

Precalculus · Series, Binomial Theorem and an Introduction to Limits · Worksheet

Common Core A-APR.C.5, A-SSE.B.4, F-BF.A.2 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

This precalculus sequences series limits worksheet gives 25 problems on series, binomial theorem and an introduction to limits, ordered from easy to hard, with a separate answer key.

These 25 problems practice sigma notation, arithmetic and geometric series, infinite sums, the binomial theorem and informal limits (A-SSE.B.4, A-APR.C.5, F-BF.A.2). They run from short evaluations to multi-step word problems.

Show each step, keep fractions exact, and check every limit with a table of values.

Precalculus Common Core: A-APR.C.5 · A-SSE.B.4 · F-BF.A.2

Precalculus Sequences Series Limits Worksheet: problems 1-5

Problem 1: Evaluate a sum

Evaluate $\sum_{k=1}^5 (3k-1)$.

Problem 2: Sums of powers

Evaluate each sum.

a. $\sum_{k=1}^4 k^2$
b. $\sum_{k=0}^3 2^k$

Problem 3: Write in sigma notation

Write each sum in sigma notation.

a. $3 + 6 + 9 + 12 + 15$
b. $2 + 4 + 8 + 16 + 32$

Problem 4: Explicit and recursive rules

Write an explicit rule and a recursive rule for each sequence, then find the requested term.

- a. 5, 9, 13, 17, ... ; find a_{20}
- b. 2, 6, 18, 54, ... ; find a_6

Problem 5: Find the nth term

An arithmetic sequence has $a_1 = 7$ and common difference $d = 4$.

- a. Find a_{20} .
- b. Which term of the sequence equals 103?

Precalculus Sequences Series Limits Worksheet: problems 6-10

Problem 6: Arithmetic series

Find the sum of the first 15 terms of the arithmetic series $12+19+26+ \dots$.

Problem 7: Decreasing series

Find $100+97+94+ \dots +4+1$.

Problem 8: Finite geometric series

Find each sum.

- a. $3+6+12+ \dots$, first 8 terms
- b. $81+27+9+3+1$ using the geometric series formula

Problem 9: Does it converge?

Decide whether each infinite geometric series converges. If it does, find its sum.

- a. $8 + 4 + 2 + 1 + \dots$
- b. $5 + 10 + 20 + 40 + \dots$
- c. $9 - 3 + 1 - 1/3 + \dots$
- d. $2 + 2.2 + 2.42 + 2.662 + \dots$

Problem 10: Infinite geometric sum

Find each sum.

- a. $12+4+\frac{4}{3}+\frac{4}{9}+ \dots$
- b. $\sum_{k=0}^{\infty} 5(0.2)^k$

Precalculus Sequences Series Limits Worksheet: problems 11-15

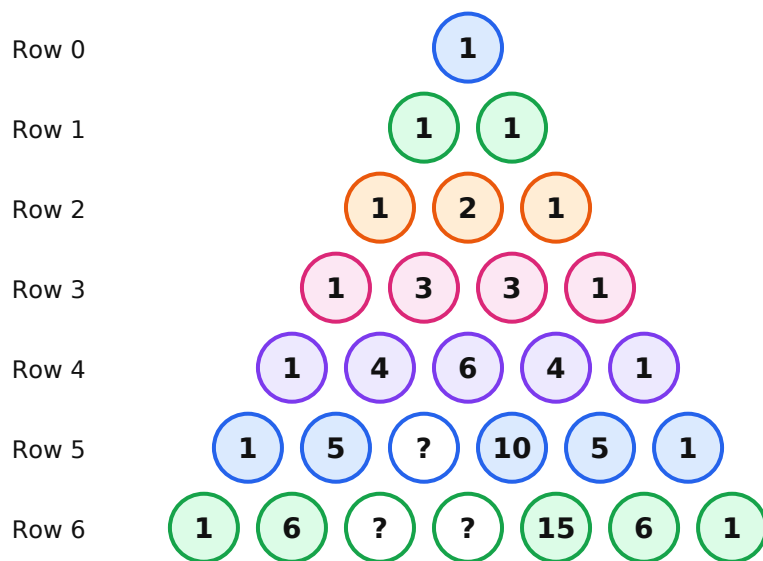
Problem 11: Repeating decimals

Write each repeating decimal as a fraction in lowest terms using an infinite geometric series.

- a. $0.\overline{27}$
- b. $0.\overline{6}$

Problem 12: Pascal's triangle

The triangle shows rows 0 through 6 with three entries missing.



Each entry is the sum of the two entries above it.

- a. Find the three missing entries.
- b. Write row 7.

Problem 13: Expand a binomial

Expand each binomial.

- a. $(x+2)^5$
- b. $(x-3)^3$

Problem 14: Binomial with a coefficient

Expand $(2x-1)^4$.

Problem 15: Find a specific term

Use the binomial theorem.

- a. Find the coefficient of x^3 in $(x+3)^7$.

b. Find the term containing x^2 in $(2x+1)^6$.

Precalculus Sequences Series Limits Worksheet: problems 16-20

Problem 16: Limit of a sequence

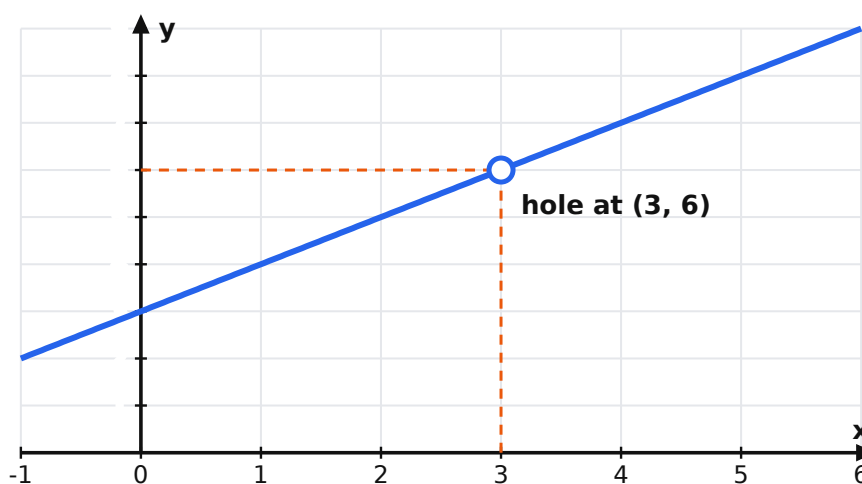
Let $a_n = \frac{3n+1}{n+2}$.

a. Find a_{10} , a_{100} and a_{1000} to 4 decimal places.

b. What is $\lim_{n \rightarrow \infty} a_n$?

Problem 17: Limit from a graph

The graph shows $f(x) = \frac{x^2-9}{x-3}$.



The open circle marks a point the graph skips.

a. Is $f(3)$ defined?

b. Find $\lim_{x \rightarrow 3} f(x)$.

Problem 18: Limit by factoring

Find each limit.

a. $\lim_{x \rightarrow 3} \frac{x^2+x-12}{x-3}$

b. $\lim_{x \rightarrow 5} \frac{x^2-25}{x-5}$

Problem 19: When does it converge?

Consider $\sum_{k=0}^{\infty} \left(\frac{x}{3}\right)^k$.

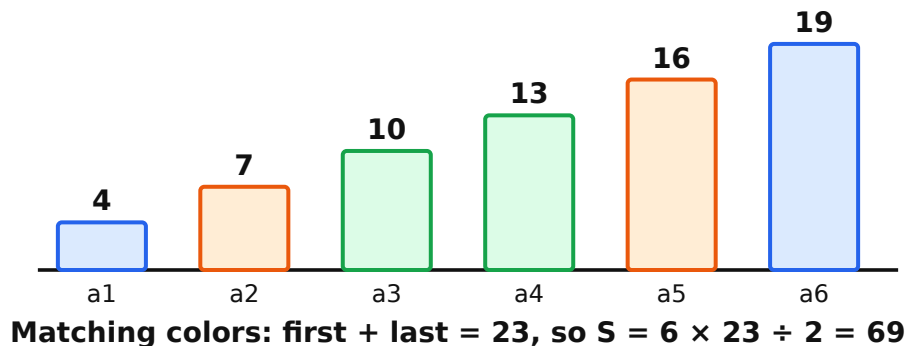
a. For which values of x does the series converge?

b. Find the sum when $x=1$.

c. Find the sum when $x = -\frac{3}{2}$.

Problem 20: Theater seats

The bar chart shows the number of seats in rows 1 to 6 of the school auditorium, and the pattern continues. Find the total number of seats in rows 1 through 6, then in rows 1 through 20.



Pairing terms from both ends gives equal sums.

Precalculus Sequences Series Limits Worksheet: problems 21-25

Problem 21: Doubling savings

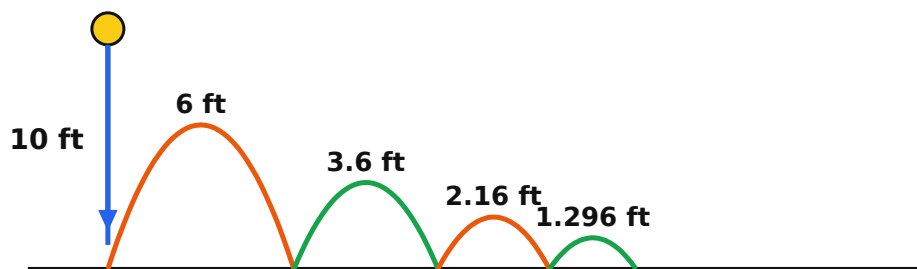
Mei saves 1 cent on day 1, 2 cents on day 2, 4 cents on day 3, and keeps doubling for 12 days. Find the total she saves, in dollars.

Problem 22: Salary raises

Jamal starts a job at \$40,000 a year and gets a \$2,500 raise every year. Write a recursive rule for his salary, then find his salary in year 10 and his total earnings over the first 10 years.

Problem 23: Bouncing ball

A ball is dropped from 10 feet and rebounds to 60% of its previous height on every bounce, as sketched. Find the total distance the ball travels before it comes to rest.



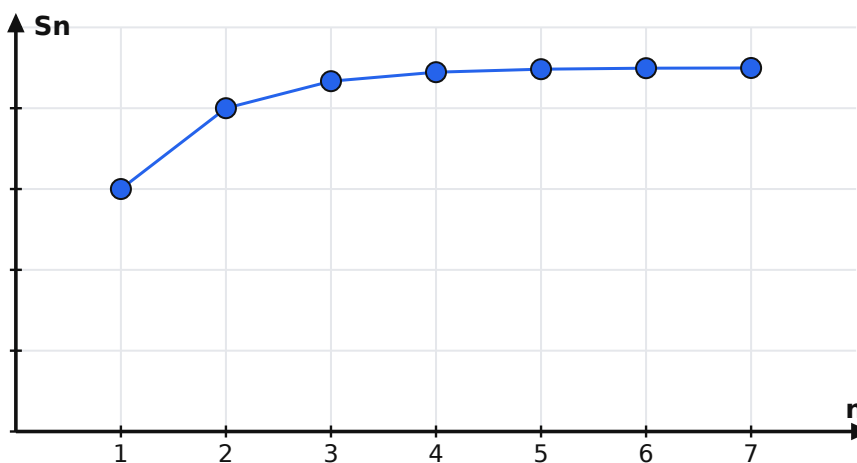
Each bounce rises to a fixed fraction of the previous height.

Problem 24: Medicine in the body

Ethan takes a 100 mg dose every morning. Overnight his body removes 80% of the drug, so 20% remains. Find the amount in his body just after the dose on day 3, and the long-run amount just after a dose.

Problem 25: Cleaning a pond

A filter removes 6 pounds of algae the first week, and each week after that it removes one third as much as the week before. The graph shows the total removed after n weeks. Estimate the long-run total from the graph, then find it exactly.



The partial sums level off at the limit of the series.

How to use this precalculus sequences series limits worksheet

Print this precalculus sequences series limits worksheet as a PDF, solve every problem on paper, then compare with the answer key.

