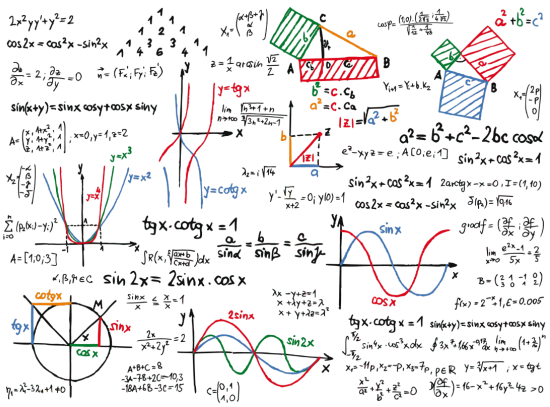
B4 - Mathematics

B-MAT-400

202unsold

Statistics for Selling Suit Stock



202unsold

binary name: 202unsold
language: everything working on "the dump"
compilation: when necessary, via Makefile, including re, clean and fclean rules

- The totality of your source files, except all useless files (binary, temp files, obj files,...), must be included in your delivery.
- All the bonus files (including a potential specific Makefile) should be in a directory named *bonus*.
- Error messages have to be written on the error output, and the program should then exit with the 84 error code (0 if there is no error).

Once a year, a suit-seller gets rid of their unsold stock, selling separately jackets and trousers, at $\$10$, $\$20$, $\$30$, $\$40$ and $\$50$. They'd like to know how much each piece of clothing is likely to yield (expected value and variance).

They gave their statistician friend a mission: to deduce from their past results the probability to sell a $\$x$ jacket and $\$y$ trousers together. It appears that the probability is defined by the following formula (a and b being integers greater than 50, depending on the economic climate):

$$\frac{(a-x)(b-y)}{(5a-150)(5b-150)}$$

Let's call X, Y and Z, respectively, the random variables that represent "the price of a sold jacket", "the price of sold trousers" and "the price of a sold suit". Given the values of a and b, your software must print:

- an array summing up the joint law of (X, Y), and the marginal laws of X and Y,
- an array summing up the law of Z,
- expected values and variances of X, Y and Z.

USAGE

Terminal

```
~/B-MAT-400> ./202unsold -h
USAGE
    ./202unsold a b

DESCRIPTION
    a       constant computed from past results
    b       constant computed from past results
```

EXAMPLES

Terminal

```
~/B-MAT-400> ./202unsold 60 70

--------------------------------------------------------------------------------
        X=10    X=20    X=30    X=40    X=50    Y law
Y=10    0.100   0.080   0.060   0.040   0.020   0.300
Y=20    0.083   0.067   0.050   0.033   0.017   0.250
Y=30    0.067   0.053   0.040   0.027   0.013   0.200
Y=40    0.050   0.040   0.030   0.020   0.010   0.150
Y=50    0.033   0.027   0.020   0.013   0.007   0.100
X law   0.333   0.267   0.200   0.133   0.067   1.000
--------------------------------------------------------------------------------
z       20      30      40      50      60      70      80      90      100
p(Z=z)  0.100   0.163   0.193   0.193   0.167   0.100   0.053   0.023   0.007
--------------------------------------------------------------------------------
expected value of X:    23.3
variance of X:          155.6
expected value of Y:    25.0
variance of Y:          175.0
expected value of Z:    48.3
variance of Z:          330.6
--------------------------------------------------------------------------------
```

Don't worry too much about tabulations in the printing format.