Finding a Sum In Exercises 45–54, find the sum using the formulas for the sums of powers of integers.

45. $\sum_{n=1}^{15} n$

46. $\sum_{n=1}^{30} n$

47. $\sum_{n=1}^{6} n^2$

48. $\sum_{n=1}^{10} n^3$

49. $\sum_{n=1}^{5} n^4$

50. $\sum_{n=1}^{8} n^5$

51. $\sum_{n=1}^{6} (n^2 - n)$

52. $\sum_{n=1}^{20} (n^3 - n)$

53. $\sum_{i=1}^{6} (6i - 8i^3)$

54. $\sum_{j=1}^{10} \left(3 - \frac{1}{2}j + \frac{1}{2}j^2\right)$

Finding a Linear or Quadratic Model In Exercises 55–60, decide whether the sequence can be represented perfectly by a linear or a quadratic model. Then find the model.

55. 5, 14, 23, 32, 41, 50, . . .

56. 3, 9, 15, 21, 27, 33, . . .

57. 4, 10, 20, 34, 52, 74, . . .

58. 0, 9, 24, 45, 72, 105, . . .

59. −1, 11, 31, 59, 95, 139, . . .

60. −2, 13, 38, 73, 118, 173, . . .

Linear Model, Quadratic Model, or Neither? In Exercises 61–68, write the first six terms of the sequence beginning with the term a_1. Then calculate the first and second differences of the sequence. State whether the sequence has a perfect linear model, a perfect quadratic model, or neither.

61. $a_1 = 0$
$a_n = a_{n-1} + 3$

62. $a_1 = 2$
$a_n = a_{n-1} + 2$

63. $a_1 = 4$
$a_n = a_{n-1} + 3n$

64. $a_1 = 3$
$a_n = 2a_{n-1}$

65. $a_1 = 3$
$a_n = a_{n-1} + n^2$

66. $a_1 = 0$
$a_n = a_{n-1} - 2n$

67. $a_1 = 5$
$a_n = 4n - a_{n-1}$

68. $a_1 = -2$
$a_n = a_{n-1} + 4n$

Finding a Quadratic Model In Exercises 69–74, find the quadratic model for the sequence with the given terms.

69. $a_0 = 3, a_1 = 3, a_4 = 15$

70. $a_0 = 7, a_1 = 6, a_3 = 10$

71. $a_0 = -1, a_2 = 5, a_4 = 15$

72. $a_0 = 3, a_2 = -3, a_6 = 21$

73. $a_1 = 0, a_2 = 7, a_4 = 27$

74. $a_0 = -7, a_2 = -3, a_6 = -43$

75. Residents The table shows the numbers a_n (in thousands) of residents of Alabama from 2010 through 2015. *(Source: U.S. Census Bureau)*

DATA

Year	Number of Residents, a_n
2010	4785
2011	4801
2012	4816
2013	4831
2014	4846
2015	4859

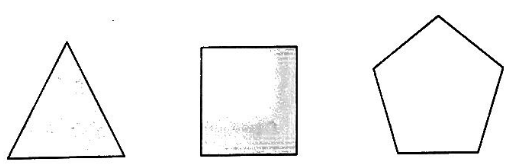
Spreadsheet at LarsonPrecalculus.com

(a) Find the first differences of the data shown in the table. Then find a linear model that approximates the data. Let n represent the year, with $n = 10$ corresponding to 2010.

(b) Use a graphing utility to find a linear model for the data. Compare this model with the model from part (a).

(c) Use the models found in parts (a) and (b) to predict the number of residents in 2021. How do these values compare?

76. **HOW DO YOU SEE IT?** Find a formula for the sum of the angles (in degrees) of a regular polygon. Then use mathematical induction to prove this formula for a general n-sided polygon.



Equilateral triangle (180°) | Square (360°) | Regular pentagon (540°)

Exploration

True or False? In Exercises 77 and 78, determine whether the statement is true or false. Justify your answer.

77. If the statement P_k is true and P_k implies P_{k+1}, then P_1 is also true.

78. A sequence with n terms has $n - 1$ second differences.