

Name: _____
PC

Date: _____
Ms. Loughran

Do Now:

Factor each of the following completely.

1. $x^2 + 2xy - 3y^2$ multiply to: $-3x^2y^2$
add to: $2xy$

$$\begin{aligned} &x^2 + 3xy - xy - 3y^2 \\ &x(x + 3y) - y(x + 3y) \\ &(x - y)(x + 3y) \end{aligned}$$

2. $2x^2 + 3xy + y^2$ multiply to: $2x^2y^2$
add to: $3xy$

$$\begin{aligned} &2x^2 + 2xy + xy + y^2 \\ &2x(x + y) + y(x + y) \\ &(2x + y)(x + y) \end{aligned}$$

3. $x^3 - 6x^2 - x + 6$

$$\begin{aligned} &x^2(x - 6) - 1(x - 6) \quad \text{GROUPING} \\ &(x^2 - 1)(x - 6) \quad \text{DOTS} \\ &(x + 1)(x - 1)(x - 6) \end{aligned}$$

4. $x^6 + 2x^4 - 16x^2 - 32$

$$\begin{aligned} &x^4(x^2 + 2) - 16(x^2 + 2) \quad \text{GROUPING} \\ &(x^4 - 16)(x^2 + 2) \quad \text{DOTS} \\ &(x^2 + 4)(x^2 - 4)(x^2 + 2) \quad \text{DOTS} \\ &(x^2 + 4)(x + 2)(x - 2)(x^2 + 2) \end{aligned}$$

4. Multiply: $(a - b)(a^2 + ab + b^2)$

$$\begin{aligned} &= a^3 + a^2b + ab^2 - a^2b - ab^2 - b^3 \\ & \quad \quad \quad a^3 - b^3 \end{aligned}$$

Name: _____
PC: Factoring Differences and Sums of Cubes

Date: _____
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Formulas:

SOAP

Sum of Cubes: $c^3 + d^3 = (c + d)(c^2 - cd + d^2)$

Difference of cubes: $c^3 - d^3 = (c - d)(c^2 + cd + d^2)$

Factor each of the following completely.

1) $x^3 + 125$

$(x + 5)(x^2 - 5x + 25)$

2) $a^3 + 64$

3) $x^3 - 64$

$(x - 4)(x^2 + 4x + 16)$

4) $u^3 + 8$

5) $x^3 - 27$

6) $125 - x^3$

$(5 - x)(25 + 5x + x^2)$

7) $1 - a^3$

8) $a^3 + 125$

9) $x^3 + 27$

10) $x^3 + 1$

11) $8x^3 + 27$

$(2x + 3)(4x^2 - 6x + 9)$

12) $-27u^3 + 125$

or $-(27u^3 - 125)$
 $125 - 27u^3$
 $(5 - 3u)(25 + 15u + 9u^2)$
 $-(3u - 5)(9u^2 + 15u + 25)$

$$13) -a^3 - 8$$

$$14) 250x^4 + 128x$$

$$15) 648a + 1029a^4$$

$$16) 8a^3 + 125$$

$$17) 64x^3 + 1$$

$$18) 8x^4 + x$$

$$19) 343m^3 + 64n^3$$

$$20) m^3 + 8n^3$$

$$21) a^3 + 343b^3$$

$$22) x^3 - 216y^3$$

$$23) 1029yx^3 + 24y^4$$

$$24) m^3 + 64n^3$$

$$3y(343x^3 + 8y^3) \begin{matrix} \text{GCF} \\ \text{Sum of cubes} \end{matrix}$$
$$3y(7x + 2y)(49x^2 - 14xy + 4y^2)$$

Answers to Review of Factoring Sheet

Exercises

- 1) $2x^2 - 18 = 2(x^2 - 9) = 2(x-3)(x+3)$
- 2) $3y^2 - 48 = 3(y^2 - 16) = 3(y-4)(y+4)$
- 3) $a^4 - 16 = (a^2 + 4)(a^2 - 4) = (a^2 + 4)(a-2)(a+2)$
- 4) $5a^2 - 30a + 45 = 5(a-3)^2$
- 5) $4a^2 + 16a + 16 = 4(a+2)(a+2)$
- 6) $-x^2 + 50x - 625 = -(x-25)^2$
- 7) $ax - bx + ay - by = (x+y)(a-b)$
- 8) $2ax + 3 + x + 6a = (x+3)(2a+1)$
- 9) $x^3 - 3x^2 - 9x + 27 = (x-3)(x-3)(x+3)$
- 10) $3x^2 + 5x - 2 = (3x-1)(x+2)$
- 11) $12a^2b^2 - 3ab = 3ab(4ab-1)$
- 12) $x^2 - 4x + 2xy - 8y = (x-4)(x+2y)$
- 13) $x^2 - 16y^2 = (x-4y)(x+4y)$
- 14) $x^2 - 9x + 18 = (x-6)(x-3)$
- 15) $3a^2 - 2ax - 3a + 2x = (a-1)(3a-2x)$
- 16) $a^2 - 2a + ab - 2b = (a+b)(a-2)$
- 17) $6x^2 + 13x + 6 = (2x+3)(3x+2)$
- 18) $x^4 - 11x^3 + 24x^2 = x^2(x-8)(x-3)$
- 19) $8x^2 - 6x - 2 = (2x-1)(4x+2)$
- 20) $9x^2 - 12x + 4 = (3x-2)^2$
- 21) $a^3 - a^2b - a + b = (a-1)(a+1)(a-b)$
- 22) $x^2 + 6x + 5 = (x+5)(x+1)$
- 23) $x^2 - 4x + 3 = (x-3)(x-1)$
- 24) $n^2 + 5n + 6 = (n+2)(n+3)$
- 25) $n^2 - 10n + 25 = (n-5)^2$
- 26) $m^2 + 3ms - 4s^2 = (m-s)(m+4s)$
- 27) $y^2 + 4y - 12 = (y+6)(y-2)$
- 28) $y^2 - y - 30 = (y-6)(y+5)$
- 29) $t^2 - 14t - 72 = (t-18)(t+4)$
- 30) $6 - x - x^2 = (3+x)(2-x)$
- 31) $36 + 5x - x^2 = (9-x)(4+x)$
- 32) $36s^2 + 12s + 1 = (6s+1)^2$
- 33) $6s^2 + 30s - 900 = 6(s+15)(s-10)$
- 34) $2a^4 - 10a^3 - 72a^2 = 2a^2(a-9)(a+4)$
- 35) $2x^3 - 3x^2 - 2x + 3 = (x-1)(x+1)(2x-3)$
- 36) $(x-1)^2 - 4 = (x+1)(x-3)$
- 37) $(x+2)^2 - (y-3)^2 = (x+y-1)(x-y+5)$
- 38) $16 - (2x-1)^2 = (5-2x)(3+2x)$
- 39) $4a^2 - 4ab - 36 + b^2 = (2a-b+6)(2a-b-6)$
- 40) $2a^3 - 16a^2 + 32a = 2a(a-4)^2$

(19) $8x^2 - 6x - 2$
 $8x^2 - 8x + 2x - 2 = (8x+2)(x-1)$
 $8x(x-1) + 2(x-1) = 2(4x+1)(x-1)$

(20) $9x^2 - 6x - 6x + 4$
 $3x(3x-2) - 2(3x-2)$
 $(3x-2)(3x-2)$

Name: _____

Factoring Review Worksheet

Factor the following polynomials using the strategy and examples above:

Polynomial:	Factored form:
$12a^2b^2 - 3ab$	$3ab(4ab - 1)$ GCF
$4x^2 - 9$	$(2x-3)(2x+3)$ DOTS
$x^2 - 16y^2$	$(x-4y)(x+4y)$ DOTS
$x^2 - 4x + 2xy - 8y$ $x(x-4) + 2y(x-4)$	$(x+2y)(x-4)$ GROUPING
$x^2 - 9x + 20$	$(x-5)(x-4)$ AM
$9x^2 - 12x + 4$	$(3x-2)^2$ or $(3x-2)(3x-2)$ GROUPING
$8x^3 - x^2$ $x^2(8x-1)$	$x^2(8x-1)$ GCF
$x^2 + 49$	can't factor further
$16x^3 + 16x^2 + 3x$ $x(16x^2 + 16x + 3)$ <i>ac = 48 b = 16</i>	$x(16x^2 + 12x + 4x + 3)$ GCF $x(4x(4x+3) + 1(4x+3))$ SPLITTING THE MIDDLE $x(4x+1)(4x+3)$
$x^2 - 9x + 18$	$(x-6)(x-3)$ AM
$6x^2 + 13x + 6$	$6x^2 + 4x + 9x + 6$ $2x(3x+2) + 3(3x+2)$ AC/SPLITTING THE MIDDLE $(2x+3)(3x+2)$

Factoring Review Worksheet

AC / SPLITTING THE MIDDLE

$2x^2 + 3x - 2$	$2x^2 + 4x - x - 2$ $2x(x+2) - 1(x+2)$ \int^{\rightarrow} $(2x-1)(x+2)$
$5x^2 - 22x - 15$	$5x^2 - 25x + 3x - 15$ \int^{\rightarrow} $(5x+3)(x-5)$ $5x(x-5) + 3(x-5)$
$3x^3 + 9x^2 - 12x$	$3x(x^2 + 3x - 4)$ GCF $3x(x+4)(x-1)$ AM
$x^2 + 3x - 28$	$(x+7)(x-4)$ AM
$x^2 - 8x + 16$	$(x-4)^2$ AM or $(x-4)(x-4)$
$4x^2 - 7xy + 3y^2$	$4x^2 - 4xy - 3xy + 3y^2$ SPLIT THE MIDDLE $4x(x-y) - 3y(x-y)$ \int^{\rightarrow} $(4x-3y)(x-y)$
$x^3 - xy + x^2 - y$	$x(x^2 - y) + 1(x^2 - y)$ GROUPING $(x+1)(x^2 - y)$
$8x^2 - 6x - 2$	$8x^2 - 8x + 2x - 2$ AC / SPLITTING THE MIDDLE $8x(x-1) + 2(x-1)$ \int^{\rightarrow} $(8x+2)(x-1)$ $2(4x+1)(x-1)$
$x^4 - 11x^3 + 24x^2$	$x^2(x^2 - 11x + 24)$ GCF $x^2(x-8)(x-3)$ AM
$6x^4y^5 - 2x^2y^3 + 14x^3y^4$	$2xy^3(3x^3y^2 - 1 + 7xy^2)$

rearranging

$$6x^4y^5 + 14x^3y^4 - 2x^2y^3$$

$$2x^2y^3(3x^2y^2 + 7xy - 1)$$

$$ac = -3x^2y^2$$

$$b = 7xy$$

can not factor further