1) KS Test

Given p(x) = 2x
Let this target distribution be Y.
Given threshold C = 0.25

Given Samples X = {0.592, 0.774, 0.245, 0.424, 0.685, 0.436, 0.648, 0.959, 0.842, 0.995}.

Null Hypothesis H_0: The given samples X follow the distribution Y.
Alternate Hypothesis H_1: The given samples X do not follow the distribution Y.

CDF of Y = $F_Y(X) = Pr(X<x)$

$= \int_0^x p(x)\,dx$

$= \int_0^x 2x\,dx$

$= 2(x^2 / 2)$

$= x^2$

X	$F_Y(X) = X^2$	$F^{\wedge -}(X)$	$F^{\wedge +}(X)$	$\lvert F(X) - F^{\wedge -}(X) \rvert$	$\lvert F(X) - F^{\wedge +}(X) \rvert$
0.245	0.06	0	0.1	0.06	0.04
0.424	0.179	0.1	0.2	0.079	0.02
0.436	0.19	0.2	0.3	0.01	0.11
0.592	0.35	0.3	0.4	0.05	0.05
0.648	0.42	0.4	0.5	0.02	0.08
0.685	0.47	0.5	0.6	0.03	0.13
0.774	0.59	0.6	0.7	0.01	0.11
0.842	0.709	0.7	0.8	0.0089	0.091
0.959	0.92	0.8	0.9	0.12	0.02
0.995	0.99	0.9	1	0.1	0.01

$\text{Max} (F_Y(X) - F^{\wedge}(X)) = 0.13$

$\text{Max} (F_Y(X) - F^{\wedge}(X)) < C$

Therefore, the null hypothesis is accepted.

2) Permutation Test

Should we consider/not consider the repeated permutations while performing the permutations test?

Actually, it does not matter if we consider/did not consider the repeated permutations, as the obtained p_value will be same in both scenarios.

How?
Consider a permutation [a,b,a,c]. This permutation will be repeated two times. Let m and n be the lengths of the two samples we consider in this scenario. We have to note that if [a,b,a,c] is repeated two times, symmetrically [c,a,b,a] is also repeated two times. If T is greater than T_{obs} in first case, then T will be less than or equal to T_{obs} is the second case. This is true in all the possible cases of m and n i.e $m>n$, $m<n$, $m=n$.
So, if we remove all the repeated permutations, if one 1 is removed, one 0 will also be removed. So, the final $Pr(T>T_{obs})$ will not change.
Therefore we can conclude that the P_Value is irrespective of the decision that we are including/not including the duplicate permutations. So to reduce the calculational complexity, it is advised not to include the duplicate permutations.

Given Problem

Given X = {3,2} and Y = {2,5}
Let us use the difference of the means of the distributions as the measure for this experiment.

$X_{mean} = 2.5$
$Y_{mean} = 3.5$

Null Hypothesis H_0: The two samples follow similar distributions
Alternate Hypothesis H_1: The two samples do not follow similar distributions.

T_{obs} = | 2.5 - 3.5 | = 1

Let us generate all the permutations of these distributions(exclusing the repeated permutations. These repetitions are caused by the element 2, which is repeated twice).

Index	X	Y	X_mean	Y_mean	T = |X_mean - Y_mean |	I (T > T_obs)
0	[3, 2]	[2, 5]	2.5	3.5	1	0
1	[3, 2]	[5, 2]	2.5	3.5	1	0
2	[3, 5]	[2, 2]	4	2	2	1
3	[2, 3]	[2, 5]	2.5	3.5	1	0
4	[2, 3]	[5, 2]	2.5	3.5	1	0
5	[2, 2]	[3, 5]	2	4	2	1
6	[2, 2]	[5, 3]	2	4	2	1
7	[2, 5]	[3, 2]	3.5	2.5	1	0
8	[2, 5]	[2, 3]	3.5	2.5	1	0
9	[5, 3]	[2, 2]	4	2	2	1
10	[5, 2]	[3, 2]	3.5	2.5	1	0
11	[5, 2]	[2, 3]	3.5	2.5	1	0
Total						4

P_Value = 4/12 = 0.33
P_Value >0.05

Therefore the Null Hypothesis is Accepted.