```
In [1]:  import matplotlib.pyplot as plt
         import numpy as np
         def ejes(max):
             hx=np.array([-max,max])
             hy=np.array([0,0])
             plt.plot(hx,hy,'-k',linewidth=2)

             vx=np.array([0,0])
             vy=np.array([-max,max])
             plt.plot(vx,vy,'-k',linewidth=2)


         ejes(20)
         cx = 0.0
         cy = 0.0
         x1 = np.array([cx])
         y1 = np.array([cy])
         plt.plot(x1,y1,'ob')
         x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
         y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
         plt.plot(x5,y5,'-ob')
         plt.title('Como hago un hexagono?')
         plt.grid()
         plt.axis('square')
         plt.show()
```



```
In [16]: import matplotlib.pyplot as plt
         import numpy as np
         def ejes(max):
             hx=np.array([-max,max])
             hy=np.array([0,0])
             plt.plot(hx,hy,'-k',linewidth=2)
```
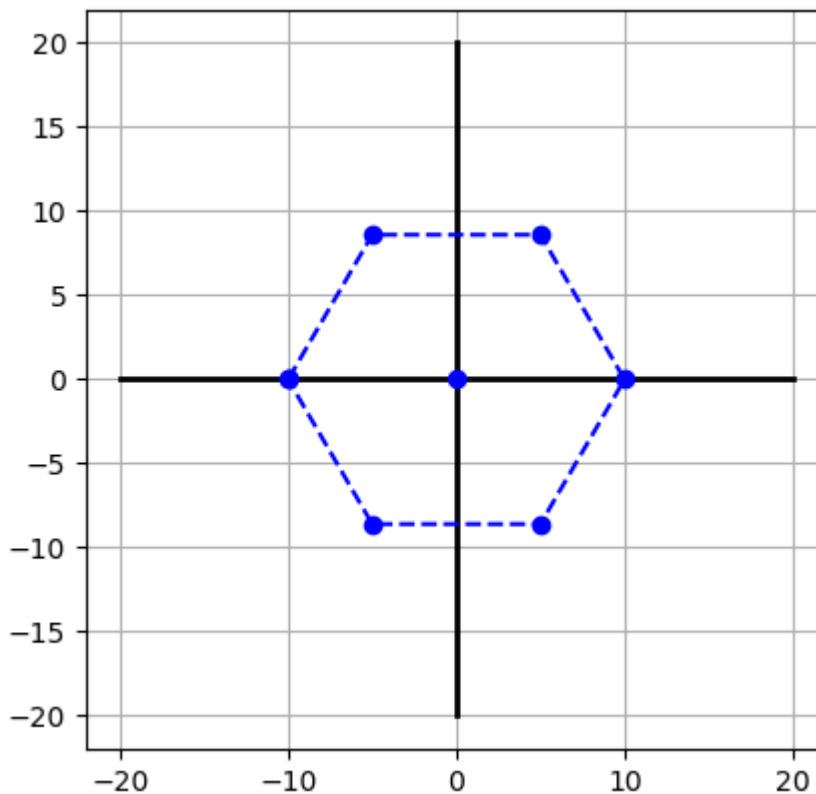
```
        vx=np.array([0,0])
        vy=np.array([-max,max])
        plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)

plt.grid()
plt.axis('square')
plt.show()
```



```
In [15]:  import matplotlib.pyplot as plt
          import numpy as np
          def ejes(max):
              hx=np.array([-max,max])
              hy=np.array([0,0])
              plt.plot(hx,hy,'-k',linewidth=2)
              vx=np.array([0,0])
              vy=np.array([-max,max])
              plt.plot(vx,vy,'-k',linewidth=2)

          def hexagono(cx,cy):
           x1 = np.array([cx])
           y1 = np.array([cy])
           plt.plot(x1,y1,'ob')
           x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
```

```
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)
hexagono(15,8.66)

plt.grid()
plt.axis('square')
plt.show()
```
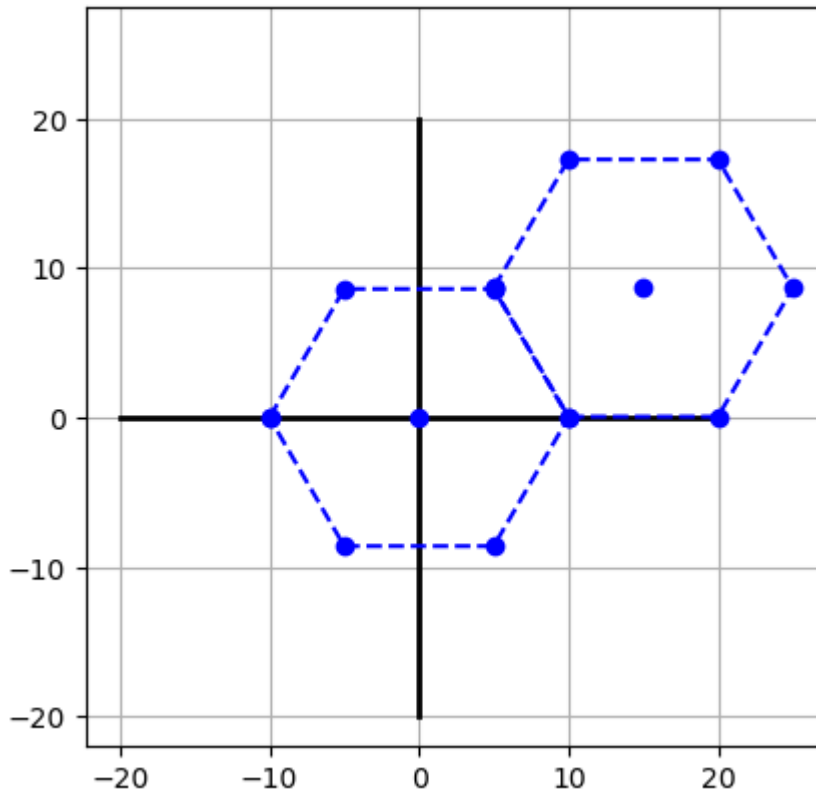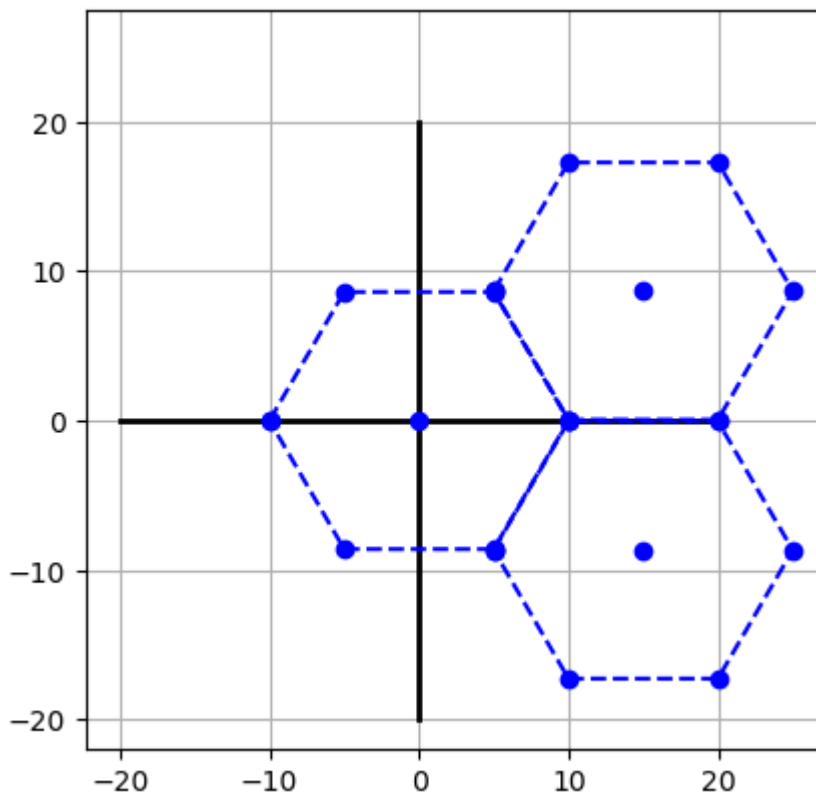
```python
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)
hexagono(15,8.66)
hexagono(15,-8.66)
```

```
plt.grid()
plt.axis('square')
plt.show()
```



```
In [28]:  import matplotlib.pyplot as plt
          import numpy as np
          def ejes(max):
              hx=np.array([-max,max])
              hy=np.array([0,0])
              plt.plot(hx,hy,'-k',linewidth=2)
              vx=np.array([0,0])
              vy=np.array([-max,max])
              plt.plot(vx,vy,'-k',linewidth=2)

          def hexagono(cx,cy):
           x1 = np.array([cx])
           y1 = np.array([cy])
           plt.plot(x1,y1,'ob')
           x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
           y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
           plt.plot(x5,y5,'--ob')


          ejes(20)
          hexagono(0,0)

          a_x = 15
          a_y = 8.6

          b_x = 15
          b_y = -8.6

          hexagono(a_x,a_y)
          hexagono(b_x,b_y)
```
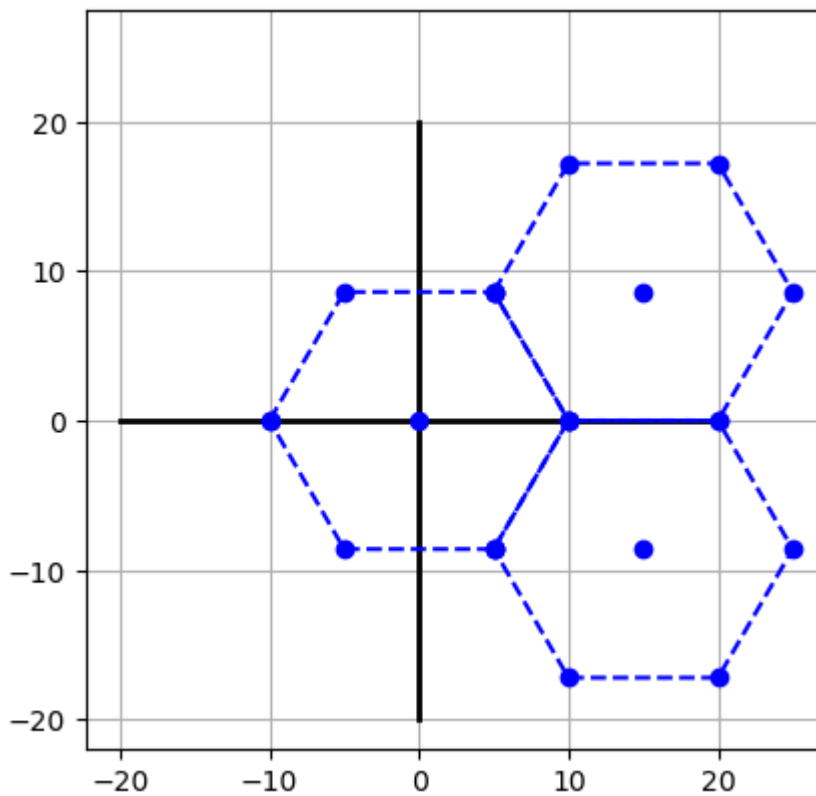
```
plt.grid()
plt.axis('square')
plt.show()
```

```
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)
```
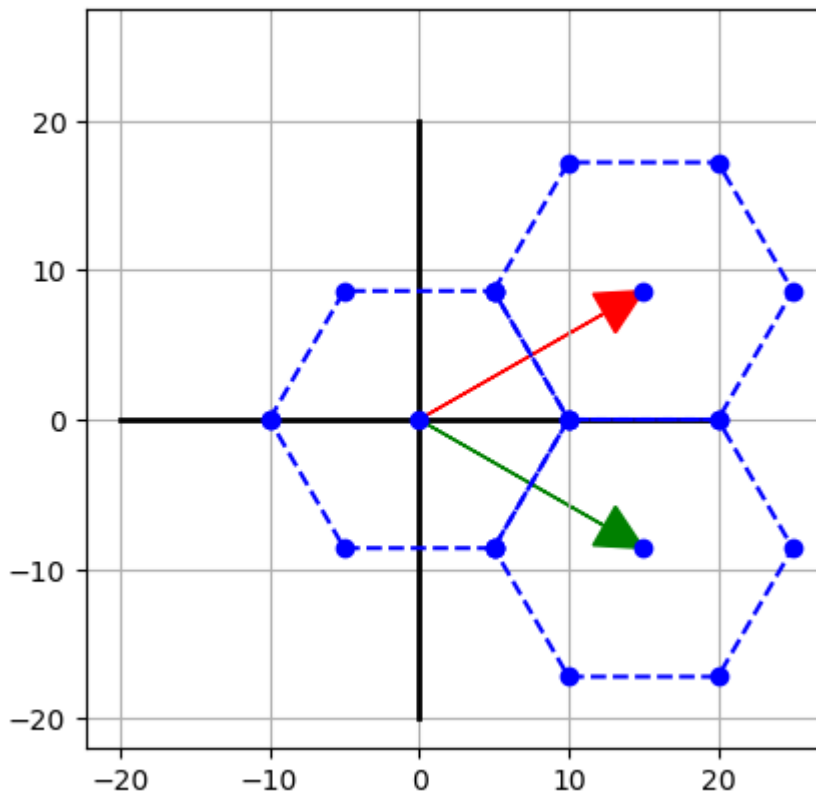
```
plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng

plt.grid()
plt.axis('square')
plt.show()
```

```
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6
```

```python
hexagono(a_x,a_y)
hexagono(b_x,b_y)

plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng

import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)

plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
```

```
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)

plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng


plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng

plt.grid()
plt.axis('square')
plt.show()
```
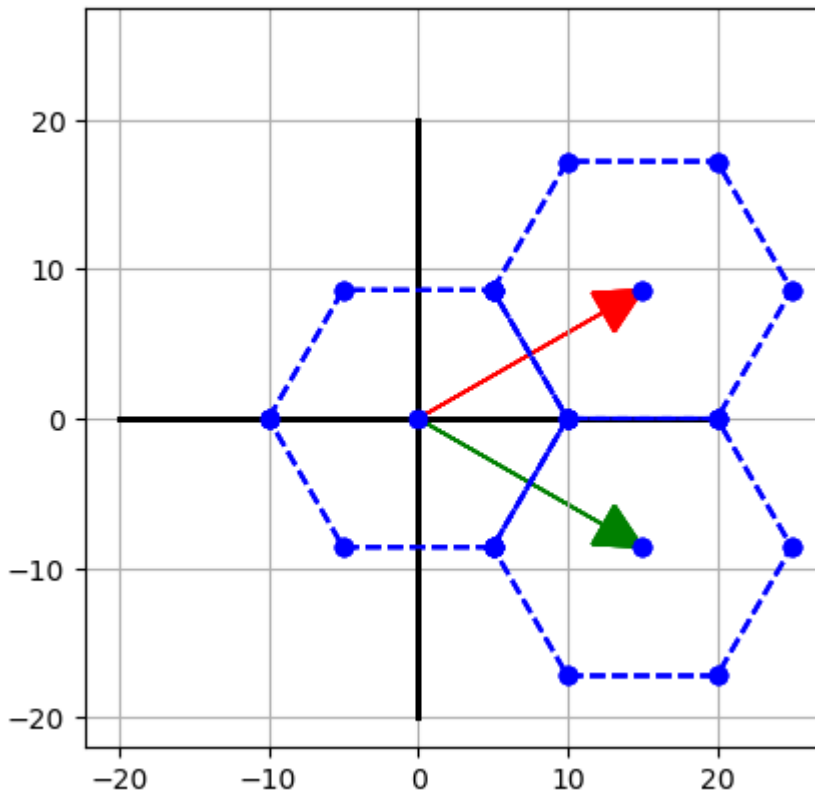

In [46]:
```
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
```

```
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)

plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng

plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng

plt.grid()
plt.axis('square')
plt.show()
```
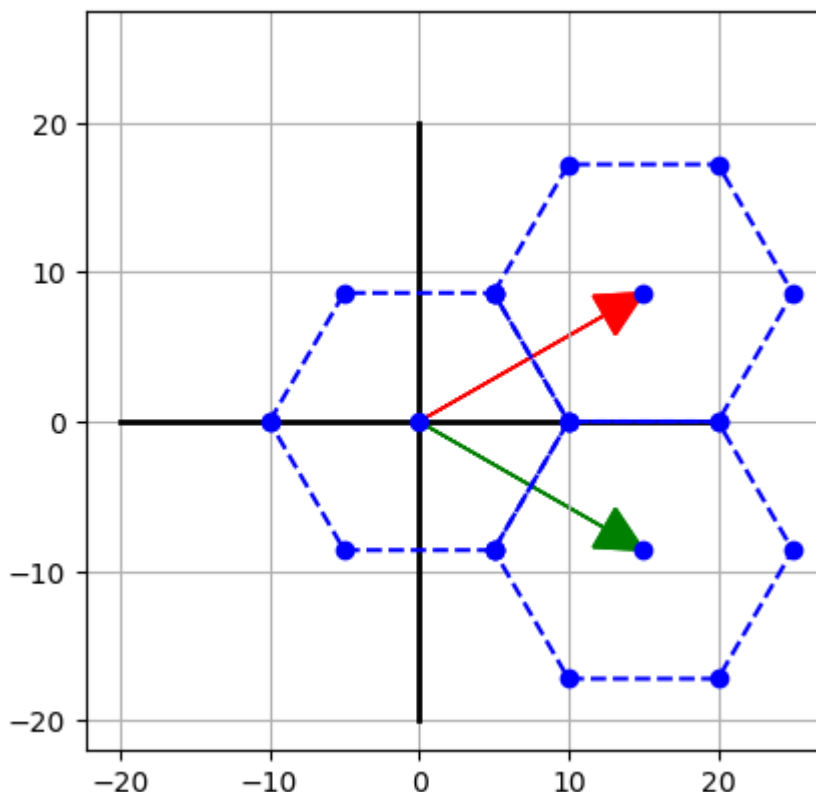

In [48]:
```python
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
```

```python
        vy=np.array([-max,max])
        plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)

plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng

plt.arrow(0,0,a_x,a_y,color='red', head_length = 3, head_width = 3,length
plt.arrow(0,0,b_x,b_y,color='green', head_length = 3, head_width = 3,leng

hexagono(-a_x,-a_y)
hexagono(-b_x,-b_y)

plt.arrow(0,0,-a_x,-a_y,color='red', head_length = 3, head_width = 3,leng
plt.arrow(0,0,-b_x,-b_y,color='green', head_length = 3, head_width = 3,le

plt.arrow(0,0,-a_x,-a_y,color='red', head_length = 3, head_width = 3,leng
plt.arrow(0,0,-b_x,-b_y,color='green', head_length = 3, head_width = 3,le




plt.grid()
plt.axis('square')
plt.show()
```
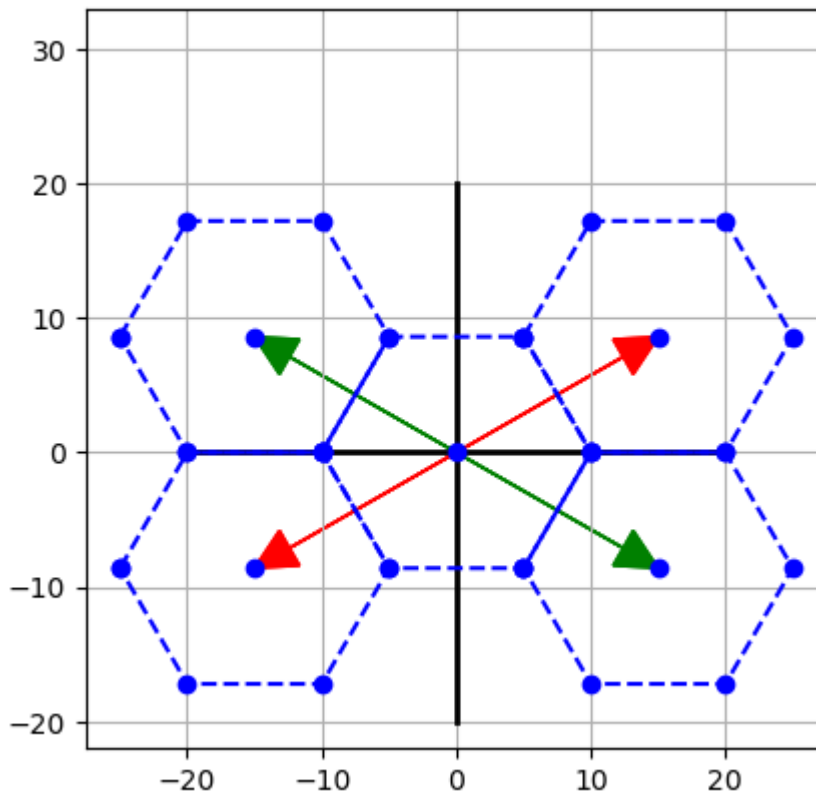
```
In [54]: import matplotlib.pyplot as plt
         import numpy as np
         def ejes(max):
             hx=np.array([-max,max])
             hy=np.array([0,0])
             plt.plot(hx,hy,'-k',linewidth=2)
             vx=np.array([0,0])
             vy=np.array([-max,max])
             plt.plot(vx,vy,'-k',linewidth=2)

         def hexagono(cx,cy):
          x1 = np.array([cx])
          y1 = np.array([cy])
          plt.plot(x1,y1,'ob')
          x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
          y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
          plt.plot(x5,y5,'--ob')


         ejes(20)
         hexagono(0,0)

         a_x = 15
         a_y = 8.6

         b_x = 15
         b_y = -8.6

         hexagono(a_x,a_y)
         hexagono(b_x,b_y)

         hexagono(-a_x,-a_y)
         hexagono(-b_x,-b_y)
```

```python
plt.arrow(0,0,-a_x,-a_y,color='red', head_length = 3, head_width = 3,leng
plt.arrow(0,0,-b_x,-b_y,color='green', head_length = 3, head_width = 3,le

plt.arrow(0,0,-a_x,-a_y,color='red', head_length = 3, head_width = 3,leng
plt.arrow(0,0,-b_x,-b_y,color='green', head_length = 3, head_width = 3,le

hexagono(2*a_x,2*a_y)
hexagono(2*b_x,2*b_y)

plt.arrow(0,0,2*a_x,2*a_y,color='red', head_length = 3, head_width = 3,le
plt.arrow(0,0,2*b_x,2*b_y,color='green', head_length = 3, head_width = 3,




plt.grid()
plt.axis('square')
plt.show()
```
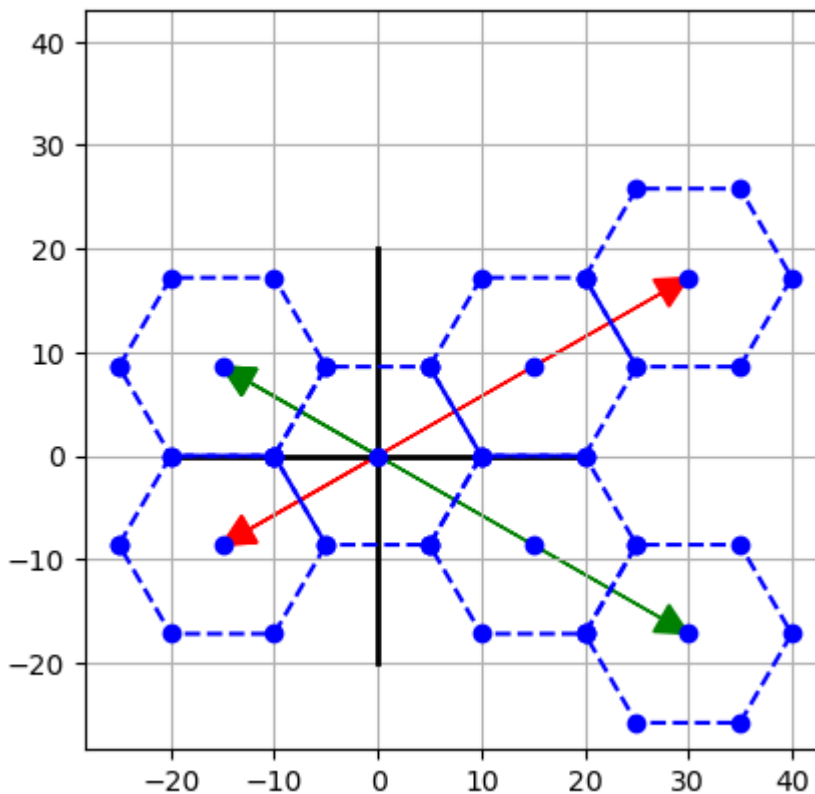

In [55]:
```python
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
```

```python
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(20)
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)

hexagono(-a_x,-a_y)
hexagono(-b_x,-b_y)

hexagono(2*a_x,2*a_y)
hexagono(2*b_x,2*b_y)



plt.grid()
plt.axis('square')
plt.show()
```
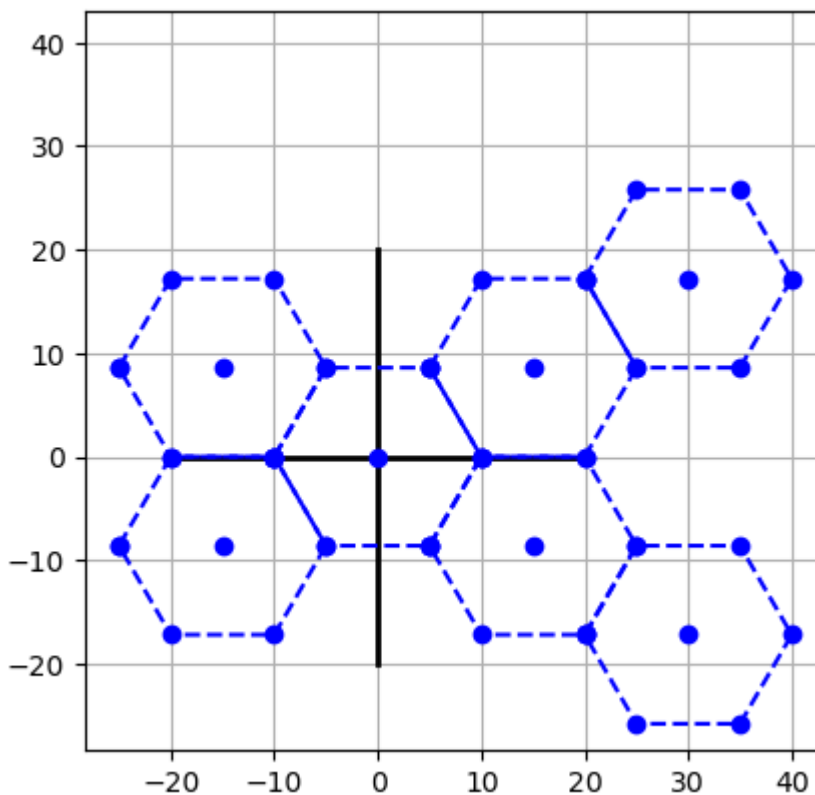


```python
In [57]:  import matplotlib.pyplot as plt
          import numpy as np
          def ejes(max):
              hx=np.array([-max,max])
              hy=np.array([0,0])
              plt.plot(hx,hy,'-k',linewidth=2)
```

```python
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(40)
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)

hexagono(-a_x,-a_y)
hexagono(-b_x,-b_y)

hexagono(2*a_x,2*a_y)
hexagono(2*b_x,2*b_y)

hexagono(-2*a_x,-2*a_y)
hexagono(-2*b_x,-2*b_y)



plt.grid()
plt.axis('square')
plt.show()
```
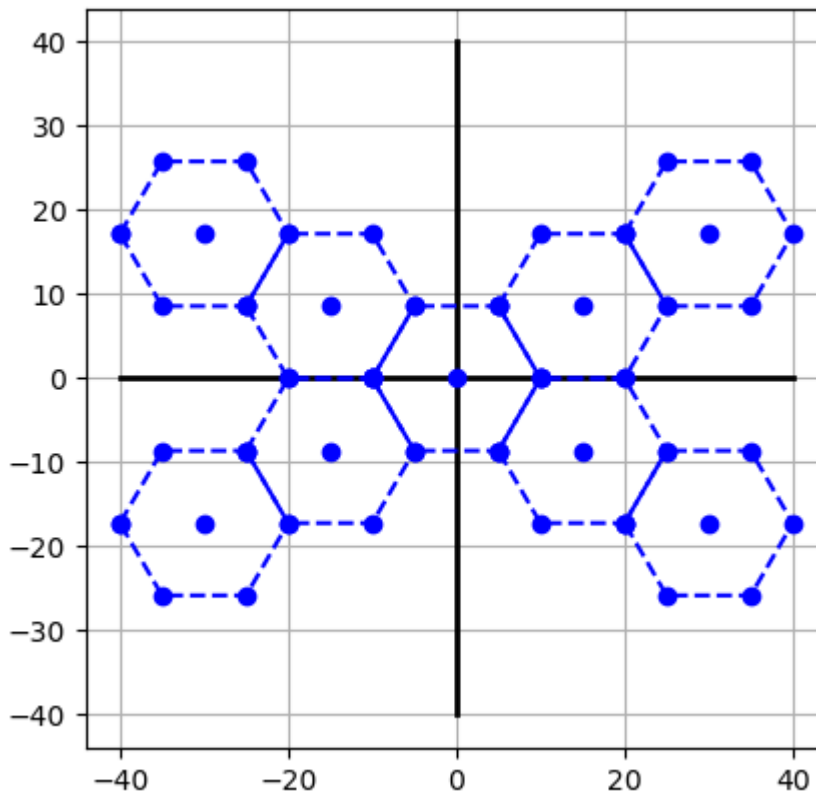
In [59]:
```python
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=2)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=2)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(40)
hexagono(0,0)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)

hexagono(-a_x,-a_y)
hexagono(-b_x,-b_y)
```
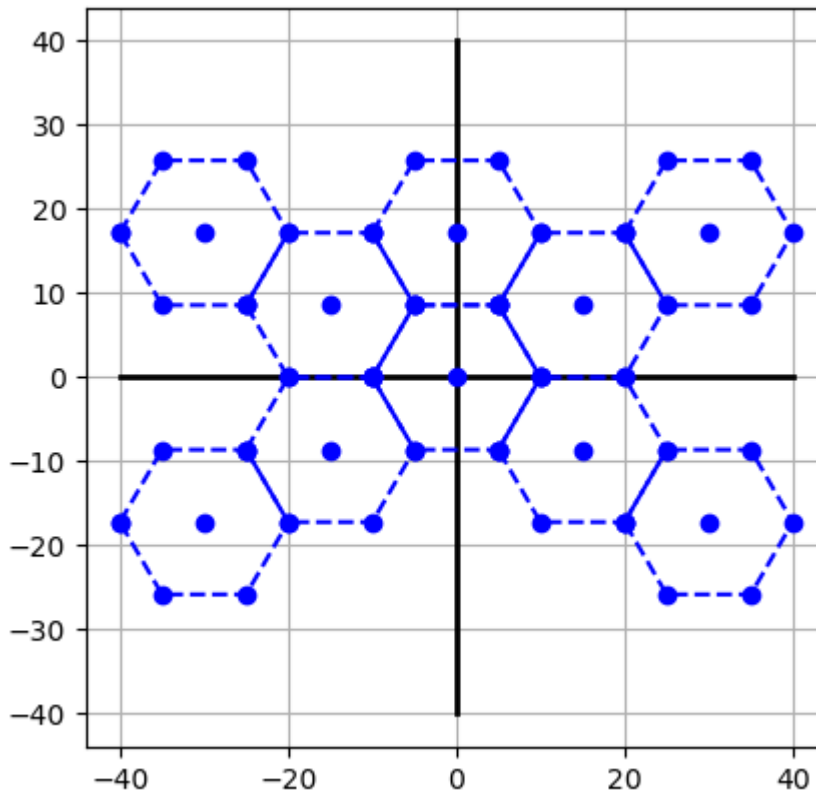
```
hexagono(2*a_x,2*a_y)
hexagono(2*b_x,2*b_y)

hexagono(-2*a_x,-2*a_y)
hexagono(-2*b_x,-2*b_y)

hexagono(a_x-b_x,a_y-b_y)


plt.grid()
plt.axis('square')
plt.show()
```


In [63]:
```python
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=1)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=1)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(40)
hexagono(0,0)
```

```
a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

hexagono(a_x,a_y)
hexagono(b_x,b_y)

hexagono(-a_x,-a_y)
hexagono(-b_x,-b_y)

hexagono(2*a_x,2*a_y)
hexagono(2*b_x,2*b_y)

hexagono(-2*a_x,-2*a_y)
hexagono(-2*b_x,-2*b_y)

hexagono(a_x-b_x,a_y-b_y)
hexagono(-a_x+b_x,-a_y+b_y)


plt.grid()
plt.axis('square')
plt.show()
```
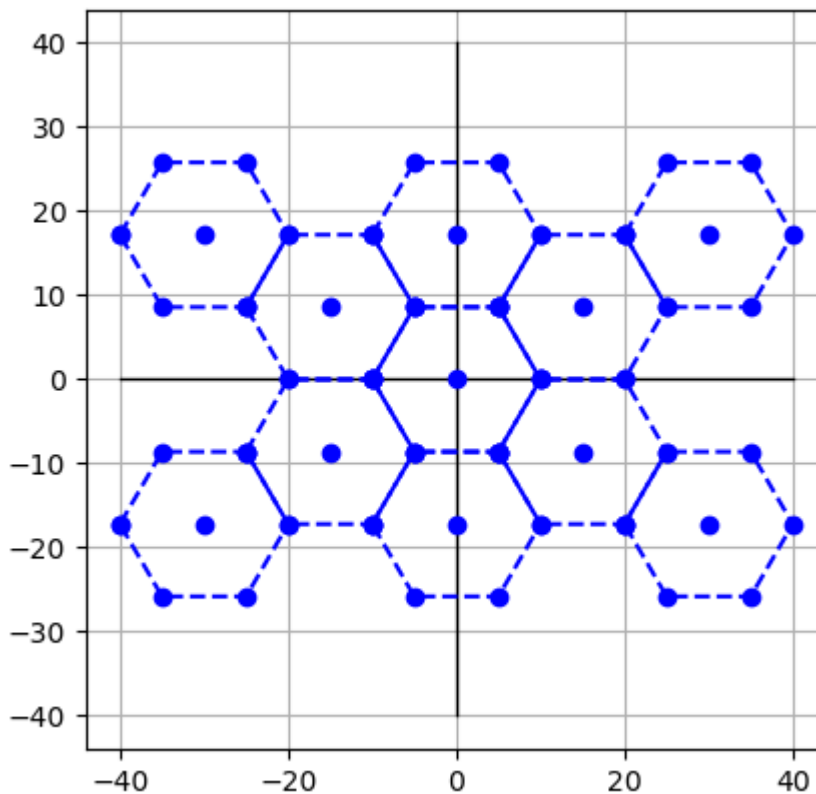
```
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=1)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=1)
```

```python
def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(40)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

for ia in range(-1,2):
 print(ia)
 hexagono(ia*a_x,ia*a_y)



plt.grid()
plt.axis('square')
plt.show()
```
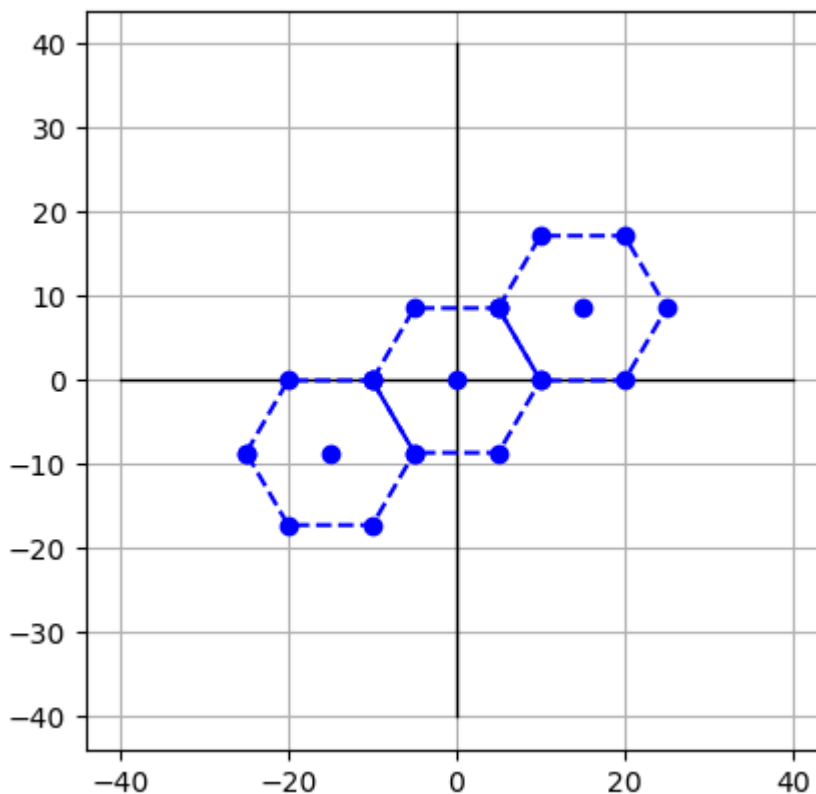-1
0
1


```python
import matplotlib.pyplot as plt
import numpy as np
def ejes(max):
    hx=np.array([-max,max])
```

```python
    hy=np.array([0,0])
    plt.plot(hx,hy,'-k',linewidth=1)
    vx=np.array([0,0])
    vy=np.array([-max,max])
    plt.plot(vx,vy,'-k',linewidth=1)

def hexagono(cx,cy):
 x1 = np.array([cx])
 y1 = np.array([cy])
 plt.plot(x1,y1,'ob')
 x5=np.array([cx-10,cx-5  ,cx+5  ,cx+10,cx+5  ,cx-5  ,cx-10])
 y5=np.array([cy+0 ,cy+8.6,cy+8.6,cy+0 ,cy-8.6,cy-8.6,cy+0])
 plt.plot(x5,y5,'--ob')


ejes(60)

a_x = 15
a_y = 8.6

b_x = 15
b_y = -8.6

for ia in range(-3,3):
 print(ia)
 hexagono(ia*a_x,ia*a_y)



plt.grid()
plt.axis('square')
plt.show()
```
-3
-2
-1
0
1
2