

SAT

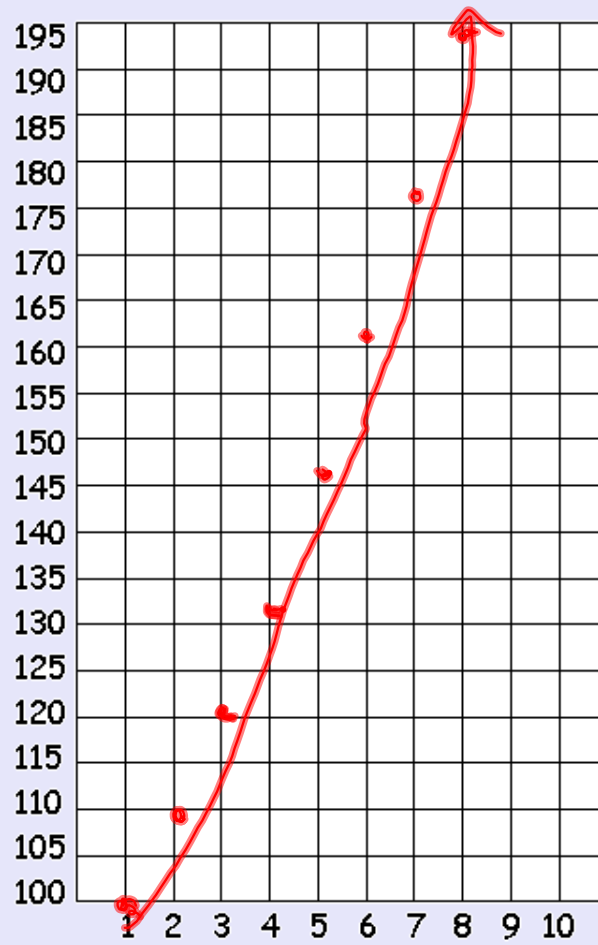
Gina's test results are 82, 87, 94, and 98. What is the lowest score she can achieve on the fifth test and still maintain an average of 90?

For his science experiment, Ahad exposed a 100 mm plant he was growing to a special light for 20 hours each day. During the course of the school year, he found that the plants grew about 10% each month.

a) How tall will the plant be at the beginning of the eighth month?

$$\begin{array}{l}
 m_1 = 100 \quad (100) \quad m_4 = 133.1 \quad (100r^3) \quad m_7 = 177.16 \quad 100r^4 \\
 m_2 = 110 \quad (100r) \quad m_5 = 144.41 \quad (100r^4) \quad m_8 = 194.87 \quad 100r^7 \\
 m_3 = 121 \quad (100r^2) \quad m_6 = 161.05 \quad (100r^5)
 \end{array}$$

b) Graph the height at the beginning of each month.



A geometric sequence is a list of numbers with a common ratio between each successive term

$$5, 15, 45, \underline{135}, \underline{405}, \underline{1215}, \dots$$

$$6, -24, 96, \underline{-384}, \underline{1536}, \underline{-6144}, \dots$$

$$81, 27, 9, \underline{3}, \underline{1}, \underline{\frac{1}{3}}, \dots$$

$$15, 30, 45, \underline{60}, \underline{75}, \underline{90}, \dots$$

↳ arithmetic.

The general, or nth, term of a geometric sequence is found by

$$a_n = a_1 r^{n-1}$$

Why?

Find the 11th term in the sequence 3, 12, 48...

$$a_1 = 3$$

$$a_n = ?$$

$$n = 11$$

$$r = 4$$

$$a_{11} = 3 \cdot 4^{(11-1)}$$
$$= 3,145,728$$

Find the formula for the nth (general) term in the sequence 3, 12, 48...

$$a_n = 3 \cdot 4^{(n-1)}$$

What kind of function is this?

exponential.

Find the first term in the sequence for which $a_5 = 24$ and $r = 2$.

$$a_5 = 24$$

$$r = 2$$

$$n = 5$$

$$a_1 = ?$$

$$24 = a_1 \cdot 2^{(5-1)}$$

$$24 = a_1 (16)$$

$$a_1 = 1.5$$

Find a geometric sequence that has 2 terms between -2 and 54.

$$-2, \underline{6}, \underline{-18}, 54$$

$$a_n = a_1 r^{(n-1)}$$

$$54 = -2 r^{(4-1)}$$

$$-27 = r^3$$

$$r = -3$$

Verify the real life problem: How tall will the plant be in the 8th month?

$$100 \cdot 1.1^7 = 194.87$$

The sum of the first n terms of a geometric sequence is found by

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \text{ or } \frac{a_1(r^n - 1)}{r - 1}$$

Find the sum of the first 8 terms in the sequence

$$3 - 6 + 12 - \dots$$

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

$$\begin{aligned} &= \frac{3(1-(-2)^8)}{1-(-2)} = \frac{\cancel{3}(1-256)}{\cancel{3}} \\ &= -255 \end{aligned}$$

Find the sum of the terms in the sequence

$$a_n = a_1 r^{(n-1)}$$

$$\frac{5}{3} + 5 + 15 + \dots + 3645$$

$$3645 = \frac{5}{3} (3)^{n-1}$$

$$2187 = 3^{n-1}$$

$$\log 2187 = (n-1) \log 3$$

$$\begin{array}{l} 7 = n-1 \\ \boxed{8 = n} \end{array}$$

$$\begin{aligned} S_n &= \frac{a_1 (r^n - 1)}{r - 1} \\ &= \frac{\frac{5}{3} (3^8 - 1)}{3 - 1} \\ &= 5466.67 \end{aligned}$$

Homework Assignment
WS 11.3b (back of notes)