



Geometric Progressions Ex 20.4 Q 11

$$\begin{aligned}
 0.\overline{3} &= 0.3333\dots \\
 &= 0.3 + 0.03 + 0.003 + \dots \\
 &= \frac{3}{10} + \frac{3}{10^2} + \frac{3}{10^3} + \dots \\
 &= \frac{3}{10} \left(1 + \frac{1}{10} + \frac{1}{10^2} + \dots \right) \\
 &= \frac{3}{10} \left(\frac{1}{1 - \frac{1}{10}} \right) \\
 &= \frac{3}{10} \times \frac{10}{9} \\
 &= \frac{3}{9} \\
 0.\overline{3} &= \frac{1}{3}
 \end{aligned}$$

$$\begin{aligned}
 0.\overline{231} &= 0.231231231\dots \\
 &= 0.231 + 0.000231 + 0.000000231 + \dots \\
 &= \frac{231}{10^3} + \frac{231}{10^6} + \frac{231}{10^9} + \dots \\
 &= \frac{231}{10^3} \left(1 + \frac{1}{10^3} + \frac{1}{10^6} + \dots \right) \\
 &= \frac{231}{1000} \left(\frac{1}{1 - \frac{1}{1000}} \right) \\
 0.\overline{231} &= \frac{231}{999}
 \end{aligned}$$

$$\begin{aligned}
 3.5\overline{2} &= 3 + 0.52222\dots \\
 &= 3 + 0.5 + 0.02 + 0.002 + 0.0002 + \dots \\
 &= 3.5 + \frac{2}{10^2} + \frac{2}{10^3} + \frac{2}{10^4} + \dots \\
 &= 3.5 + \frac{2}{10^2} \left(1 + \frac{1}{10} + \frac{1}{10^2} + \dots \right) \\
 &= \frac{35}{10} + \frac{2}{100} \left(\frac{1}{1 - \frac{1}{10}} \right) \\
 &= \frac{35}{10} + \frac{2}{100} \times \left(\frac{10}{9} \right) \\
 &= \frac{35}{10} + \frac{2}{90} \\
 &= \frac{315 + 2}{90} \\
 3.5\overline{2} &= \frac{317}{90}
 \end{aligned}$$

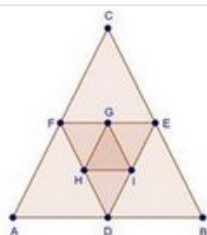
The rational number can be written as:

$$\begin{aligned} 0.6\overline{8} &= 0.6 + 0.08 + 0.008 + 0.0008 + \dots\infty \\ &= \frac{3}{5} + 8[0.01 + 0.001 + 0.0001 + \dots\infty] \\ &= \frac{3}{5} + 8\left[\frac{1}{100} + \frac{1}{1000} + \dots\infty\right] \end{aligned}$$

This is an infinite GP with first term $\frac{1}{100}$ and common ratio $\frac{1}{10}$

$$\begin{aligned} &= \frac{3}{5} + 8 \cdot \frac{1}{100} \cdot \frac{1}{1 - \frac{1}{10}} \\ &= \frac{3}{5} + \frac{4}{45} \\ &= \frac{31}{45} \end{aligned}$$

Geometric Progressions Ex 20.4 Q12



Side of triangle = 18 cm.

$$AD = BD = 9 \text{ cm.}$$

$$DE = BD = 9 \text{ cm.}$$

$$GI = IF = \frac{9}{2} \text{ cm.}$$

Sides of the triangles are 18, 9, $\frac{9}{2}$,

(i) sum of perimeters of the equilateral triangle = $\left(54 + 27 + \frac{27}{2} + \dots\right)$

$$\begin{aligned} &= \frac{54}{1 - \frac{1}{2}} \\ &= 54 \times 2 \end{aligned}$$

Perimeter = 108 cm.

(ii) sum of area of equilateral triangle

$$\begin{aligned} &= \left[\frac{\sqrt{3}}{4} (18)^2 + \frac{\sqrt{3}}{4} (9)^2 + \frac{\sqrt{3}}{4} \left(\frac{9}{2}\right)^2 + \dots \right] \\ &= \frac{\sqrt{3}}{4} \left[324 + 81 + \frac{81}{4} + \dots \right] \\ &= \frac{\sqrt{3}}{4} \left[\frac{324}{1 - \frac{1}{4}} \right] \\ &= \frac{\sqrt{3}}{4} \left[\frac{324 \times 4}{3} \right] \\ &= \sqrt{3} (108) \end{aligned}$$

Geometric Progressions Ex 20.4 Q13

$$S = a + ar + ar^2 + ar^3 + \dots$$

$$S = \frac{a}{1-r} \quad \text{--- (1)}$$

$$S_1 = a^2 + a^2r^2 + a^2r^4 + a^2r^6 + \dots$$

$$S_1 = \frac{a^2}{1-r^2} \quad \text{--- (2)}$$

$$S^2 = \frac{a^2}{(1-r)^2}$$

$$S^2 = \frac{S_1(1-r^2)}{(1-r^2)}$$

$$(1-r)S^2 = S_1(1+r)$$

$$S^2 - S^2r = S_1 + S_1r$$

$$S_1r + S^2r = S^2 - S_1$$

$$r = \frac{S^2 - S_1}{S_1 + S^2}$$

Put r in equation (1)

$$S(1-r) = a$$

$$a = S \left[1 - \frac{S^2 - S_1}{S^2 + S_1} \right]$$

$$a = S \left[\frac{S^2 + S_1 - S^2 + S_1}{S^2 + S_1} \right]$$

$$a = \frac{2SS_1}{S^2 + S_1}$$

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***** END *****