

1. State if each infinite geometric series is divergent or convergent. Find the finite sum if possible.

a) $1 + \frac{3}{2} + \frac{9}{4} + \dots$

$r = \frac{3}{2}$

divergent

no finite sum

b) $8 + 2 + \frac{1}{2} + \dots$

$r = \frac{2}{8} = \frac{1}{4}$

$-1 < r < 1 \checkmark$

convergent

$$S = \frac{a_1}{1-r}$$

$$= \frac{8}{1-\frac{1}{4}} = 8 \times \frac{4}{3} = \boxed{\frac{32}{3}}$$

2. An infinite geometric series has a sum of 16 and a common ratio of $\frac{1}{2}$. What is the first term of the series?

$S = \frac{t_1}{1-r}$

$16 = \frac{t_1}{1-\frac{1}{2}}$

$\frac{1}{2} \cdot 16 = \frac{t_1}{\frac{1}{2}}$

$t_1 = 8$

3. An infinite geometric series has a sum of 15 and a first term of 5. What is the common ratio of the series?

$S = \frac{t_1}{1-r}$

$\frac{15}{1} = \frac{5}{1-r}$

$15(1-r) = 5$

$15 - 15r = 5$

$15r = 10$

$r = \frac{10}{15} = \boxed{\frac{2}{3}}$

4. A ball is dropped from an initial height of 20 m. Each bounce of the ball achieves a height 60% of the previous height. What is the total vertical distance that the ball travels.

$$S_{\downarrow} + S_{\uparrow}$$

$$t_1 = 20 \quad t_1 = 20 \times 0.6 = 12$$

$$r = 0.6 \quad r = 0.6$$

$$\frac{20}{1-0.6} + \frac{12}{1-0.6}$$

$$50 + 30$$

$$= \boxed{80m}$$

$$20 + 2 \left(\frac{12}{1-0.6} \right)$$

$$20 + 2(30)$$

$$80m$$

$$2 \left(\frac{20}{1-0.6} \right) - 20$$

$$2(50) - 20$$

$$80m$$