$$$-3\left(x\right)-3(-6)$$*take*$ $*-3 out* $\rightarrow -3(x-6)$ |

*So…*

|  |  |
| --- | --- |
| $$x^{2}-6x$$ | $$-3x+18$$ |
| $$x(x-6)$$ | $$-3(x-6)$$ |
| *Now, we can put them back together and backwards distribute from the whole thing:*$$x\left(x-6\right)-3\left(x-6\right)$$*Both have* $(x-6)$*, so take it out*$$\left(x-6\right)\left(x-3\right)$$ |

The factored form of $$x^{2}-6x-3x+18$$is$$\left(x-6\right)\left(x-3\right)$$ |
| **Example:** Factor.$$2x^{2}+9x-2x-9$$*Split it:*

|  |  |
| --- | --- |
| $$2x^{2}+9x$$ | $$-2x-9$$ |
| $2x^{2}+9x\leftarrow $*both have*$ x$$$x(2x)+x(9) $$$x(2x+9)\leftarrow $*take x out* | *both have*$ $*-1* $\rightarrow -2x-9$$$-1\left(2x\right)-1(+9)$$*take*$ $*-1 out* $\rightarrow -1(2x+9)$ |

|  |  |
| --- | --- |
| $$2x^{2}+9x$$ | $$-2x-9$$ |
| $$x(2x+9)-1(2x+9)$$*Both have* $(2x+9)$*, so take it out*$$\left(2x+9\right)\left(x-1\right)$$ |

The factored form of $$2x^{2}+9x-2x-9$$is$$\left(2x+9\right)\left(x-1\right)$$ | **Example:** Factor.$$3x^{2}+6x+4x+8$$*Split it:*

|  |  |
| --- | --- |
| $$3x^{2}+6x$$ | $$+4x+8$$ |
| $3x^{2}+6x\leftarrow $*both have*$ 3x$$$3x(x)+3x(2) $$$3x(x+2)\leftarrow $*take 3x out* | *both have* $+$*4* $\rightarrow +4x+8$$$+4\left(x\right)+4(2)$$*take*$ $*+4 out* $\rightarrow +4(x+2)$ |

|  |  |
| --- | --- |
| $$3x^{2}+6x$$ | $$+4x+8$$ |
| $$3x(x+2)+4(x+2)$$*Both have* $(x+2)$*, so take it out*$$\left(x+2\right)\left(3x+4\right)$$ |

The factored form of $$3x^{2}+6x+4x+8$$is$$\left(x+2\right)\left(3x+4\right)$$ |

Use the examples above as a guide to solving the problems below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 1. Fill in the table.$$5x^{2}+2$$

|  |  |  |
| --- | --- | --- |
|  | 1st | 2nd |
| Term |  |  |
| Coefficient |  |  |
| Power |  |  |
| Exponent |  |  |

 | 2. Fill in the table.$$-x^{3}+4x^{2}-5x$$

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1st | 2nd | 3rd |
| Term |  |  |  |
| Coeff. |  |  |  |
| Power |  |  |  |
| Exp. |  |  |  |

 | 3. Fill in the table.$$x^{5}-x^{2}-8$$

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1st | 2nd | 3rd |
| Term |  |  |  |
| Coeff. |  |  |  |
| Power |  |  |  |
| Exp. |  |  |  |

 |
| 4. Write the polynomial in standard form and identify the degree.$$-11x^{2}-7x^{4}+2x^{8}-x$$ | 5. Write the polynomial in standard form and identify the degree.$$-7x+9-10x^{7}+x^{5}-x^{3}$$ | 6. Write the polynomial in standard form and identify the degree.$$x^{5}+11x^{6}-3x+7$$ |
| 7. Write in standard form.$$\left(-7x^{2}+x\right)+(-10x^{2}+11)$$ | 8. Write in standard form.$$\left(-7x^{2}+x\right)-(-10x^{2}+11)$$ | 9. Write in standard form.$$\left(-4x+4\right)+(2x^{2}-7)$$ | 10. Write in standard form.$$\left(-4x+4\right)-(2x^{2}-7)$$ |
| 11. Write in standard form.$$\left(-9x^{2}-8x+3\right)-(-2x^{2})$$ | 12. Write in standard form.$$\left(-9x^{2}-8x+3\right)+(-2x^{2})$$ | 13. Write in standard form.$$\left(-6x^{2}-x\right)+(9x^{2}+x+7)$$ | 14. Write in standard form.$$\left(-6x^{2}-x\right)-(9x^{2}+x+7)$$ |
| 15. Write in standard form.$$\left(7x^{3}-4x\right)+(-x^{2}-2x-7)$$ | 16. Write in standard form.$$\left(-10x+11\right)-(4x+9)$$ | 17. Write in standard form.$$\left(-10x+11\right)+(4x+9)$$ | 18. Write in standard form.$$\left(7x^{3}-4x\right)-(-x^{2}-2x-7)$$ |
| 19. Multiply.$$(-5x-3)(7x-4)$$

|  |  |  |
| --- | --- | --- |
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 | 20. Multiply.$$(3x+9)(x^{2}-4x-8)$$

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| --- | --- | --- | --- |
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 | 21. Multiply.$$(6x^{2}-8x-1)(x^{2}-5x)$$

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 | 22. Multiply.$$(-4x^{3}-8x)(5x+11)$$

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| --- | --- | --- |
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 |
| 23. $(5x^{3}+x^{2})(-x^{2}+x+1)$

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| --- | --- | --- | --- |
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|  |  |  |  |

 | 24. $(6x-5)(x^{2}-3x)$

|  |  |  |
| --- | --- | --- |
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|  |  |  |
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 | 25. $(7x-1)(-9x^{2}+2)$

|  |  |  |
| --- | --- | --- |
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|  |  |  |
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 | 26. $(x^{4}+x^{2}+2)(-3x+4)$

|  |  |  |  |
| --- | --- | --- | --- |
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|  |  |  |  |

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| 27. Factor.$$x^{2}+2x+6x+12$$ | 28. Factor.$$x^{2}-4x-x+4$$ | 29. Factor.$$x^{2}+8x+3x+24$$ | 30. Factor.$$x^{2}-5x+2x-10$$ |
| 31. Factor.$$x^{2}-x-2x+2$$ | 32. Factor.$$x^{2}+7x+3x+21$$ | 33. Factor.$$5x^{2}+x+5x+1$$ | 34. Factor.$$3x^{2}+2x+6x+4$$ |

Answers

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |
| --- | --- | --- |
|  | 1st | 2nd |
| Term | $$5x^{2}$$ | $$+2$$ |
| Coefficient | $$5$$ | $$2$$ |
| Power | $$x^{2}$$ | $$x^{0}$$ |
| Exponent | $$2$$ | $$0$$ |

 |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1st | 2nd | 3rd |
| Term | $$-x^{3}$$ | $$+4x^{2}$$ | $$-5x$$ |
| Coefficient | $$-1$$ | $$4$$ | $$-5$$ |
| Power | $$x^{3}$$ | $$x^{2}$$ | $$x^{1}$$ |
| Exponent | $$3$$ | $$2$$ | $$1$$ |

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|  |  |  |  |
| --- | --- | --- | --- |
|  | 1st | 2nd | 3rd |
| Term | $$x^{5}$$ | $$-x^{2}$$ | $$-8$$ |
| Coefficient | $$1$$ | $$-1$$ | $$-8$$ |
| Power | $$x^{5}$$ | $$x^{2}$$ | $$x^{0}$$ |
| Exponent | $$5$$ | $$2$$ | $$0$$ |

 |  | $$2x^{8}-7x^{4}-11x^{2}-x$$Degree: 8 |
|  | $$-10x^{7}+x^{5}-x^{3}-7x+9$$Degree: $7$ |  | $$11x^{6}+x^{5}-3x+7$$Degree: 6 |
|  | $$-17x^{2}+x+11$$ |  | $$3x^{2}+x-11$$ |
|  | $$2x^{2}-4x-3$$ |  | $$-2x^{2}-4x+11$$ |
|  | $$-7x^{2}-8x+3$$ |  | $$-11x^{2}-8x+3$$ |
|  | $$3x^{2}+7$$ |  | $$-15x^{2}-2x-7$$ |
|  | $$7x^{3}-x^{2}-6x-7$$ |  | $$-14x+2$$ |
|  | $$-6x+20$$ |  | $$7x^{3}+x^{2}-2x+7$$ |
|  | $$-35x^{2}-x+12$$ |  | $$3x^{3}-3x^{2}-60x-72$$ |
|  | $$6x^{4}-38x^{3}+39x^{2}+5x$$ |  | $$-20x^{4}-44x^{3}-40x^{2}-88x$$ |
|  | $$-5x^{5}+4x^{4}+6x^{3}+x^{2}$$ |  | $$6x^{3}-23x^{2}+15x$$ |
|  | $$-63x^{3}+9x^{2}+14x-2$$ |  | $$-3x^{5}+4x^{4}-3x^{3}+4x^{2}-6x+8$$ |
|  | $$(x+2)(x+6)$$ |  | $$(x-4)(x-1)$$ |
|  | $$(x+8)(x+3)$$ |  | $$(x-5)(x+2)$$ |
|  | $$(x-1)(x-2)$$ |  | $$(x+7)(x+3)$$ |
|  | $$(5x+1)(x+1)$$ |  | $$(3x+2)(x+2)$$ |