After we train a kernel SVM model, we will be getting support vectors and their corresponsing coefficients α_i

Check the documentation for better understanding of these attributes:

https://scikit-learn.org/stable/modules/generated/sklearn.svm.SVC.html

As a part of this assignment you will be implementing the `decision_function()` of kernel SVM, here decision_function() means based on the value return by `decision_function()` model will classify the data point either as positive or negative

Ex 1: In logistic regression After traning the models with the optimal weights w we get, we will find the value $\frac{1}{1+\exp(-(wx+b))}$, if this value comes out to be < 0.5 we will mark it as negative class, else its positive class

Ex 2: In Linear SVM After traning the models with the optimal weights w we get, we will find the value of $sign(wx+b)$, if this value comes out to be -ve we will mark it as negative class, else its positive class.

Similarly in Kernel SVM After traning the models with the coefficients α_i we get, we will find the value of $sign\left(\sum_{i=1}^{n}(y_i\alpha_i K(x_i,x_q))+intercept\right)$, here $K(x_i,x_q)$ is the RBF kernel. If this value comes out to be -ve we will mark x_q as negative class, else its positive class.

RBF kernel is defined as: $K(x_i,x_q) = exp(-\gamma||x_i-x_q||^2)$

For better understanding check this link: https://scikit-learn.org/stable/modules/svm.html#svm-mathematical-formulation

Task E

1. Split the data into X_{train}(60), X_{cv}(20), X_{test}(20)
1. Train $SVC(gamma=0.001, C=100.)$ on the (X_{train}, y_{train})
1. Get the decision boundry values f_{cv} on the X_{cv} data i.e. f_{cv} = `decision_function(` X_{cv} `)` you need to implement this decision_function()

```
import numpy as np
import pandas as pd
from sklearn.datasets import make_classification
import numpy as np
from sklearn.svm import SVC
from sklearn.model_selection import train_test_split
import matplotlib.pyplot as plt

X, y = make_classification(n_samples=5000, n_features=5, 
n_redundant=2,
                           n_classes=2, weights=[0.7], class_sep=0.7,
```

```
random_state=15)
print(type(X))
```

```
<class 'numpy.ndarray'>
```

Pseudo code

clf = SVC(gamma=0.001, C=100.) clf.fit(Xtrain, ytrain)

def decision_function(Xcv, ...): #use appropriate parameters for a data point x_q in Xcv: #write code to implement $\left(\sum_{i=1}^{\text{all the support vectors}} \left(y_i \alpha_i K(x_i, x_q)\right) + intercept\right)$, here the values y_i, α_i, and $intercept$ can be obtained from the trained model return # the decision_function output for all the data points in the Xcv

fcv = decision_function(Xcv, ...) # based on your requirement you can pass any other parameters

Note: Make sure the values you get as fcv, should be equal to outputs of clf.decision_function(Xcv)

```
# you can write your code here

import math

#Split the data into  Xtrain(60),  Xcv(20),  Xtest(20)
print("Total Dataset (Before spliting): ",X.shape)

X_train, X_test, y_train, y_test = train_test_split( X, y,
test_size=0.2, random_state=12)
X_train, X_CV, y_train, y_CV = train_test_split( X_train, y_train,
test_size=0.25, random_state=12)

print("X_train (60%):", X_train.shape)
print("X_CV (20%):",X_CV.shape)
print("X_test (20%):",X_test.shape)
```

```
Total Dataset (Before spliting):  (5000, 5)
X_train (60%): (3000, 5)
X_CV (20%): (1000, 5)
X_test (20%): (1000, 5)
```

```
#Train  SVC(gamma=0.001,C=100)  on the ( Xtrain ,  ytrain )
#Ref: https://stackoverflow.com/questions/20113206/scikit-learn-svc-
decision-function-and-predict#:~:text=Python%27s%20SVM
%20implementation%20uses%20one-vs-one.%20That%27s%20exactly%20what,the
%20just%20the%20regular%20binary%20SVM%20decision%20boundary

clf = SVC(gamma=0.001,C=100,random_state=12)
```

```
clf.fit(X_train,y_train)

#Get the decision boundry values  fcv  on the  Xcv  data i.e.  fcv  =
decision_function( Xcv ) you need to implement this
decision_function()
#Define decision_function for svm

gamma = 0.001
def decision_function( sv, nv, a, b, X):
    # calculate the kernels
    k = [math.exp(-gamma * np.dot((vi - X), vi - X)) for vi in sv]
    #print(k.shape)

    # define the start and end index for support vectors for each
class
    start = [sum(nv[:i]) for i in range(len(nv))]
    end = [start[i] + nv[i] for i in range(len(nv))]
    #print(len(nv))
    #print(start)
    #print(end)

    # calculate: sum(a_p * k(x_p, x)) between every 2 classes

    c = [ sum(a[ i ][p] * k[p] for p in range(start[j], end[j])) +
          sum(a[j-1][p] * k[p] for p in range(start[i], end[i]))
                for i in range(len(nv)) for j in range(i+1,len(nv))]


    # add the intercept
    return [sum(x) for x in zip(c, b)]
#print(clf.support_vectors_)
#k = kernel(clf.support_vectors_, X_CV[0])
#print(len(k))

fcv = []
for i,X in enumerate(X_CV):

fcv.append(decision_function(clf.support_vectors_,clf.n_support_,clf.d
ual_coef_,clf.intercept_,X)[0])

decision_Func_CV_fromsvm = clf.decision_function(X_CV)
print("**********fcv******************** ")
print(fcv[0:10])
print("**********clf.decision_function(Xcv)******************** ")

print(decision_Func_CV_fromsvm[0:10])
```

```
**********fcv********************
[-3.4302657404611487, -3.0443986142697064, -1.188622388183543, -
```

```
0.4208564050010717, 1.5256612283167816, 0.1883064121332756, -
2.8687024637862883, -0.47832228149371425, 2.5284867300154623,
2.6875984607807517]
**********clf.decision_function(Xcv)********************
[-3.43026574 -3.04439861 -1.18862239 -0.4208564   1.52566123
0.18830641
 -2.86870246 -0.47832228  2.52848673  2.68759846]
```

Check this PDF

TASK F

1. Apply SGD algorithm with (f_{cv}, y_{cv}) and find the weight W intercept b `Note: here our data is of one dimensional so we will have a one dimensional weight vector i.e W.shape (1,)`

   Note1: Don't forget to change the values of y_{cv} as mentioned in the above image. you will calculate y+, y- based on data points in train data

   Note2: the Sklearn's SGD algorithm doesn't support the real valued outputs, you need to use the code that was done in the `'Logistic Regression with SGD and L2'` Assignment after modifying loss function, and use same parameters that used in that assignment. if Y[i] is 1, it will be replaced with y+ value else it will replaced with y- value

1. For a given data point from X_{test}, $P(Y=1 \vee X) = \frac{1}{1+exp(-(W * f_{test}+b))}$ where f_{test} = `decision_function(`X_{test}`)`, W and b will be learned as metioned in the above step

Note: in the above algorithm, the steps 2, 4 might need hyper parameter tuning, To reduce the complexity of the assignment we are excluding the hyerparameter tuning part, but intrested students can try that

If any one wants to try other calibration algorithm istonic regression also please check these tutorials

1. http://fa.bianp.net/blog/tag/scikit-learn.html#fn:1
2. https://drive.google.com/open?id=1MzmA7QaP58RDzocB0RBmRiWfl7Co_VJ7
3. https://drive.google.com/open?id=133odBinMOIVb_rh_GQxxsyMRyW-Zts7a
4. https://stat.fandom.com/wiki/Isotonic_regression#Pool_Adjacent_Violators_Algorithm

```
#You will compute N+ and N- using the ytrain.

#You will compute the value of y+ and y- using the N+ and N- computed
in Step 1.
```

```
#You will replace all 0s with y- and all 1s with y+ in the ycv which
will result in the modified ycv.

#You will pass fcv (computed by passing Xcv to the decision function)
as X and modified ycv as y to the train function and will compute the
value of w and b after training. No need to perform any validation.
Perform only the training using the fcv and modified ycv.

#Plot the epoch vs loss curve for the training done in step 4 and make
sure the curve is decreasing.

#Compute ftest by passing Xtest to the decision function. Now compute
the value of P(Y=1|Xtest) = 1/(1+exp(-(w*ftest+ b))). The size of this
output will be the same as the size of the Xtest where each value will
be a scalar corresponding to the probability of that point in Xtest to
belong to 1. Print the output once done.
```

You will compute N+ and N- using the ytrain.

```
#Apply SGD algorithm with ( fcvfcv ,  ycvycv ) and find the weight  WW
intercept  bb  Note: here our data is of one dimensional so we will
have a one dimensional weight vector i.e W.shape (1,)

from sklearn.linear_model import SGDClassifier

clf2 = SGDClassifier()
unique, counts = np.unique(y_train, return_counts=True)
print("Value counts of Y Trains")
print(unique[0],counts[0])
print(unique[1],counts[1])
print()

#You will compute N+ and N- using the ytrain.
N_minus = counts[0]
N_plus = counts[1]
print("N_minus",N_minus)
print("N_plus",N_plus)
print()
```

```
Value counts of Y Trains
0 2084
1 916

N_minus 2084
N_plus 916
```

You will compute the value of y+ and y- using the N+ and N- computed in Step 1.

```
y_plus = ((N_plus+1)/(N_plus+2))
y_minus =(1/(N_minus+2))
print("y_plus",y_plus)
print("y_minus",y_minus)
print()
```

```
y_plus 0.9989106753812637
y_minus 0.00047938638542665386
```

You will replace all 0s with y- and all 1s with y+ in the ycv which will result in the modified ycv.

```
y_CV_modified =np.where(y_CV == 0, y_minus, y_plus)
print("ycv modified after replacing all 0s with y- and all 1s with y+")
print(y_CV_modified)
```

```
ycv modified after replacing all 0s with y- and all 1s with y+
[4.79386385e-04 4.79386385e-04 4.79386385e-04 4.79386385e-04
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4.79386385e-04	4.79386385e-04	4.79386385e-04	9.98910675e-01
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```

Logistic Regression with SGD and L2

```
#Initialize weights


def initialize_weights(row_vector):
    ''' In this function, we will initialize our weights and bias'''
    #initialize the weights as 1d array consisting of all zeros 
similar to the dimensions of row_vector
    #you use zeros_like function to initialize zero, check this link 
https://docs.scipy.org/doc/numpy/reference/generated/numpy.zeros_like.
html
    #initialize bias to zero
    w = np.zeros_like(row_vector)
    b = 0
    return w,b

#Compute sigmoid

#$sigmoid(z)= 1/(1+exp(-z))$


import math
```

```
def sigmoid(z):
    ''' In this function, we will return sigmoid of z'''
    # compute sigmoid(z) and return
    sigmoid = 1/(1+math.exp(-z))
    return sigmoid

def sig(w,x,b):
    return(1/(1+math.exp(-(np.dot(x,w)+b))))


def log_loss(w,b,X,Y):
    N = len(X)
    sum_log = 0
    for i in range(N):
        sum_log += Y[i]*np.log10(sig(w,X[i],b))+ (1-Y[i])*np.log10(1-
sig(w,X[i],b))
    return -1*sum_log/N


#Compute gradient w.r.to  'w'


#$dw^{(t)} = x_n(y_n − σ((w^{(t)})^{T} x_n+b^{t}))- \frac{λ}{N}w^{(t)}
$



#make sure that the sigmoid function returns a scalar value, you can
use dot function operation
def gradient_dw(x,y,w,b,alpha,N):
    '''In this function, we will compute the gardient w.r.to w '''
    #print("w",w)
    #print("x",x)
    #print("b",b)
    #print(np.dot(w,x))
    #print(sigmoid(np.dot(w,x)+b))
    dw = (x*(y-sigmoid(np.dot(w,x)+b))) - ((alpha/N)*w)
    #print(dw)
    return dw

#Compute gradient w.r.to 'b'


#$ db^{(t)} = y_n- σ((w^{(t)})^{T} x_n+b^{t})$


#sb should be a scalar value
def gradient_db(x,y,w,b):
    '''In this function, we will compute gradient w.r.to b '''
```

```
    db = y-sigmoid(np.dot(w,x)+b)
    return db

#Implementing logistic regression

def train(X_train,y_train,epochs,alpha,eta0):
    ''' In this function, we will implement logistic regression'''

    loss = []
    w,b = initialize_weights(X_train[0]) # Initialize the weights
    N_train = len(X_train)
    for epoch in range(0,epochs):
        print("epoch ",epoch)
        for point_idx in range(0,N_train):

grad_dw=gradient_dw(X_train[point_idx],y_train[point_idx],w,b,alpha,N_
train)
            #print(grad_dw)

grad_db=gradient_db(X_train[point_idx],y_train[point_idx],w,b)
            #print(grad_dw)
            #Updating weight vector w
            w = w +(alpha*grad_dw)
            b = b +(alpha*grad_db)
        print("updated w: ",w)
        print("updated b:",b)
        loss.append(log_loss(w,b,X_train,y_train))

    return w,b,loss
```

You will pass fcv (computed by passing Xcv to the decision function) as X and modified ycv as y to the train function and will compute the value of w and b after training. No need to perform any validation.

#Perform only the training using the fcv and modified ycv.

```
alpha=0.001
eta0=0.001
fcv = []
for i,X in enumerate(X_CV):

fcv.append(decision_function(clf.support_vectors_,clf.n_support_,clf.d
ual_coef_,clf.intercept_,X)[0])
N=len(fcv)
epochs=20

w,b,loss=train(fcv,y_CV_modified,epochs,alpha,eta0)
```

```
print()
print("Updated final w vector:")
print(w)
#w_mag=np.dot(w.T,w)
#print(w_mag)
#print()
#print(loss)
```

```
epoch  0
updated w:  0.5698628471404511
updated b: -0.09957665383377817
epoch  1
updated w:  0.8252698643131717
updated b: -0.12457002797799414
epoch  2
updated w:  0.9881074182533058
updated b: -0.13149536017725497
epoch  3
updated w:  1.1066818467102408
updated b: -0.1313953406935524
epoch  4
updated w:  1.1990996024005403
updated b: -0.1279437578133522
epoch  5
updated w:  1.2741647695430744
updated b: -0.12272887757405579
epoch  6
updated w:  1.3368479072602928
updated b: -0.11654917070269341
epoch  7
updated w:  1.3902422230943452
updated b: -0.10984707030371327
epoch  8
updated w:  1.4364094199210387
updated b: -0.10288462687990747
epoch  9
updated w:  1.476795654811148
updated b: -0.09582450185656792
epoch  10
updated w:  1.5124561516697164
updated b: -0.08877102417120178
epoch  11
updated w:  1.5441854542678315
updated b: -0.08179256494066611
epoch  12
updated w:  1.5725973323780114
updated b: -0.0749344487644276
epoch  13
updated w:  1.5981760884001668
updated b: -0.0682267575304883
```

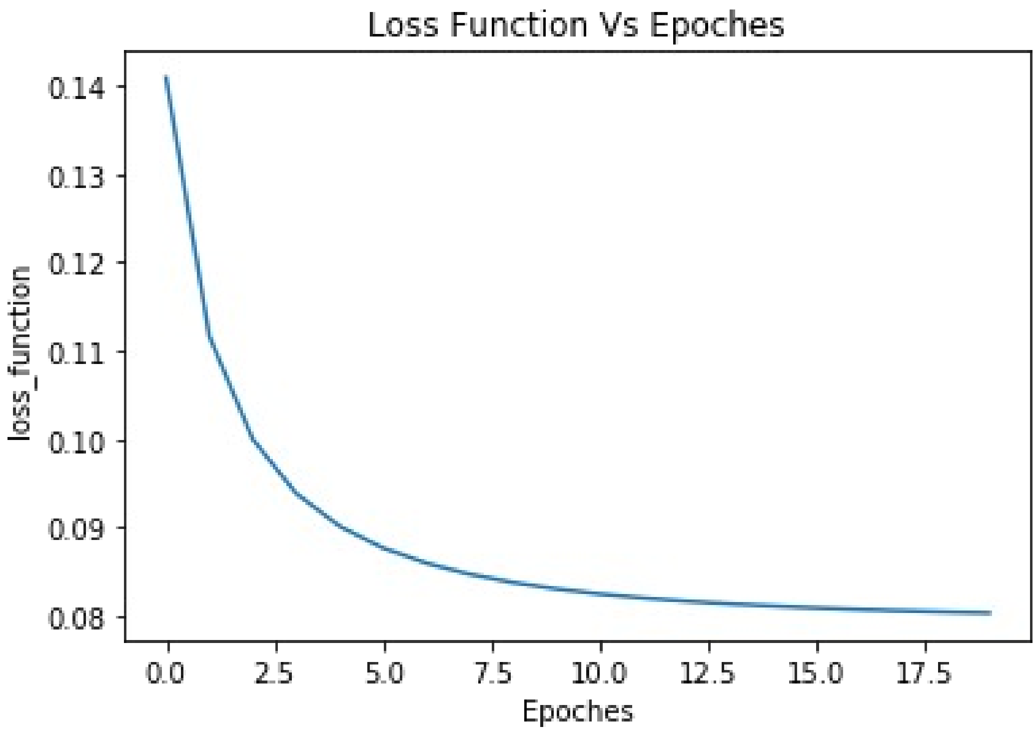
```
epoch  14
updated w:  1.6213107670990667
updated b: -0.061689231193604824
epoch  15
updated w:  1.642318701431871
updated b: -0.05533444587210759
epoch  16
updated w:  1.6614621638327274
updated b: -0.04916993176926743
epoch  17
updated w:  1.6789604207157502
updated b: -0.04319961796573497
epoch  18
updated w:  1.6949986393543663
updated b: -0.037424838128434994
epoch  19
updated w:  1.7097345885358104
updated b: -0.031845042966389146

Updated final w vector:
1.7097345885358104
```

Plot the epoch vs loss curve for the training done in step 4 and make sure the curve is decreasing.

```
epochs_list = [i for i in range(epochs)]
#print(epochs_list)
plt.plot(epochs_list,loss)
plt.xlabel("Epoches")
plt.ylabel("loss_function")
plt.title("Loss Function Vs Epoches")
```

```
Text(0.5,1,'Loss Function Vs Epoches')
```



Compute ftest by passing Xtest to the decision function. Now compute the value of P(Y=1|Xtest) = 1/(1+exp(-(w*ftest+ b))).The size of this output will be the same as the size of the Xtest where each value will be a scalar corresponding to the probability of that point in Xtest to belong to 1. Print the output once done.

```
b = clf.intercept_[0]
#print(b)
for x in X_test:
    f = 
decision_function(clf.support_vectors_,clf.n_support_,clf.dual_coef_,c
lf.intercept_,x)[0]
    #print(f)
    #print(w_mag)
    prob = (1/(1+math.exp(-((w*f)+b))))
    print("For ",x,"probability is",prob)
```

```
For  [ 0.56205839  0.95914624  0.47392055  0.64027871 -0.65230023] 
probability is 0.03797005183831936
For  [-1.12868355  0.5259836  -0.11371356 -0.11703555  0.79121172] 
probability is 0.9671697845817276
For  [ 0.77827558 -1.04397189  0.04636056  0.00756786 -1.0188899 ] 
probability is 0.055375289600710365
For  [-0.10445915 -1.35403628 -0.55372204 -0.7593877   0.56623399]
```

```
probability is 0.9864660010309189
For  [-1.28523571  0.04712579  0.15703589  0.19905871 -0.44336442]
probability is 0.1769246497759671
For  [-1.47325101  1.7701801   0.43925358  0.63609024  0.13509864]
probability is 0.3115275393497318
For  [ 1.20189375 -0.15709433  0.12650684  0.15091977 -0.52090478]
probability is 0.18627507547794694
For  [ 1.49952363 -0.58600389  0.13007707  0.13463546 -0.89191499]
probability is 0.06772504871576612
For  [-1.07690686 -0.15079241  0.23152617  0.28282199 -0.83857399]
probability is 0.04500821994677382
For  [-0.26724655 -1.15451929  0.07747155  0.04120209 -1.20735807]
probability is 0.025445317675763\99
For  [ 0.66526567 -1.72732043  0.15647213  0.11247379 -1.93111833]
probability is 0.0021655874462919774
For  [ 0.49054689  1.36764199 -0.12216664 -0.08689388  1.52370326]
probability is 0.9970052610150786
For  [ 1.63069288  0.07452828  0.2477281   0.31402916 -0.69926232]
probability is 0.08272527552782148
For  [ 0.11604991  1.7762677   0.66176578  0.91520961 -0.54406865]
probability is 0.025411523428207926
For  [ 0.05308313  0.19295574 -0.34001346 -0.41672424  1.20759021]
probability is 0.9963511117753958
For  [ 0.38884459  0.77534135 -0.06302905 -0.04145574  0.84465829]
probability is 0.9693098789303106
For  [-0.79753544  1.4437188   0.61278549  0.8377391  -0.67258757]
probability is 0.019312124135747472
For  [ 0.10174365  0.93061088  0.46498737  0.62770372 -0.64878146]
probability is 0.03778310067762044
For  [ 1.24541218  1.25235608  0.45744699  0.63382667 -0.35551695]
probability is 0.10380633503411225
For  [-0.69938151  0.4009604  -0.09764993 -0.10295739  0.63686659]
probability is 0.9453745830572092
For  [-0.59753387 -0.07836349  0.28876151  0.3580476  -0.95378855]
probability is 0.026457592394563408
For  [ 3.29407838  0.38638607  0.45580951  0.58986413 -1.07738506]
probability is 0.018529267195039723
For  [-0.38742417  0.33602152 -0.08552771 -0.09091019  0.54507757]
probability is 0.9263220350116798
For  [-0.69014058 -0.91344944 -0.44413429 -0.60074265  0.59905882]
probability is 0.9817699985942365
For  [ 1.95952628  0.82828063 -0.11003453 -0.09779507  1.03364893]
probability is 0.9879716136596849
For  [-0.03399506  0.27160522 -0.06994023 -0.07449547  0.44307073]
probability is 0.8978525342704314
For  [ 1.46277949  0.2110868  -0.09381287 -0.10733863  0.46568494]
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For  [-0.05963652  0.99414937 -0.05909246 -0.02593317  1.01622196]
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For  [ 0.31942805  0.32496041  0.40132275  0.51861523 -0.96138678]
```

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probability is 0.0186720282861205
For  [-2.2848864   0.7244152   0.5713659   0.75102481 -1.14900312]
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For  [-0.18094927 -0.16306564  0.29010888  0.3556366  -1.02903187]
probability is 0.021440029660534102
For  [-1.06285988 -0.28360201  0.10783967  0.12140574 -0.56969063]
probability is 0.14742629276879984
For  [-0.71081737 -0.44576286  0.30833761  0.36479681 -1.32238834]
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For  [-0.17981967 -0.04227175  0.27680426  0.34481101 -0.88672146]
probability is 0.034792262611756886
For  [-0.57130956  0.94852427  0.04504853  0.10235529  0.65766581]
probability is 0.9156471383085838
For  [ 1.0265705  -0.48414377  0.53594438  0.64814791 -2.05454994]
probability is 0.00042305524971455717
For  [-1.27184178e+00 -6.98697496e-01 -7.42944217e-04 -3.47460662e-02
 -5.84208829e-01] probability is 0.1949721758997922
For  [-1.58238747 -2.16586084  0.0257775  -0.07252073 -1.89731678]
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For  [-0.49675481  0.00138658  0.29210464  0.36609649 -0.89712648]
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For  [ 0.33802464  0.57670515  0.44428009  0.58462782 -0.88217366]
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For  [-0.13939285  0.68066741  0.41346981  0.55105169 -0.70015788]
probability is 0.03807789520021641
For  [ 0.84603259 -1.33529761 -0.5165849  -0.71194512  0.46775797]
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For  [-1.20608587  1.54632615 -0.03145658  0.03542058  1.39473777]
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probability is 0.12111617848654993
For  [ 0.35375589  0.28929301  0.48523022  0.62203148 -1.24936153]
probability is 0.005690127743228185
For  [-0.98475786 -1.17496455  0.24239233  0.24687091 -1.73169017]
probability is 0.00267846577811699
For  [ 0.94510065 -0.32199603  0.19460311  0.22826878 -0.86873692]
probability is 0.05439918663459002
For  [ 0.35757432  0.33619883 -0.01733035 -0.00544511  0.33550349]
probability is 0.8416442490149258
For  [ 0.85295148 -1.08478386 -0.10973061 -0.19000148 -0.57313084]
probability is 0.29796508800022153
For  [ 1.34179243 -0.01570117  0.17711614  0.22118013 -0.55785344]
probability is 0.14778021851071388
For  [ 1.16760215  0.49775997 -0.08220969 -0.07892476  0.67063874]
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For  [-1.404448   -0.99079568 -0.52220478 -0.70231429  0.77421875]
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For  [-0.37465063  0.73535974  0.28485556  0.3925352  -0.25872958]
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For  [-1.15053255 -2.25026998  0.07572356 -0.01401969 -2.1217665 ]
probability is 0.001372867551751845
For  [-1.2548967  -0.43476358 -0.05408404 -0.08881282 -0.19862371]
probability is 0.5019927315328827
For  [ 1.05108858  0.23039131 -0.22727393 -0.27364123  0.89231345]
probability is 0.9863730762051497
For  [-0.14439516  1.4090939   0.58811606  0.80515067 -0.62578777]
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For  [-1.11238701  1.20017064  0.56953353  0.77175401 -0.74401437]
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For  [ 1.65867251 -0.41211496  0.14801892  0.16553372 -0.8011263 ]
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For  [ 0.39995005 -0.02559866  0.1265051   0.15728163 -0.41052068]
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For  [-1.70200015  0.07134955 -0.07184931 -0.08657954  0.28084503]
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For  [ 0.45863252 -0.05545667 -0.37472168 -0.47223879  1.10580631]
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For  [-1.93555792 -2.14277854 -0.33751885 -0.52664164 -0.76071964]
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For  [ 1.93367969  0.68294007  0.52093653  0.68582568 -1.0287356 ]
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For  [-0.87597668  1.14118375  0.64523456  0.86375837 -1.02632699]
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For  [-0.20371334  0.00972192  0.45966826  0.5764699  -1.40542722]
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For  [ 1.24074158  0.68258126  0.31895735  0.432713   -0.40790336]
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For  [-1.70424569 -1.57760961  0.15467374  0.11746588 -1.79991911]
probability is 0.002903197079663188
For  [-0.16016811 -0.33272782  0.09321537  0.10070283 -0.56595417]
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For  [-0.44028421  0.91316964  0.39986814  0.54526026 -0.4631649 ]
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probability is 0.07877575540016359
For  [ 0.49586572  1.08526941  0.3661869   0.51138426 -0.21512492]
probability is 0.18612037934295905
For  [ 1.66717547 -0.11393322 -0.31130861 -0.3956075   0.86171046]
probability is 0.9896862039832278
For  [-1.0083496  -0.14962075  0.03602509  0.03790094 -0.23637876]
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For  [ 0.04573165 -0.95394057 -0.04410492 -0.10143501 -0.66511412]
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For  [-0.23056355  0.83328406  0.41919969  0.56561791 -0.5896707 ]
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For  [-0.39542908  0.74903617  0.29707675  0.40851118 -0.28483246]
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For  [-0.41361423  0.26456198  0.27059012  0.35187414 -0.61005224]
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For  [ 1.04662643 -1.41833294 -0.01330064 -0.08531025 -1.14966005]
probability is 0.0466489116634301

For  [ 1.31614485  1.82298738 -0.08456671 -0.01774079  1.79029605]
probability is 0.9985899588735699
For  [-1.54778667 -0.91188039  0.04234206  0.00892525 -0.89565317]
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For  [ 1.26713016  1.99215205  0.58754089  0.8326484  -0.13459423]
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For  [-1.30563968 -0.83845904  0.11052015  0.09791098 -1.04368618]
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For  [ 0.19569218  1.39891509  0.42026167  0.59432369 -0.11814028]
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For  [-0.47530866  0.68653284 -0.01305608  0.0168661   0.61643294]
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For  [ 2.1676674  -1.71610792  0.06316327 -0.00390666 -1.63475979]
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For  [-0.06780266 -1.17102703 -0.47156443 -0.64758079  0.46719981]
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For  [ 1.16515594  0.90042372 -0.01377109  0.02632189  0.79817387]
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For  [-0.90672914  0.61616376 -0.20738771 -0.23005193  1.15497986]
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For  [-1.62750656 -2.40017274  0.03232418 -0.07565731 -2.11413309]
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For  [ 1.15183043  0.74708054  0.44215377  0.5902091  -0.73261995]
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For  [ 0.19325131  0.16637348  0.34591727  0.44151275 -0.92412133]
probability is 0.025149246555187358
For  [-1.68825863 -0.19104795  0.24874187  0.30244632 -0.92530724]
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For  [ 1.57893122  1.35322282 -0.09371769 -0.05194303  1.42411247]
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For  [-0.08147714  1.31294891  0.46700903  0.64874116 -0.33406025]
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For  [-0.58650754 -0.50064692 -0.37816144 -0.4980951   0.74268733]
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For  [ 0.0139043   0.17951737  0.37438197  0.47781732 -1.00062386]
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For  [-1.31072097 -2.52328539 -0.39205851 -0.61339951 -0.91239858]
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For  [-1.87162971  0.79553491 -0.05011905 -0.02430122  0.8219077 ]
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For  [ 0.40662068 -0.40350519  0.02283915  0.00909062 -0.40894198]
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For  [ 0.98926425 -2.81428929  0.07668769 -0.04010859 -2.59817481]
probability is 0.00035954305571089335
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For  [-0.40930521  0.4376487   0.51107193  0.66159314 -1.20429964]
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For  [ 1.47392125 -1.66311991 -0.59937856 -0.83155762  0.44719067]
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For  [ 0.19820984  0.09889437  0.17160883  0.21982518 -0.44472457]
probability is 0.18077262742954714
For  [-0.49194425 -2.55682689 -0.70887259 -1.01201503  0.0337241 ]
probability is 0.9538541288126677
For  [-0.00425738  1.20477293  0.62952802  0.84715441 -0.92464829]
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For  [-1.29796139 -0.72131463 -0.00695258 -0.04362182 -0.5840978 ]
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For  [ 0.95504654 -1.45938678 -0.54888309 -0.7584228   0.46292083]
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For  [-0.45229976  1.41877809  0.39495096  0.56356875 -0.02363069]
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For  [ 1.05521794  0.62488091 -0.13883221 -0.14372477  0.95147285]
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For  [ 2.38222742  0.29775045  0.39799155  0.51312409 -0.97398285]
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For  [-0.03083344  1.36772366  0.36543033  0.52410626  0.02429658]
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For  [-0.58866811 -1.65729194 -0.10253727 -0.20869555 -1.07582097]
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For  [-0.49513972  0.62625746  0.36247475  0.4845177  -0.58900834]
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For  [-1.36262594  0.90544791 -0.07721488 -0.05293486  0.99749578]
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For  [ 2.6400082  -2.79273263 -0.06336715 -0.2145647  -2.1493784 ]
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For  [ 1.22301781 -0.88438689 -0.05860625 -0.11624007 -0.56213508]
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For  [-0.94218604  0.1602347   0.06901233  0.09423264 -0.07772654]
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For  [-1.82173944 -0.80494013 -0.00701544 -0.04774784 -0.65410055]
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For  [ 0.65600545  0.53120613 -0.0271889  -0.0083608   0.52951191]
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For  [ 1.70267057 -1.09647962 -0.1668684  -0.26216553 -0.40723625]
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For  [ 0.32106634 -2.00683403 -0.66402874 -0.92920408  0.35748815]
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For  [-0.96133066 -0.86086216 -0.43707484 -0.58935155  0.62149165]
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For  [-1.77462781  0.11012474  0.02680137  0.0389139   0.01001929]
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For  [-0.53652664  1.39467153 -0.01107676  0.05361837  1.20476464]
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For  [-0.22443636  1.7407127  -0.0405152   0.03347723  1.58576513]
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For  [-0.24305621  0.27066087  0.21940731  0.28803336 -0.44753363]
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For  [-0.48568197  1.43200574  0.32138497  0.47202514  0.21370542]
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For  [ 0.06316575 -0.56152359  0.01829629 -0.0042496  -0.52761383]
probability is 0.2249080128764428
For  [-1.21724311 -0.48862648 -0.01856288 -0.04690893 -0.35307265]
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For  [-0.12355154 -0.50384199 -0.3980416  -0.52316109  0.80114152]
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For  [-0.15452121  0.65051864  0.33983247  0.45731937 -0.49901292]
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For  [ 0.91457358  0.400132   -0.03021244 -0.01849317  0.4287851 ]
probability is 0.8880858156160751
For  [ 0.04262692 -0.99157255  0.09038942  0.06527536 -1.11030445]
probability is 0.03367765468603105
For  [-0.12823953  0.78099191  0.49896714  0.66304181 -0.8788689 ]
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For  [-0.89589772 -1.83541858 -0.18287993 -0.31799187 -0.97826969]
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For  [ 0.71054755 -1.27233814 -0.14898181 -0.24826335 -0.60985909]
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For  [-0.19155852  0.13923777 -0.02934979 -0.03003878  0.20713504]
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For  [-1.59249652  0.12439521  0.4452613   0.56396676 -1.26486455]
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For  [-0.11634465 -0.46189688 -0.00502419 -0.02865027 -0.37227023]
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For  [ 1.18620812  1.20955729  0.41619279  0.58006066 -0.26457631]
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For  [ 0.53560153 -2.42432442  0.08136389 -0.0153757  -2.28521486]
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For  [-0.62813193 -2.13560299 -0.0610427  -0.17984866 -1.60492554]
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For  [ 0.7449977   0.65802146  0.52843587  0.69401693 -1.07271475]
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For  [-0.44387873  1.11725757  0.37100756  0.51897306 -0.20309841]
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For  [-1.68677653 -1.22846217  0.11639819  0.08640151 -1.38913503]
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For  [ 1.33610275  1.53661139  0.5518192   0.76583943 -0.40712694]
probability is 0.06575967424060054
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probability is 0.09451235814282023
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For  [ 0.18918227 -0.75480788  0.20757066  0.22357117 -1.27192171]
probability is 0.013826368968259199
For  [-0.14106793 -1.18035082 -0.11116954 -0.19642975 -0.64892565]
probability is 0.2334392311176012
For  [-2.37406015  0.67738335  0.42825314  0.56941739 -0.74837677]
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For  [ 0.27960058 -0.54340992 -0.18352537 -0.25627088  0.10823999]
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For  [ 0.71612414 -0.03899267 -0.30079408 -0.37880506  0.89228163]
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For  [-2.35291426  0.01866489  0.40193346  0.50455661 -1.22037233]
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For  [-1.68019657 -2.59867358 -0.03553053 -0.17029136 -2.07208745]
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For  [ 1.07716498 -0.25331422 -0.00602506 -0.01980959 -0.19410598]
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For  [-1.82013059 -1.60368082 -0.55645204 -0.77489073  0.36507529]
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For  [-0.89864254 -1.67229827 -0.58171153 -0.80986369  0.38515597]
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For  [ 1.46094914  0.77778368  0.32368882  0.44324944 -0.3425399 ]
probability is 0.16976376766006454
For  [ 0.70034407 -0.90188972  0.10371937  0.08631921 -1.07601653]
probability is 0.038155763805272816
For  [ 1.89373904 -0.82688452 -0.06580187 -0.12247377 -0.49173879]
probability is 0.354131109760477

For  [-1.17191811 -1.03546864 -0.02867374 -0.08604431 -0.78100409]
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For  [-0.4837323   1.31076284  0.47617232  0.66011766 -0.36407452]
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For  [-0.22466206 -1.34842271  0.12235494  0.08805999 -1.50814948]
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For  [ 0.12148292  1.08228351  0.50112327  0.68032531 -0.63259235]
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For  [-2.11924105  1.44662545  0.4146469   0.58959701 -0.060825  ]
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probability is 0.023099208592834347
For  [ 0.52031622  1.39431151  0.51817436  0.71679295 -0.42310908]
probability is 0.06361739579098585
For  [ 0.39888386 -0.29970417  0.33962963  0.41107694 -1.29601555]
probability is 0.008273176529604855
For  [ 0.16729571 -0.09489727  0.3557654   0.4412084  -1.1737199 ]
probability is 0.011185163270139771
For  [-0.30863161 -0.4861574  -0.32166202 -0.42659576  0.58110096]
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For  [ 1.15741396 -0.40288791  0.39341907  0.47348539 -1.54804415]
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For  [ 0.86814515  0.91973522 -0.05739665 -0.02740964  0.948543  ]
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For  [ 1.81154765  1.08512223 -0.07015561 -0.0353933   1.12660727]
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For  [-0.59255619 -0.23194738  0.09364027  0.10611276 -0.48266474]
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For  [ 0.02618364  0.56511204  0.35741748  0.47522128 -0.62478211]
probability is 0.05880623037526312
For  [-2.02429678e+00  9.30389227e-01 -3.49233159e-02  1.26678617e-03
  8.88375279e-01] probability is 0.9669356968750394
For  [-1.13255661  1.747015    0.50434313  0.71653127 -0.08451201]
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For  [-0.06880395 -0.44427995  0.06183503  0.05598204 -0.56309021]
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For  [-0.23232873  1.65006065 -0.06715426 -0.00429086  1.59159228]
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For  [-1.44973657  0.54121248 -0.06104724 -0.0503036   0.64203368]
probability is 0.9373506512463591
For  [ 0.37359385  0.83609507 -0.13101188 -0.1237031   1.10471874]
probability is 0.9892918976003025
For  [-1.90664897  1.0448075   0.66166962  0.87968839 -1.15776783]
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For  [ 0.80750054  0.23164738  0.17116173  0.22568981 -0.33191543]
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For  [-1.29117832  0.83393998  0.55595356  0.73701268 -1.00967039]
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For  [-0.48576539 -0.77304823 -0.08927192 -0.149278   -0.37437216]
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For  [-0.89675937  0.64766547  0.39705671  0.52888762 -0.6773859 ]
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For  [-1.23599213  0.54681814 -0.12599771 -0.1314202   0.8464771 ]
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```
probability is 0.9734235458030631
For  [-0.13237664  1.23642823  0.54313799  0.74043316 -0.6324069 ]
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For  [-0.3238182   0.27409153 -0.08333615 -0.09116125  0.48635337]
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For  [-0.95140032 -1.65040125 -0.56050105 -0.78222558  0.33830935]
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For  [-0.85345769  0.32378879  0.4622575   0.59491441 -1.14975891]
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For  [ 2.87711406  0.48120583  0.34376136  0.45404828 -0.65321804]
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For  [ 0.1213914  -3.25099083 -0.1391179  -0.33166465 -2.30109348]
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For  [ 0.10367586 -0.61563592  0.16910028  0.1821004  -1.03679394]
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For  [ 1.97881471 -1.55334087 -0.15998471 -0.27565061 -0.81189905]
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For  [ 0.41376956  0.59807959  0.31563798  0.42446391 -0.46862703]
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For  [-0.40382246  0.05165715  0.05752384  0.07458183 -0.1335378 ]
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For  [ 0.56680793 -1.50020775 -0.06007395 -0.14788331 -1.07454764]
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probability is 0.011891622187080847
For  [-0.03440807  1.06244505 -0.05850653 -0.02189363  1.07174817]
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For  [-0.60671686  0.57763581 -0.0457773  -0.0294064   0.62564912]
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For  [ 1.32045392  0.08865948  0.39852589  0.50367421 -1.15113909]
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For  [-0.36104299 -1.12717407 -0.48545573 -0.66286527  0.5467294 ]
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For  [ 0.9904016  -1.1642176   0.02278543 -0.02779315 -1.04732627]
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For  [-0.6799954  -2.79184312 -0.08179969 -0.23761903 -2.09194734]
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For  [-0.53078526 -0.09784625  0.01574457  0.01499364 -0.13055135]
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For  [-0.192264   -1.90056929 -0.59508139 -0.83766486  0.23465852]
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For  [-1.71108965 -0.63887097 -0.39194402 -0.5220554   0.66904536]
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For  [-0.59402808  1.50742779  0.61330723  0.84147623 -0.62071411]
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For  [ 0.44156516 -0.68163871 -0.10031989 -0.15869797 -0.26366702]
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For  [-0.96906362 -1.79099887 -0.27831329 -0.43542736 -0.64750333]
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For  [ 9.28154895e-01 -2.10369173e+00 -1.78227375e-03 -1.04046409e-01
 -1.76037864e+00] probability is 0.006516985240048018
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probability is 0.06416232057126711
For  [-1.22263845  0.81641847 -0.16349814 -0.16536315  1.18810488]
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For  [0.53772007 1.98902436 0.30739643 0.48145466 0.72429038]
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For  [ 1.11153696 -1.41615325  0.02369275 -0.03884923 -1.26159375]
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For  [ 0.59270585 -0.77328179  0.05015709  0.02542588 -0.80334518]
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For  [-0.09555585  0.77869493  0.43330947  0.58065657 -0.67888424]
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For  [-1.07985253  1.08227191 -0.03340536  0.01051962  1.01119903]
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For  [-0.03988178  1.0541064   0.50933718  0.68925427 -0.6815042 ]
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For  [-0.17301051 -1.01014622 -0.51079898 -0.68895846  0.72290018]
probability is 0.9905093630803331
For  [ 1.57270336 -0.39201712  0.06770592  0.0658681  -0.53727465]
probability is 0.22037741501283475
For  [ 0.53984491 -0.43787797  0.28218653  0.33240911 -1.23534895]
probability is 0.012415006211181386
For  [ 0.90845057  0.01034029 -0.0537631  -0.06686882  0.17401391]
probability is 0.7937208555683124
For  [ 0.07395481 -0.6397693  -0.11988497 -0.18118815 -0.16835418]
probability is 0.6002260763639695
For  [-1.24581648  0.5232722  -0.04975154 -0.0370175   0.59223752]
probability is 0.9248551409341783
For  [-0.43679133  0.33895172 -0.01393419 -0.00105625  0.32737033]
probability is 0.8280600730448092
For  [-1.76108328  0.04188552  0.27005016  0.34042059 -0.79530857]
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For  [-0.71858935 -1.38847535  0.01964164 -0.04258605 -1.22590252]
probability is 0.028479181339011363
For  [ 1.43923499 -2.00682912  0.03526131 -0.05294008 -1.79298893]
probability is 0.00559809332429483
For  [-0.43703821  1.34282449  0.71527651  0.96128514 -1.07246321]
probability is 0.003978221139991541

For  [-2.16355502 -0.31380573  0.16718081  0.19430294 -0.77753189]
probability is 0.06715415501751636
For  [ 1.60272616 -0.61229226  0.10668833  0.10405529 -0.84205581]
probability is 0.085837088924773
For  [-1.16745975  1.34490092  0.46185975  0.64383512 -0.29140418]
probability is 0.10048828928972012
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```
For  [ 0.77537917 -1.76762352  0.04130614 -0.03378853 -1.61078668]
probability is 0.008901059762519222
For  [-0.21746259 -0.89636608  0.19082197  0.19573274 -1.33924089]
probability is 0.011468571210013339
For  [ 1.54887698  1.41927397  0.47367038  0.66223419 -0.26529516]
probability is 0.13137492017455207
For  [ 0.3972256  -0.57652215  0.26058651  0.29863262 -1.2853031 ]
probability is 0.01126847721637857
For  [-0.60937717  0.43230924 -0.21740841 -0.2515067   1.03146658]
probability is 0.9895840888634104
For  [-0.46539932 -1.1004281   0.07989125  0.04685203 -1.16939453]
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For  [-2.01777685 -2.13787854 -0.11837923 -0.25180584 -1.43051234]
probability is 0.02356625281010097
For  [ 0.0790232  -0.0329928   0.24481848  0.30517945 -0.78056881]
probability is 0.054650084459668805
For  [ 0.99219069 -0.98497228 -0.55360775 -0.74138276  0.87567846]
probability is 0.9954375012282967
For  [-0.66514311 -0.54904505 -0.37037157 -0.49067614  0.67810576]
probability is 0.9816904171919414
For  [ 0.21145593 -1.28435946  0.0733973   0.02981283 -1.30381791]
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For  [ 0.36911367  0.50799005  0.24774077  0.33502344 -0.33544922]
probability is 0.19356988311578624
For  [ 0.93915272  0.64900539 -0.00205435  0.02883587  0.55109913]
probability is 0.9134132281780295
For  [-1.07869798 -1.18969323 -0.46383892 -0.63880353  0.42777345]
probability is 0.9702562978845822
For  [-0.06667605  1.15487549  0.51413926  0.7001486  -0.61168517]
probability is 0.03490837755952132
For  [ 1.61050899 -2.15017139  0.03500104 -0.0602036  -1.91251147]
probability is 0.003947532665908566
For  [-0.86021532 -0.66695629 -0.06436713 -0.11293583 -0.36190563]
probability is 0.38520067079190606
For  [-0.60209227  0.89389046 -0.10530546 -0.08869385  1.07417947]
probability is 0.9861297158802808
For  [-0.20047893  1.58733209 -0.11442084 -0.06655539  1.68429315]
probability is 0.998012436309942
For  [ 0.21923093 -1.21066975 -0.52264716 -0.71350994  0.59101469]
probability is 0.9864160717259544
For  [-0.74210376  1.7283588  -0.06524018  0.00189705  1.65143029]
probability is 0.997242791439978
For  [-1.17721013  0.17726118  0.37470065  0.47810746 -1.00349775]
probability is 0.016371739766541753
For  [ 0.17913805 -2.14165402 -0.07603064 -0.19892254 -1.5639134 ]
probability is 0.014320681653976262
For  [ 0.42725096 -0.76872663  0.27129496  0.30274895 -1.47957244]
probability is 0.005919333266632726
For  [ 0.28185789 -1.34736294  0.19150191  0.17475772 -1.71990309]
probability is 0.003594190264735645
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For  [ 0.04406951 -0.25926198  0.31858491  0.3866636  -1.19735052]
probability is 0.011708806573907566
For  [-0.41198415 -0.04858814 -0.07370832 -0.09471368  0.18588504]
probability is 0.792949638843224
For  [-1.65249139  0.65269065 -0.11449931 -0.11188787  0.89998723]
probability is 0.9762906336116216
For  [-1.20055753  0.81960279  0.52860984  0.70205503 -0.9376168 ]
probability is 0.011512103696949558
For  [1.08248592 1.49603548 0.00457049 0.07813131 1.24173158]
probability is 0.9890422595320026
For  [-0.15559384 -0.23202122  0.22907598  0.27582046 -0.89922335]
probability is 0.039559243867097964
For  [-0.89489877  0.11465273 -0.01207254 -0.00957893  0.13336653]
probability is 0.7162771759502089
For  [-1.23177034 -2.25421988  0.01309843 -0.09268491 -1.93249512]
probability is 0.0030816323576083144
For  [-1.10979958 -1.08755603  0.0649763   0.02878543 -1.11272261]
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For  [ 1.88235002 -0.46948687 -0.37176938 -0.4885773   0.7491863 ]
probability is 0.9884277258031651
For  [-0.30243034 -1.07273502  0.15001122  0.13605797 -1.36178408]
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For  [ 1.14691665  0.09540135 -0.11807329 -0.14333766  0.44318393]
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For  [ 0.12855553  0.7325984  -0.12484663 -0.12098653  0.99888303]
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For  [-0.11008907 -1.14285499 -0.07389815 -0.14791116 -0.73206955]
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For  [-0.41370722 -0.70215487 -0.21912292 -0.30856015  0.08445873]
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For  [ 0.85765023  0.60669523  0.36421108  0.48574669 -0.6107687 ]
probability is 0.06520795866300892
For  [ 0.39508575 -1.49447121 -0.58983954 -0.81144235  0.55942132]
probability is 0.9881559379503783
For  [-0.35289816  0.41948232  0.26261279  0.34937568 -0.45547843]
probability is 0.12770761859364574
For  [ 1.29888152 -0.55300726 -0.38706893 -0.51179097  0.72612817]
probability is 0.9873030781431442
For  [-0.75613636  0.10849648  0.2886068   0.36689727 -0.7964607 ]
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For  [-0.10978102 -1.96660347 -0.58436544 -0.82743283  0.14627469]
probability is 0.9531714469360333
For  [ 0.86174528  0.64510946  0.36234257  0.48526445 -0.5727773 ]
probability is 0.07335636251580907
For  [ 0.41464864 -0.2613405  -0.15102078 -0.20188874  0.24505258]
probability is 0.866973697822484
For  [ 0.47722272 -0.83405937  0.10940004  0.09672034 -1.03654847]
probability is 0.04124925556046327
For  [-0.53888686 -0.34001424  0.00872117 -0.00552749 -0.31223096]
probability is 0.36475603615099683
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For  [ 1.03913078  0.35315408  0.21497604  0.28647308 -0.3646608 ]
probability is 0.21073931220655648
For  [ 0.68231109  0.23577956  0.34801506  0.44750051 -0.87231238]
probability is 0.030827600669000028
For  [ 1.81188846  0.71350112  0.31784093  0.43281048 -0.37851568]
probability is 0.16512166822520888
For  [-0.63948788 -0.70154711  0.16482308  0.17258287 -1.09575524]
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For  [ 1.06231974  1.46335793 -0.10744193 -0.0638103   1.55876622]
probability is 0.9973093102415872
For  [ 0.31897664 -1.12898944  0.30032746  0.32169313 -1.87126236]
probability is 0.001542443441770611
For  [-1.63429978  1.18875652  0.17714551  0.27950948  0.45308987]
probability is 0.7690661237064691
For  [-0.69678622 -1.52985869  0.17767733  0.14860215 -1.83057797]
probability is 0.0024744252127514724
For  [ 0.01007187 -0.10413347  0.34441481  0.42653824 -1.14656711]
probability is 0.01248905880535566
For  [-0.24651935  1.30749014  0.66986047  0.90266529 -0.96245821]
probability is 0.006687831718758491
For  [ 1.8681059   0.94917408  0.4004726   0.5477602  -0.43480126]
probability is 0.11019437338084728
For  [-1.37383611  1.3522813   0.52161122  0.71906545 -0.46895879]
probability is 0.04861652155547512
For  [-1.154155    0.21649936  0.39706358  0.50802893 -1.0393321 ]
probability is 0.013535492993157226
For  [-0.82589738 -0.49048322  0.09565764  0.09612823 -0.70588615]
probability is 0.1055404139388067
For  [ 0.39015501 -1.82606859 -0.03851927 -0.13664445 -1.41436415]
probability is 0.020681980886131324
For  [-0.60294138  0.71341867 -0.07282579 -0.0567287   0.82280707]
probability is 0.9661094454253598
For  [-1.20758789  0.88038405  0.50287148  0.67274455 -0.80744489]
probability is 0.018848664661385163
For  [-0.44652723 -0.85282334  0.08977539  0.07122102 -0.99194871]
probability is 0.046927843202197575
For  [-0.51890532  2.3705123   0.03249235  0.15544188  1.88990976]
probability is 0.998035934734877
For  [-1.76526638 -1.13106429  0.14698941  0.12944844 -1.40145348]
probability is 0.010479613221101974
For  [ 0.87853966 -1.53561354 -0.5933573  -0.81784156  0.53570398]
probability is 0.9878731346208383
For  [ 1.60009021  0.40650212  0.32156099  0.42261406 -0.64765371]
probability is 0.07492101896749871
For  [ 1.28855943 -1.3692602   0.1796404   0.15883457 -1.70180693]
probability is 0.004504145057615634
For  [-0.58066717  0.70802927  0.42596263  0.56803039 -0.71560842]
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For  [-1.1420775   0.40049936  0.35045747  0.45853304 -0.74155595]
probability is 0.039820042795812645
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For  [ 0.61465903  0.64796367  0.43223457  0.5729826  -0.78531577]
probability is 0.029639233512709293
For  [ 2.29069032  0.73932872  0.54342622  0.71673604 -1.0505635 ]
probability is 0.011697549544964964
For  [-0.11579009 -3.26307927 -0.22343878 -0.43791019 -2.05193412]
probability is 0.004786747382578334
For  [ 0.5616482   0.56770768  0.47484237  0.62248924 -0.98371243]
probability is 0.013779525637654054
For  [-0.00317024  0.73916061  0.39004133  0.52452494 -0.57901004]
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For  [ 2.01628025  1.10173299  0.52893434  0.71611601 -0.70179184]
probability is 0.03356698209137144
For  [ 0.31094106  1.06638752 -0.10970742 -0.08586144  1.23251227]
probability is 0.9921481622009051
For  [-0.30282509  0.65772832  0.38063967  0.50880283 -0.61845277]
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For  [-0.7575582   0.4356171   0.44331405  0.57658902 -0.99763358]
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For  [-0.46172459 -1.12137047 -0.54032743 -0.73134282  0.72034437]
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For  [ 1.66118232  0.24814688  0.3448389   0.44411908 -0.85216369]
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For  [-1.36721611 -0.37233656 -0.41470394 -0.53767576  0.96276909]
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For  [-1.25968678 -1.90472951 -0.05751761 -0.1642578  -1.42196853]
probability is 0.019661501003952826
For  [0.43716675 0.7508982  0.00190048 0.03872292 0.62446694]
probability is 0.9254972267613885
For  [ 1.92454864  0.72842072 -0.14894512 -0.15138597  1.06948477]
probability is 0.9906319405634078
For  [-1.22038062  1.29705502  0.54007054  0.73952358 -0.57208302]
probability is 0.03358292781047457
For  [ 0.07626624 -1.0977153   0.09495869  0.06586398 -1.21345332]
probability is 0.024145034708055003
For  [-1.00596778  0.93763182  0.05426946  0.11338266  0.62016604]
probability is 0.9012965078317586
For  [-0.46480868 -1.36573197 -0.18398994 -0.29665123 -0.58059655]
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For  [ 1.73476251 -1.30722902 -0.53819555 -0.73766647  0.55777683]
probability is 0.9876585444678166
For  [ 1.77755816  1.16998314  0.47829139  0.65595966 -0.48876304]
probability is 0.07183583844959063
For  [ 0.62744343 -1.10273748 -0.10786647 -0.18853448 -0.59393395]
probability is 0.27777280855262776
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```
For  [0.43391659 0.44411825 0.00238426 0.0244818  0.36546507]
probability is 0.8455020692423786
For  [ 0.82841299  0.02244399  0.0338897   0.04355261 -0.08537909]
probability is 0.5486301965905085
For  [ 0.12804625  0.86234439  0.46944913  0.62999074 -0.71980601]
probability is 0.030087779115351678
For  [-0.32114831  0.90084588  0.00094695  0.04478515  0.7532668 ]
probability is 0.946223568659352
For  [ 0.72261592  0.48521752  0.30446484  0.4050009  -0.52900455]
probability is 0.09932445529878131
For  [ 0.94148136 -0.10975316  0.02709178  0.02863631 -0.17544148]
probability is 0.48659595517560517
For  [-0.54445308  1.82827823  0.40889113  0.60085557  0.27723847]
probability is 0.45031258372714267
For  [ 2.04794793  0.05582338  0.28983944  0.36589262 -0.84446567]
probability is 0.05027116708199153
For  [-1.67471233 -0.0158885   0.01710663  0.02066695 -0.06594387]
probability is 0.5419385982023651

For  [ 0.38190284  0.52693405  0.28819548  0.38663311 -0.44395516]
probability is 0.12830987690029397
For  [-0.42801231  0.31810543  0.0229427   0.0441444   0.19646665]
probability is 0.7350839265903734
For  [-0.52341609  1.66575495  0.00171576  0.08276809  1.39297473]
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For  [-0.71790141  0.68154156  0.46983014  0.62171779 -0.87274537]
probability is 0.017719651742760564
For  [-1.50694727  1.10401636  0.4689007   0.64099979 -0.51525761]
probability is 0.051100370376602915
For  [ 1.14177626 -1.01805247  0.00471478 -0.04336305 -0.86906233]
probability is 0.10278725830468097
For  [-0.09388957 -1.28933698 -0.52731255 -0.72316331  0.53932781]
probability is 0.9838770311086287
For  [ 0.585611    0.06544894 -0.06721327 -0.0810558   0.2616351 ]
probability is 0.8376166795992404
For  [ 0.10338023 -0.45963241  0.1830246   0.20709879 -0.9486636 ]
probability is 0.040647822519011285
For  [ 8.40813103e-01  2.44871494e+00 -9.36725153e-02  1.13248596e-03
  2.34354042e+00] probability is 0.9997297107361081
For  [-0.24375144  0.13970162  0.09596876  0.12701736 -0.17785956]
probability is 0.3954567456658742
For  [-0.46830436 -1.6020392   0.11612312  0.06797669 -1.70187335]
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For  [-0.1091271   1.03861324  0.3261863   0.45900242 -0.13127731]
probability is 0.245799488684413
For  [0.4338897  1.78536665 0.07352051 0.1785338  1.27256152]
probability is 0.9860630625557002
For  [-0.17928458  1.18552706  0.66700921  0.89318976 -1.05606695]
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For  [ 0.52379675  1.12738446  0.52077877  0.70713792 -0.65517945]
```

```
probability is 0.03170813719229655
For  [-1.62900667 -1.51740387 -0.58094941 -0.80141223  0.51283218]
probability is 0.9845931405510489
For  [-4.03928478e-01  1.41014114e+00 -5.55568791e-02 -1.36992511e-03
  1.35453681e+00] probability is 0.9930095289929791
For  [ 0.49704684  0.02856178  0.03309493  0.04285278 -0.07779965]
probability is 0.5463844376826354
For  [ 1.41866516 -1.01811348 -0.56994119 -0.76345375  0.89808857]
probability is 0.9961626578356847
For  [ 0.08315519  0.87542171  0.28346303  0.39756887 -0.13687779]
probability is 0.2764183526334173
For  [-0.58842549  0.93518621  0.41910251  0.57042793 -0.50383418]
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For  [ 0.49107792 -0.86379647  0.03254283 -0.00102681 -0.8251561 ]
probability is 0.09970240950769761
For  [-1.26649518  0.80312971  0.42620501  0.57293671 -0.63652554]
probability is 0.04164340841214013
For  [0.94111946 1.09040672 0.24088828 0.35462416 0.17451009]
probability is 0.5656593184398738
For  [ 1.18927983  1.16219521  0.60910033  0.81949631 -0.8975685 ]
probability is 0.012067145731319482
For  [-0.63376623 -0.71439631 -0.00392841 -0.03949747 -0.58759052]
probability is 0.1983898247331231
For  [-1.31608785 -0.00645588  0.06993274  0.08731861 -0.22047873]
probability is 0.37464138070966807
For  [-1.16687224 -1.84913015 -0.64160289 -0.89347033  0.42090158]
probability is 0.98314799559737
For  [ 0.50164278  0.34012001  0.24020737  0.31745905 -0.453194  ]
probability is 0.14718447455029054
For  [ 0.47417008 -0.05955553  0.04734864  0.05644913 -0.19559969]
probability is 0.439568814625633
For  [ 0.51103474  1.20757675  0.51863165  0.70832851 -0.58126236]
probability is 0.039819979125544046
For  [-0.68244331 -0.12957935  0.11459277  0.13732218 -0.46116987]
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For  [ 0.24217439  0.15857851  0.42834848  0.54442808 -1.18415984]
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For  [-0.71999968 -0.68625936  0.21645396  0.2380202  -1.24169966]
probability is 0.013838564987104262
For  [-0.25435274  0.25158405  0.3570079   0.45953412 -0.88670104]
probability is 0.026133407526669632
For  [ 0.8190747   0.31240376 -0.21955243 -0.25999642  0.93741009]
probability is 0.9875318534960744
For  [ 0.10688834 -1.36845467  0.07545278  0.02831852 -1.38072936]
probability is 0.015310489478302823
For  [ 0.37106285 -0.66002167  0.01365637 -0.01483082 -0.59602524]
probability is 0.19585734684644746
For  [-0.30414236 -0.40167365  0.03271564  0.02155526 -0.4377771 ]
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For  [-0.12770729  0.92108694  0.62125163  0.82305382 -1.13732526]
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probability is 0.004707032709215312
For  [-0.2199821   1.08424921  0.51067371  0.69238788 -0.66031218]
probability is 0.030158893801586928
For  [ 0.64284421  1.05667138 -0.09420826 -0.06691005  1.1766929 ]
probability is 0.9903933549819374
For  [-1.66979926 -0.80306857 -0.12625953 -0.1970792  -0.28582596]
probability is 0.4953745139497356
For  [-0.74787666  0.12181051 -0.07123947 -0.08337318  0.32132705]
probability is 0.8517341446416113
For  [-1.84591836  0.03912745  0.45464891  0.57160341 -1.36530823]
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For  [-2.12357927 -0.81540881 -0.42834219 -0.57620904  0.63279067]
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For  [ 0.60079687 -1.22744038 -0.5195724  -0.71046869  0.56748167]
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For  [ 0.48639016 -0.07920483  0.27583389  0.3418076  -0.91473933]
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For  [ 0.99620866  1.59633067  0.67658695  0.9250732  -0.74068816]
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For  [ 0.66807365  0.17628513  0.28710594  0.36829736 -0.73494274]
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For  [-0.02208474  1.4906994  -0.16404386 -0.13341358  1.75578117]
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For  [ 0.7653941  -0.1418871  -0.35382698 -0.45023914  0.96899966]
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For  [-2.60671452  0.29884637  0.2639189   0.34517388 -0.56075804]
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For  [-1.97551589  0.26368234  0.28346253  0.36796168 -0.65037631]
probability is 0.0656218522585514
For  [-0.50922015 -0.26538548  0.46756152  0.57304629 -1.66062871]
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For  [-1.86826095 -0.05280928  0.03539078  0.04179151 -0.15316358]
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For  [-0.09900429  1.26862859  0.54219469  0.74080954 -0.60247672]
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For  [ 1.65835226 -2.92289507 -0.09831653 -0.26465846 -2.15116047]
probability is 0.0028804538137500815
For  [ 0.14414575  0.84576709  0.41030787  0.55507993 -0.55184788]
probability is 0.06132910926642775
For  [ 2.25567776 -1.07346356 -0.4639512  -0.63331902  0.52568307]
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For  [-1.52292118  0.26710135  0.33301638  0.43022192 -0.79989611]
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For  [-1.67435305  0.53061224  0.50643109  0.66027699 -1.11199343]
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probability is 0.15884906186736025
For  [-0.04124063  0.09135446  0.05220498  0.06983814 -0.08385876]
probability is 0.5122609256075545
For  [-1.05630265 -0.07824772 -0.27316213 -0.34607996  0.77435581]
probability is 0.98062605804637
For  [ 1.51245427  0.68310863  0.35152067  0.47354285 -0.50760055]
probability is 0.09997466556576955
For  [ 0.25435206 -0.42193373  0.22440466  0.26077568 -1.04427237]
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For  [-0.8487388   1.09862642  0.41085395  0.56800192 -0.34127457]
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For  [ 0.46506513 -1.72002154  0.13408625  0.08477583 -1.85614975]
probability is 0.002892586921122354
For  [ 0.20810884 -0.24876653  0.3999859   0.48917319 -1.43886767]
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For  [ 0.15144612  1.48036815  0.5159731   0.71819952 -0.3441029 ]
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For  [-1.14142484  1.48142418 -0.01880816  0.04812893  1.30136155]
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For  [ 2.10449872 -0.28012492  0.03689334  0.03267287 -0.3485953 ]
probability is 0.38542567769958724
For  [-2.51449325  0.87319019  0.54157134  0.72089026 -0.93249465]
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For  [-1.35426244 -0.37731337  0.29455168  0.35083475 -1.22253617]
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For  [ 0.39403283  1.63618471  0.55072184  0.76928345 -0.3201695 ]
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For  [ 0.09618943  0.01555735 -0.0376111  -0.04637665  0.12872197]
probability is 0.7435389688750695
For  [ 1.19880212 -0.49394672  0.0389681   0.02492429 -0.53445979]
probability is 0.23008502602573744
For  [-0.91743372  1.96934993  0.60844328  0.85773712 -0.21801429]
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For  [ 0.29495323 -1.55734723 -0.21164689 -0.34058116 -0.65638867]
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For  [ 0.16269938 -1.60144093 -0.63695344 -0.87565671  0.61451618]
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For  [ 1.03474135 -0.96644292 -0.43898643 -0.59685673  0.5387447 ]
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For  [-1.25397332  0.46162274  0.37676205  0.49445289 -0.77114114]
probability is 0.0330861552143179
For  [ 1.77403741  1.27385185 -0.01319837  0.04511248  1.10987187]
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probability is 0.9530470522040714
For  [ 0.23487925 -0.08178015  0.39373984  0.4894281  -1.27948958]
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For  [-1.55636148 -0.70604917  0.1068897   0.09977004 -0.92137556]
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For  [-0.14654939 -0.76434474 -0.01533953 -0.05621385 -0.59442585]
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For  [-0.72982271 -0.0730185   0.51819545  0.64580451 -1.6548652 ]
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For  [ 1.12117377  0.83916342  0.40724047  0.55091665 -0.5479581 ]
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For  [ 1.5817218  -1.79917983 -0.18425357 -0.31795929 -0.94362624]
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For  [ 0.73617042 -1.86883686 -0.04540428 -0.14734176 -1.42909122]
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For  [ 0.93615586  0.03923169  0.02519052  0.03346435 -0.04453531]
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For  [ 0.79034739 -0.14620418 -0.32218825 -0.41080234  0.86807934]
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For  [ 0.87370629 -2.1085973  -0.63451553 -0.89714684  0.181307  ]
probability is 0.9667776181429908
For  [ 1.43984321e+00  3.85650311e-01 -1.41986666e-02  8.72437363e-04
  3.67382904e-01] probability is 0.86809242207286
For  [-0.0043424   0.28715205  0.00770972  0.02355827  0.21732904]
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For  [ 0.13591132  1.36504351 -0.01775937  0.04381063  1.2004452 ]
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For  [-0.16764266 -1.02109269  0.10138584  0.07762602 -1.16890054]
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For  [-0.89622058  1.2127232   0.08155845  0.16089153  0.7671604 ]
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For  [-0.66151744  1.15445762  0.47705915  0.65366417 -0.49800587]
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For  [-1.54387938  0.38050471  0.28249163  0.37239897 -0.54932873]
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For  [-1.29923262 -0.16798037 -0.30407541 -0.38915948  0.79409895]
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For  [-1.20908046  0.0946345   0.38436955  0.48622442 -1.10258954]
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For  [-0.44062119 -0.84802928  0.11394578  0.10174039 -1.06225416]
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For  [-1.05519647  0.56423632  0.37636809  0.49892546 -0.68379478]
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For  [ 1.77537387  0.31805528 -0.10990086 -0.12232113  0.6049497 ]
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For  [-0.5516931   1.09946548  0.42582064  0.58679693 -0.38659634]
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probability is 0.08915579523422895
For  [-0.24560677  1.30849641 -0.07523306 -0.03094501  1.32972409]
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For  [-0.98720724  0.69938085 -0.0523191  -0.03171165  0.74796068]
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For  [ 0.03136555 -2.30801328 -0.39406379 -0.60549368 -0.72553035]
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For  [1.71183412 0.25506282 0.0600066  0.0875372  0.02956786]
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For  [-0.87181569  1.1238543   0.43044585  0.59377303 -0.38034774]
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For  [ 0.16846477 -0.5566157   0.27381802  0.31617614 -1.30928344]
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For  [-1.02757938 -0.60628763 -0.14214765 -0.20746456 -0.07178638]
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For  [ 0.1072182   0.61988678  0.54785462  0.71650449 -1.1644426 ]
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For  [-0.94211297 -0.1995074   0.35973077  0.44111446 -1.27372512]
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For  [-0.62982417  1.5210264   0.17309725  0.29051769  0.74444981]
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For  [-0.31035695  0.50610859 -0.21791418 -0.24856878  1.09496985]
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For  [-0.00852424  0.52217886  0.06121852  0.10198355  0.25006073]
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For  [-1.25061418  2.48225331  0.70656156  1.00550997 -0.08921492]
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For  [-1.87010319  1.55651908  0.400804    0.57756936  0.07399097]
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For  [ 0.37565182 -0.97436512  0.03519707 -0.00305206 -0.92613094]
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For  [ 1.07414561  0.29648831 -0.29323578 -0.35309755  1.15064413]
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For  [ 0.14270651 -1.02301498 -0.47718368 -0.64745874  0.60872307]
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For  [ 0.85692288  0.60055406  0.44889781  0.5915684  -0.87635523]
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For  [-0.04948513  0.64864194  0.19400007  0.27448942 -0.05211935]
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For  [ 1.84362104 -1.87343389  0.05299604 -0.02426114 -1.73555413]
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For  [ 0.4667151   0.12100056 -0.00192809  0.00344006  0.1074984 ]
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For  [-0.04836249  0.16131903  0.40163473  0.51108635 -1.09970837]
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For  [-0.61402129  0.38221387  0.29384162  0.3867041  -0.58279794]
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For  [-1.61587095  0.99839244  0.44127034  0.60126492 -0.51894952]
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For  [-0.34021969 -0.03309069  0.1994369   0.24830814 -0.64109197]
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For  [-1.42704956  0.76204161  0.55513034  0.73250143 -1.06749098]
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For  [ 0.76757891 -0.18149365  0.22339785  0.27115073 -0.83934842]
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For  [ 0.87923918 -0.16823529 -0.12193776 -0.16093945  0.23376889]
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For  [ 0.68164562 -2.22957808 -0.10942725 -0.24502634 -1.53501529]
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For  [ 1.24368858  0.18727708  0.45493104  0.579127   -1.24181762]
probability is 0.007304422285230007
For  [-0.33607862 -0.91606347  0.3423153   0.38461214 -1.82165267]
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For  [-1.14156723  0.54962741 -0.13370375 -0.14094048  0.87253309]
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For  [ 1.0819981   1.02924911  0.38632785  0.53391118 -0.32408708]
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For  [-0.30098373  1.62638193  0.52621724  0.73810289 -0.25304065]
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For  [-0.60560638  0.61345176  0.01370786  0.04686643  0.47278255]
probability is 0.8720910402643632
For  [ 2.84885596  0.76552467  0.23788303  0.33513494 -0.08895726]
probability is 0.44402310537899314
For  [-0.70466754 -0.40417164  0.03625329  0.02586731 -0.45075305]
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For  [ 1.30537483  0.53368397 -0.04761364 -0.03383464  0.59440272]
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For  [ 0.79650391  0.94145514  0.45862241  0.62025278 -0.62010494]
probability is 0.04537787737967357
For  [ 1.49588941 -2.48726918 -0.10220543 -0.24844841 -1.77353253]
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For  [ 0.80190017  0.67966314  0.44993602  0.59669802 -0.81314302]
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For  [ 0.78379253  0.75166474  0.49356019  0.65484713 -0.88685876]
probability is 0.01784249837518854
For  [-1.16500432  1.30741389  0.42480348  0.59558651 -0.20891441]
probability is 0.14247084897540682
For  [-0.26977093  0.91827504  0.00546812  0.05129404  0.75399336]
probability is 0.9456315793891431
For  [0.21068042 0.8463168  0.03721481 0.08759248 0.59596236]
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For  [-0.0254071   0.80665907  0.53781837  0.71296758 -0.97680026]
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For  [ 1.91773318  0.4240524   0.47750379  0.61887167 -1.11248257]
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For  [-0.1184243   0.5813142   0.4627382   0.60798031 -0.93506781]
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For  [ 0.58342499 -0.14059539  0.03935965  0.0425162  -0.23905732]
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For  [ 0.52383418 -1.09626506 -0.01964744 -0.07767605 -0.85979519]
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For  [ 0.18313532 -1.16412335  0.00462226 -0.05054843 -0.99139113]
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For  [ 0.22612009 -0.56632852 -0.08612831 -0.13533413 -0.21051695]
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For  [ 0.14951604  0.0497888   0.40364721  0.50821038 -1.19951678]
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For  [ 1.40000738  0.18219484  0.27586828  0.35450173 -0.69542363]
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For  [ 1.18366548 -1.01281665  0.03262311 -0.00813838 -0.95049201]
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For  [ 1.33174202 -2.30706996 -0.07915239 -0.21084003 -1.69316504]
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For  [-0.09072009 -1.22084319 -0.22006103 -0.33483881 -0.34804843]
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For  [0.83242364 1.08741263 0.02190316 0.08007421 0.84542751]
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For  [ 1.29723309 -0.9035474   0.21574549  0.22661626 -1.42191466]
probability is 0.009627721622948813
For  [-0.32479989  0.19505772  0.01936045  0.03370039  0.10419544]
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probability is 0.996114742736956
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For  [ 0.48427833  0.14479035 -0.31248866 -0.38456464  1.08251448]
probability is 0.9942003416537154
For  [ 1.67008746 -1.03336017 -0.01530248 -0.06918706 -0.82035397]
probability is 0.134276970523436
For  [ 1.19417845  0.51940025 -0.20452061 -0.23114233  1.06493861]
probability is 0.9915092688976899
For  [-0.97791005 -1.71644011 -0.67054632 -0.9233168   0.62129073]
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For  [-0.73088708  0.28713878 -0.10280079 -0.11492048  0.5571637 ]
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For  [ 0.9415606  -1.86329885 -0.04329272 -0.14442778 -1.43093613]
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For  [ 0.96414873  0.52290311  0.44827676  0.58703208 -0.93962632]
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For  [ 0.57574496  0.59799453  0.33117712  0.44393153 -0.51648496]
probability is 0.09275141080196884
For  [ 1.13326766  0.77866597 -0.08379628 -0.06731776  0.91131312]
probability is 0.9784991346864537

For  [ 0.02989763  0.54180024 -0.24797996 -0.28451611  1.2173891 ]
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For  [ 0.82448985 -2.07073945 -0.18418899 -0.33102113 -1.17177467]
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For  [ 0.11384518  1.11213546  0.42888996  0.59125622 -0.38539993]
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For  [ 0.09205615 -2.2597757  -0.1373615  -0.28149157 -1.47445909]
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For  [-1.22113082  1.71455658  0.56909468  0.796099   -0.31088415]
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probability is 0.36790572150216383
For  [-0.47833965 -0.64795672  0.09335647  0.08562339 -0.83099432]
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For  [-0.49457178  0.57925312  0.26174512  0.35602091 -0.31869698]
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For  [-0.88160143  0.01458756  0.2034893   0.25569361 -0.61353248]
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For  [-0.77502869  1.14476666  0.41722789  0.57822202 -0.32214538]
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For  [-0.40142769 -3.1541345  -0.27025867 -0.49130644 -1.81650267]
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For  [-0.14133048 -3.45409    -0.79724206 -1.16617386 -0.44769052]
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For  [-0.01879843 -0.21270515  0.008838    0.00078032 -0.20572572]
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For  [-0.95620766  1.20392773  0.5187989   0.70836148 -0.58483972]
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For  [-0.20606604 -0.41331837  0.31530256  0.37509465 -1.31657297]
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For  [ 0.80650333  0.59231452  0.37327531  0.49640887 -0.65071463]
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For  [ 0.66305577  0.73844128 -0.036261   -0.00969921  0.73136598]
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For  [-0.54877051  0.38714717 -0.10046675 -0.10715561  0.63393402]
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For  [-0.77208586 -1.06310033 -0.02580914 -0.08379205 -0.81300771]
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For  [-1.5403491  -1.43740172  0.10025204  0.05605704 -1.51486775]
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For  [-0.04222591  0.69461132  0.37131769  0.49890672 -0.55882554]
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For  [-0.6792445  -0.55788917  0.04000537  0.02312942 -0.59132357]
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probability is 0.09208346625278231
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For  [ 1.06633309  0.39221729 -0.044273   -0.03649517  0.46538093]
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For  [ 0.15084186  1.00123396  0.5024729   0.67809392 -0.70477658]
probability is 0.02803432627570976
For  [-2.39067782  1.48759639  0.14483005  0.25347881  0.80331662]
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For  [-0.90775649  1.626196    0.50623903  0.71305966 -0.19175901]
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For  [-0.36481277  1.43334177  0.54527917  0.75264631 -0.47370037]
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For  [ 2.08013432 -0.98573921 -0.0562176  -0.11815209 -0.65455689]
probability is 0.2453258381236921
For  [-0.03126766 -1.32252422 -0.58429883 -0.79617764  0.68671633]
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For  [-0.76908835 -1.91719609 -0.65592258 -0.9147082   0.40780275]
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For  [ 0.44807911 -0.14427809  0.22382903  0.27349217 -0.80943531]
probability is 0.05568984421441911
For  [ 0.76946597  1.25163562  0.54770413  0.74689087 -0.63368361]
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For  [-1.49007673  1.12600231  0.53569377  0.72576066 -0.70220678]
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For  [ 0.41338896 -0.81161882 -0.10373404 -0.16926685 -0.36227429]
probability is 0.4390316845985776
For  [-1.00548079 -2.23511545  0.08314566 -0.00398579 -2.13187036]
probability is 0.001300610231684
For  [-0.42671381 -2.01263768 -0.69701371 -0.97081763  0.45405301]
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For  [ 1.65184488  0.16567136  0.41429336  0.52715922 -1.13498323]
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For  [-1.13270004  1.4536559  -0.1182488  -0.07782168  1.58385591]
probability is 0.9972055698330003
For  [ 0.41189762  1.33651527 -0.0255553   0.03266105  1.20047262]
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For  [ 2.79877759 -2.21661804 -0.16161637 -0.30979605 -1.36364271]
probability is 0.05185346085636759
For  [-0.37471594 -1.24169047  0.1437682   0.120058   -1.48440818]
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For  [-0.71607053 -1.51844028 -0.15705356 -0.27028855 -0.79161714]
probability is 0.17893006611822082
For  [ 0.64827383  0.84508415 -0.2372065  -0.25633801  1.43883767]
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For  [-1.00132591 -0.34792511  0.08191276  0.08580428 -0.54395274]
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For  [1.43271076 0.7461023  0.00533167 0.04279036 0.60988947]
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For  [-1.00611527  0.91942971  0.4567587   0.61685143 -0.63286196]
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For  [-0.57409978 -2.24178489  0.01997553 -0.08346556 -1.94320577]
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For  [-0.13898987 -1.68592294 -0.33084654 -0.49617013 -0.39774948]
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For  [ 0.19387875 -0.14342074 -0.04175951 -0.05926903  0.00803151]
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For  [-0.24109419  0.80218057  0.38592194  0.52241303 -0.51344237]
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probability is 0.06719268258363509

For  [-0.83969049  0.11209876  0.33947818  0.43081733 -0.94987835]
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For  [-0.19770384  1.3318945   0.62198533  0.8438552  -0.79474567]
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For  [ 0.73022495 -0.21280917  0.0734732   0.08176812 -0.40458146]
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For  [-0.33222381  1.4039752   0.60154781  0.82173394 -0.67139023]
probability is 0.020783457687853214
For  [-0.95524076  0.28821615  0.3643326   0.47048542 -0.87847686]
probability is 0.025138815378068835
For  [ 0.85223639  0.5318241   0.36008681  0.4769551  -0.66093315]
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For  [ 0.55302338  1.31916822 -0.00550869  0.05694143  1.1242633 ]
probability is 0.9840452041473557
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For  [-0.62777181  0.29780123  0.33284245  0.43148976 -0.77359144]
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For  [-0.35363873  1.05839644  0.62830295  0.83853508 -1.04375079]
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For  [ 1.76978583  0.9357938   0.4391341   0.59555845 -0.56492601]
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For  [ 0.06099195 -1.23503075 -0.4940778  -0.67888936  0.48270833]
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For  [-0.08695384 -1.25860469 -0.06340983 -0.14037048 -0.86148503]
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For  [-0.74414153  0.32891993  0.35106018  0.45582403 -0.80349391]
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For  [ 0.34212161 -1.12687426 -0.24915014 -0.36674184 -0.17971414]
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For  [ 1.57910435  0.4963455   0.58743227  0.76011923 -1.38985494]
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For  [-0.18698114  0.99075389  0.07935752  0.14739087  0.58760556]
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For  [ 1.08158141 -1.05155466  0.05805644  0.02185669 -1.06122252]
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For  [-1.11350905  0.79523735  0.47834532  0.63789053 -0.80349417]
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For  [ 1.06808044  0.32351293  0.31783826  0.41393274 -0.70586737]
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For  [-1.01915788 -2.20836104 -0.05321956 -0.17356696 -1.69005736]
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probability is 0.02222977322211151
For  [-0.22009159 -0.31026388 -0.39042954 -0.50425393  0.94022402]
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For  [ 0.47416651 -1.24005935 -0.05734151 -0.13186886 -0.86457941]
probability is 0.11738739308172186
For  [ 0.01155872  0.51066934  0.35764853  0.47287592 -0.67119239]
probability is 0.051131430796771515
For  [ 0.82089708  0.74828413 -0.22045696 -0.24003442  1.30607402]
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For  [-0.7209059  -0.18151884 -0.32492838 -0.41594507  0.84686241]
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For  [-0.08714665  0.85945809 -0.03724151 -0.00507097  0.83596398]
probability is 0.9640390787933043
For  [ 1.54058872e+00 -1.03142524e+00  3.69631935e-04 -4.94550615e-02
 -8.66925210e-01] probability is 0.11037309498997847
For  [-0.11584188 -0.57533642  0.24648434  0.28101892 -1.24094032]
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For  [-1.28847668  0.31002681  0.3371152   0.43743552 -0.77646888]
probability is 0.03742535787182635
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probability is 0.3940814543146112
For  [ 0.61645916  0.22564191  0.21056855  0.27477892 -0.45814172]
probability is 0.16084897536477755
For  [-0.41605999 -0.32671063  0.22674077  0.26831155 -0.97152525]
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For  [ 0.86169853 -1.3594315   0.04303688 -0.01186437 -1.27346872]
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For  [-0.47923326  1.21035676  0.36407319  0.51478952 -0.10362521]
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For  [-0.59567778  0.8550168  -0.04378458 -0.01348488  0.85235739]
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For  [ 0.67049821 -1.11007502 -0.49364105 -0.67229456  0.5862543 ]
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For  [ 0.55622066  0.80821416  0.26148216  0.3667725  -0.12569614]
probability is 0.3104098936440664
For  [ 0.38119637 -0.26374287 -0.16752781 -0.22268958  0.29379903]
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For  [ 0.22210957  0.87301234  0.47861964  0.64199838 -0.73905268]
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For  [0.08571252 0.21099659 0.02033086 0.0356878  0.11459043]
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For  [1.1263315  1.97660383 0.47540212 0.69137747 0.19720752]
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For  [-0.15540969 -2.23860522 -0.08506342 -0.21493349 -1.61751728]
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For  [ 0.21498933 -1.97343623 -0.08668924 -0.20413729 -1.38993202]
probability is 0.02574298092431685
For  [ 1.19582964  0.60370333  0.37095738  0.49405552 -0.63402657]
probability is 0.06219811871817626
For  [0.11231555 1.34393334 0.01551794 0.08448796 1.08038956]
probability is 0.9794652646843177
For  [ 1.2394407   0.0679781   0.03246194  0.04396724 -0.0427666 ]
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For  [ 0.69428442  1.06116801  0.53388649  0.72035819 -0.7510715 ]
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For  [-0.57244694 -1.20398593  0.09643428  0.06256979 -1.30719571]
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For  [ 1.42070526 -0.45112461 -0.37726909 -0.49458017  0.78151265]
probability is 0.9891374945203463
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For  [ 0.2944533   1.36688023 -0.06622603 -0.01683289  1.35103331]
probability is 0.9935543417593081
For  [ 0.98547179 -1.61731684  0.33406989  0.34034121 -2.38493509]
probability is 0.00029866132356369
For  [ 0.7221195  -1.76345295 -0.61930976 -0.86138878  0.42426323]
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For  [-1.32704099  0.45701346  0.51274506  0.66462689 -1.19318991]
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For  [ 1.6075335  -0.84565129 -0.47335035 -0.63407136  0.74581551]
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For  [ 0.31783045 -2.51723704  0.03721269 -0.07519724 -2.22743132]
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For  [-2.48672174  0.63008427  0.51969753  0.68171504 -1.06929307]
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For  [ 1.07358173 -0.4333928  -0.37094476 -0.48579713  0.7769481 ]
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For  [-0.35918607  0.7254096   0.44135015  0.58815329 -0.74833944]
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For  [-0.94687401 -1.23157388 -0.52298806 -0.71494882  0.57451592]
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For  [ 0.06341753 -1.07150495 -0.05215037 -0.11720638 -0.73905716]
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For  [-2.33264431 -1.1351693   0.19363773  0.18770366 -1.5483538 ]
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For  [-1.92154746  1.07344954  0.41624708  0.57354143 -0.37899345]
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For  [-0.12953873  0.01227074  0.08909409  0.11223556 -0.26368509]
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For  [-1.86877859 -0.30334065 -0.34172612 -0.44288977  0.79626099]
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For  [ 1.55488166  0.46238695  0.49353381  0.64081379 -1.12960025]
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For  [-7.27851195e-01 -1.18437597e+00  4.55078089e-02 -2.95892304e-04
 -1.13412406e+00] probability is 0.03470293828993702
For  [ 0.01973588 -0.40697906  0.23269651  0.27188977 -1.05721867]
probability is 0.024377647695555404
For  [ 0.09875869  0.3514713   0.22622063  0.30048198 -0.40065312]
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For  [-0.79098     0.52027362  0.36969882  0.48844067 -0.70018793]
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For  [ 0.65751539 -3.91151666 -0.8818165  -1.29429032 -0.57157268]
probability is 0.8350494310247993
For  [ 0.87832839  1.8280486  -0.10394483 -0.04177811  1.85413676]
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For  [ 1.09284217  0.61639026  0.37950113  0.5053755  -0.64965107]
probability is 0.056879696072295906
For  [ 1.31195864 -0.594573   -0.01002452 -0.04133724 -0.46826267]
probability is 0.30822001678837474
For  [0.14828445 1.78788058 0.48180695 0.69026952 0.01909499]
probability is 0.22742664895951734
For  [-0.07979567  0.19767269  0.07151252  0.09917748 -0.05398941]
probability is 0.5176002757978001
For  [ 0.23569914 -1.51551389 -0.55242917 -0.76558271  0.4267122 ]
probability is 0.9791775271214282
For  [ 0.22811421 -0.36697064  0.32322361  0.38726343 -1.30202731]
```

```
probability is 0.00844856977597563
For  [-0.55951598  0.28271876  0.25159016  0.32894449 -0.53638194]
probability is 0.10440445597685195
For  [1.33240524 1.79162974 0.22219715 0.36514009 0.8206032 ]
probability is 0.9160032716400605
For  [ 1.0447783  -0.81492497 -0.14793958 -0.22481978 -0.22910707]
probability is 0.6002990617119859
For  [-0.6988881   1.23954201 -0.08684893 -0.04883779  1.30756463]
probability is 0.9927292474340007
For  [-0.91027606  0.53984292 -0.0705222  -0.06224273  0.6700218 ]
probability is 0.9450694598831332
For  [ 0.76700611 -0.43629931  0.10313483  0.10812008 -0.68339777]
probability is 0.12295603680723273
For  [-0.65901463 -0.00192831 -0.03593199 -0.04511885  0.10888068]
probability is 0.7202833595349037
For  [-1.74674071 -0.23113305  0.48701978  0.59908669 -1.69171559]
probability is 0.0012789218621998945
For  [-0.06043946  1.17349498 -0.06910388 -0.0297984   1.19755391]
probability is 0.9894831155715407
For  [-0.10319527 -0.80094616 -0.45205063 -0.60521758  0.71783981]
probability is 0.9882287768788881
For  [ 0.87192989  0.72614222  0.47239294  0.62708772 -0.84318833]
probability is 0.02224990048475814
For  [-0.51386932 -0.87174456 -0.01591302 -0.06213035 -0.68281469]
probability is 0.1606314486100648
For  [-1.46882835  0.13815188 -0.27227731 -0.33449805  0.95328275]
probability is 0.9888112423222196
For  [ 0.46931227 -0.21280917  0.1338457   0.15741947 -0.59024109]
probability is 0.140562530632814
For  [ 1.05333537  0.61644958 -0.05470879 -0.03871977  0.68569624]
probability is 0.9521139424091299
For  [ 0.47439973  0.54728277  0.4763536   0.62339441 -1.00550468]
probability is 0.012684296342330807
For  [ 0.26956222  0.66766041 -0.11658913 -0.11378208  0.91897968]
probability is 0.9797332210125699
For  [ 0.55671209  1.32358171  0.45720309  0.63696817 -0.29497939]
probability is 0.11320039092505797
For  [ 0.66093272 -1.51382144 -0.10208762 -0.2011885  -0.95677321]
probability is 0.10510796822762986
For  [-0.305302   -0.11586563  0.2615508   0.32213551 -0.9015889 ]
probability is 0.03474533683455363
For  [-1.04689032 -0.49760745 -0.00965913 -0.0361865  -0.38799249]
probability is 0.3202698442293771
For  [-0.51729484 -1.25728701  0.0593754   0.01355255 -1.23797239]
probability is 0.024224954789945106
For  [-0.04510433  0.60958112 -0.0476168  -0.03016537  0.65812123]
probability is 0.9410810955539152
For  [-1.22946303  0.78361938  0.17833383  0.26139098  0.1093594 ]
probability is 0.5325377142244766
```

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For  [ 0.15786322  0.24588685  0.17847529  0.23554342 -0.34245361]
probability is 0.22869008104231614
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