

**LESSON 4.7** Skills Practice

Name \_\_\_\_\_ Date \_\_\_\_\_

**The Curious Case of Pascal's Triangle**  
**Pascal's Triangle and the Binomial Theorem****Vocabulary**

Write a definition for the term in your own words.

1. Binomial Theorem

**Problem Set**

Use Pascal's Triangle to expand each binomial.

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1.  $(a + b)^4 =$

$$(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

2.  $(a + b)^7 =$

3.  $(a + b)^8 =$

4.  $(a + b)^9 =$

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

6.  $(a + b)^{13} =$

Perform each calculation and simplify.

7.  $7! =$   
 $7! = (7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1)$   
 $= 5040$

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8.  $12! =$

9.  $3!4! =$

10.  $5!8! =$

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11.  $\frac{6!}{4!} =$

12.  $\frac{17!}{14!3!} =$

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Perform each calculation and simplify.

13.  $\binom{5}{3} =$

$$\begin{aligned}\binom{5}{3} &= \frac{5!}{3!(5-3)!} \\ &= \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{(3 \cdot 2 \cdot 1)(2 \cdot 1)} \\ &= \frac{20}{2} \\ &= 10\end{aligned}$$

14.  ${}_6C_3 =$

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15.  $\binom{10}{4} =$

16.  ${}_{11}C_5 =$

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17.  $\binom{16}{2} =$

18.  ${}_{13}C_4 =$

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Use the Binomial Theorem and substitution to expand each binomial.

19.  $(x - 2y)^6 =$

$$(a + b)^6 = \binom{6}{0}a^6b^0 + \binom{6}{1}a^5b^1 + \binom{6}{2}a^4b^2 + \binom{6}{3}a^3b^3 + \binom{6}{4}a^2b^4 + \binom{6}{5}a^1b^5 + \binom{6}{6}a^0b^6$$

$$= a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$$

Let  $a = x$  and let  $b = -2y$ .

$$(x - 2y)^6 = x^6 + 6x^5(-2y) + 15x^4(-2y)^2 + 20x^3(-2y)^3 + 15x^2(-2y)^4 + 6x(-2y)^5 + (-2y)^6$$

$$= x^6 - 12x^5y + 15x^4(4y^2) - 20x^3(8y^3) + 15x^2(16y^4) - 6x(32y^5) + 64y^6$$

$$= x^6 - 12x^5y + 60x^4y^2 - 160x^3y^3 + 240x^2y^4 - 192xy^5 + 64y^6$$

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20.  $(x + 3y)^5 =$

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21.  $(4x - y)^7 =$

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22.  $(3x + 2y)^4 =$

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23.  $(-x + 5y)^8 =$

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24.  $(2x - 3)^6 =$