Matlab Array Draw Random Index and Find Combinations or Permuations

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Matlab Draw Random with and without Replacement

```
%Generate a matrix named foo, with limited numbers
rng(1234);
foo = unique((round((randn(5,1)+1)*100)));
disp(foo);
```

```
     5
    78
   154
   219
   232
```

```
% draw 10 random samples without replacement
index = randsample(1:length(foo), 4);
bar_rand_noreplace = foo(index,:);

% draw 1000 random samples with replacement
index = randsample(1:length(foo), 4, true);
bar_rand_replace = foo(index,:);

% Display
disp(table(bar_rand_noreplace, bar_rand_replace));
```

bar_rand_noreplace	bar_rand_replace
5	78
78	154
154	219
232	219

Matrix Meshgrid to Loop Permutated Vectors

Meshgrid to generate all permutations of arrays.

```
k = linspace(1,10,10);
kp = linspace(1,10,10);
z = linspace(0,1,10);

[kM kpM zM] = meshgrid(k,kp,z);
kMVec = kM(:);
kMpVec = kpM(:);
zMVec = zM(:);

outputVec = zeros(size(zMVec));
for a=1:length(zMVec)
     outputVec(a) = kMVec(a)+kMpVec(a)+zMVec(a);
```

```
end

outputTens = reshape(outputVec,size(kM));
disp(outputTens);
```

```
(:,:,1) =

     2     3     4     5     6     7     8     9    10    11
     3     4     5     6     7     8     9    10    11    12
     4     5     6     7     8     9    10    11    12    13
     5     6     7     8     9    10    11    12    13    14
     6     7     8     9    10    11    12    13    14    15
     7     8     9    10    11    12    13    14    15    16
     8     9    10    11    12    13    14    15    16    17
     9    10    11    12    13    14    15    16    17    18
    10    11    12    13    14    15    16    17    18    19
    11    12    13    14    15    16    17    18    19    20


(:,:,2) =

    2.1111    3.1111    4.1111    5.1111    6.1111    7.1111    8.1111    9.1111   10.1111   11.1111
    3.1111    4.1111    5.1111    6.1111    7.1111    8.1111    9.1111   10.1111   11.1111   12.1111
    4.1111    5.1111    6.1111    7.1111    8.1111    9.1111   10.1111   11.1111   12.1111   13.1111
    5.1111    6.1111    7.1111    8.1111    9.1111   10.1111   11.1111   12.1111   13.1111   14.1111
    6.1111    7.1111    8.1111    9.1111   10.1111   11.1111   12.1111   13.1111   14.1111   15.1111
    7.1111    8.1111    9.1111   10.1111   11.1111   12.1111   13.1111   14.1111   15.1111   16.1111
    8.1111    9.1111   10.1111   11.1111   12.1111   13.1111   14.1111   15.1111   16.1111   17.1111
    9.1111   10.1111   11.1111   12.1111   13.1111   14.1111   15.1111   16.1111   17.1111   18.1111
   10.1111   11.1111   12.1111   13.1111   14.1111   15.1111   16.1111   17.1111   18.1111   19.1111
   11.1111   12.1111   13.1111   14.1111   15.1111   16.1111   17.1111   18.1111   19.1111   20.1111


(:,:,3) =

    2.2222    3.2222    4.2222    5.2222    6.2222    7.2222    8.2222    9.2222   10.2222   11.2222
    3.2222    4.2222    5.2222    6.2222    7.2222    8.2222    9.2222   10.2222   11.2222   12.2222
    4.2222    5.2222    6.2222    7.2222    8.2222    9.2222   10.2222   11.2222   12.2222   13.2222
    5.2222    6.2222    7.2222    8.2222    9.2222   10.2222   11.2222   12.2222   13.2222   14.2222
    6.2222    7.2222    8.2222    9.2222   10.2222   11.2222   12.2222   13.2222   14.2222   15.2222
    7.2222    8.2222    9.2222   10.2222   11.2222   12.2222   13.2222   14.2222   15.2222   16.2222
    8.2222    9.2222   10.2222   11.2222   12.2222   13.2222   14.2222   15.2222   16.2222   17.2222
    9.2222   10.2222   11.2222   12.2222   13.2222   14.2222   15.2222   16.2222   17.2222   18.2222
   10.2222   11.2222   12.2222   13.2222   14.2222   15.2222   16.2222   17.2222   18.2222   19.2222
   11.2222   12.2222   13.2222   14.2222   15.2222   16.2222   17.2222   18.2222   19.2222   20.2222


(:,:,4) =

    2.3333    3.3333    4.3333    5.3333    6.3333    7.3333    8.3333    9.3333   10.3333   11.3333
    3.3333    4.3333    5.3333    6.3333    7.3333    8.3333    9.3333   10.3333   11.3333   12.3333
    4.3333    5.3333    6.3333    7.3333    8.3333    9.3333   10.3333   11.3333   12.3333   13.3333
    5.3333    6.3333    7.3333    8.3333    9.3333   10.3333   11.3333   12.3333   13.3333   14.3333
    6.3333    7.3333    8.3333    9.3333   10.3333   11.3333   12.3333   13.3333   14.3333   15.3333
    7.3333    8.3333    9.3333   10.3333   11.3333   12.3333   13.3333   14.3333   15.3333   16.3333
    8.3333    9.3333   10.3333   11.3333   12.3333   13.3333   14.3333   15.3333   16.3333   17.3333
    9.3333   10.3333   11.3333   12.3333   13.3333   14.3333   15.3333   16.3333   17.3333   18.3333
   10.3333   11.3333   12.3333   13.3333   14.3333   15.3333   16.3333   17.3333   18.3333   19.3333
   11.3333   12.3333   13.3333   14.3333   15.3333   16.3333   17.3333   18.3333   19.3333   20.3333


(:,:,5) =

    2.4444    3.4444    4.4444    5.4444    6.4444    7.4444    8.4444    9.4444   10.4444   11.4444
```

```
    3.4444    4.4444    5.4444    6.4444    7.4444    8.4444    9.4444   10.4444   11.4444   12.4444
    4.4444    5.4444    6.4444    7.4444    8.4444    9.4444   10.4444   11.4444   12.4444   13.4444
    5.4444    6.4444    7.4444    8.4444    9.4444   10.4444   11.4444   12.4444   13.4444   14.4444
    6.4444    7.4444    8.4444    9.4444   10.4444   11.4444   12.4444   13.4444   14.4444   15.4444
    7.4444    8.4444    9.4444   10.4444   11.4444   12.4444   13.4444   14.4444   15.4444   16.4444
    8.4444    9.4444   10.4444   11.4444   12.4444   13.4444   14.4444   15.4444   16.4444   17.4444
    9.4444   10.4444   11.4444   12.4444   13.4444   14.4444   15.4444   16.4444   17.4444   18.4444
   10.4444   11.4444   12.4444   13.4444   14.4444   15.4444   16.4444   17.4444   18.4444   19.4444
   11.4444   12.4444   13.4444   14.4444   15.4444   16.4444   17.4444   18.4444   19.4444   20.4444


(:,:,6) =

    2.5556    3.5556    4.5556    5.5556    6.5556    7.5556    8.5556    9.5556   10.5556   11.5556
    3.5556    4.5556    5.5556    6.5556    7.5556    8.5556    9.5556   10.5556   11.5556   12.5556
    4.5556    5.5556    6.5556    7.5556    8.5556    9.5556   10.5556   11.5556   12.5556   13.5556
    5.5556    6.5556    7.5556    8.5556    9.5556   10.5556   11.5556   12.5556   13.5556   14.5556
    6.5556    7.5556    8.5556    9.5556   10.5556   11.5556   12.5556   13.5556   14.5556   15.5556
    7.5556    8.5556    9.5556   10.5556   11.5556   12.5556   13.5556   14.5556   15.5556   16.5556
    8.5556    9.5556   10.5556   11.5556   12.5556   13.5556   14.5556   15.5556   16.5556   17.5556
    9.5556   10.5556   11.5556   12.5556   13.5556   14.5556   15.5556   16.5556   17.5556   18.5556
   10.5556   11.5556   12.5556   13.5556   14.5556   15.5556   16.5556   17.5556   18.5556   19.5556
   11.5556   12.5556   13.5556   14.5556   15.5556   16.5556   17.5556   18.5556   19.5556   20.5556


(:,:,7) =

    2.6667    3.6667    4.6667    5.6667    6.6667    7.6667    8.6667    9.6667   10.6667   11.6667
    3.6667    4.6667    5.6667    6.6667    7.6667    8.6667    9.6667   10.6667   11.6667   12.6667
    4.6667    5.6667    6.6667    7.6667    8.6667    9.6667   10.6667   11.6667   12.6667   13.6667
    5.6667    6.6667    7.6667    8.6667    9.6667   10.6667   11.6667   12.6667   13.6667   14.6667
    6.6667    7.6667    8.6667    9.6667   10.6667   11.6667   12.6667   13.6667   14.6667   15.6667
    7.6667    8.6667    9.6667   10.6667   11.6667   12.6667   13.6667   14.6667   15.6667   16.6667
    8.6667    9.6667   10.6667   11.6667   12.6667   13.6667   14.6667   15.6667   16.6667   17.6667
    9.6667   10.6667   11.6667   12.6667   13.6667   14.6667   15.6667   16.6667   17.6667   18.6667
   10.6667   11.6667   12.6667   13.6667   14.6667   15.6667   16.6667   17.6667   18.6667   19.6667
   11.6667   12.6667   13.6667   14.6667   15.6667   16.6667   17.6667   18.6667   19.6667   20.6667


(:,:,8) =

    2.7778    3.7778    4.7778    5.7778    6.7778    7.7778    8.7778    9.7778   10.7778   11.7778
    3.7778    4.7778    5.7778    6.7778    7.7778    8.7778    9.7778   10.7778   11.7778   12.7778
    4.7778    5.7778    6.7778    7.7778    8.7778    9.7778   10.7778   11.7778   12.7778   13.7778
    5.7778    6.7778    7.7778    8.7778    9.7778   10.7778   11.7778   12.7778   13.7778   14.7778
    6.7778    7.7778    8.7778    9.7778   10.7778   11.7778   12.7778   13.7778   14.7778   15.7778
    7.7778    8.7778    9.7778   10.7778   11.7778   12.7778   13.7778   14.7778   15.7778   16.7778
    8.7778    9.7778   10.7778   11.7778   12.7778   13.7778   14.7778   15.7778   16.7778   17.7778
    9.7778   10.7778   11.7778   12.7778   13.7778   14.7778   15.7778   16.7778   17.7778   18.7778
   10.7778   11.7778   12.7778   13.7778   14.7778   15.7778   16.7778   17.7778   18.7778   19.7778
   11.7778   12.7778   13.7778   14.7778   15.7778   16.7778   17.7778   18.7778   19.7778   20.7778


(:,:,9) =

    2.8889    3.8889    4.8889    5.8889    6.8889    7.8889    8.8889    9.8889   10.8889   11.8889
    3.8889    4.8889    5.8889    6.8889    7.8889    8.8889    9.8889   10.8889   11.8889   12.8889
    4.8889    5.8889    6.8889    7.8889    8.8889    9.8889   10.8889   11.8889   12.8889   13.8889
    5.8889    6.8889    7.8889    8.8889    9.8889   10.8889   11.8889   12.8889   13.8889   14.8889
    6.8889    7.8889    8.8889    9.8889   10.8889   11.8889   12.8889   13.8889   14.8889   15.8889
    7.8889    8.8889    9.8889   10.8889   11.8889   12.8889   13.8889   14.8889   15.8889   16.8889
    8.8889    9.8889   10.8889   11.8889   12.8889   13.8889   14.8889   15.8889   16.8889   17.8889
    9.8889   10.8889   11.8889   12.8889   13.8889   14.8889   15.8889   16.8889   17.8889   18.8889
   10.8889   11.8889   12.8889   13.8889   14.8889   15.8889   16.8889   17.8889   18.8889   19.8889
   11.8889   12.8889   13.8889   14.8889   15.8889   16.8889   17.8889   18.8889   19.8889   20.8889
```

```
(:,:,10) =

     3     4     5     6     7     8     9    10    11    12
     4     5     6     7     8     9    10    11    12    13
     5     6     7     8     9    10    11    12    13    14
     6     7     8     9    10    11    12    13    14    15
     7     8     9    10    11    12    13    14    15    16
     8     9    10    11    12    13    14    15    16    17
     9    10    11    12    13    14    15    16    17    18
    10    11    12    13    14    15    16    17    18    19
    11    12    13    14    15    16    17    18    19    20
    12    13    14    15    16    17    18    19    20    21
```

Given integer arrays, all possible combinations

given any sizes arrays, N of them, create all possible combinations

```
ar_it_a = 1:3;
ar_it_b = 1:2;
ar_it_c = 2:4;
ar_it_d = -1:-1:-2;
ar_it_e = 0.1;

cl_ar_all = {ar_it_a, ar_it_b, ar_it_c, ar_it_d, ar_it_e};
cl_mt_all = cl_ar_all;
[cl_mt_all{:}] = ndgrid(cl_ar_all{:});
mt_it_allcombo = cell2mat(cellfun(@(m) m(:), cl_mt_all, 'uni', 0));

disp(mt_it_allcombo)
```

```
    1.0000    1.0000    2.0000   -1.0000    0.1000
    2.0000    1.0000    2.0000   -1.0000    0.1000
    3.0000    1.0000    2.0000   -1.0000    0.1000
    1.0000    2.0000    2.0000   -1.0000    0.1000
    2.0000    2.0000    2.0000   -1.0000    0.1000
    3.0000    2.0000    2.0000   -1.0000    0.1000
    1.0000    1.0000    3.0000   -1.0000    0.1000
    2.0000    1.0000    3.0000   -1.0000    0.1000
    3.0000    1.0000    3.0000   -1.0000    0.1000
    1.0000    2.0000    3.0000   -1.0000    0.1000
    2.0000    2.0000    3.0000   -1.0000    0.1000
    3.0000    2.0000    3.0000   -1.0000    0.1000
    1.0000    1.0000    4.0000   -1.0000    0.1000
    2.0000    1.0000    4.0000   -1.0000    0.1000
    3.0000    1.0000    4.0000   -1.0000    0.1000
    1.0000    2.0000    4.0000   -1.0000    0.1000
    2.0000    2.0000    4.0000   -1.0000    0.1000
    3.0000    2.0000    4.0000   -1.0000    0.1000
    1.0000    1.0000    2.0000   -2.0000    0.1000
    2.0000    1.0000    2.0000   -2.0000    0.1000
    3.0000    1.0000    2.0000   -2.0000    0.1000
    1.0000    2.0000    2.0000   -2.0000    0.1000
    2.0000    2.0000    2.0000   -2.0000    0.1000
    3.0000    2.0000    2.0000   -2.0000    0.1000
    1.0000    1.0000    3.0000   -2.0000    0.1000
    2.0000    1.0000    3.0000   -2.0000    0.1000
    3.0000    1.0000    3.0000   -2.0000    0.1000
    1.0000    2.0000    3.0000   -2.0000    0.1000
    2.0000    2.0000    3.0000   -2.0000    0.1000
```

```
3.0000    2.0000    3.0000   -2.0000    0.1000
1.0000    1.0000    4.0000   -2.0000    0.1000
2.0000    1.0000    4.0000   -2.0000    0.1000
3.0000    1.0000    4.0000   -2.0000    0.1000
1.0000    2.0000    4.0000   -2.0000    0.1000
2.0000    2.0000    4.0000   -2.0000    0.1000
3.0000    2.0000    4.0000   -2.0000    0.1000
```