Review Exam 1

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A = Jim watches, B = Mary watches

1a) $P(A \text{ and } B) = P(A|B) \cdot P(B) = .8 \cdot .5 = \boxed{.4}$

1 b) $P(B|A) = \dfrac{P(A|B) \cdot P(B)}{P(A)} = \dfrac{.4}{.6} = \boxed{.6666}$

c) $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .6 + .5 - .4 = \boxed{.7}$

2) $P(\text{at least 1 "3"}) = 1 - P(\text{none}) = 1 - \left(\frac{5}{6}\right)^5 = \boxed{0.5981}$

4a) $P(\text{none failed}) = (.9999)^{748} = \boxed{.9279}$

b) $P(\text{at least 1 failed}) = 1 - .9279 = \boxed{.0721}$

5a) AD, AH, AA, DA, DH, DD, HA, HD, HH

b) each is equally likely, $\boxed{1/9}$

6) 4 heads out of 5. when you do more tests, It should be closer to 50%.

9a) iv $P(\text{blood alch.} \mid 16\text{-}20)$

b) $P(ba \cap 16\text{-}20) = P(ba \mid 16\text{-}20) \cdot P(16\text{-}20) = .127 \cdot .141 = \boxed{.0179}$

c) $P(ba \mid 21\text{-}24) = \dfrac{P(ba \cap 21\text{-}24)}{P(21\text{-}24)} = \dfrac{.0317}{.114} = \boxed{.2781}$

d) $P(ba \mid 16\text{-}20)$? $P(ba \mid 21\text{-}24)$ $\boxed{.127 < .2781}$

7 10a) $P(\text{all blind}) = (.09)^4 = \boxed{.000066}$

b) $P(\text{at least 1 blind}) = 1 - P(\text{none blind}) = 1 - (.91)^4 = \boxed{.3143}$

c) $P(\text{3 not blind, last is}) = .91 \cdot .91 \cdot .91 \cdot .09 = \boxed{.0678}$

d) $P(C,B,B,B) + P(B,C,B,B) + P(B,B,C,B) + P(B,B,B,C) = P(\text{one color blind}) =$
$= (.0678)^4 = \boxed{.2712}$

11a) yes.

b) $\frac{1}{10} = P(\text{1st is a 6})$

c) $\frac{1}{10} = P(\text{2nd is 9})$ because we put the 6 back.

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d) $P(\text{1st} = 6 \cap \text{2nd} = 9) = \frac{1}{10} \cdot \frac{1}{10} = \boxed{\frac{1}{100}}$

e) $P(\text{both have high \#'s}) = \frac{1}{2} \cdot \frac{1}{2} = \boxed{\frac{1}{4}}$

Cont.

12a) no.

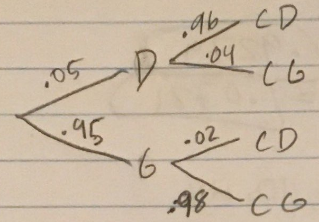
9 b) $P(1st=6) = \boxed{\frac{1}{10}}$

c) $P(2nd=9 \mid 1st=6) = \boxed{\frac{1}{9}}$

d) $P(1st=6 \text{ and } 2nd=9) = \frac{1}{10} \cdot \frac{1}{9} = \boxed{\frac{1}{90}}$

e) $P(\text{both high}) = \frac{5}{10} \cdot \frac{4}{9} = \boxed{\frac{2}{9}}$

15a)

10 

b) $P(D \mid CG) = \dfrac{P(D \cap CG)}{P(CG)} = \dfrac{(.05 \cdot .04)}{(.05 \cdot .04) + (.95 \cdot .98)} = \boxed{.0021}$

11 16) $P(\text{Stopped} \mid \text{late}) = \dfrac{P(\text{late} \mid \text{stopped}) \cdot P(\text{stopped})}{P(\text{late})} = \dfrac{.76 \cdot .23}{.34} = \boxed{.5141}$

12 19a) $\mu_x = 1(.28) + (2(.36)) = \boxed{1}$

b) $\sigma_x = \sqrt{(0-1)^2(.36) + (1-1)^2(.28) + (2-1)^2(.36)} = \boxed{.85}$

20a) discrete 0,1,2,3,4

b) discrete, 0,1,2,3,

12 c) continuous

d) discrete

e) discrete

f) continuous

21a) no, no fixed n

13 b) yes, n=100, $p = \frac{1}{4}$

c) no, no fixed n

d) no, p is different.

cont

22a) $\mu_x = \frac{10}{16} = \boxed{.625 \text{ lbs}}$ $\sigma_x = \sqrt{\left(\frac{1}{16}\right)^2 (1.2)^2} = \boxed{.075}$

14 b) $\mu_y = 10+10+10+10 = \boxed{40 oz}$ $\sigma_y = \sqrt{(1.2)^2 + (1.2)^2 + (1.2)^2 + (1.2)^2} = \sqrt{5.76} = \boxed{2.4}$

c) $\mu_x = 10 - 10 = 0 oz$, $Var(x) = (1.2)^2 + (-1)^2(1.2)^2 = 2.88$, $\sigma_x \boxed{= 1.697 oz}$

23a) yes, $n = 3$, $p = .25$

b)

x	prob.
0	.4219
1	.4219
2	.1406
3	.0156

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c) discrete

d) $\mu_x = np = 3(.25) = \boxed{.75}$

e) $\sigma_x = \sqrt{np(1-p)} = \boxed{.75}$

24a) $n = 12$, $p = .45$, succes or fail ✓, indep, $\boxed{\text{Binomial}}$

b) $E(x) = np = 12(.45) = \boxed{5.4}$

16 c) $\sigma_x = \sqrt{np(1-p)} = \sqrt{2.97} = \boxed{1.7234}$

d) $\sigma_x^2 = \boxed{2.97}$

e) $P(x > 7) = P(x=8) + P(x=9) + P(x=10) + P(x=11) + P(x=12)$

$= .0762 + .0277 + .0068 + .00101 + .0000689$

$= \boxed{.1118}$

25a) $P = 1500(1-.0075) + (-75000+1500)(.0075) = 937.5$

17 b) If you have a lot of contracts, you will make \$937.5 per year per policy.

26a) $P(\text{at least } 1) = 1 - p(\text{none}) = 1 - (.94)^{12} = \boxed{.5241}$

18 b) $P(x=3) = \binom{12}{3} .06^3 (1-.06)^9 = \boxed{.0272}$

c) $P(x \le 3) = P(x=0) + P(x=1) + P(x=2) + P(x=3)$

$= .4759 + .3645 + .1280 + .0272 = \boxed{.9959}$

19 27) $\mu_{x+y} = 6.46(.7) + 11.1(.3) = \boxed{7.852}$

$\sigma_{x+y}^2 = (.7)^2(4.18)^2 + (.3)^2(15.62)^2 = 30.52$, $\boxed{\sigma = \sqrt{30.52}}$

20 questions 28 a

29a) No, I think she'll make less.

b)

Possible	Probability
1	3/5
5	1/5
10	1/5

$E(x) = \frac{3}{5} + 5(\frac{1}{5}) + 10(\frac{1}{5}) = 3.6$

21 c) In the long run, she will make \$3.6 a week.

d) lose, $3.6 < 5$

30a) $\int_0^4 A\sqrt{y}\,dy$ should be 1, $\int_0^4 A\sqrt{y}\,dy = A\frac{2y^{3/2}}{3}\Big|_0^4 = \frac{16}{3}A$, $\boxed{A = \frac{3}{16}}$

b) $F(y) = \int_0^y \frac{3}{16}\sqrt{x}\,dx = \frac{3}{16}\frac{2y^{3/2}}{3} = \boxed{\frac{1}{8}y^{3/2},\ 0 \le y \le 4}$

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c) $P(x \ge 2.5) = 1 - F(2.5) = \boxed{.5059}$

d) $P(0 \le x \le 2.5) = F(2.5) = \boxed{.4941}$

e) $P(x \ge 2.5) = \boxed{.5059}$

33a) $F(y) = \int_0^y \frac{3}{1000}x^2\,dx = \frac{3}{1000}\frac{x^3}{3}\Big|_0^y = \boxed{\frac{y^3}{1000}},\ 0 \le y \le 10$

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b) $F(x) = .5$, $\sqrt[3]{y^3} = \sqrt[3]{500} = \boxed{7.937}$

c) $F(x) = .37$, $\sqrt[3]{y^3} = \sqrt[3]{1000 \cdot .37} = \boxed{7.179}$

24 34) $E(4Y+2) = E(4x^3+2) = \int_0^1 (4x^3+2)(3x^2)\,dx = \boxed{4}$

35a) $F_x(x) = \int_0^y 2x\,dx = y^2 \quad 0 \le y < 1$

b) $F_Y(y) = P(Y \le y)$, $Y = \sqrt{x} \Rightarrow y^2 = x$, now using $F_X(y^2) = (y^2)^2 = \boxed{y^4}$

25 c) $\frac{d}{dy} y^4 = 4y^3$

d) $E(Y) = \int_0^1 (y)4y^3\,dy = \boxed{.8}$

e) $P(Y > .3) = 1 - F_Y(.3) = 1 - (.3)^4 = \boxed{.9919}$