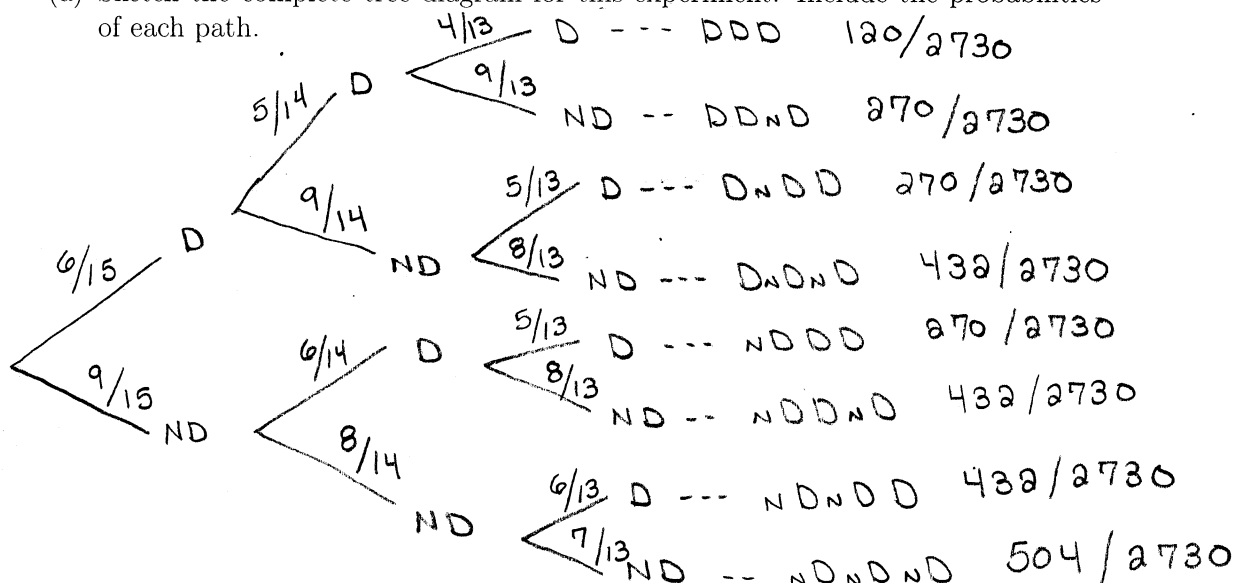# Math 153 - Quiz 6

Name **key**

March 26, 2015

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (6 points) A box contains 15 iPads, 6 of which are defective. Three iPads are selected at random without replacement. Let the random variable x represent the number of defective iPads in the sample of 3.

    (a) Sketch the complete tree diagram for this experiment. Include the probabilities of each path.

    $4/13$ D --- DDD $120/2730$

    $5/14$ D $9/13$ ND -- DDND $270/2730$

    $6/15$ D $9/14$ ND $5/13$ D --- DNDD $270/2730$

      $8/13$ ND --- DNDND $432/2730$

    $6/14$ D $5/13$ D --- NDDD $270/2730$

    $9/15$ ND $8/13$ ND -- NDDND $432/2730$

    $8/14$ ND $6/13$ D --- NDNDD $432/2730$

    $7/13$ ND -- NDNDND $504/2730$

    (b) The random variable x can take four different values: 0, 1, 2, 3. Use your tree to find the probablity distribution for x.

    $X = \#\ DEFECTIVE$

x	0	1	2	3
$P(x)$	$\dfrac{504}{2730}$	$\dfrac{1296}{2730}$	$\dfrac{810}{2730}$	$\dfrac{120}{2730}$

    (c) Find the mean value of x.

    $$\mu = 0\left(\frac{504}{2730}\right) + 1\left(\frac{1296}{2730}\right) + 2\left(\frac{810}{2730}\right) + 3\left(\frac{120}{2730}\right) = \frac{3276}{2730}$$

    $$= \boxed{1.2}$$

    (d) Find the standard deviation in x.

    $$\sigma^2 = 0\left(\frac{504}{2730}\right) + 1\left(\frac{1296}{2730}\right) + 4\left(\frac{810}{2730}\right) + 9\left(\frac{120}{2730}\right) - (1.2)^2$$

    $$\approx 0.61714$$

    $$\boxed{\sigma \approx 0.786}$$

2. (4 points) If the iPad selection above is done with replacement, then the distribution is binomial. Repeat parts (b), (c), and (d) using the binomial distribution.

$\text{binompdf}\left(3, \frac{6}{15}\right) \dots$

X	0	1	2	3
P(x)	0.216	0.432	0.288	0.064

$$\mu = 0(0.216) + 1(0.432) + 2(0.288) + 3(0.064)$$

$$= 3\left(\frac{6}{15}\right) = \boxed{1.2}$$

$$\sigma^2 = 0(0.216) + 1(0.432) + 4(0.288) + 9(0.064) - (1.2)^2$$

$$= 3\left(\frac{6}{15}\right)\left(\frac{9}{15}\right) = \frac{162}{225} = 0.72$$

$$\sigma = \sqrt{0.72} \approx \boxed{0.8485}$$