LESSON 4.6 Skills Practice

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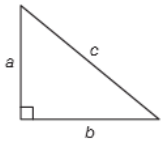
Identity Theft
Exploring Polynomial Identities

Vocabulary

1. Given positive integers r and s, where $r > s$, write the terms in Euclid's Formula that correspond to each side length in a right triangle, a, b, and c.



Problem Set

Use polynomial identities and number properties to perform each calculation.

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1. 109^2

   Answers will vary.

   $109^2 = (100 + 9)^2$
   $= 100^2 + 2(100)(9) + 9^2$
   $= 10{,}000 + 1800 + 81$
   $= 11{,}881$

2. 54^3

3. 38^3

4. 99^2

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5. 127^2

6. 75^3

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Determine whether each set of numbers is a Pythagorean triple. Explain your reasoning.

7. 5, 12, 13

$5^2 + 12^2 \stackrel{?}{=} 13^2$

$25 + 144 \stackrel{?}{=} 169$

$169 = 169$

These numbers are a Pythagorean triple because $5^2 + 12^2 = 13^2$.

8. 60, 61, 11

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9. 8, 15, 16

10. 4, 8, 12

11. 10, 24, 26

12. 1, 2, $\sqrt{5}$

4 Generate a Pythagorean triple using each pair of given numbers and Euclid's Formula.

13. 3 and 8

$(8^2 + 3^2)^2 = (8^2 - 3^2)^2 + (2(8)(3))^2$

$(64 + 9)^2 = (64 - 9)^2 + (6(8))^2$

$73^2 = 55^2 + 48^2$

$5329 = 5329$

The Pythagorean triple is 48, 55, 73.

14. 4 and 12

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15. 11 and 9

16. 7 and 13

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17. 50 and 60

18. 25 and 100

Verify each algebraic statement by transforming one side of the equation to show that it is equivalent to the other side of the equation.

19. $g^6 - h^6 = (g^2 - h^2)(g^2 - gh + h^2)(g^2 + gh + h^2)$

Method 1:

$g^6 - h^6 \stackrel{?}{=} (g^2 - h^2)(g^2 - gh + h^2)(g^2 + gh + h^2)$

$\stackrel{?}{=} (g^4 - g^3h + g^2h^2 - g^2h^2 + gh^3 - h^4)(g^2 + gh + h^2)$

$\stackrel{?}{=} g^6 + g^5h + g^4h^2 - g^5h - g^4h^2 - g^3h^3 + g^4h^2 + g^3h^3 + g^2h^4 - g^4h^2 - g^3h^3 - g^2h^4 + g^3h^3 + g^2h^4 - gh^5 - g^2h^4 - gh^5 - h^6$

$= g^6 - h^6$

Method 2:

$g^6 - h^6 \stackrel{?}{=} (g^2 - h^2)(g^2 - gh + h^2)(g^2 + gh + h^2)$

$(g^3 + h^3)(g^3 - h^3) \stackrel{?}{=}$

$(g + h)(g^2 - gh + h^2)(g - h)(g^2 + gh + h^2) \stackrel{?}{=}$

$(g^2 - h^2)(g^2 - gh + h^2)(g^2 + gh + h^2) =$

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20. $(m^2 + n^2)^3 = (m^2 + n^2)(m^4 + 2m^2n^2 + n^4)$

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21. $p^8 - q^8 = (p - q)(p + q)(p^2 + q^2)(p^4 + q^4)$

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22. $r^4 - s^4 = (r^2 + s^2)(r + s)(r - s)$

23. $a^{15} + b^{15} = (a^5 + b^5)(a^{10} - a^5b^5 + b^{10})$

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24. $(v^6 + w^6)^2 = (v^6 - w^6)^2 + (2v^3w^3)^2$