In[232]:= `Sort[exam2]`

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, 20, 20}
```

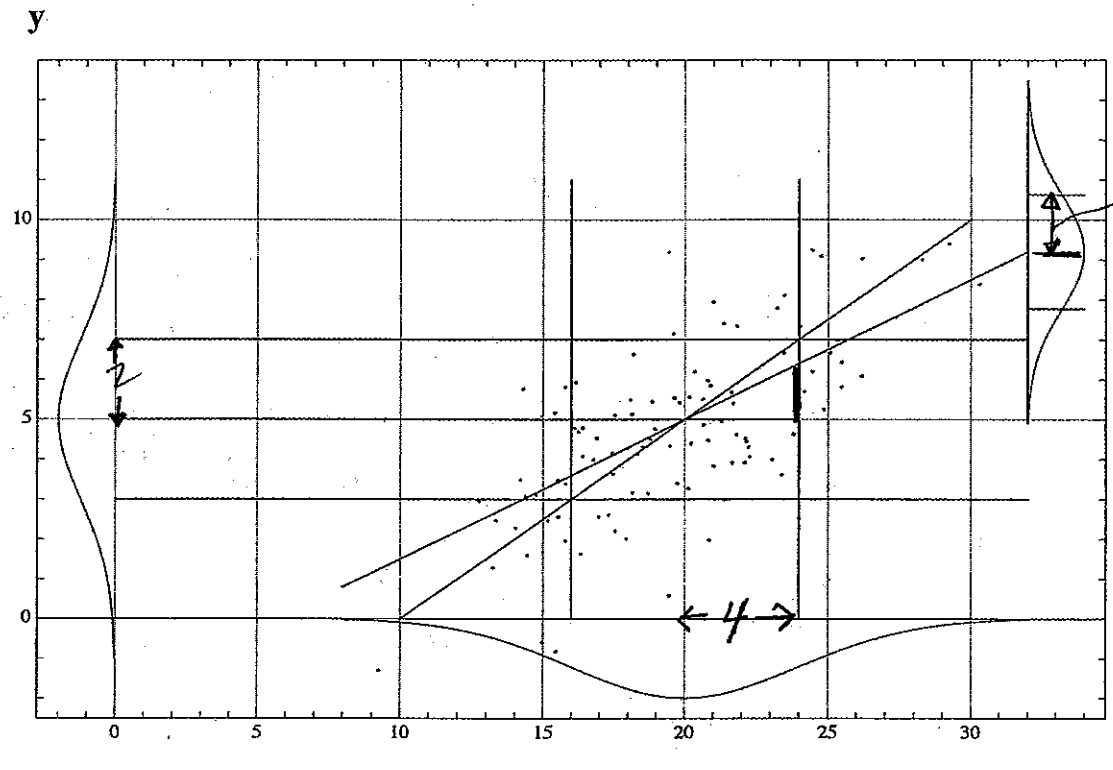
Your raw score (number correct) on exam 2 will be the last score in the scores reported to you by the registrar in a mailing that should come to you later today.

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

exam 2 GRADE = 2.0 + 0.4 (exam 2 raw score - 11) (REVISED from -12 to -11) then rounded into range 0.0 to 4.5.

Also, if you were present 10-12-09 in lecture, ths participating in a previously announced assignment in lecture, your exam 2 GRADE calculated above will be increased by 0.4.

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.



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

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

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

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)

SAME AS AT x = 32

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

$z = \frac{15-10}{4} = \frac{5}{4} = 1.25$

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

$P(x < 15) = P(z < 1.25)$

1.2 .05

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

0.8944

z .08

1.2 .8997

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

$x = 10 + z4 = 10 + 1.28(4) = 15.12$

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

$3(5) - 2 = 15 - 2 = 13$

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

$3(2) = 6$

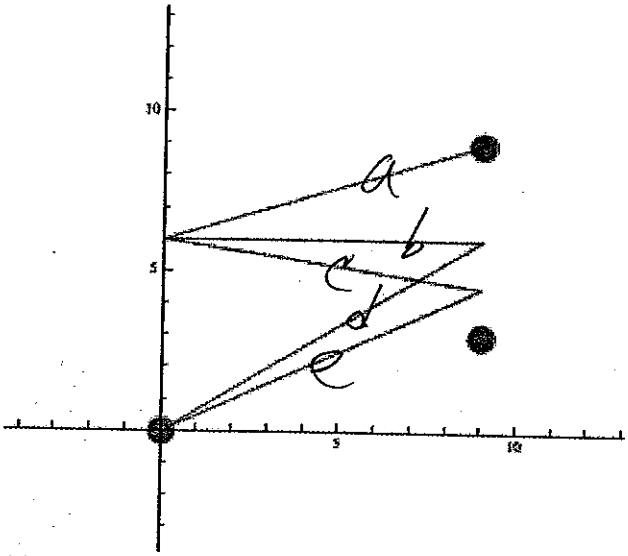
11. If correlation between (x, y) is 0.3 what is the correlation between (x+4, 3y+2)?
a) 0.9 b) 4.9 c) 0.6 d) 0.3 e) none of the others

SAME SINCE $1.3 > 0$
(SAME SIGNS ON SCALES)

Questions 12 through 14 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?



ANS. (d) REGRESSION LINE JOINS VERTICAL STRIP AVGS (IF THEY LIE ON A LINE)

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

IF REGR LINE EXISTS IT MUST EQUAL THE LEAST SQUARES LINE

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

$\sqrt{\frac{3}{2}}\sqrt{54-6^2} = 5.196$

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

$$\frac{36-6(4)}{\sqrt{54-6^2}\sqrt{30-4^2}} = 0.7559$$

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 (CLOSEST TO)
a) 1.1 b) 1.6 c) 1.5 (d) 1.4 e) 1.2

$1.96\, s_x/\sqrt{n} = 1.96\, 6/\sqrt{70} = 1.40559$

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

$48 + 1.40559$

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

$48 + 1.40559\sqrt{\frac{800-70}{800-1}} = 49.3435$

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

DF
9 (2.262)
CONF 95%

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

In[206]:= `regrpic[20, 5, 4, 2, 0.7, 100, 10, .003]`

$48 + 2.262\,\frac{6}{\sqrt{10}} = 52.2918$