

Exercise Set 11.5

Practice Exercises

In Exercises 1–8, evaluate the given binomial coefficient.

1. $\binom{8}{3}$
2. $\binom{7}{2}$
3. $\binom{12}{1}$
4. $\binom{11}{1}$
5. $\binom{6}{6}$
6. $\binom{15}{2}$
7. $\binom{100}{2}$
8. $\binom{100}{98}$

In Exercises 9–30, use the Binomial Theorem to expand each binomial and express the result in simplified form.

9. $(x + 2)^3$
10. $(x + 4)^3$
11. $(3x + y)^3$
12. $(x + 3y)^3$
13. $(5x - 1)^3$
14. $(4x - 1)^3$
15. $(2x + 1)^4$
16. $(3x + 1)^4$
17. $(x^2 + 2y)^4$
18. $(x^2 + y)^4$
19. $(y - 3)^4$
20. $(y - 4)^4$
21. $(2x^3 - 1)^4$
22. $(2x^5 - 1)^4$
23. $(c + 2)^5$
24. $(c + 3)^5$
25. $(x - 1)^5$
26. $(x - 2)^5$
27. $(3x - y)^5$
28. $(x - 3y)^5$
29. $(2a + b)^6$
30. $(a + 2b)^6$

In Exercises 31–38, write the first three terms in each binomial expansion, expressing the result in simplified form.

31. $(x + 2)^8$
32. $(x + 3)^8$
33. $(x - 2y)^{10}$
34. $(x - 2y)^9$
35. $(x^2 + 1)^{16}$
36. $(x^2 + 1)^{17}$
37. $(y^3 - 1)^{20}$
38. $(y^3 - 1)^{21}$

In Exercises 39–48, find the term indicated in each expansion.

39. $(2x + y)^6$; third term
40. $(x + 2y)^6$; third term
41. $(x - 1)^9$; fifth term
42. $(x - 1)^{10}$; fifth term
43. $(x^2 + y^3)^8$; sixth term
44. $(x^3 + y^2)^8$; sixth term
45. $(x - \frac{1}{2})^9$; fourth term
46. $(x + \frac{1}{2})^8$; fourth term
47. $(x^2 + y)^{22}$; the term containing y^{14}
48. $(x + 2y)^{10}$; the term containing y^6

Practice Plus

In Exercises 49–52, use the Binomial Theorem to expand each expression and write the result in simplified form.

49. $(x^3 + x^{-2})^4$
50. $(x^2 + x^{-3})^4$

$$51. \left(x^{\frac{1}{3}} - x^{-\frac{1}{3}}\right)^3$$

$$52. \left(x^{\frac{2}{3}} - \frac{1}{\sqrt[3]{x}}\right)^3$$

In Exercises 53–54, find $\frac{f(x+h) - f(x)}{h}$ and simplify.

$$53. f(x) = x^4 + 7$$

$$54. f(x) = x^5 + 8$$

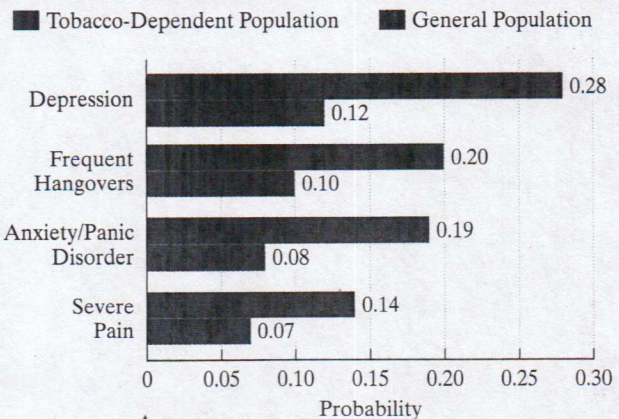
$$55. \text{ Find the middle term in the expansion of } \left(\frac{3}{x} + \frac{x}{3}\right)^{10}.$$

$$56. \text{ Find the middle term in the expansion of } \left(\frac{1}{x} - x^2\right)^{12}.$$

Application Exercises

The graph shows that U.S. smokers have a greater probability of suffering from some ailments than the general adult population. Exercises 57–58 are based on some of the probabilities, expressed as decimals, shown to the right of the bars. In each exercise, use a calculator to determine the probability, correct to four decimal places.

Probability That United States Adults Suffer from Various Ailments



Source: MARS 2005 OTC/DTC

If the probability an event will occur is p and the probability it will not occur is q , then each term in the expansion of $(p + q)^n$ represents a probability.

57. The probability that a smoker suffers from depression is 0.28. If five smokers are randomly selected, the probability that three of them will suffer from depression is the third term of the binomial expansion of

$$(0.28 + 0.72)^5.$$

5 smokers are selected.

Probability a smoker suffers from depression

Probability a smoker does not suffer from depression

What is this probability?