Here is the list of exam 2 scores arranged by size.

```
In[246]:= exam2scores = {0, 0, 0, 0, 4, 5, 5, 6, 6, 6, 6, 6, 6, 7, 7, 7, 8, 8, 8, 8, 8,
          9, 9, 9, 9, 10, 10, 10, 10, 10, 10, 10, 10, 11, 11, 11, 11, 12, 12, 12,
          12, 12, 12, 12, 12, 12, 13, 13, 13, 13, 13, 13, 14, 14, 14, 14, 14, 14,
          14, 15, 15, 15, 15, 15, 15, 15, 15, 15, 16, 16, 16, 16, 16, 16, 16,
          16, 16, 17, 17, 17, 17, 17, 17, 17, 18, 18, 18, 18, 18, 18, 18, 18,
          18, 18, 18, 19, 19, 19, 19, 19, 19, 19, 19, 19, 19, 19, 19, 20, 20}
```

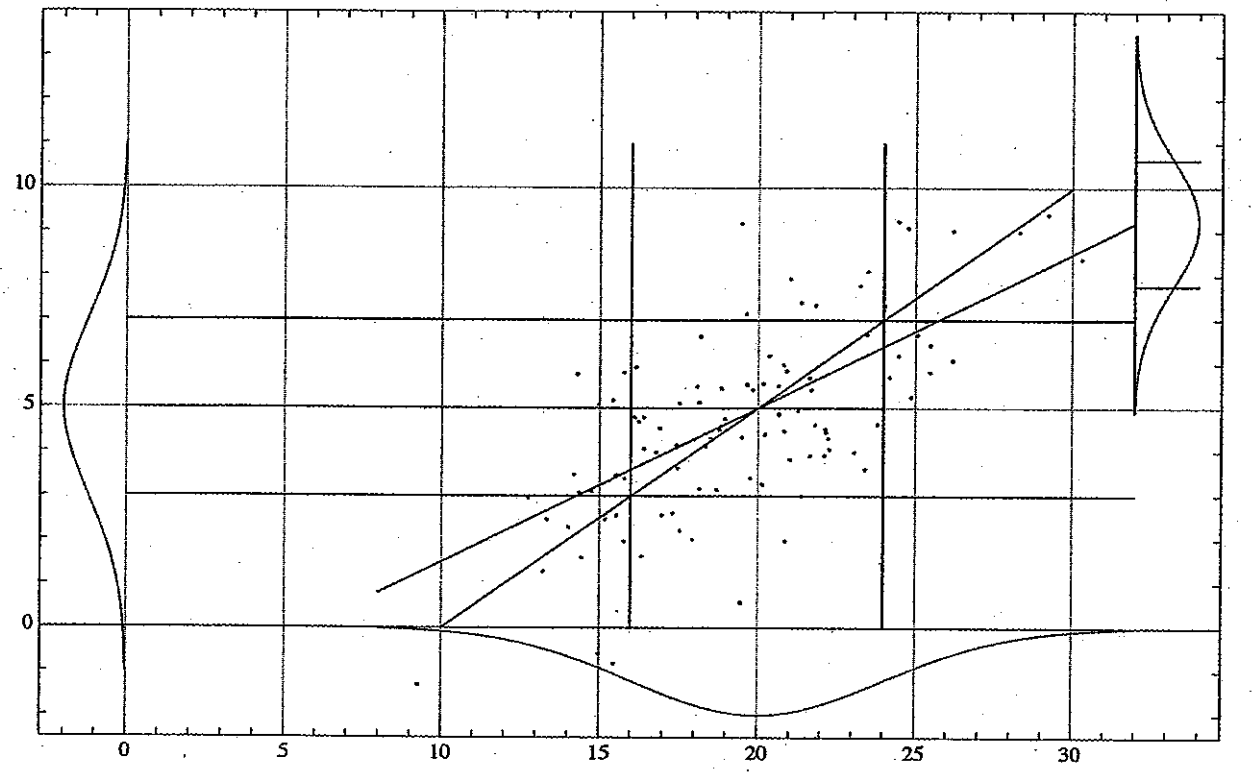
Your raw score (number correct) on exam 2 will be the last score in the scores reported to you by the registrar in a mailing that should come to you later today.

Here is the formula for converting your raw score into a GRADE.

exam 2 GRADE = 2.0 + 0.4 (exam 2 raw score - 12)

Questions 1 through 4 refer to the figure below. The distribution of (x, y) is 2 - dimensional normal (bi - variate normal) vaguely represented by a modest - sized sample of points (x, y). All curves plotted are for the population not for the sample.

EXAM 2



1. Determine the *population correlation* R of x, y .
a) 0.88 b) 0.70 c) 0.45 d) 0.54 e) 0.99

```
ITEM   1   TEST 7300   09 10 15

    1   2*   3    4    5 OMT NO   105
U   7  68   11   14    0    0 DIFF  51
L  18  21   18   21   21    0 DISC  46
```

2. Determine the *population standard deviation* σ_y of *y*.
a) 2 b) 5 c) 4 d) 1 e) 3

```
ITEM   2   TEST 7300   09 10 15

   1*   2    3    4    5 OMT NO   105
U  89   4    4    4    0    0 DIFF  32
L  25  43   14    4   14    0 DISC  64
```

3. Use the regression line to *predict* y conditional on x = 32 (choose c
a) 7 b) 8 c) 6 d) 5 e) 9

```
ITEM   3   TEST 7300   09 10 15

    1   2    3    4   5*OMT NO   105
U   0   0    0    0 100    0 DIFF   5
L   0  14    0    0  86    0 DISC  14
```

4. Determine standard deviation of *error of prediction* at x = 20 (not a typo).
a) 3.4 b) 4.4 c) 1.4 d) 2.4 e) 0.4 (choose closest answer)

```
ITEM   4   TEST 7300   09 10 15

    1   2   3*   4    5 OMT NO   105
U   0   4  93    0    4    0 DIFF  55
L  14  32  25   11   18    0 DISC  68
```

Questions 5-8 assume that score x in a particular population is distributed as normal with mean 10 and standard deviation 4.

5. Determine the standard score z of a person having x score 15.
a) 1.46 b) 0.9 c) 0.2 d) 1.25 e) 0.75

```
ITEM   5   TEST 7300   09 10 15

   1   2   3   4*  5 OMT NO   105
U  0   0   0 100   0   0 DIFF  11
L 11  11   7  61  11   0 DISC  39
```

6. Determine P(x < 15) (choose nearest answer).
a) 0.94 b) 0.52 c) 0.89 d) 0.97 e) 0.63

```
ITEM   6   TEST 7300   09 10 15

   1   2   3*  4   5 OMT NO   105
U  0   0 100   0   0   0 DIFF  11
L 11   4  64  14   7   0 DISC  36
```

7. Find the 90th percentile of *standard normal* z (use closest table entry).
a) 1.28 b) 1.04 c) 0.86 d) 0.71 e) 0.53

```
ITEM   7   TEST 7300   09 10 15

   1*  2   3   4   5 OMT NO   105
U100   0   0   0   0   0 DIFF  25
L 32  14  29  11  14   0 DISC  68
```

8. Using #7 find the 90th percentile of x.
a) 10.61 b) 13.03 c) 15.12 d) 11.71 e) 9.92

```
ITEM   8   TEST 7300   09 10 15

   1   2   3*  4   5 OMT NO   105
U  0   4  96   0   0   0 DIFF  31
L 11  29  21  29   7   4 DISC  75
```

Questions 9 through 11 deal with algebraic properties of sample mean, sample standard deviation and correlation.

9. If sample mean of a list y is 5 what is the sample mean of list 3x - 2?
a) 13 b) 15 c) 3 d) 1 e) 10

```
ITEM   9   TEST 7300   09 10 15

   1*  2   3   4   5 OMT NO   105
U 89  11   0   0   0   0 DIFF  13
L 71  14   0  11   4   0 DISC  18
```

10. If s_x (of list x) is equal to 2 what is the *sample standard deviation* of the list 3x + 4?
a) 2 b) 0.33 c) 8 d) 10 e) 6

```
ITEM  10   TEST 7300   09 10 15

   1   2   3   4   5*OMT NO   105
U  0   0   0   7  93   0 DIFF  39
L 54   0   4  29  14   0 DISC  79
```

11. If correlation between (x, y) is 0.3 what is the correlation between (x+4, 3y+2)?
a) 0.9 b) 4.9 c) 0.6 d) 0.3 e) none of the others

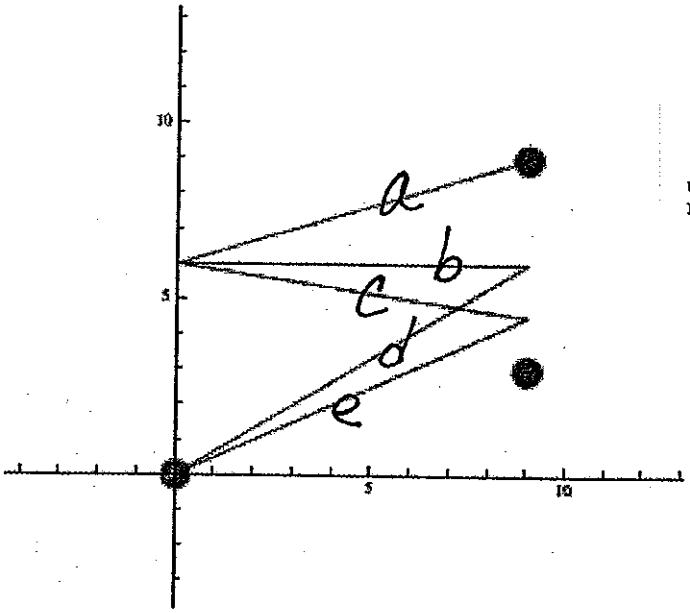
```
ITEM  11   TEST 7300   09 10 15

   1   2   3   4*  5 OMT NO   105
U  0   0   0 100   0   0 DIFF  10
L  7   0  11  71  11   0 DISC  29
```

Questions 12 through 15 are about calculations of means, standard deviations, correlation in rerlation to the following data of (x, y) pairs (column means are recorded at the bottom):

x	y	x^2	y^2	xy
0	0	0	0	0
9	3	81	9	27
9	9	81	81	81
—	—	—	—	—
6.	4.	54.	30.	36.

12. Which of the five lines is the regression line?




```
ITEM  12   TEST 7300   09 10 15

   1   2   3   4*  5 OMT NO   105
U  0   4   0  89   7   0 DIFF  35
L 14   0   7  54  25   0 DISC  36
```

13. Is the least squares line for this data the same as the regression line?
a) Yes b) No

```
ITEM  13   TEST 7300   09 10 15

   1*  2   3   4   5 OMT NO   105
U 89  11   0   0   0   0 DIFF  30
L 50  50   0   0   0   0 DISC  39
```

14. Calculate the sample standard deviation S_x.
a) 3.812 b) 2.798 c) 1.638 d) 5.196 e) 3.894

```
ITEM  14   TEST 7300   09 10 15

   1   2   3   4*  5 OMT NO   105
U  4   0   4  93   0   0 DIFF  37
L 14   7  21  29  29   0 DISC  64
```

15. Calculate the correlation R for the sample data.
a) 0.58 b) 0.76 c) 0.47 d) 0.69 e) 0.61

```
ITEM  15   TEST 7300   09 10 15

   1   2*  3   4   5 OMT NO   105
U  0 100   0   0   0   0 DIFF  41

L 25  18  29  25   4   0 DISC  82
```

Questions 16 through 20 concern T and z based confidence intervals and the margin of error. Unless specfied in a problem, the population scores are "*not assumed*" to be normal distributed. Suppose with-replacement equal-probability sampling and

$\overline{x} = 48$ $s_x = 6$ $n = 70$ $N = 800.$

16. Give the estimated margin of error for the sample mean.

a) 1.1 b) 1.6 c) 1.5 d) 1.4 e) 1.2

```
ITEM  16   TEST 7300   09 10 15

    1   2   3   4*  5 OMT NO   105
U   0   0   0 100   0   0 DIFF  31
L   4  18  32  36  11   0 DISC  64
```

17. Give the *right endpoint* of the 95% confidence interval for μ_x based on this data (choose the closest value).

a) 49.1 b) 49.2 c) 49.3 d) 49.4 e) 49.5

```
ITEM  17   TEST 7300   09 10 15

    1   2   3   4*  5 OMT NO   105
U   0   4   0  96   0   0 DIFF  47
L  18  29  21  18  14   0 DISC  79
```

18. If *instead* of sampling with-replacement we sampled *without-replacement* what would be the *right endpoint* of the 95% confidence interval for μ_x based on this data (choose the closest value)?

a) 49.10 b) 49.21 c) 49.34 d) 49.46 e) 49.58

```
ITEM  18   TEST 7300   09 10 15

    1   2   3*  4   5 OMT NO   105
U   4  21  68   7   0   0 DIFF  54
L  14  18  18  32  18   0 DISC  50
```

19. If *instead* we had this same data but from a sample of only **n = 10** *and if the population distribution is known to be close to normal* (making N essentially infinite) what number would we use in place of the z-score when calculating a 95% confidence interval for μ_x?

a) 2.63 b) 2.87 c) 3.05 d) 2.26 e) 2.48

```
ITEM  19   TEST 7300   09 10 15

    1   2   3   4*  5 OMT NO   105
U   0   4   0  96   0   0 DIFF  36
L  25  11  14  32  18   0 DISC  64
```

20. If the data above refer to a sample of **n = 10** from a *normal population* give the *right endpoint* of a 95% confidence interval for the population mean.

a) 61.6 b) 49.4 c) 52.3 d) 62.9 e) 58.4

```
ITEM  20   TEST 7300   09 10 15

    1   2   3*  4   5 OMT NO   105
U   0   7  86   4   4   0 DIFF  51
L  29  25  29  14   0   4 DISC  57
```