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Unit 1 Review

For each type of question, the achievement level is indicated. Showing work is an important strategy in communicating your knowledge and ideas so please be thorough.

Learning Goal 1.1	Given a polynomial expression, identify the GCF and use it to find factored form.

Developing	
Write each for the following numbers as a product of primes and then find the Greatest Common Factor (GCF) and Lowest Common Multiple (LCM).	Prime factor each of the following numbers and use the prime factors to justify whether each is a perfect square, perfect cube, neither or both.
18, 54 GCF(18, 54) = 18 LCM(18, 54) = 54	1728 Perfect Cube
22, 46 GCF(22, 46) = 2 LCM(22, 46) = 506	2025 Perfect Square
15, 36 GCF(15, 36) = 3 LCM(15, 36) = 180	5556 Neither
12, 40 GCF(12, 40) = 4 LCM(12, 40) = 120	4096 Perfect Square, Perfect Cube

Developing	
Identify the Greatest Common Factor (GCF) of the following terms:	For each arrangement of algebra tiles, write the polynomial they represent and identify its factors.
1. $4x, 70$ $\text{GCF}(4x, 70) = 2$	2. $3x + 12 = 3(x + 4)$ 
3. $12ab^2, 36a^2b$ $\text{GCF}(12ab^2, 36a^2b) = 12ab$	4. $6x + 9 = 3(2x + 3)$ 
5. $9mn, 33m^2n^3$ $\text{GCF}(9mn, 33m^2n^3) = 3mn$	6. $4x + 12 = 2(2x + 6)$ 
7. $15x^4y, 25x^3y^3$ $\text{GCF}(15x^4y, 25x^3y^3) = 5x^3y$	8. $4x + 12 = 4(x + 3)$ 

Proficient	
1. For each of the following polynomials, identify the GCF and then use it to factor the polynomial.	
a. $12ab^2 + 36a^2b = 12ab(b + 3a)$	b. $4x - 70 = 2(2x - 35)$
c. $9mn - 33m^2n^3 = 3mn(3 - 11mn^2)$	d. $34 - 8g = 2(17 - 4g)$
e. $6 + 24k = 6(1 + 4k)$	f. $25x^3y^3 - 15x^4y = 5x^3y(5y^2 - 3x)$
g. $q^5 - q^2 = q^2(q^3 - 1)$	h. $162v^4w^2 - 36v^2w^4 = 18v^2w^2(9v^4 - 2w^2)$

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Extending
1. For each of the following polynomials, identify the GCF and then use it to factor the polynomial.
a. $26xyz + 4x^2yz^2 - 8z = 2z(13xy + 2x^2yz - 4)$
b. $78a^3bc^6 - 312ab^2c^3 + 507a^5bc^3 = 39abc^3(2a^2c^3 - 8b + 13a^4)$
c. $405f^2g^2h^2 - 90fg^2h^3 + 225f^3g^4h^2 = 45fg^2h^2(9f - 2h + 5f^2g^2)$
d. $512\,m^5n^4p^2 + 208m^2n^4p^5 - 416m^3n^3p^3 = 16m^2n^3p^2(32m^3n + 13np^3 - 26mp)$

Extending
1. Gillian says that she knows that 61 is a prime number because she tried dividing 61 by all the natural numbers up to and including 7, and none of them was a factor. Do you agree with Gillian? Explain. No
2. A bar of soap has the shape of a rectangular prism that measures 10cm by 6 cm by 3 cm. What is the edge length of the smallest cube that could be filled with these soap bars? 30 cm
3. A cube has a volume of 2197 m^3. Its surface is to be painted. Each can of paint covers about 40 m^2. How many cans of paint are needed? Justify your answer. 26 cans
4. Suppose *n* is an integer. Is $n^2 - n$ always an integer? Justify your answer. Yes

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Learning Goal 1.2	Factor trinomials of the form $ax^2 + bx + c$.

Developing	
Factor the following trinomials into a product of binomials.	
1. $x^2 + 4x + 4 = (x + 2)^2$	2. $m^2 + 14m + 24 = (m + 12)(m + 2)$
3. $a^2 + 8a + 12 = (a + 6)(a + 2)$	4. $b^2 + 7b + 12 = (b + 3)(b + 4)$
5. $c^2 + 13c + 12 = (c + 12)(c + 1)$	6. $d^2 + 8d + 15 = (d + 5)(d + 3)$
7. $f^2 + 9f + 18 = (f + 6)(f + 3)$	8. $g^2 + 9g + 20 = (g + 5)(g + 4)$
9. $h^2 + 7h + 6 = (h + 6)(h + 1)$	10. $k^2 + 5k + 4 = (k + 4)(k + 1)$
11. $a^2 + 12a + 36 = (a + 6)^2$	12. $k^2 + 19k + 18 = (k + 18)(k + 1)$

Write the area statement shown by the algebra tiles as both a trinomial and a product of 2 binomials.

1. $x^2 + 12x + 20 = (x + 2)(x + 10)$

2. $x^2 + 9x + 18 = (x + 3)(x + 6)$

3. $x^2 + 10x + 25 = (x + 5)^2$

Proficient	
Factor the following trinomials into a product of binomials.	
1. $z^2 + z - 6 = (z + 3)(z - 2)$	2. $b^2 - 7b + 12 = (b - 3)(b - 4)$
3. $x^2 - 7x - 18 = (x - 9)(x + 2)$	4. $p^2 - 5p - 14 = (p - 7)(p + 2)$
5. $m^2 - 9m + 8 = (m - 8)(m - 1)$	6. $q^2 - 16q + 63 = (q - 7)(q - 9)$
7. $24n - n^2 - 25 = (25 - n)(n + 1)$	8. $a^2 + 11a - 80 = (a + 16)(a - 5)$
9. $20 + 8n - n^2 = (10 - n)(n + 2)$	10. $11p - p^2 - 24 = (8 - p)(p - 3)$
Factor the following polynomials into a product of binomials.	
1. $4g^2 + 11g + 6 = (4g + 3)(g + 2)$	2. $36x^2 + 12x + 1 = (6x + 1)^2$
3. $6m^2 - 7m - 10 = (6m + 5)(m - 2)$	4. $16 - 56z + 49z^2 = (7z - 4)^2$
5. $8p^2 - 18p - 5 = (4p + 1)(2p - 5)$	6. $81m^2 - 49 = (9m + 7)(9m - 7)$
7. $3n^2 - 8n + 4 = (3n - 2)(n - 2)$	8. $49a^2 - 100 = (7a + 10)(7a - 10)$
9. $6y^2 + 5y - 6 = (3y - 2)(2y + 3)$	10. $1 + 2b + b^2 = (1 + b)^2$
11. $4a^2 - 17a + 4 = (4a - 1)(a - 4)$	12. $9 - r^2 = (3 - r)(r + 3)$
13. $3r^2 - 2r - 5 = (3r - 5)(r + 1)$	14. $k^4 - 100 = (k^2 + 10)(k^2 - 10)$
15. $5x^2 + 19x + 12 = (5x + 4)(x + 3)$	16. $4t^2 - 4t + 1 = (2t - 1)^2$
Factor the following binomials.	
1. $x^2 - 25 = (x - 5)(x + 5)$	2. $a^4 - 4 = (a^2 + 2)(a^2 - 2)$
3. $81 - a^2 = (9 - a)(9 + a)$	4. $100 - b^6 = (10 - b^3)(10 + b^3)$
5. $169 - q^{10} = (13 - q^5)(13 + q^5)$	6. $m^2 - 49 = (m + 7)(m - 7)$

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7. $144 - n^8 = (12 - n^4)(12 + n^4)$	8. $b^{20} - 4 = (b^{10} - 2)(b^{10} + 2)$

Extending

Without a calculator, what values of *a* could you use to complete the trinomial (note that *a* can be either a positive or a negative value).

1. $x^2 + ax + 18$ $a = \pm 19, \pm 11, \pm 9$	2. $y^2 + ay + 24$ $a = \pm 25, \pm 14, \pm 11, \pm 10$
3. $m^2 + am - 16$ $a = \pm 15, \pm 6, 0$	4. $n^2 + an - 20$ $\pm 19, \pm 8, \pm 1$

Factor the following trinomials into a product of binomials.

1. $24h^2 - 20h - 24 = 4(3h + 2)(2h - 3)$	2. $162v^4 - 2w^4 = 2(9v^2 - w^2)(9v^2 + w^2)$
3. $10x^2 + 80x + 120 = 10(x + 2)(x + 6)$	4. $4y^2 - 20y - 56 = 4(y - 7)(y + 2)$
5. $-3m^2 - 18m - 24 = -3(m + 2)(m + 4)$	6. $-5n^2 + 40n - 35 = -5(n - 7)(n - 1)$
7. $21 + 66k + 9k^2 = 3(3k + 1)(k + 7)$	8. $10n^2 + 100n + 250 = 10(n + 5)^2$
9. $2x^2 + 5xy + 2y^2 = (2x + y)(x + 2y)$	10. $10p^3 - 1960p = 10p(p + 14)(p - 14)$
11. $16b^2 + 60b - 100 = 4(4b - 5)(b + 5)$	12. $343b^2 - 7b^4 = 7b^2(7 - b)(7 + b)$
13. $4b^2 - 35ab + 49a^2 = (4b - 7a)(b - 7a)$	14. $98n^2 - 200 = 2(7n - 10)(7n + 10)$
15. $7q^3r^2 + 53q^2r^2 + 28qr^2 = qr^2(7q + 4)(q + 7)$	16. $81x^4 - 900x^2 = 9x^2(3x - 10)(3x + 10)$
17. $9 - 3p - 2p^2 = (3 - 2p)(p + 3)$	18. $100m^2 + 180m + 81 = (10m + 9)^2$
19. $2w^2v^2 + 11wv + 5 = (2vw + 1)(vw + 5)$	20. $400v^2w^4 - 36v^4 = 4v^2(10w^2 - 3)(10w^2 + 3)$

Factor the following binomials.

1. $4m^2 - 25 = (2m + 5)(2m - 5)$	2. $125 - 5r^2 = 5(5 - r)(5 + r)$
3. $121p^6 - 25q^4 = (11p^3 + 5q^2)(11p^3 - 5q^2)$	4. $4z^2 - 64 = 4(z + 4)(z - 4)$
5. $900a^2 - 81 = (30a + 9)(30a - 9)$	6. $9s^8 - 4t^2 = (3s^4 + 2t)(3s^4 - 2t)$

Extending

1. Find all the trinomials that begin with $9m^2$, end with $+16$, and can be factored.

$$9m^2 \pm 145m + 16$$
$$9m^2 \pm 74m + 16$$
$$9m^2 \pm 51m + 16$$
$$9m^2 \pm 40m + 16$$
$$9m^2 \pm 30m + 16$$
$$9m^2 \pm 26m + 16$$
$$9m^2 \pm 25\,m + 16$$
$$9m^2 \pm 24m + 16$$