Program report

1. Trap.f90

Integer of x^2 from 0 to 2: right answer is 8/3 = 2.6666666….

```
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 3
 low:     0.00000000
 high:     2.00000000
 n: :              3
 dx is:    0.666666687
 the result is:     2.81481504
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 5
 low:     0.00000000
 high:     2.00000000
 n: :              5
 dx is:    0.400000006
 the result is:     2.72000027
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 10
 low:     0.00000000
 high:     2.00000000
 n: :             10
 dx is:    0.200000003
 the result is:     2.68000007
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 20
 low:     0.00000000
 high:     2.00000000
 n: :             20
 dx is:    0.100000001
 the result is:     2.67000008
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 30
 low:     0.00000000
 high:     2.00000000
 n: :             30
 dx is:     6.66666701E-02
 the result is:     2.66814876
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 60
 low:     0.00000000
 high:     2.00000000
 n: :             60
 dx is:     3.33333351E-02
 the result is:     2.66703749
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 100
 low:     0.00000000
 high:     2.00000000
 n: :            100
 dx is:     1.99999996E-02
 the result is:     2.66680026
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 200
 low:     0.00000000
 high:     2.00000000
 n: :            200
 dx is:     9.99999978E-03
 the result is:     2.66670012
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 400
 low:     0.00000000
 high:     2.00000000
 n: :            400
 dx is:     4.99999989E-03
 the result is:     2.66667414
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 800
 low:     0.00000000
 high:     2.00000000
 n: :            800
 dx is:     2.49999994E-03
 the result is:     2.66666842
[zhihangzhou@joes-MBP hw2 % ./trap 0 2 1000
 low:     0.00000000
 high:     2.00000000
 n: :           1000
 dx is:     2.00000009E-03
 the result is:     2.66666746
zhihangzhou@joes-MBP hw2 %
```

Conclusion: I think 1000 intervals will give a decent answer.

2. Integer of sin(x)dx from 0 to pi: the right answer is 2.

```
[zhihangzhou@joes-MBP hw2 % ./trap 0 3.14159265359 5
  low:    0.00000000
  high:    3.14159274
  n: :            5
  dx is:   0.628318548
  the result is:    1.93376553
[zhihangzhou@joes-MBP hw2 % ./trap 0 3.14159265359 10
  low:    0.00000000
  high:    3.14159274
  n: :           10
  dx is:   0.314159274
  the result is:    1.98352349
[zhihangzhou@joes-MBP hw2 % ./trap 0 3.14159265359 50
  low:    0.00000000
  high:    3.14159274
  n: :           50
  dx is:    6.28318563E-02
  the result is:    1.99934208
[zhihangzhou@joes-MBP hw2 % ./trap 0 3.14159265359 100
  low:    0.00000000
  high:    3.14159274
  n: :          100
  dx is:    3.14159282E-02
  the result is:    1.99983561
[zhihangzhou@joes-MBP hw2 % ./trap 0 3.14159265359 200
  low:    0.00000000
  high:    3.14159274
  n: :          200
  dx is:    1.57079641E-02
  the result is:    1.99995887
[zhihangzhou@joes-MBP hw2 % ./trap 0 3.14159265359 400
  low:    0.00000000
  high:    3.14159274
  n: :          400
  dx is:    7.85398204E-03
  the result is:    1.99998951
[zhihangzhou@joes-MBP hw2 % ./trap 0 3.14159265359 500
  low:    0.00000000
  high:    3.14159274
  n: :          500
  dx is:    6.28318544E-03
  the result is:    1.99999356
[zhihangzhou@joes-MBP hw2 % ./trap 0 3.14159265359 1000
  low:    0.00000000
  high:    3.14159274
  n: :         1000
  dx is:    3.14159272E-03
  the result is:    1.99999857
 zhihangzhou@joes-MBP hw2 %
```

Conclusion: I think 1000 intervals will give a decent answer.

2. ones.f90

Note: I assume all the elements out of the matrix are 0, demo the 0 around the random assigned array as well.

```
zhihangzhou@joes-MBP hw2 % ./ones
 row:
6
 colum:
6
 assume all elements not in array are 0s.
 row:           6
 colum:           6
 orignail matrix:
           0           0           0           0           0           0           0           0
           0           0           1           0           1           0           1           0
           0           0           1           1           0           1           0           0
           0           0           0           1           1           0           1           0
           0           0           1           1           0           0           0           0
           0           0           1           1           0           1           0           0
           0           0           0           1           0           0           0           0
           0           0           0           0           0           0           0           0
 solution:
           0           0           0           0           1           0
           0           1           0           0           0           1
           0           0           0           0           1           0
           0           0           0           0           1           0
           0           0           0           0           0           0
           0           1           0           1           0           0
zhihangzhou@joes-MBP hw2 %
```