12 is the smallest order for which axially symmetric bimagic squares exist

Order m = 8

This is the smallest order for which bimagic squares exist. See website of **Christian Boyer**. With a short computer program (see next page) one can show that there are 81 different symmetric bimagic series for squares of order 8. Additionally the program can search for disjoint combinations of these series. There are 4993 combinations of 6 disjoint symmetric bimagic 8x8-series. But a combination of 7 disjoint series does not exist. Therefore axially symmetric bimagic squares of order 8 cannot exist.
This confirms the computer proof that **Francis Gaspalou** has done before.

Orders m = 9, 11

If the order m is odd then the number $a = (m^2+1)/2$ is an element of each symmetric bimagic series. Therefore two of these series can't be disjoint.

Order m = 10

Any symmetric series of order 10 consist of exactly 5 even and 5 odd numbers as $(m^2+1) = 101$. The square of an even number is equivalent to 0 modulo 4 and the square of an odd number is equivalent to 1 modulo 4. Therefore the sum of the squares of the numbers of any symmetric series of order 10 is equivalent to $(5{\cdot}0 + 5{\cdot}1) \equiv 1$ modulo 4. But for m = 10 the magic sum of the squares of the numbers is 33835 which is equivalent to 3 modulo 4. Therefore symmetric series of order 10 can't be bimagic.

Order m = 12

Since 2001 axially symmetric trimagic squares of order 12 are known. See record table on the website of Christian Boyer. Of course these squares are bimagic. Thus 12 is the smallest order for which axially symmetric bimagic squares exist.

```
Program that searches for combinations of disjoint bimagic 8x8-series

' Walter Trump, 2012-07-31

Global Int b(1 To 100), c(1 To 8)
Global Int sq = 0, Row = 0, bv = 0, cnt = 0, sum = 0, r

Series(1, 1)
Print " Number of series:"; cnt
NewRow(1)

For r = 1 To 8
  Print r, c(r)
End For

Proc Series(ByVal num As Int, ByVal k As Int)
  Local Int i
  For i = k To 32
    sum += i ^ 2 + (65 - i) ^ 2
    bv = Bset(bv, i - 1)
    If num < 4
      Series(num + 1, i + 1)
    Else If sum = 11180
      cnt++
      b(cnt) = bv
    EndIf
    bv = Bclr(bv, i - 1)
    sum -= i ^ 2 + (65 - i) ^ 2
  End For

Proc NewRow(ByVal k As Int)
  Local Int i
  Row++
  For i = k To cnt
    If (sq And b(i)) = 0
      c(Row)++
      sq = sq Or b(i)
      NewRow(i + 1)
      sq = sq Xor b(i)
    End If
  End For
  Row--
```