1. Determine which sequences are geometric. If it is, state the common ratio:

a) 15, 26, 37, 48, ...

$+11$ ∴ no

b) 3, 9, 81, 6561, ...

Squaring, ∴ no

c) -5, 15, -45, 135, ...

$\times -3$ ∴ yes

d) 6000, 3000, 1500, 750, 375, ...

$\times \frac{1}{2}$ ∴ yes

2. The 31st term of a geometric sequence is 123 and the 32nd term is 1107. What is the 33rd term?

$$\frac{1107}{123} = 9 \qquad 1107 \times 9 = \boxed{9963}$$

3. For each geometric sequence, determine the general term t_n and t_6.

a) 4, 20, 100, ...

$a = 4$
$r = 5$

$$t_n = 4(5)^{n-1}$$

$$t_6 = 4(5)^{6-1}$$

$$t_6 = 12500$$

b) -11, -22, -44,...

$a = -11$
$r = 2$

$$t_n = -11(2)^{n-1}$$

$$t_6 = -11(2)^{6-1}$$

$$t_6 = -352$$

c) 15, -60, 240, ...

$a = 15$
$r = -4$

$$t_n = 15(-4)^{n-1}$$

$$t_6 = 15(-4)^{6-1}$$

$$t_6 = -15360$$

d) 1, 0.2, 0.04, ...

$a = 1$
$r = 0.2$

$$t_n = 1(0.2)^{n-1}$$

$$t_6 = 1(0.2)^{6-1}$$

$$t_6 = \frac{1}{32} \text{ or } 0.03125$$

4. The 5th term of a geometric sequence is 45 and the 8th term is 360. Determine the 20th term.

$$45 \xrightarrow{\times r} \xrightarrow{\times r} \xrightarrow{\times r} 360$$
$$\;5\quad 6\quad 7\quad 8$$

$$r^3 = \frac{360}{45}$$

$$r^3 = 8$$

$$r = 2$$

$$t_5 = 45 = a(2)^{5-1}$$

$$45 = a(16)$$

$$\frac{45}{16} = a$$

$$t_{20} = \frac{45}{16}(2)^{20-1}$$

$$t_{20} = 1,474,560$$

OR t_5 to t_{20} is (16) terms

Make t_5 the "a".

$$t_{16} = 45(2)^{16-1}$$

$$t_{16} = 1,474,560$$

∴ $t_{20} = $ ✓

5. A doctor makes observations of a bacterial culture at fixed time intervals. The table below shows his first four observations. If the pattern continues, how many bacteria will be present at the 9th observation?

Observation	Number of Bacteria
1	(a) 5120
2	7680
3	11520
4	17280

$$r = \frac{7680}{5120} = 1.5$$

$$t_n = 5120(1.5)^{n-1}$$

$$t_9 = 5120(1.5)^{9-1}$$

$$t_9 = 131,220.$$

6. The Sierpinski gasket is a fractal created from an equilateral triangle. At each stage, the "middle" is cut out of each remaining equilateral triangle. The first three stages are shown:

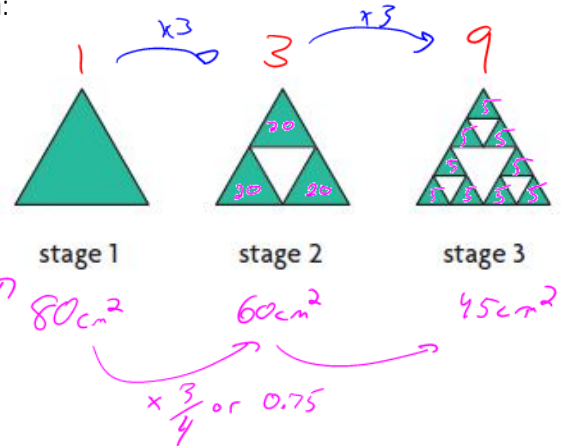a) How many shaded triangles would be in the 6th stage?

$$r = 3$$
$$a = 1$$

$$t_n = 1(3)^{n-1}$$

$$t_6 = 1(3)^{6-1}$$

$$t_6 = 243$$

$1 \xrightarrow{\times 3} 3 \xrightarrow{\times 3} 9$

stage 1   stage 2   stage 3

$80cm^2$ $60cm^2$ $45cm^2$

$\times \frac{3}{4}$ or 0.75

b) If the triangle in the first stage has an area of 80 cm², what is the area of the shaded region in the 6th stage?

$$r = \frac{3}{4}$$

$$a = 80$$

$$t_n = 80\left(\frac{3}{4}\right)^{n-1}$$

$$t_6 = 80\left(\frac{3}{4}\right)^{6-1}$$

$$t_6 = \frac{1215}{64} cm^2 \text{ or } 18.984375 cm^2$$