MATH 1552
5.3 REVIEW WS
* Problems from Elementary Stats (Navidi)

Name KEY
Date

1. Let X = the number of boys in a family of 5 children. The probability distribution of X is given in the table below. Find the expected value of the number of boys in a family of five.

p.253

X	f(x)
0	0.03125
1	0.15625
2	0.31250
3	0.31250
4	0.15625
5	0.03125

$X \cdot f(X)$

$(0)(0.03125) = 0$
$(1)(0.15625) = 0.15625$
$(2)(0.31250) = 0.6250$
$(3)(0.31250) = 0.9375$
$(4)(0.15625) = 0.6250$
$(5)(0.03125) = 0.15625$

$E(X) = \mu = \Sigma X \cdot f(X) = 2.5$

As we sample more & more families with 5 kids, the mean number of boys approaches 2.5.

2. A computer monitor is comprised of multiple points of lights called pixels. It is not uncommon for a few of these pixels to be defective.

Let X = the number of defective pixels on a randomly chosen monitor.
The probability of x is as follows:

p.251

X	f(x)
0	0.2
1	0.5
2	0.2
3	0.1

$X \cdot f(X)$

$(0)(0.2) = 0$
$(1)(0.5) = 0.5$
$(2)(0.2) = 0.4$
$(3)(0.1) = 0.3$
1.2

a) $E(X) = \mu = \Sigma X \cdot f(X)$
$= 1.2$ defective pixels

a. Determine the expected value for the number of defective pixels.
b. Compute the variance and the standard deviation of the number of defective pixels.

$(x-\mu)^2 \cdot f(x) = (x-\mu)^2 f(x)$

$(0-1.2)^2 = (-1.2)^2 = 1.44 \cdot (0.2) = 0.288$
$(1-1.2)^2 = (0.2)^2 = 0.04 \cdot (0.5) = 0.02$
$(2-1.2)^2 = (0.8)^2 = 0.64 \cdot (0.2) = 0.128$
$(3-1.2)^2 = (1.8)^2 = 3.24 \cdot (0.1) = 0.324$

Variance: $\sigma^2 = 0.76$

Standard Dev: $\sigma = \sqrt{0.76}$
$\sigma \approx 0.8718$

3. A mineral economist estimated that a particular mining venture had a 40% probability of a $30 million loss, a 50% probability of a $20 million profit, and a 10% probability of a $40 million profit.

P. 255

a. Create a probability distribution for the profit (X).
b. Determine the value of the expected mean.
c. Compute the variance and the standard deviation.

(millions)

a)

x	f(x)
−30	0.40
20	0.50
40	0.10

b) $E(x) = \mu = \Sigma x \cdot f(x)$

$(-30)(0.40) = -12$
$(20)(0.50) = 10$
$(40)(0.10) = 4$
$\Sigma x \cdot f(x) = 2$

The expected value is a gain of $2 million.

c) **Variance**

$(x-\mu)^2$	$\cdot f(x)$	$= (x-\mu)^2 \cdot f(x)$
$(-30-2)^2 = (-32)^2 = 1024$	$\cdot (0.40)$	$= 409.6$
$(20-2)^2 = (18)^2 = 324$	$\cdot (0.50)$	$= 162$
$(40-2)^2 = (38)^2 = 1444$	$\cdot (0.10)$	$= 144.4$

$\sigma^2 = 716$ million

Standard Deviation

$\sigma = \sqrt{\sigma^2}$
$\sigma = \sqrt{716}$
$\sigma \approx 26.76$ million