Patterns Stretch
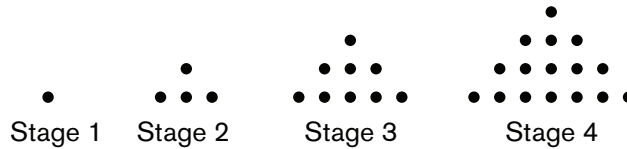
11._____ dots The first four stages of a dot pattern are shown. How many more dots are in the figure at Stage 47 than in the figure at Stage 27?

Stage 1   Stage 2   Stage 3   Stage 4

12._____ The first three terms of a sequence are 1, 2 and 3. Each subsequent term is the sum of the three previous terms. What is the 11th term of this sequence?

13._____ What is the sum of the terms in the arithmetic series 2 + 5 + 8 + 11 + 14 + ... + 89 + 92?

14._____ Three consecutive terms in an arithmetic sequence are x, $2x + 11$ and $4x - 3$. What is the constant difference between consecutive terms in this sequence?

15._____ What is the sum of the terms in the geometric series 1 + 4 + 16 + ... + 1024?

16._____ What is the sum of the first 51 consecutive odd positive integers?

17._____ What is the sum of the terms in the infinite series $1 + \dfrac{1}{2} + \dfrac{1}{4} + \dfrac{1}{8} + \dfrac{1}{16} + \dfrac{1}{32} + ...$?

18._____ What is the sum of the terms in the infinite series $1 + \dfrac{1}{4} + \dfrac{1}{16} + \dfrac{1}{64} + \dfrac{1}{256} + ...$? Express your answer as a common fraction.

19._____ Let $f(x) = 2x + 3$ and $f^2(x) = f(f(x)) = f(2x + 3) = 2(2x + 3) + 3 = 4x + 9$. If $f^5(x) = ax + b$, what is the value of $a + b$?

20._____ degrees The degree measures of the interior angles of a quadrilateral form a geometric sequence whose terms have integer values and are all integer multiples of the first term. What is the largest possible degree measure of an angle in this quadrilateral?