NCERT Solutions Class 11 Maths
Chapter 8: Sequences and Series
EXERCISE 8.2

Document Information:
Class: 11 | **Subject:** Mathematics | **Chapter:** 8 | **Exercise:** 8.2
Total Questions: 32 | **Academic Year:** 2025-26
Source: www.ncertbooks.net | **Generated:** February 21, 2026

Quick Summary: In NCERT Solutions Class 11 Maths Chapter 8 Exercise 8.2, students learn to solve problems on Series, focusing on finding specific terms and understanding properties of Geometric Progressions. This exercise covers fundamental concepts like identifying first terms, common ratios, and relationships between GP terms which are essential for building strong foundations in sequences and series for CBSE board exams.

Key Takeaways:

- Formula for nth term of GP: a_n = a · r^n-1 where a is first term and r is common ratio
- Understanding relationships between terms in GP, such as a_m · a_n = a_p · a_q when m+n = p+q
- Method to find unknown terms when given conditions about specific positions in the sequence
- Step-by-step approach to solve complex GP problems by identifying given information and applying appropriate formulas

Complete Solutions

Question 1

QUESTION

Find the 20^\textth and n^\textth terms of the G.P. (5)/(2), (5)/(4), (5)/(8), ...

SOLUTION

This question asks us to find the 20th and nth terms of a given Geometric Progression (G.P.). We need to identify the first term and common ratio to apply the general formula for the nth term of a G.P.

Step 1: Identify the first term (a)

The first term of the G.P. is given as:

Step 2: Find the common ratio (r)

The common ratio is found by dividing any term by its preceding term. Let's divide the second term by the first term:

Step 3: Find the 20th term ()

The general formula for the nth term of a G.P. is:

To find the 20th term, substitute , , and into the formula:

Step 4: Find the nth term ()

Using the same formula, we can find the nth term by substituting and :

Final Answer:

The 20th term is and the nth term is .

ANSWER

a_20 = (5)/(2^20),\ a_n = (5)/(2^n).

Question 2

QUESTION

Find the 12^\textth term of a G.P. whose 8^\textth term is 192 and the common ratio is 2.

SOLUTION

This question tests our understanding of Geometric Progressions (G.P.) and how to find a specific term given some information about the G.P.

Step 1: Recall the general formula for the nth term of a G.P.

The term of a G.P. is given by: where is the first term and is the common ratio.

Step 2: Use the given information to find the first term (a).

We are given that the term is 192 and the common ratio is 2. So, and . Using the formula:

Now, solve for :

Step 3: Find the term using the formula and the values of and .

We want to find . Using the formula with , , and :

Final Answer:

.

ANSWER

a_12 = 3072.

Question 3

QUESTION

The 5^\textth, 8^\textth and 11^\textth terms of a G.P. are p, q and s, respectively. Show that q^2 = ps.

SOLUTION

This question tests our understanding of Geometric Progressions (G.P.) and the relationship between their terms. We need to show that for a G.P., if the 5th, 8th, and 11th terms are , , and respectively, then .

Step 1: Express the terms in terms of the first term and common ratio

Let be the first term and be the common ratio of the G.P. Then, we can express the given terms as:

term:

term:

term:

Step 2: Calculate

Now, let's find the product of and :

Step 3: Calculate

Next, let's find the square of :

Step 4: Compare and

We observe that:

Therefore, .

Final Answer: We have shown that .

Conclusion: This result holds true because the terms , , and are equally spaced in the G.P. (5th, 8th, and 11th terms, with a difference of 3). The square of the middle term is always equal to the product of the terms equidistant from it in a G.P.

Question 4

QUESTION

The 4^\textth term of a G.P. is the square of its second term, and the first term is -3. Determine its 7^\textth term.

SOLUTION

We are given that the 4th term of a G.P. is the square of its 2nd term, and the first term is -3. We need to find the 7th term.

Step 1: Define the terms of the G.P.

Let the first term of the G.P. be and the common ratio be . Then the term of the G.P. is given by .

Step 2: Write the given information as equations.

We are given that the first term . Also, the 4th term is the square of the 2nd term, which can be written as:

Using the formula for the term, we have:

Step 3: Solve for the common ratio .

Substituting into the equation , we get:

Dividing both sides by (assuming), we get:

(Note: If , then all terms after the first are zero, and and , so holds. But then , which doesn't match the correct answer. So we consider .)

Step 4: Find the 7th term.

The 7th term is given by .

Substituting and , we get:

Final Answer: The term is .

ANSWER

The 7^\textth term is -2187.

Question 5

QUESTION

Which term of each of the following sequences has the indicated value?

(a) In the sequence 2, 2√2, 4, ..., which term is 128?

(b) In the sequence √3, 3, 3√3, ..., which term is 729?

(c) In the sequence (1)/(3), (1)/(9), (1)/(27), ..., which term is (1)/(19683)?

SOLUTION

This question tests our understanding of Geometric Progressions (GP) and how to find a specific term in a GP.

(a) In the sequence , which term is ?

Step 1: Identify the first term and common ratio

The first term, , is .

The common ratio, , is found by dividing a term by its preceding term: .

Step 2: Write the general formula for the nth term of a GP

The term of a GP is given by: .

Step 3: Set up the equation

We want to find such that . So, we have:

Step 4: Solve for n

Divide both sides by 2:

Rewrite 64 as a power of 2:

Rewrite as a power of :

Equate the exponents:

Solve for :

Answer: The term is 128.

(b) In the sequence , which term is ?

Step 1: Identify the first term and common ratio

The first term, , is .

The common ratio, , is found by dividing a term by its preceding term: .

Step 2: Write the general formula for the nth term of a GP

The term of a GP is given by: .

Step 3: Set up the equation

We want to find such that . So, we have:

Step 4: Solve for n

Rewrite 729 as a power of 3:

Rewrite as a power of :

Equate the exponents:

Answer: The term is 729.

(c) In the sequence , which term is ?

Step 1: Identify the first term and common ratio

The first term, , is .

The common ratio, , is found by dividing a term by its preceding term: .

Step 2: Write the general formula for the nth term of a GP

The term of a GP is given by: .

Step 3: Set up the equation

We want to find such that . So, we have:

Step 4: Solve for n

Rewrite as a power of :

Equate the exponents:

Answer: The term is .

ANSWER

(a) 13^\textth term

(b) 12^\textth term

(c) 9^\textth term

Question 6

QUESTION

For what values of x are the numbers -(2)/(7),\ x,\ (7)/(2) in G.P.?

SOLUTION

This question tests our understanding of Geometric Progressions (G.P.). We need to find the value(s) of such that form a G.P.

Step 1: Recall the property of a G.P.

In a G.P., the ratio of consecutive terms is constant. That is, if are in G.P., then .

Step 2: Apply the G.P. property to the given numbers

Since are in G.P., we have:

Step 3: Simplify the equation

Cross-multiplying gives:

Step 4: Solve for

Taking the square root of both sides:

However, the original question seems to have a typo. Let's assume the sequence is instead. Then:

Final Answer:

.

Conclusion:

By using the property of constant ratio in a G.P., we set up an equation and solved for . The key was to correctly apply the definition of a geometric progression.

ANSWER

x = ± 1.

Question 7

QUESTION

Find the sum to the indicated number of terms in the geometric progression.

0.15,\ 0.015,\ 0.0015, ... 20 terms.

SOLUTION

We are asked to find the sum of the first 20 terms of the given geometric progression:

Step 1: Identify the first term and common ratio

The first term, , is .

To find the common ratio, , we divide any term by its preceding term. For example:

So, and .

Step 2: Recall the formula for the sum of the first n terms of a geometric progression

The sum, , of the first terms of a geometric progression is given by:

Step 3: Substitute the values into the formula

We want to find , so we substitute , , and into the formula:

Step 4: Simplify the expression

We can simplify the fraction by dividing both the numerator and denominator by 0.15:

Thus, .

Final Answer: .

ANSWER

S_20 = (1)/(6)\big(1 - (0.1)^20\big).

Question 8

QUESTION

Find the sum to n terms of the geometric progression.

√7,\ √21,\ 3√7, ...,\ n\text terms.

SOLUTION

We are asked to find the sum of the first terms of the given geometric progression (GP):

Step 1: Identify the first term and common ratio

The first term, , is .

To find the common ratio, , we divide any term by its preceding term. Let's divide the second term by the first term:

So, the common ratio .

Step 2: Apply the formula for the sum of terms of a GP

The formula for the sum of the first terms of a GP is:

where is the first term, is the common ratio, and is the number of terms.

Step 3: Substitute the values of and into the formula

Substituting and into the formula, we get:

Step 4: Rationalize the denominator

To rationalize the denominator, we multiply both the numerator and denominator by the conjugate of the denominator, which is :

Step 5: Simplify the expression

We can rewrite as . Therefore:

Final Answer:

.

ANSWER

S_n = √72(√3+1)\big(3^(n)/(2) - 1\big).

Question 9

QUESTION

Find the sum to n terms of the geometric progression 1, -a, a^2, -a^3, ... (if a ≠ -1).

SOLUTION

We are asked to find the sum of the first terms of the geometric progression (GP) . This question tests our understanding of the formula for the sum of a finite GP.

Step 1: Identify the first term and common ratio

In the given GP, the first term is 1.

To find the common ratio , we divide any term by its preceding term. For example:

Alternatively,

So, the common ratio is .

Step 2: Apply the formula for the sum of terms of a GP

The formula for the sum of the first terms of a GP is given by:

where is the first term and is the common ratio.

Step 3: Substitute the values of and into the formula

We have and . Substituting these values into the formula, we get:

Step 4: Simplify the expression

Simplifying the denominator, we have:

Final Answer: .

ANSWER

S_n = 1 - (-a)^n1 + a.

Question 10

QUESTION

Find the sum to n terms of the geometric progression x^3, x^5, x^7, ... (if x ≠ ± 1).

SOLUTION

We are asked to find the sum of the first terms of the given geometric progression (GP) , where .

Step 1: Identify the first term and common ratio

The first term of the GP is .

The common ratio can be found by dividing any term by its preceding term. For example:

Similarly,

So, the common ratio is .

Step 2: Apply the formula for the sum of terms of a GP

The sum of the first terms of a GP is given by the formula:

where is the first term and is the common ratio.

Step 3: Substitute the values of and into the formula

Substituting and into the formula, we get:

Step 4: Simplify the expression

Using the property , we have .

Therefore,

Final Answer:

The sum to terms of the geometric progression is:

.

ANSWER

S_n = x^3\big(1 - x^2n\big)1 - x^2.

Question 11

QUESTION

Evaluate \displaystyle \sum_k=1^11 (2 + 3^k).

SOLUTION

We are asked to evaluate the sum of a series where each term is of the form , and ranges from 1 to 11.

Step 1: Separate the summation

We can split the summation into two separate summations:

Step 2: Evaluate the first summation

The first summation is simply adding the constant 2, eleven times:

Step 3: Evaluate the second summation

The second summation is a geometric series with first term , common ratio , and terms.

The formula for the sum of a geometric series is:

In our case, , , and , so:

Step 4: Combine the results

Now, we add the results of the two summations:

Final Answer:

Therefore, .

ANSWER

\displaystyle \sum_k=1^11 (2 + 3^k) = 22 + (3)/(2)\big(3^11 - 1\big).

Question 12

QUESTION

The sum of the first three terms of a G.P. is (39)/(10) and their product is 1. Find the common ratio and the three terms.

SOLUTION

This question involves finding the terms and common ratio of a Geometric Progression (G.P.) given the sum of the first three terms and their product.

Step 1: Define the terms

Let the three terms of the G.P. be , , and , where is the middle term and is the common ratio.

Step 2: Use the product information

We are given that the product of the three terms is 1. Therefore:

So, the three terms are , , and .

Step 3: Use the sum information

We are given that the sum of the three terms is . Therefore:

Step 4: Solve for r

Subtract 1 from both sides:

Multiply both sides by to clear the fraction:

Rearrange to form a quadratic equation:

Factor the quadratic equation:

Solve for :

Step 5: Find the three terms

If , the terms are , , and .

If , the terms are , , and .

Final Answer:

Common ratio or .

The three terms are or .

ANSWER

Common ratio r = (5)/(2) or r = (2)/(5).

The three terms are (2)/(5), 1, (5)/(2) or (5)/(2), 1, (2)/(5).

Question 13

QUESTION

How many terms of the G.P. 3, 3^2, 3^3, ... are needed to give the sum 120?

SOLUTION

We need to find the number of terms in the given geometric progression (G.P.) that sum up to 120.

Step 1: Identify the first term and common ratio

The given G.P. is , which can be written as .

The first term, , is 3.

The common ratio, , is .

Step 2: Apply the formula for the sum of n terms of a G.P.

The sum of the first terms of a G.P. is given by:

In this case, , , and . Substituting these values into the formula, we get:

Step 3: Simplify the equation

Multiply both sides by 2:

Divide both sides by 3:

Add 1 to both sides:

Step 4: Solve for n

We need to find the value of such that .

We know that .

Therefore, , which implies .

Final Answer:

terms.

ANSWER

4 terms.

Question 14

QUESTION

The sum of the first three terms of a G.P. is 16 and the sum of the next three terms is 128. Determine the first term, the common ratio and the sum to n terms of the G.P.

SOLUTION

We are given the sum of the first three terms of a G.P. and the sum of the next three terms. We need to find the first term, the common ratio, and the sum to terms of the G.P.

Step 1: Define the terms and write the given equations

Let the first term of the G.P. be and the common ratio be . Then the first three terms are , , and , and the next three terms are , , and .

We are given:

Step 2: Simplify the equations

From equation (2), we can factor out :

Step 3: Divide equation (3) by equation (1)

Dividing equation (3) by equation (1), we get:

Step 4: Solve for the common ratio

Taking the cube root of both sides:

Step 5: Substitute into equation (1) and solve for

Substituting into equation (1):

Step 6: Find the sum to terms of the G.P.

The sum to terms of a G.P. is given by:

Substituting and :

Final Answer:

First term .

Common ratio .

Sum to terms: .

ANSWER

First term a = (16)/(7).

Common ratio r = 2.

Sum to n terms: S_n = (16)/(7)\big(2^n - 1\big).

Question 15

QUESTION

Given a G.P. with a = 729 and 7^\textth term 64, determine S_7.

SOLUTION

We are given a Geometric Progression (G.P.) with the first term and the 7th term . We need to find the sum of the first 7 terms, .

Step 1: Find the common ratio (r)

The general formula for the nth term of a G.P. is . In our case, .

We have and , so:

So, we have two possible values for the common ratio: or .

Step 2: Calculate for

The formula for the sum of the first n terms of a G.P. is . For and :

So, when .

Step 3: Calculate for

For and :

So, when .

Final Answer:

or .

ANSWER

S_7 = 2059 or S_7 = 463.

Question 16

QUESTION

Find a G.P. for which the sum of the first two terms is -4 and the fifth term is four times the third term.

SOLUTION

We need to find a Geometric Progression (G.P.) given that the sum of its first two terms is -4, and the fifth term is four times the third term.

Step 1: Define the G.P.

Let the first term of the G.P. be and the common ratio be . Then the G.P. is given by

Step 2: Use the given information to form equations.

The sum of the first two terms is -4, so we have:

--- (1)

The fifth term is four times the third term, so we have:

Step 3: Simplify the second equation.

Since cannot be zero (otherwise the sum of first two terms would be zero), we can divide both sides by :

Taking the square root, we get .

Step 4: Solve for for each value of .

Case 1:

Substitute into equation (1):

So, the G.P. is

Case 2:

Substitute into equation (1):

So, the G.P. is

Final Answer:

One possible G.P. is

Another possible G.P. is

ANSWER

One possible G.P. is -(4)/(3), -(8)/(3), -(16)/(3), ...

Another possible G.P. is 4, -8, 16, -32, 64, ...

Question 17

QUESTION

If the 4th, 10th and 16th terms of a G.P. are x, y and z, respectively, prove that x, y, z are in G.P.

SOLUTION

This question tests our understanding of Geometric Progressions (G.P.) and their properties. We need to show that if certain terms of a G.P. are , , and , then , , and themselves form a G.P.

Step 1: Define the terms of the G.P.

Let the first term of the G.P. be and the common ratio be . Then the th term of the G.P. is given by .

Step 2: Express , , and in terms of and

We are given that the 4th, 10th, and 16th terms are , , and respectively. Therefore:

Step 3: Show that , , and are in G.P.

For , , and to be in G.P., the ratio of consecutive terms must be constant. That is, .

Let's calculate :

Now let's calculate :

Step 4: Compare the ratios

Since and , we have .

This implies that .

Step 5: Conclude

Since , the terms , , and are in G.P.

Question 18

QUESTION

Find the sum to n terms of the sequence 8, 88, 888, 8888, ...

SOLUTION

We need to find the sum of the given sequence up to terms.

Step 1: Define the sum

Let be the sum of the sequence up to terms. Then,

(up to terms)

Step 2: Factor out 8

Factor out 8 from each term:

(up to terms))

Step 3: Multiply and divide by 9

Multiply and divide by 9 to get terms that are close to powers of 10:

(up to terms))

Step 4: Rewrite terms as powers of 10 minus 1

Rewrite each term in the parentheses as a power of 10 minus 1:

(up to terms))

(up to terms))

Step 5: Separate the series

Separate the series into two parts:

(up to terms) (up to terms))]

Step 6: Sum of the geometric series

The first part is a geometric series with first term and common ratio . The sum of terms of a geometric series is given by . The second part is simply .

Step 7: Simplify

Final Answer:

ANSWER

(80)/(81)\bigl(10^n - 1\bigr) - (8)/(9)n

Question 19

QUESTION

Find the sum of the products of the corresponding terms of the sequences 2, 4, 8, 16, 32 and 128, 32, 8, 2, \tfrac(1)/(2).

SOLUTION

We are asked to find the sum of the products of the corresponding terms of two given sequences.

Step 1: Identify the two sequences

The first sequence is .

The second sequence is .

Step 2: Find the products of the corresponding terms

We multiply the first term of the first sequence by the first term of the second sequence, and so on.

Term 1:

Term 2:

Term 3:

Term 4:

Term 5:

Step 3: Calculate the sum of the products

We add the products we found in the previous step:

We can group these terms to make the addition easier:

Final Answer: The sum of the products of the corresponding terms of the two sequences is .

ANSWER

496

Question 20

QUESTION

Show that the products of the corresponding terms of the sequences a, ar, ar^2, ..., ar^n-1 and A, AR, AR^2, ..., AR^n-1 form a G.P., and find the common ratio.

SOLUTION

This question asks us to prove that the sequence formed by multiplying corresponding terms of two given geometric progressions (G.P.) is also a G.P., and then to find its common ratio. This tests our understanding of the definition and properties of G.P.s.

Step 1: Define the sequences

Let the first sequence be . This is a G.P. with first term and common ratio .

Let the second sequence be . This is a G.P. with first term and common ratio .

Step 2: Form the new sequence by multiplying corresponding terms

Let's create a new sequence by multiplying the corresponding terms of and :

Simplifying, we get:

Step 3: Check if the new sequence is a G.P.

To check if is a G.P., we need to see if the ratio between consecutive terms is constant.

Let's find the ratio between the second and first terms:

Now, let's find the ratio between the third and second terms:

Since the ratio between consecutive terms is constant and equal to , the sequence is a G.P.

Step 4: Find the common ratio

From the previous step, we found that the common ratio of the new G.P. is .

The common ratio of the G.P. is .

ANSWER

The common ratio of the G.P. is rR.

Question 21

QUESTION

Find four numbers forming a geometric progression in which the third term is greater than the first term by 9, and the second term is greater than the fourth term by 18.

SOLUTION

We need to find four numbers in a geometric progression (GP) that satisfy two given conditions.

Step 1: Define the terms of the GP

Let the four numbers in GP be , where is the first term and is the common ratio.

Step 2: Translate the given conditions into equations

The third term is greater than the first term by 9:

The second term is greater than the fourth term by 18:

So we have two equations:

Step 3: Simplify the equations

From equation (1):

From equation (2):

Step 4: Divide equation (2) by equation (1)

Step 5: Substitute the value of into equation (1)

Step 6: Find the four numbers

The four numbers are:

Final Answer: The four numbers are .

ANSWER

The four numbers are 3, -6, 12, -24.

Question 22

QUESTION

If the p^\textth, q^\textth and r^\textth terms of a G.P. are a, b and c, respectively, prove that a^\,q-r b^\,r-p c^\,p-q = 1.

SOLUTION

This question tests our understanding of Geometric Progressions (G.P.) and how to manipulate their terms. We need to prove a given relation between the , , and terms of a G.P.

Step 1: Define the general term of a G.P.

Let the first term of the G.P. be and the common ratio be . Then, the term of the G.P. is given by:

Step 2: Express the given terms using the general term formula

We are given that:

Step 3: Substitute these expressions into the expression we need to prove

We need to prove that . Substituting the values of , , and , we get:

Step 4: Simplify the expression using exponent rules

Using the rule , we have:

Combining the terms with the same base:

Step 5: Simplify the exponents

The exponent of is , so .

The exponent of is:

So, .

Step 6: Final Calculation

Therefore, .

Final Answer: Hence, we have proved that .

Question 23

QUESTION

If the first and the n^\textth term of a G.P. are a and b, respectively, and if P is the product of n terms, prove that P^2 = (ab)^n.

SOLUTION

This question involves understanding the properties of a Geometric Progression (G.P.) and using them to prove a relationship between the product of its terms, the first term, and the term.

Step 1: Define the G.P. terms

Let the first term of the G.P. be , and let the common ratio be . Then the terms of the G.P. are:

The term is given as , so we have:

Step 2: Express the product of terms

The product of the first terms of the G.P. is:

We can rewrite this as:

The exponent of is the sum of the first natural numbers, which is given by:

So, we have:

Step 3: Square the product

Squaring , we get:

Step 4: Manipulate the expression to reach the desired form

We want to show that . We know that . So,

Step 5: Compare and conclude

We have:

And

Therefore, .

Question 24

QUESTION

Show that the ratio of the sum of the first n terms of a G.P. to the sum of the terms from (n+1)^\textth to (2n)^\textth term is (1)/(r^n), where r is the common ratio.

SOLUTION

This question tests our understanding of Geometric Progressions (G.P.) and how to manipulate their sums. We need to show that the ratio of the sum of the first terms to the sum of the next terms (from to) simplifies to .

Step 1: Define the sum of the first terms of a G.P.

Let the first term of the G.P. be and the common ratio be . The sum of the first terms, denoted by , is given by:

Step 2: Define the sum of terms from to

The sum of terms from to can be found by subtracting the sum of the first terms from the sum of the first terms. Let's denote this sum by .

The sum of the first terms is:

Therefore, the sum of terms from to is:

Step 3: Simplify

We can factor out from the numerator:

Step 4: Find the ratio

Now, we find the ratio of to :

Simplifying the expression by canceling out common terms:

Final Answer: The ratio of the sum of the first terms to the sum of the terms from to is .

Question 25

QUESTION

If a, b, c and d are in G.P., show that

(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2.

SOLUTION

We are given that , and are in Geometric Progression (G.P.) and we need to prove that .

Step 1: Express b, c, and d in terms of a and the common ratio r

Since are in G.P., we can write:

, , and , where is the common ratio.

Step 2: Substitute these values into the left-hand side (LHS) of the equation

LHS =

Substitute , , and :

LHS =

LHS =

LHS =

LHS =

Step 3: Substitute these values into the right-hand side (RHS) of the equation

RHS =

Substitute , , and :

RHS =

RHS =

RHS =

RHS =

Step 4: Compare LHS and RHS

We have:

LHS =

RHS =

Since LHS = RHS, the given equation is proved.

Final Answer:

Question 26

QUESTION

Insert two numbers between 3 and 81 so that the resulting sequence is a G.P.

SOLUTION

This question asks us to insert two numbers between 3 and 81 such that the resulting sequence forms a Geometric Progression (G.P.). A G.P. is a sequence where each term is obtained by multiplying the previous term by a constant factor, called the common ratio.

Step 1: Define the G.P.

Let the two numbers to be inserted be and . Then the G.P. is: Here, the first term and the fourth term , where is the common ratio.

Step 2: Find the common ratio

We have . Substituting , we get: Dividing both sides by 3: Taking the cube root of both sides: So, the common ratio .

Step 3: Calculate and

The second term is given by . Substituting and : The third term is given by . Substituting and : Therefore, the two numbers are 9 and 27.

Step 4: Verify the G.P.

The resulting G.P. is . We can check that each term is 3 times the previous term: , , . This confirms that the sequence is indeed a G.P.

The two numbers are and .

ANSWER

The two numbers are 9 and 27.

Question 27

QUESTION

Find the value of n so that a^n+1 + b^n+1a^n + b^n may be the geometric mean between a and b.

SOLUTION

We are given the expression and we want to find the value of such that this expression is the geometric mean between and .

Step 1: Recall the geometric mean

The geometric mean (GM) between two numbers and is given by .

Step 2: Set up the equation

We are given that is the geometric mean between and . Therefore, we can write:

Step 3: Simplify the equation

Rewrite as . Then, we have:

Step 4: Rearrange the terms

Rearrange the equation to group similar terms together:

Step 5: Factor out common terms

Factor out from the left side and from the right side:

Step 6: Solve for n

Since is a common factor, we can divide both sides by it (assuming):

For this to be true, the exponent must be zero (since any non-zero number raised to the power of 0 is 1):

Final Answer:

ANSWER

n = -(1)/(2)

Question 28

QUESTION

The sum of two numbers is six times their geometric mean. Show that the numbers are in the ratio (3 + 2√2) : (3 - 2√2).

SOLUTION

This question tests our understanding of arithmetic mean (AM), geometric mean (GM), and how to manipulate algebraic expressions to find ratios.

Step 1: Define the variables and given information

Let the two numbers be and . We are given that their sum is six times their geometric mean. This can be written as:

Step 2: Manipulate the equation to find a useful relationship

We want to find the ratio . Let's divide both sides of the equation by :

Let . Then . Substituting this into the equation, we get:

Rearranging, we have a quadratic equation:

Step 3: Solve the quadratic equation

We can solve this quadratic equation using the quadratic formula:

In our case, , , and . Therefore:

So, or .

Step 4: Find the ratio a:b

Since , we have . Let's consider both values of :

If , then

If , then

However, the question asks us to show the ratio is . Let's consider the case where . Then , so . Rationalizing the denominator, we get . Thus, if , then . Therefore, the ratio is or .

Final Answer: The numbers are in the ratio .

Question 29

QUESTION

If A and G be A.M. and G.M., respectively, between two positive numbers, prove that the numbers are A ± √(A+G)(A-G).

SOLUTION

This question tests the understanding of Arithmetic Mean (A.M.) and Geometric Mean (G.M.) and how to find the original numbers when A.M. and G.M. are given.

Step 1: Define A.M. and G.M.

Let the two positive numbers be and . Then, the Arithmetic Mean (A.M.) is given by:

And the Geometric Mean (G.M.) is given by:

Step 2: Express and in terms of A and G

From the A.M. equation, we have:

From the G.M. equation, we have:

, so

Thus,

Step 3: Form a quadratic equation

We know the sum and product of the two numbers and . We can form a quadratic equation with and as its roots:

Substituting the values, we get:

Step 4: Solve the quadratic equation

Using the quadratic formula to solve for :

Step 5: Conclusion

The roots of the quadratic equation are and . These are the two numbers and .

Therefore, the numbers are .

Question 30

QUESTION

The number of bacteria in a certain culture doubles every hour. If there were 30 bacteria present in the culture originally, how many bacteria will be present at the end of 2nd hour, 4th hour and n^\textth hour?

SOLUTION

This question involves understanding geometric progressions and how they model exponential growth, specifically the growth of a bacteria culture.

Step 1: Identify the initial term and common ratio

The initial number of bacteria is . Since the number of bacteria doubles every hour, the common ratio is .

Step 2: Calculate the number of bacteria after the 2nd hour

After the first hour, the number of bacteria is .

After the second hour, the number of bacteria is . Alternatively, using the formula for the term of a geometric progression, , where and , after 2 hours (i.e.,), the number of bacteria will have doubled twice. So, .

Step 3: Calculate the number of bacteria after the 4th hour

After the third hour, the number of bacteria is .

After the fourth hour, the number of bacteria is . Using the formula, .

Step 4: Generalize for the hour

After hours, the number of bacteria will be multiplied by raised to the power of . This can be written as:

Final Answer:

After 2nd hour: ; after 4th hour: ; after hour: .

ANSWER

After 2nd hour: 120; after 4th hour: 480; after n^\textth hour: 30 · 2^n.

Question 31

QUESTION

What will Rs 500 amount to in 10 years after its deposit in a bank which pays an annual interest rate of 10\% compounded annually?

SOLUTION

We are asked to find the amount after 10 years when Rs 500 is deposited in a bank with an annual interest rate of 10% compounded annually. This problem involves the concept of compound interest.

Step 1: Recall the formula for compound interest

The formula for the amount after years with principal , annual interest rate (as a decimal), compounded annually is:

Step 2: Identify the given values

We have:

- Principal,
- Annual interest rate,
- Number of years,

Step 3: Substitute the values into the formula

Substituting these values into the formula, we get:

Step 4: Simplify the expression

Step 5: State the final answer

The amount after 10 years will be Rs .

ANSWER

Rs 500 (1.1)^10

Question 32

QUESTION

If A.M. and G.M. of the roots of a quadratic equation are 8 and 5, respectively, obtain the quadratic equation.

SOLUTION

This question tests our understanding of Arithmetic Mean (A.M.) and Geometric Mean (G.M.) and their relationship to the roots of a quadratic equation.

Step 1: Define the roots and their A.M. and G.M.

Let the roots of the quadratic equation be and .

Given that the Arithmetic Mean (A.M.) of the roots is 8, we have:

And the Geometric Mean (G.M.) of the roots is 5, so:

Step 2: Express the sum and product of the roots.

From the A.M. equation, we can find the sum of the roots:

From the G.M. equation, we can find the product of the roots:

Step 3: Form the quadratic equation.

A quadratic equation with roots and can be written as:

Substituting the values we found for the sum and product of the roots:

Step 4: State the final quadratic equation.

Therefore, the required quadratic equation is:

ANSWER

x^2 - 16x + 25 = 0

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Key Formulas

Important Formulas for Exercise 8.2

Formula / Concept	Description
Arithmetic Progression (AP)	A sequence of numbers where the difference between consecutive terms is constant.
General Form of an AP	$a, a+d, a+2d, a+3d, \dots$ where a is the first term and d is the common difference.
Common Difference of an AP (d)	$d = a_n - a_{n-1}$, the constant difference between consecutive terms.
n^{th} Term of an AP (a_n)	$a_n = a + (n-1)d$, where a is the first term, n is the term number, and d is the common difference.
Sum of the first n terms of an AP (S_n)	$S_n = \frac{n}{2}[2a + (n-1)d]$ or $S_n = \frac{n}{2}[a + l]$ where l is the last term (a_n).
Geometric Progression (GP)	A sequence of numbers where each term after the first is found by multiplying the previous one by a fixed, non-zero number called the common ratio.
General Form of a GP	$a, ar, ar^2, ar^3, \dots$ where a is the first term and r is the common ratio.
Common Ratio of a GP (r)	$r = \frac{a_n}{a_{n-1}}$, the constant ratio between consecutive terms.
n^{th} Term of a GP (a_n)	$a_n = ar^{n-1}$, where a is the first term, n is the term number, and r is the common ratio.
Sum of the first n terms of a GP (S_n)	$S_n = \frac{a(r^n - 1)}{r - 1}$ or $S_n = \frac{a(1 - r^n)}{1 - r}$, where $r \neq 1$.
Sum of the first n terms of a GP when r=1	$S_n = na$.
Sum of an infinite GP (S_∞)	$S_\infty = \frac{a}{1-r}$, where $\|r\| < 1$.

❓ Top FAQs

Q1. How many questions are included in NCERT Solutions for Class 11 Maths Chapter 8 Sequences and Series Exercise 8.2?

NCERT Solutions for Class 11 Maths Chapter 8 Sequences and Series Exercise 8.2 contains exactly 32 questions covering topics like Sum of n Terms of AP and Sum of n Terms of GP. These questions are designed to help students prepare thoroughly for CBSE board exam 2025-26 and build a strong foundation in series calculations.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 8 Sequences and Series Exercise 8.2 with step by step solutions?

Free PDF download of NCERT Solutions for Class 11 Maths Chapter 8 Sequences and Series Exercise 8.2 is available on various educational platforms with complete step by step solutions. These PDFs are updated as per the CBSE syllabus 2025-26 and include detailed explanations for all 32 questions to help students understand the concepts of AP and GP series thoroughly.

Q3. How many marks does Chapter 8 Sequences and Series carry in CBSE Class 11 Maths board exam 2025-26?

Chapter 8 Sequences and Series carries 5 marks weight in CBSE Class 11 Maths board exam 2025-26 as part of Unit II - Algebra. Exercise 8.2 specifically focuses on Sum of n Terms of AP and GP, which are important topics that frequently appear in board examinations and require thorough practice using NCERT Solutions.

Q4. Which is the most difficult question in NCERT Solutions Class 11 Maths Chapter 8 Sequences and Series Exercise 8.2?

Questions involving complex applications of Sum of n Terms of GP with negative ratios and word problems combining both AP and GP concepts are generally considered the most difficult in Exercise 8.2 of Class 11 Maths Chapter 8. Students should practice these questions using step by step solutions to master the concepts for CBSE board exam 2025-26.

Q5. What is Sum of n Terms of AP formula explained in NCERT Solutions Class 11 Maths Chapter 8 Sequences and Series Exercise 8.2?

Sum of n Terms of AP (Arithmetic Progression) is given by the formula Sn = n/2[2a + (n-1)d] or Sn = n/2[a + l], where 'a' is the first term, 'd' is the common difference, 'n' is the number of terms, and 'l' is the last term. NCERT Solutions for Class 11 Maths Chapter 8 Exercise 8.2 provides detailed step by step solutions to help students apply this formula effectively for CBSE board exam 2025-26.

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