

**Topic:** p-series test

**Question:** Use the p-series test to say whether the series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{3}{\sqrt{n}}$$

**Answer choices:**

- A The series converges
- B The series conditionally converges
- C The series diverges
- D None of these



**Solution: C**

If we have a series  $a_n$  in the form

$$a_n = \sum_{n=1}^{\infty} \frac{1}{n^p}$$

then we can use the p-series test for convergence to say whether or not  $a_n$  will converge. The p-series test says that

$a_n$  will converge when  $p > 1$

$a_n$  will diverge when  $p \leq 1$

The key is to make sure that the given series matches the format above for a p-series, and then to look at the value of  $p$  to determine convergence.

For the series we're given in this problem,  $p = 1/2$  since

$$\sum_{n=1}^{\infty} \frac{3}{\sqrt{n}} = 3 \sum_{n=1}^{\infty} \frac{1}{n^{\frac{1}{2}}}$$

Because

$$p = \frac{1}{2} \leq 1$$

the p-series test proves that this series diverges.



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- C      The series diverges
- D      None of these



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The key is to make sure that the given series matches the format above for a p-series, and then to look at the value of  $p$  to determine convergence.

For the series we're given in this problem,  $p = 1$  since

$$\sum_{n=1}^{\infty} \frac{1}{n} = \sum_{n=1}^{\infty} \frac{1}{n^1}$$

Because

$$p = 1 \leq 1$$

the p-series test proves that this series diverges.



**Topic:** p-series test

**Question:** Use the p-series test to say whether the series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{1}{n^8}$$

**Answer choices:**

- A      The series converges
- B      The series conditionally converges
- C      The series diverges
- D      None of these



**Solution: A**

If we have a series  $a_n$  in the form

$$a_n = \sum_{n=1}^{\infty} \frac{1}{n^p}$$

then we can use the p-series test for convergence to say whether or not  $a_n$  will converge. The p-series test says that

$a_n$  will converge when  $p > 1$

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The key is to make sure that the given series matches the format above for a p-series, and then to look at the value of  $p$  to determine convergence.

For the series we're given in this problem,  $p = 8$ .

Because

$$p = 8 > 1$$

the p-series test proves that this series converges.

