Problem A 3.2

A function to find the norm of an input vector:

In [ ]:
```
function norm(a)
        sum = 0
        for i in 1:length(a)
                sum += (a[i] * a[i])
        end
        return sqrt(sum)
end
```

Out[ ]:
```
norm (generic function with 1 method)
```

A function to find the distance between two vectors:

In [ ]:
```
function distanceBetween(a, b)
        return norm(a-b)
end
```

Out[ ]:
```
distanceBetween (generic function with 1 method)
```

A function to find the angle between two vectors:

In [ ]:
```
function angleBetween(a, b)
        return acos(a'b/(norm(a)norm(b)))
end
```

Out[ ]:
```
angleBetween (generic function with 1 method)
```

All the vectors from the problem statement:

In [ ]:
```
a = [1,3,4]
x1 = [4,3,5]
x2 = [0.4,10,50]
x3 = [1,4,10]
x4 = [30,40,50]
```

Out[ ]:
```
3-element Vector{Int64}:
 30
 40
 50
```

Vector containing the names of the vectors:

In [ ]:
```
vectors = ["x1","x2","x3","x4"]
```

Out[ ]:
```
4-element Vector{String}:
 "x1"
 "x2"
 "x3"
 "x4"
```

Finding distance between a vector and the vectors x1, x2, x3, x4

In [ ]:
```
distance_between_a_and_x1 = distanceBetween(a,x1)
```

Out[ ]:
```
3.1622776601683795
```

In [ ]:
```
distance_between_a_and_x2 = distanceBetween(a,x2)
```

Out[ ]:
```
46.53342884421908
```

In [ ]:
```
distance_between_a_and_x3 = distanceBetween(a,x3)
```

Out[ ]:
```
6.082762530298219
```

In [ ]:
```
distance_between_a_and_x4 = distanceBetween(a,x4)
```

Out[ ]:
```
65.7723346096214
```

Finding the least distant vector from a among x1, x2, x3, x4

In [ ]:
```
leastDistance = min(distance_between_a_and_x1, distance_between_a_and_x2, c
```

Out[ ]:
```
3.1622776601683795
```

In [ ]:
```
distances = [distance_between_a_and_x1, distance_between_a_and_x2, distance
println("The vector that is least distant from 'a' is ", vectors[argmin(dis
```

```
The vector that is least distant from 'a' is x1 and the distance is 3.16227
76601683795
```

Finding angle between 'a' vector and the vectors x1, x2, x3, x4

In [ ]:
```
angle_between_a_and_x1 = angleBetween(a,x1)
```

Out[ ]:
```
0.4146551062003066
```

In [ ]:
```
angle_between_a_and_x2 = angleBetween(a,x2)
```

Out[ ]:
```
0.4818770434517026
```

In [ ]:
```
angle_between_a_and_x3 = angleBetween(a,x3)
```

Out[ ]:
```
0.2804174688623895
```

In [ ]:
```
angle_between_a_and_x4 = angleBetween(a,x4)
```

Out[ ]:
```
0.24256387409548533
```

Finding the vector with least angle among x1, x2, x3, x4 and 'a'

In [ ]:
```
leastAngle = min(angle_between_a_and_x1, angle_between_a_and_x2, angle_betw
```

Out[ ]:
```
0.24256387409548533
```

In [ ]:

```
angles = [angle_between_a_and_x1, angle_between_a_and_x2, angle_between_a_a
println("The vector that has the least angle from 'a' is ", vectors[argmin(
```

```
The vector that has the least angle from 'a' is x4 and the angle is 0.24256
387409548533 Radians
```