

```
"""General functions"""
```

```
def ZeroEntry(w,n):  
    """Counts how many elements in a vector of length n have the first entry 0"""  
    l=0  
    for i in range(n):  
        if w[i]==0:  
            l=l+1  
    return l
```

```
def BadNumbers(w,n):  
    """Return vector with 0 entries in a vector"""  
    l=ZeroEntry(w,n)  
    r=0  
    u=vector(SR,l)  
    for i in range(n):  
        if w[i]==0:  
            u[r]=i  
            r=r+1  
    return u
```

```
def Sum15sq(v):  
    """Sum of 15 squares"""  
    e=0  
    for i in range(15):  
        e=e+(v[i])^2  
    return e
```

```
def Sum15binom(v):  
    """Sum of 15 binomial coefficients"""  
    e=0  
    for i in range(15):  
        e=e+(v[i]*(v[i]-1)/2)  
    return e
```

```
def eNumbA4(a,d,v):  
    """Takes two numbers and a vector of length 15 and returns a number via the  
formula in Case A4"""  
    e=2*(d+1)*(a+3)^2-(1/4)  
    for i in range(15):  
        e=e-((v[i]+1)/2)^2  
    return e
```

```
def eNumbA5(a,d,v):  
    """Takes two numbers and a vector of length 15 and returns a number via the  
formula in Case A5"""  
    e=2*(2*d+1)*(a+(5/2))^2-(1/4)  
    for i in range(15):  
        e=e-((v[i]+1)/2)^2  
    return e
```

```

def FracNumb(v):
    """Returns how many elements in a vector of length 15 are fractional"""
    l=0
    for i in range(15):
        if isInt((v[i]+1)/2)==False:
            l=l+1
    return l

```

```

def isInt(x):
    """Returns True if n is an integer and False if n is not an integer."""
    if floor(x) - x == 0:
        return True
    return False

```

"""Case A1"""

```

def CaseA1(n,l):
    """Returns the numbers which are not in case A1 smaller than n"""
    w=vector(SR,[0]*n)
    h=15
    while h<l:
        M=Partitions(h, length=15)
        u=len(M)
        for i in range(u):
            v=M[i]
            e=Sum15sq(v)
            if v[0]<floor(sqrt((e/3)-3))+1 and e<n:
                w[e]=1
        h=h+1
    return BadNumbers(w,n)

```

"""Case A2"""

```

def CaseA2(n,l):
    """Returns the numbers which are not in case A2 smaller than n, where the ai form
    a partition of l"""
    w=vector(SR,[0]*n)
    h=15
    while h<l:
        M=Partitions(h, length=15)
        u=len(M)
        for i in range(u):
            v=M[i]
            b=floor(sqrt((1/2)*(n+1+Sum15sq(v))))-v[0]-v[1]-v[2]-v[3]-1
            for a in range(b+1):
                e=2*(a+v[0]+v[1]+v[2]+v[3]+1)^2-1-Sum15sq(v)
                if e>0 and e<n:

```





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CaseA1(102,35)

(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 22, 23, 25, 26, 28, 29, 31, 32, 34, 35)

CaseA2(1216,35)

(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 54, 55, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 75, 77, 78, 80, 81, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 98, 99, 100, 102, 105, 108, 111, 114, 115, 117, 118, 120, 121, 123, 124, 126, 127, 129, 133, 136, 141, 144, 147, 150, 153, 156, 159, 162)

CaseA3(186,30)

(0, 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 26, 27, 28, 29, 31)

CaseA4(161)

(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 61, 63, 64, 65, 66, 67, 68, 69, 70, 72, 87, 89, 91, 92, 93, 94)

CaseA5(161)

(0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 48, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 72, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84)

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