Find the geometric mean between each pair of numbers.

54. 4, 16 **55.** 9, 81 **56.** $-3, -\frac{1}{3}$ **57.** $\frac{1}{8}, \frac{1}{32}$

58. $\log 2, 4(\log 2)^2$ **59.** $1\frac{1}{2}, 13\frac{1}{2}$ **60.** $2^{-6}, 2^{-10}$ **61.** $\frac{3}{2}, \frac{2}{3}$

Find four geometric means between the given two numbers.

62. 1 and 32 **63.** 9 and $-\frac{1}{27}$ **64.** $4, \frac{1}{8}$ **65.** $\sqrt{2}$ and $\frac{1}{4}$

66. 1 and 2^{-10} **67.** -27 and $-\frac{1}{27}$ **68.** x^2y^{-1} and x^7y^{-6} **69.** a^x and a^{11x}

70. Write a formula for the nth term: $2, 2+\sqrt{2}, 2+2\sqrt{2}, 2+3\sqrt{2}, ...$
71. Write a formula for the nth term: $2, 2\sqrt{2}, 4, 4\sqrt{2}, 8, ...$
72. How many multiples of 7 are there between 100 and 1,000 ?
73. How many multiples of 3 are there between 200 and 1,500 ?
74. How many multiples of 8 are there between 150 and 5,000 ?

Find the sum of each series.

75. $1+4+7+10+........+t_{18}$. **76.** $3a+7a+11a+........+t_{15}$.

77. $1+\frac{1}{2}+0-\frac{1}{2}-1+.......+t_{17}$. **78.** $\sum_{n=1}^{30}(n+3)$.

79. $1+2+4+8+.......+t_8$. **80.** $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+.......+t_9$.

81. $9-3+1-\frac{1}{3}+........+t_{12}$. **82.** $t_1 = 1\frac{1}{2}, r = 3, n = 13$.

Find the sum of each infinite geometric series.

83. $9-3+1-\frac{1}{3}+\cdots\cdots$ **84.** $2-\sqrt{2}+1-\frac{\sqrt{2}}{2}+\cdots\cdots$ **85.** $2-2\sqrt{2}+4-4\sqrt{2}+\cdots\cdots$

86. $3+\frac{3}{2}+\frac{3}{4}+\frac{3}{8}+\cdots\cdots$ **87.** $\sum_{n=1}^{\infty}(-\frac{1}{2})^{n-1}$ **88.** $\sum_{n=1}^{\infty}(-\sqrt{2})^{n-1}$

Simplify: **89.** $\frac{10!}{6!}$. **90.** $\frac{9!0!}{4!7!}$. **91.** $\frac{(n+1)!}{(n-2)!(n-1)}$.

Prove: **92.** $0.\overline{13} = \frac{13}{99}$. **93.** $0.1\overline{3} = \frac{12}{90}$. **94.** $0.01\overline{3} = \frac{12}{900}$.

Find an expression for the *n*th term of each sequence.

95. 1, 6, 15, 28, 45, ····· **96.** 6, 20, 42, 72, 110, ····· **97.** –3, 8, 25, 48, 77, ·····

98. 21, 40, 63, 90, 121 **99.** 2, 8, 24, 64, 160, ····· **100.** 2, 3, 5, 9, 17, 33, ·····

101. 1, 5, 12, 22, 35, 51, ····· **102.** 5, 7, 11, 19, 35, ····· **103.** 15, 49, 99, 165, 247, ·····

104. 4, 18, 48, 100, 180, ····· **105.** 2, 4, 7, 12, 21, ·····

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Prove the formula of each series.

106. $1+3+5+\cdots\cdots+(2n-1)=n^2$

107. $\frac{1}{1\cdot 3}+\frac{1}{2\cdot 4}+\frac{1}{3\cdot 5}+\cdots\cdots+\frac{1}{n(n+2)}=\frac{n(3n+5)}{4(n+1)(n+2)}$

108. $1+(1+2)+(1+2+3)+\cdots\cdots+(1+2+3+\cdots\cdots+n)=\frac{n(n+1)(n+2)}{6}$

Use Mathematical Induction to prove the formula of each series.

109. $1+3+5+\cdots\cdots+(2n-1)=n^2$

110. $\frac{1}{1\cdot 3}+\frac{1}{2\cdot 4}+\frac{1}{3\cdot 5}+\cdots\cdots+\frac{1}{n(n+2)}=\frac{n(3n+5)}{4(n+1)(n+2)}$

111. $1+(1+2)+(1+2+3)+\cdots\cdots+(1+2+3+\cdots\cdots+n)=\frac{n(n+1)(n+2)}{6}$

112. Expand $(x-3)^4$ by Pascal's Triangle and Binomial Theorem.
113. Expand $(x^2-3)^4$ by Pascal's Triangle and Binomial Theorem.
114. Expand $(x-2y)^6$ by Pascal's Triangle and Binomial Theorem.
115. Expand $(2x-y^2)^5$ by Pascal's Triangle and Binomial Theorem.
116. Expand $(2x-y)^7$ by Pascal's Triangle and Binomial Theorem.
117. Find 6<u>th</u> term of $(x+2y)^9$.
118. Find 7<u>th</u> term of $(2x-y)^{10}$.
119. Find 11<u>th</u> term of $(x-2y)^{10}$.
120. Find the term with x^6 in the expansion of $(2x+3)^{10}$.
121. Find the term with x^{20} in the expansion of $(x^2+y)^{15}$.
122. Find the term with x^5y^3 in the expansion of $(2x+3y)^8$.
123. Find the sum of multiples of 4 and 6 between 100 and 999.
124. If *a*, *b*, *c* are the lengths of three sides of a right triangle, *c* is the hypotenuse. *a*, *b*, *c* form an arithmetic sequence. Find $a:b:c$.
125. The probability (*P*) of *r* successes in the *n* trials of an experiment is given by the formula $P(r)={}_nC_r p^r(1-p)^{n-r}$, where *p* is the probability of a success on each trial. The probability of a basketball player getting a hit on the basket on free throws is $\frac{3}{5}$. Find the probability of the player of getting 5 hits on the basket during the next 8 free throws.
Hint: Evaluate ${}_8C_5(\frac{3}{5})^5(\frac{2}{5})^3$ in the Binomial Expansion $(\frac{3}{5}+\frac{2}{5})^8$.