

Series and applications



Geometric series

QUESTION 1 Complete:

In a geometric series, each term is formed by _____ the previous term by a common _____.

QUESTION 2 The given series is a geometric series. True or false?

a $3 + 9 + 15 + 21 + 27 + \dots$

b $2 + 4 + 8 + 16 + 32 + \dots$

c $56 + 52 + 48 + 44 + 40 + \dots$

d $-18 + 21 - 24 + 27 - 30 + \dots$

e $512 + 256 + 128 + 64 + 32 + \dots$

f $10\,000 - 6000 + 3600 - 2160 + 1296 - \dots$

g $1 + 4 + 9 + 16 + 25 + 36 + \dots$

h $7776 + 6480 + 5400 + 4500 + 3750 + \dots$

QUESTION 3 Write down the first four terms of the series with first term a and common ratio r :

a $a = 2, r = 3$

b $a = 3, r = -2$

c $a = 3072, r = 0.5$

d $a = 1875, r = 1.4$

e $a = 448, r = \frac{1}{2}$

f $a = -2, r = -5$

g $a = 288, r = -3.5$

h $a = 50\,421, r = \frac{2}{7}$

i $a = 1000, r = 0.3$

QUESTION 4 Find the common ratio for each series.

a $4 + 24 + 144 + 864 + 5184 + \dots$

b $48 + 72 + 108 + 162 + 243 + \dots$

c $2000 + 1400 + 980 + 686 + 480.2 + \dots$

d $4096 + 3072 + 2304 + 1728 + 1296 + \dots$

e $9 - 18 + 36 - 72 + 144 - 288 + \dots$

f $972 - 324 + 108 - 36 + 12 - 4 + \dots$

QUESTION 5 Write down the next three terms of each geometric series:

a $5 + 10 + 20 + 40 + 80 + \dots$

b $2 - 10 + 50 - 250 + 1250 - \dots$

c $312.5 + 62.5 + 12.5 + 2.5 + 0.5 + \dots$

d $-20\,480 + 5120 - 1280 + 320 - 80 + \dots$

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The n^{th} term of a geometric series (1)

QUESTION 1 Find the given term of the geometric series with first term a and common ratio r :

a $a = 5, r = 2, n = 7$

b $a = 3, r = 3, n = 8$

c $a = 1, r = -2, n = 18$

d $a = 17, r = 4, n = 9$

e $a = 2000, r = 0.8, n = 5$

f $a = 800, r = 0.04, n = 4$

QUESTION 2 Find the given term of the series:

a $28 + 70 + 175 + 437.5 + \dots$ (6^{th} term)

b $1.5 - 4.5 + 13.5 - 40.5 + 121.5 - \dots$ (13^{th} term)

QUESTION 3 Find an expression for the n^{th} term of the geometric series:

a $a = 7, r = 2$

b $a = 6, r = -3$

c $1.25 + 2.5 + 5 + 10 + 20 + \dots$

QUESTION 4 The n^{th} term of a geometric series is given by $T_n = 2(3)^{n-1}$. Find:

a the first term

b the second term

c the common ratio

QUESTION 5 The first term of a geometric series is 8000 and the second term is 7200. Find:

a r

b T_4

c T_n

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The n^{th} term of a geometric series (2)

QUESTION 1 The first term of a geometric series is 4374 and the sixth term is 18 432. Find:

a the common ratio

b the ninth term

QUESTION 2 The n^{th} term of a geometric series is given by $T_n = 62\,500(0.4^{n-1})$
Which term of the series is 40.96?

QUESTION 3 The n^{th} term of a geometric series is given by $T_n = 320(0.5)^{n-1}$
Find the first term of the series which is less than one.

QUESTION 4 The third term of a geometric series is 4.5 and the eighth term is 1093.5
Find the fourteenth term.



Sum to n terms of a geometric series (1)

QUESTION 1 Find the sum to n terms of a geometric series with first term a and common ratio r :

a $a = 7, r = 2, n = 10$

b $a = 5, r = -3, n = 17$

c $a = 250, r = 0.2, n = 8$

d $a = 1, r = 7, n = 9$

e $a = 4, r = -1.5, n = 5$

f $a = 8000, r = 0.04, n = 6$

QUESTION 2 Find the sum of the series to the given number of terms:

a $3 + 6 + 12 + 24 + 48 + \dots$ (14 terms)

b $1 + 1.5 + 2.25 + 3.375 + \dots$ (7 terms)

c $5120 + 2560 + 1280 + 640 + \dots$ (11 terms)

d $2 - 6 + 18 - 54 + 162 - \dots$ (20 terms)

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Sum to n terms of a geometric series (2)

QUESTION 1 Find an expression for the sum to n terms of a geometric series with first term a and common ratio r :

a $a = 2, r = 5$

b $a = 3, r = 0.25$

c $a = 8, r = -2$

QUESTION 2 The sum to n terms of a geometric series is given by $S_n = 2^{n+1} - 2$. Find:

a the first term

b the sum of the first 10 terms

c the 10th term

QUESTION 3 The n^{th} term of a geometric series is $T_n = 7^n$. Find the sum of the first seven terms.

QUESTION 4 The common ratio of a geometric series is 2 and the sum of the first eight terms is 1530. Find the first term.

Page 148 1 multiplying, ratio 2 a false b true c false d false e true f true g false h true 3 a $2 + 6 + 18 + 54$
b $3 - 6 + 12 - 24$ c $3072 + 1536 + 768 + 384$ d $1875 + 2625 + 3675 + 5145$ e $448 + 224 + 112 + 56$ f $-2 + 10 - 50 + 250$

g $288 - 1008 + 3528 - 12348$ h $50421 + 14406 + 4116 + 1176$ i $1000 + 300 + 90 + 27$ 4 a 6 b 1.5 c 0.7 d $\frac{3}{4}$ e -2 f $-\frac{1}{3}$
5 a $160 + 320 + 640$ b $-6250 + 31250 - 156250$ c $0.1 + 0.02 + 0.004$ d $20 - 5 + 1.25$

Page 149 1 a 320 b 6561 c -131072 d 114112 e 819.2 f 0.0512 2 a 2734.375 b 797161.5 3 a $7(2)^{n-1}$
b $6(-3)^{n-1}$ c $1.25(2)^{n-1}$ 4 a 2 b 6 c 3 5 a 0.9 b 5832 c $8000(0.9)^{n-1}$

Page 150 1 a $1\frac{1}{3}$ b $43690\frac{2}{3}$ 2 9th term 3 $T_{10} = 0.625$ 4 797161.5

Page 151 1 a 7161 b 161425205 c 312.4992 d 6725601 e 13.75 f 8333.3332992
2 a 49149 b 32.171875 c 10235 d -1743392200

Page 152 1 a $\frac{5^n - 1}{2}$ b $4(1 - 0.25^n)$ c $\frac{8(1 - (-2)^n)}{3}$ 2 a 2 b 2046 c 1024 3 960799 4 6