Geometric Progressions Ex 20.3 Q1

$2, 6, 18, \ldots$ to 7 term

$$a = 2, \ r = \frac{6}{2} = 3, \ n = 7$$

$$S_n = a\frac{\left(r^n - 1\right)}{r - 1}$$

$$S_7 = 2\frac{\left(3^7 - 1\right)}{3 - 1} = \frac{2}{2}\left(3^7 - 1\right)$$

$$= 2187 - 1 = 2186$$

$1, 3, 9, 27, \ldots$ to 8 terms

$$a = 1, \ r - \frac{3}{1} = 3, \ n = 8$$

$$S_n = a\frac{\left(r^n - 1\right)}{r - 1}$$

$$S_8 = 1\frac{\left(3^8 - 1\right)}{3 - 1} = 3280$$

$1, \dfrac{-1}{2}, \dfrac{1}{4}, \dfrac{-1}{8}, \ldots, 9$ terms

$$a = 1, \ r = \frac{\frac{-1}{2}}{1} = \frac{-1}{2}, \ n = 9$$

$$S_n = a\frac{\left(r^n - 1\right)}{r - 1}$$

$$S_9 = 1\frac{\left(\frac{-1}{2}\right)^9 - 1}{\frac{-1}{2} - 1}$$

$$= \frac{\frac{-1}{512} - 1}{\frac{-1}{2} - 1}$$

$$= \frac{\frac{-1 - 512}{512}}{\frac{-1 - 2}{2}}$$

$$= \frac{-513}{512} \times \frac{2}{-3}$$

$$= \frac{171}{256}$$

$\left(a^2 - b^2\right),\ (a-b),\ \left(\dfrac{a-b}{a+b}\right),\ldots n$ terms

$$a = a^2 - b^2,\ r = \dfrac{a-b}{a^2-b^2} = \dfrac{1}{a+b},\ n = n$$

$$S_n = a\dfrac{\left(1 - r^n\right)}{1-r} \qquad\qquad [\because r < 1]$$

$$S_n = \left(a^2 - b^2\right)\dfrac{\left(1 - \dfrac{1}{(a+b)^n}\right)}{1 - \dfrac{1}{a+b}}$$

$$= \dfrac{(a-b)\left((a+b)^n - 1\right)}{\dfrac{(a+b)^{-1}(a+b)^n\,(a+b) - 1}{(a+b)}}$$

$$= \dfrac{a-b}{(a+b)^n}\dfrac{\left((a+b)^n - 1\right)}{(a+b) - 1}$$

$4, 2, 1, \dfrac{1}{2},\ldots 10$ terms

$$a = 4,\ r = \dfrac{2}{4} = \dfrac{1}{2},\ n = 10$$

$$S_n = a\dfrac{\left(1 - r^n\right)}{1-r}$$

$$= 4\,\dfrac{1 - \left(\dfrac{1}{2}\right)^{10}}{1 - \dfrac{1}{2}}$$

$$= 8\left(1 - \dfrac{1}{2^{10}}\right)$$

$$= 8\left(1 - \dfrac{1}{1024}\right)$$

********** END *********