proprep™

Workbook

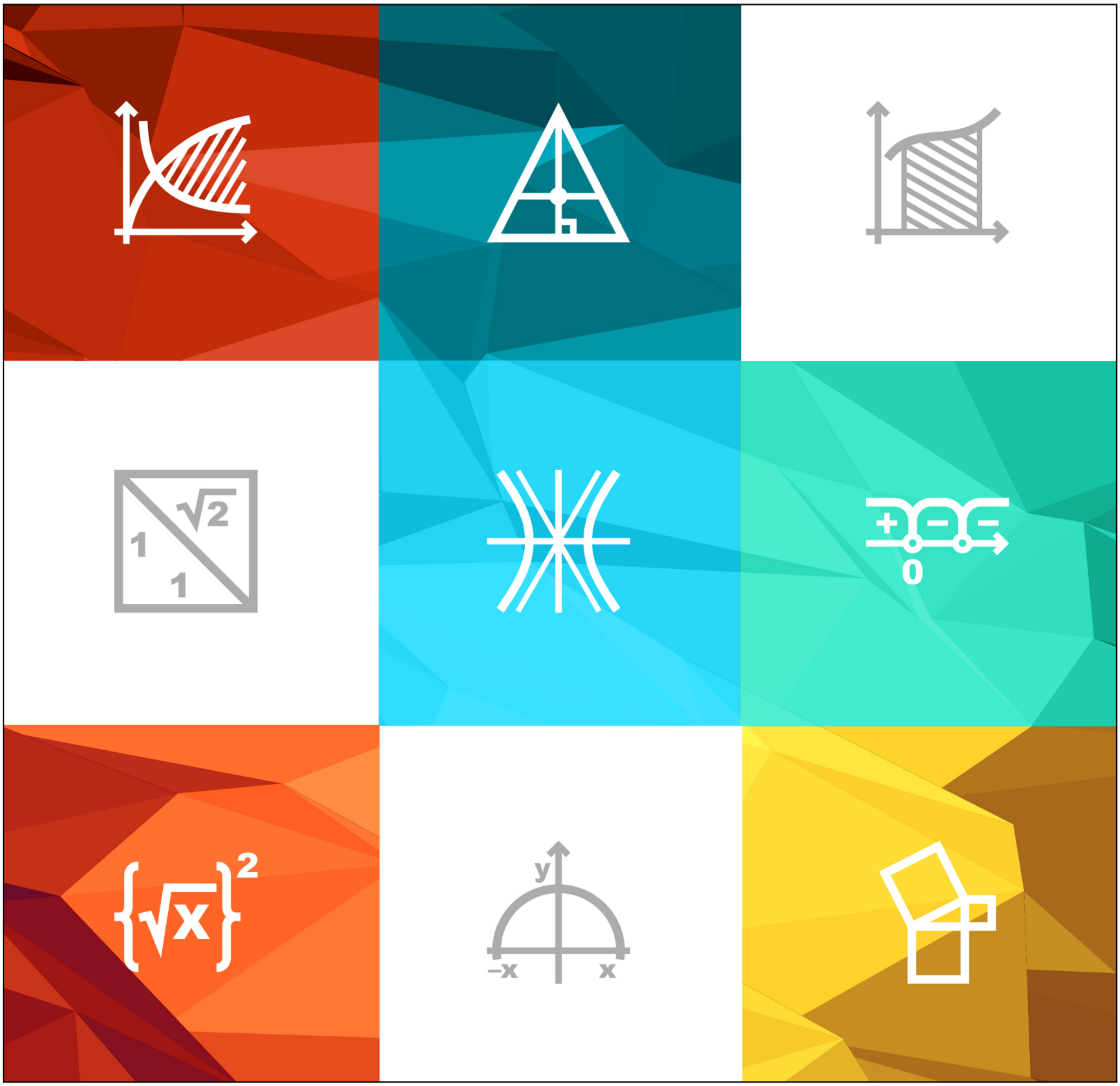

Table of Contents

Sequences and Series

Arithmetic Sequences

Questions

1) Given the arithmetic sequence: 17, 11, 5, -1, -7, …
Find the last term of the sequence, given that it has 43 terms.

2) In an arithmetic sequence, the 6th term is 15 and the 10th term is 31.
Find the first term of the sequence and its common difference.

3) Find the number of terms in the following arithmetic sequence:
$2, 4\frac{1}{2}, 7, 9\frac{1}{2}, 12, 14\frac{1}{2}, ..., 49\frac{1}{2}$.

4) In an arithmetic sequence, the sum of the 2nd, 5th and 8th terms is 87;
the difference between the 12th and the 6th terms is 24; and the last term is 201.
How many terms are in the sequence?

5) Phil the flea has an afternoon pastime of hopping on Rover the dog.
Phil typically makes 4 hops in the first minute, 7 in the second, and so on;
i.e. in each minute he makes 3 more hops than in the previous minute.
How long does an afternoon session last, given that the last minute has 46 hops?

6) How many whole numbers divisible by 6 are there, between 201 and 550?

7) Find the number of positive terms in the following arithmetic sequence: $91, 88, 85, 82, ...$

8) Find x, given that following are consecutive terms in an arithmetic sequence:
$x-3,\ 3x-4,\ x^2-1$.

9) A sequence is defined by the the recursive formula: $\begin{cases} a_1 = 5 \\ a_{n+1} = a_n + 3 \end{cases}$.
Prove that the sequence is arithmetic and find its 11th term.

10) In an arithmetic sequence $(a_k)=a_1,\ a_2,\ a_3,\ ...,\ a_n$, it's known that the sum of the first four terms is the opposite (±) of the sum of the 6th through the 9th terms.

a. Prove that $a_5=0$.

b. Given that $a_3-a_{11}=24$, find a_1 and d.

Define a new sequence (b_k), by $b_k=2a_k-3\ (k=1,2,...,n)$.

c. Find the first negative number in the sequence (b_k), as well as its position.

11) Find the sum of the first 14 terms of the following arithmetic sequence: $-3,\ 2,\ 7,\ 12,\ ...$

12) Given an arithmetic sequence: $-13,-7,-1,\ 5,...$, How many terms, starting with the first, must we add, in order to get a sum of 987?

13) Phil the flea has an afternoon pastime of hopping on Rover the dog.
Phil typically makes 11 hops in the first minute, 13 in the second, and so on;
i.e. in each minute he makes 2 more hops than in the previous minute.
How long does an afternoon session last, given that there were 416 hops in total?

14) Given the arithmetic sequence: -71, -67, -63, ….
How many terms, at the very least, need we add in order to get a positive sum?

15) Given that the arithmetic sequence: 4, 13, 22, 31, … contains 36 terms,
compute the sum of the last fourteen terms of the sequence.

16) Given the arithmetic sequence: 4, 9, 14, …,599.
Someone deleted every third term in the sequence (3rd, 6th, 9th, etc.).
Find the sum of the remaining terms.

17) In an arithmetic sequence containing $3n$ terms, the sum of the <u>last</u> n terms exceeds the sum of the <u>first</u> n terms by 1024.

a. Express n in terms of the common difference, d.

b. If $d=8$, how many terms does the sequence have?

18) Given a sequence (a_n), such that $S_n=2n^2+4n$.

a. Find the first three terms of the sequence.

b. Prove that the sequence is arithmetic and find its common difference.

19) In a certain arithmetic sequence, the sum of the 5th, 7th and 16th terms is 0. Furthermore, the sum of the first three terms is 132.

a. Find the sequences' first term and common difference.
b. Find the first negative term in the sequence.
c. How many terms (starting from the first) must we add, to get a sum of 210?

20) Given two arithmetic series: $150+144+138+\ldots$, and $90+93+96+\ldots$, and the following conditions:
- Both have the same number of terms.
- The sum of their last terms is 0.

a. Find the (common) number of terms in the two serieses.

- If we add the sum of the first n terms from each of the two serieses, we get 3480.

b. Find n, given that it is less than 20.

21) Given two arithmetic sequences (a_n) and (b_n) with common differences d and D.

a. Find d, given that:
- $d=-2D$
- The sum of the first 50 terms is the same in each of the sequences.
- The 20th term in (a_n) is 1 more than the 37th term in (b_n).

b. Find a_1 and b_1, given that a_{10} is 1 less than 5 times b_{50}.

22) Given an arithmetic sequence containing 18 terms: $-21, -17, -13, \ldots$

a. Compute the sum of the odd terms (1st, 3rd, etc).
b. Compute the sum of the even terms (2nd, 4th, etc).

23) An arithmetic sequence has $2n$ terms and common difference d.
The sum of the odd terms is 552, and the sum of the even terms is 612.
Prove that $nd=60$.

24) In an arithmetic sequence with an odd number of terms, the sum of all the terms is $1\frac{14}{15}$ times bigger than the sum of the odd terms.
How many terms does the sequence have?

25) The following are 3 consecutive terms in an arithmetic sequence $(a_n): 2x+23,\ x-16,\ x-5$.

a. Find x and the common difference d.
b. If $a_{12}=0$, find a_1.
c. If the last term is $a_n=308$, find the sum of all the positive odd terms.

26) In an arithmetic sequence with an even number of terms, it is given that $a_4^{\,2} + a_5^{\,2} = a_6^{\,2}$ and that $a_1 \neq 0$.

a. Prove that $a_1 = -4d$ and that $S_9 = 0$.

b. Find a_1 and d, given that $a_6 = a_5 + 2$.

c. Find the number of terms in the sequence, given that the even terms' sum is 504.

27) An arithmetic sequence has $2n$ terms.
The sum of the all the terms is 66 more than twice the sum of the odd terms.

a. Prove that $nd = 66$.

b. If $d = 3$, express the sum of the first n terms of the sequence in terms of a_1.

c. Given the sum of the first n terms is 187.
Find the smallest positive term and its place in the sequence.

28) A man who wanted to buy a sports car received 2 financing options (without interest):
Option #1: A first installment of $\$1,000$ and each subsequent installment being $\$500$ more than the previous one.
Option #2: A first installment of $\$7,200$ and each subsequent installment being $\$450$ less than the previous one.
Under option #2, the number of installments is 4 less than under option #1.

a. How many installments are there under each option?

b. What is the cost of the car?

Answer Key

1) -235
2) -5, 4
3) 20
4) 48
5) 15 min.
6) 58
7) 31
8) 1 or 4.
9) 59
10) a. Solution in the recording. b. 12, -3 c. -3, 5
11) 413
12) 21
13) 16 min.
14) 37
15) 3,647
16) 23,920
17) a. $n=\sqrt{\frac{512}{d}}$ b. 8
18) a. 6, 10, 14 b. 4
19) a. 5, -6 b. -4 c. 6
20) a. 8 b. 16
21) a. $d=4\ [D=-2]$ b. $a_1=-52,\ b_1=95$
22) a. 99 b. 135
23) Solution in the recording.
24) 14
25) a. -50, 11 b. -121 c. 2,156
26) a. Solution in the recording. b. -8, 2 c. 36
27) a. Solution in the recording. b. $220a_1+693$ c. 1, 9
28) a. 12, 8 b. $\$45,000$

Geometric Sequences

Questions

1) Given the geometric sequence: $\frac{1}{9},\frac{1}{3},1,3,...$

Find the last term of the sequence, given that it has 9 terms.

2) How many terms are there in the following geometric sequence: $\frac{9}{64},\frac{3}{16},\frac{1}{4},...,\frac{64}{81}$.

3) In a certain geometric sequence, the 6th term is 8 and the 10th term is 128.
Find the first term and the common ratio of the sequence.

4) In a geometric sequence, the difference between the 7th and 5th terms is 432, and the difference between the 5th and 3rd terms is 48.
Find the first term and the common ratio of the sequence.

5) In an increasing geometric sequence, the difference between the 8th and the 4th terms is 3120, and the sum of the 2nd and the 4th terms is $5\frac{1}{5}$.

Find the first term and the common ratio of the sequence.

6) Freda the flea has an afternoon pastime of hopping on Rover the dog.
Freda typically makes 4 hops in the first minute, 12 in the second, …;
i.e. in each minute she makes 3 times as many hops than in the previous minute.
How long does a "session" last, given that there were 324 hops in the last minute?

7) The following are three consecutive terms in an geometric sequence: $x-6,\ x+4,\ 4x+1$.
Find x, and the common ratio of the sequence.

8) A sequence is defined by the the recursive formula: $\begin{cases} a_1 = 3 \\ a_{n+1} = 2a_n \end{cases}$.

Prove that the sequence is geometric and find its 8th term.

9) Find the sum of the first nine terms of the following geometric sequence:
$5,\ 10,\ 20,\ 40,...$

10) Freda the flea has an afternoon pastime of hopping on Rover the dog.
Freda typically makes 2 hops in the first minute, 10 in the second, ...,
i.e. in each minute she makes 5 times as many hops than in the previous minute.
How long does a "session" last, given that there were, in total, 1562 hops in it?

11) Given a geometric sequence with $3n$ terms and common ratio 2, such that the sum of its last n terms is 256 times more than the sum of its first n terms.
How many terms are there in the sequence?

12) In an increasing geometric sequence with n terms, the sum of the last $n-3$ terms is 8 times the sum of the first $n-3$ terms.
Find the common ratio of the sequence.

13) In a geometric sequence, the sum of the terms is 252, the last term is 120 more than the 2nd term, and the common ratio is 2.
How many terms are there in the sequence?

14) The following are three consecutive terms in an increasing geometric sequence:
$x-13,\ x-9,\ 2x-3$.

a. Find x.
b. Write a formula for the general term of the sequence.
c. Find two consecutive terms whose sum is 18,750.
d. Given that the last term is $a_n = 5^{11}$, find the sum of the last 7 terms.

15) Given a sequence $(a_n) = 4, 12, 36, \ldots$, we form a new sequence (b_n) from it, thus:

$$b_1 = a_1 + \frac{a_2}{6},\ b_2 = a_2 + \frac{a_3}{6},\ b_3 = a_3 + \frac{a_4}{6},\ \ldots,\ \boxed{b_n = a_n + \frac{a_{n+1}}{6}}$$

a. Prove that (b_n) is a geometric sequence and find its common ratio.
b. Show that the ratio between the sum of the first *n* elements of (a_n) and of (b_n) is $\frac{2}{3}$.
c. Find two consecutive terms of (b_n) whose sum equals $\frac{2}{9}$ of a_6.

16) Given a sequence $7, 14, 28, \ldots$ with 8 terms.
Compute the sum of the odd terms and the sum of the even terms.

17) In a geometric sequence with $2n$ terms, the sum of the even terms is 4 times greater than the sum of the odd terms.
Find the common ratio.

18) A geometric sequence has an even number of terms and a common ratio q.
Express, in terms of q, the ratio of the sum of all the terms to the sum of the even terms.

19) A geometric sequence has $2n$ terms and a common ratio q.
Show that the ratio of the sum of all the terms to the sum of the odd terms depends only on q (and not on n).

20) A geometric sequence has $2n$ terms and a common ratio q.

a. Show that the ratio of the sum of all the terms to the sum of the odd terms depends only on q (and not on n).
b. Write a formula for the general term a_n of the sequence.
c. Find two consecutive terms of whose sum is 324.

21) A geometric sequence (a_n), has 12 terms. Another geometric sequence (b_n), is obtained from it by changing the sign of all the odd terms.
The sum of the terms in (a_n) is 3 times the sum of the terms in (b_n).

a. Find the common ratio of (a_n).
b. Given that $a_5 - a_4 = 8$, find a_1.
c. Find the sum of all the even terms in (a_n).

22) In an eastern land ruled a king who enjoyed games of thought.
In honor of his birthday, his chief minister presented him with a board game involving 25 squares and some playing pieces.
Despite protestations from the minister, the king insisted on rewarding him for his gift, and offered him half the treasures of the kingdom which consisted of some 40 million gemstones.
The minister then made a challenging proposal to the king: "Give me 1 gemstone for the first square, 2 stones for the second square, 4 for the third, 8 for the fourth and so on!".
The king accepted.

a. How many stones will the king give for the last game square?
b. Which of the two scenarios yield more gemstones for the minister?
c. Just as the king was about to hand over the stones, his daughter, the princess, made an additional (alternative) proposal to the king:
"Give the minister 2^n for each even square n [0 for the odd squares]!".
Which proposal is better for the king: the minister's or his daughter's?

Answer Key

1) 729
2) 7
3) $\frac{1}{4}, 2$ or $-\frac{1}{4}, -2$
4) $\frac{2}{3}, 3$ or $\frac{2}{3}, -3.$
5) $\frac{1}{25}, 5$
6) 5 min.
7) 11, 3 or $-\frac{2}{3}, -\frac{1}{2}.$
8) 384
9) 2,555
10) 5 min.
11) 12
12) 2
13) 6
14) a. 14 b. $a_n = 5^{n-1}$ c. $a_6 = 3{,}125,\ a_7 = 15{,}625$ d. 610,343
15) a. 3 b. Solution in the recording. c. $b_5 = 486,\ b_6 = 1{,}458$
16) 595, 1,190
17) 4
18) $\frac{q}{q+1}$
19) Solution in the recording.
20) a. $\frac{1}{q+1}$ b. $a_n = 3^{n-1}$ c. $a_5 = 81,\ a_6 = 243$
21) a. 2 b. 1 c. 2,730
22) a. $16{,}777{,}216$ b. $33{,}554{,}431 > 20{,}000{,}000$ c. $22{,}369{,}620 < 33{,}554{,}431$

Infinite Geometric Series

Questions

1) Find the sum of the infinite geometric series: $12+4+1\frac{1}{3}+\ldots$.

2) An infinite geometric series has a common ratio of $\frac{1}{4}$ and a sum of 32.
Find its first term.

3) A certain infinite geometric series has a sum of $62\frac{1}{2}$ and its 2nd term is 10.
Find the first term and the common ratio of the series.

4) The first term in a decreasing infinite geometric series is 14 and the sum of the even terms is $9\frac{1}{3}$. Find the sum of the odd terms.

5) Let (a_n) be a convergent infinite geometric sequence with common ratio q and sum S_∞.
For each n, let the sum of the first n terms be S_n (a.k.a. partial sum).
Define three new infinite geometric sequences (b_n), (c_n) and (d_n), as follows:
$b_n = S_n$, $c_n = a_{n+1}^2 - a_n^2$, $d_n = S_\infty + a_n$ E.g., $b_3 = a_1 + a_2 + a_3$, $c_3 = a_4^2 - a_3^2$, $d_3 = S_\infty + a_3$.
Determine if each of the new sequences is geometric, and if so:

a. Express its common ratio in terms of q.
b. If it converges, express its sum in terms of a_1 and q.
c. Prove that the sum of the terms squared $\neq$ the terms' sum squared, for any q.

6) Let (a_n) be a positive infinite geometric sequence with common ratio $0<q<1$. For each n, let $S_n^* = \dfrac{a_n}{1-q}$ be the terms' sum from a_n onwards (to infinity), and denote $b_n = S_n^*$.

a. Show that (b_n) geometric as well, and express b_n in terms of a_1 and q.
b. Find a_1 and q, if the sum of (b_n) is 126 and the sum of the first 8 terms of (a_n) is 6,560 times bigger than the 9th term of (b_n).
c. Use the above to compute $b_2 + b_3 + b_4 + \ldots$.
d. Compute the sum of the even terms in (b_n), and likewise the odd terms.
e. Make a sequence, (b_n^*), from (b_n) by negating its "odd terms".
Show that (b_n^*) is also geometric and compute its sum.
f. Reapet part e, but negate the "even terms" to get sequence (b_n^{**}). Compute its sum.
g. For (b_n), prove that the sum of the terms squared $\neq$ the terms' sum squared.
h. Prove that the sum's ratio of (a_n) to (b_n) is 2:3.

7) Given a decreasing, positive, infinite geometric sequence $a_1,\ a_2,\ a_3,\ a_4,\ \ldots$, whose sum is 24. A new sequence is created from it, as follows: $a_1+a_2,\ a_2+a_3,\ a_3+a_4,\ a_4+a_5,\ \ldots$.

a. Prove that the new sequence is also positive, geometric and decreasing.
b. If the sum of the new sequence is 32, find a_1 and q (common ratio) for the first sequence.

8) In a decreasing, infinite, positive geometric series (a_n), the sum of the "odd terms" is $1\frac{2}{3}$ times bigger than the sum of the "even terms".

a. Find the common ratio of the sequence.

A new sequence (b_n) is formed, by adding each successive pair of terms of (a_n).

b. Prove that (b_n) is decreasing, positive and geometric and find its common ratio.
c. Show that the sequences (a_n) and (b_n) have equal sum.
d. If the sum of (a_n) is 500, find a_1.

9) Given an infinite geometric sequence $a_1, a_2, a_3, \ldots$ with common ratio $q,\ (0<q<1)$.
Define the sums $V=a_3+a_7+a_{11}+\ldots$ and $T=a_1+a_2+a_5+a_6+a_9+a_{10}+\ldots$
Given: $T=6V$.

a. Find the common ratio q of the sequence.
b. How many times smaller V is, than the sum of the "odd terms" of the sequence?
c. If the sum of the "even terms" is $1365\frac{1}{3}$, find the first term.

10) Answer the following questions:

a. Given the geometric sequence $a_1, a_2, a_3, \ldots, a_{2n}$ with common ratio q.
From it, we build a new sequence $a_1^2,\ a_2^2,\ a_3^2,\ \ldots,\ a_{2n}^2$.
Prove that the ratio of the (new sequence's first n terms sum) to the (sum of the odd terms of the given sequence) is dependent only on a_1.
b. Given a decreasing, infinite, geometric series whose sum is 640, such that the (sum of the first 10 terms squared) is 320 times greater than the (sum of the first 10 odd terms). Find the common ratio of the sequence.
c. For the sequence above, we add all the terms from some a_n onward (to infinity).
Given that this sum is 16x smaller than the sum of the whole sequence, find a_n.

11) Given an infinite geometric sequence $a_1, a_2, a_3, \ldots$ with common ratio $q,\ (0<|q|<1)$.
Define the sums $V=a_2+a_7+a_{12}+\ldots$ and $T=a_1+a_3+a_6+a_8+a_{11}+a_{13}+\ldots$, given: $T=\frac{3}{10}V$.

a. Find the common ratio q of the sequence.
b. If we change the sign of all the "odd terms", we get a new sequence whose sum is 12.
Find the first term of the original sequence.
c. This time we square all the terms. What is the sum now?

Answer Key

1) 18

2) 21

3) $a_1 = 12\frac{1}{2},\ q = \frac{4}{5}$ or $a_1 = 50,\ q = \frac{1}{5}$

4) $18\frac{2}{3}$

5) a. q^2 b. $-a_1^2$ c. Solution in the recording.

6) a. $\frac{b_{n+1}}{b_n} = q,\ b_n = \frac{a_1 \cdot q^{n-1}}{1-q}$ b. $a_1 = 56,\ q = \frac{1}{3}$ c. 42 d. $31\frac{1}{2},\ 94\frac{1}{2}$

e. -63 f. 63 g. $7938 \neq 15876$ h. Solution in the recording.

7) a. Solution in the recording. b. $a_1 = 16,\ q = \frac{1}{3}$

8) a. $\frac{3}{5}$ b. $\frac{9}{25}$ c. Solution in the recording. d. 200

9) a. $q = \frac{1}{2}$ b. 5 times smaller. c. $a_1 = 2048$

10) a. Solution in the recording. b. $\frac{1}{2}$ c. 20

11) a. $q = \frac{1}{3}$ b. $a_1 = -16$ c. $S = -18$

Recursive Definitions of Sequences

Questions

1) A sequence (a_n) is defined by the recurrence relation: $\begin{cases} a_{n+1} = a_n + 2n - 11 \\ a_1 = -6 \end{cases}$.

a. Find the 3rd term of the sequence.
b. Given that the 13th term is 18, find the 12th and 14th terms.
c. Given that the 31st term is k, express the 30th and the 32nd terms, using k.
d. Find the position of two consecutive terms whose difference is 133.
e. Explain why the sequence doesn't have two consecutive terms whose difference is 62.

2) A sequence (a_n) is defined by the recurrence relation: $\begin{cases} a_{n+1} = a_n + 2n \\ a_1 = 0 \end{cases}$.

Given that $a_k = 72$, express a_{k+2} in terms of k.

3) A sequence (a_n) is defined by the recurrence relation: $\begin{cases} a_{n+1} = 2a_n + n^2 - 31 \\ a_7 = t \end{cases} (n \geq 7)$.

Find the value of t for which the terms $a_7,\ a_8,\ a_9$ form an arithmetic sequence.

4) A sequence (a_n) satisfies the recurrence relation: $a_{n+1} = a_n + 6n - 2$, and a new sequence (b_n) is defined by $b_n = a_{n+1} - a_n$.

a. Prove that (b_n) is an arithmetic sequence and find its common difference.
b. Compute b_1.

5) A sequence (a_n) satisfies the recurrence relation: $a_{n+1} = 3a_n + 4$, and a new sequence (b_n) is defined by $b_n = a_n + 2$.

a. Prove that (b_n) is a geometric sequence and find its common ratio.
b. Given that $b_5 = 162$, find a_1.

6) A sequence (a_n) is defined by the recurrence relation: $\begin{cases} a_{n+1} = 3a_n + 10n - 5 \\ a_1 = 3 \end{cases}$,

and a new sequence (b_n) is defined by $b_n = a_n + 5n$.

a. Prove that (b_n) is a geometric sequence.
b. Compute b_5.
c. Compute the sum: $b_2 + b_4 + b_6 + ... + b_{12}$.

7) A sequence (a_n) is defined by the recurrence relation: $\begin{cases} a_{n+1} = 8n - a_n + 3 \\ a_1 = k \end{cases}$.

a. Express the first four terms of the sequence in terms of k.
b. Prove that both the *odd terms* and the *even terms* are arithmetic sequences and find their common difference.
c. Compute the sum of the first 20 terms of the sequence.

8) A sequence (a_n) is defined by the recurrence relation: $a_1 = 2,\ a_{n+1} = \frac{3a_n}{2a_n + 3}$,

and a new sequence (b_n) is defined by $b_n = \frac{4 - 7a_n}{a_n}$.

a. Prove that (b_n) is an arithmetic sequence and find its common difference.
b. Compute the sum: $b_2 + b_4 + b_6 + ... + b_{22}$.

9) A sequence (a_n) is defined by the recurrence relation: $\begin{cases} a_{n+1} = 3n - a_n - 7 \\ a_1 = 1 \end{cases}$.

a. Compute the first 5 terms and determine if the sequence is arithmetic.
b. Prove that $a_{n+2} = a_n + 3$ for all natural n.
c. Write a formula for the sum of the first n odd terms.
d. Compute the following sum: $a_1 + a_3 + a_5 + ... + a_{17}$.

10) A sequence (a_n) satisfies the recurrence relation: $a_{n+1} = a_n + 2 \cdot 3^n + 2$.

a. Answer the following sections:
   i. Express a_{n+2} in terms of a_n.
   ii. Find the position of the term that's 652 more than the term standing 2 places before it.
b. Given the formula: $S_n = 1\frac{1}{2} \cdot 3^n + n^2 + n - 1\frac{1}{2}$, compute the sum: $a_6 + a_7 + a_8 + ... + a_{11}$.
c. Given all the above, find a_1.

11) A sequence (a_n) is defined by the recurrence relation: $a_1 = 6,\ a_{n+1} = \frac{2a_n}{a_n + 5}$,

and a new sequence (b_n) is defined by $b_n = \frac{a_n + 3}{a_n}$.

a. Prove that the sequence (b_n) is geometric and find its common ratio.
b. Express (b_n) in terms of just n.
c. Compute the following sum: $b_1 - b_2 + b_3 - b_4 + ... - b_{10}$.

Answer Key

1) a. $a_3 = -22$ b. $a_{14} = 33,\ a_{12} = 5$ c. $a_{32} = k + 51,\ a_{30} = k - 49$
d. $a_{72},\ a_{73}$ e. $n = 36\frac{1}{2}$ not whole.

2) $a_{k+2} = 74 + 4k$

3) $t = -33$

4) a. $d = 6$ b. $b_1 = 4$

5) a. $q = 3$ b. $a_1 = 0$

6) a. $q = 3$ b. $b_5 = 648$ c. $1{,}584{,}320$

7) a. $a_1 = k,\ a_2 = 11 - k,\ a_3 = 8 + k,\ a_4 = 19 - k$ b. $d = 8$ c. $470 - 10k$

8) a. $d = 2\frac{2}{3}$ b. $267\frac{2}{3}$

9) a. 1, -5, 4, -2, 7; Not arithmetic. b. Solution in the recording. c. $\frac{3}{2}n^2 - \frac{1}{2}n$ d. 117

10) a.i. $a_{n+2} = a_n + 8 \cdot 3^n + 4$ ii. a_6 b. $265{,}458$ c. 5

11) a. $2\frac{1}{2}$ b. $b_n = 1\frac{1}{2} \cdot \left(2\frac{1}{2}\right)^{n-1}$ c. $-4{,}086.74$