8. (6 points) A box contains 5 blue balls, 6 red balls and 7 purple balls. Three balls are drawn from the box without replacement. Write out the expression for (but no need to evaluate) the probability that the first ball is **not** blue, the second ball is red and the third ball is purple. No justification needed. Only the final answer worths credit.

3 Choices, multiplication Principle. 18 total balls, no replace.

(5b 6r 7p)

Choice 1: not blue: 6/18 R; 7/18 P

(5b, 5r, 7p) (5b, 6r, 6p)

Choice 2: Red: 5/17 R; 6/17 R

(5b, 4r, 7p) (5b, 5r, 6p)

Choice 3: Purple: 7/16 P; 6/16 P

(5b, 4r, 6p) (5b, 5r, 5p)

R R P P R P

$$P(!b, r, p) = \left(\frac{6}{18} \cdot \frac{5}{17} \cdot \frac{7}{16}\right) + \left(\frac{7}{18} \cdot \frac{6}{17} \cdot \frac{6}{16}\right)$$

Question	Points Awarded	Points
Name		1
1-6		18
7		5
8		6
		30

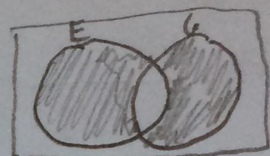
End of exam

Part II: WORK OUT

7. (5 points) At a company, 75% of the workers have electricity license, 55% have gas pipe license and 40% have both license. What is the probability that a selected worker has either electricity or gas pipe license but not both? Show your work and box your final answer.

Looking for the symmetric difference. Let event E be the event where a worker has an electricity license + G be the event where a worker has a gas pipe license.

Want to find $P(E \Delta G) = P(E \cap G^c) + P(G \cap E^c)$



$P(E \Delta G)$ is shaded.

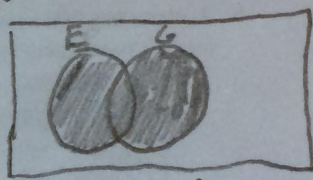
$P(E) = 0.75$

$P(G) = 0.55$

$P(E \cap G) = 0.4$

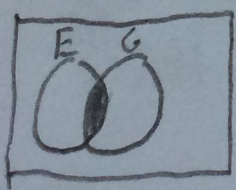
$\Rightarrow$ $P(E) + P(G) - P(E \cap G) = P(E \cup G)$

$1.3 - 0.4 = P(E \cup G) = 0.9$



$P(E \cup G)$ is shaded.

Note that $P(E \cup G) - P(E \cap G)$ is the desired probability:



$P(E \cap G)$ is shaded.

Thus $P(E \Delta G) = P(E \cup G) - P(E \cap G) = 0.5$

P for proof

R H W

5. A store sells three types of shoes: running shoes (40%), hiking shoes (30%) and raining shoes (30%). 10% of running shoes are water proof; 70% of hiking shoes are water proof; all raining shoes are, of course, water proof. If a selected shoe is water proof, what is the probability that it is a hiking shoe?

B

A. 0.3/0.55
(B.) 0.21/0.55
C. 0.3/0.75
D. 0.21/0.91
E. 0.3/0.91

Want $P(H|P)$

$P(R) = 0.4$ $P(H) = 0.3$ $P(W) = 0.3$

$P(P|R) = 0.1$ $P(P|H) = .7$ $P(P|W) = 1$

$P(H|P) = \frac{P(P \cap H)}{P(P)}$

$P(P) = P(P|H) \cdot P(H) + P(P|R) \cdot P(R) + P(P|W) \cdot P(W)$

0.04 0.21 +0.3

0.55

$P(P|H) = \frac{P(H \cap P)}{P(H)}$

$P(H|P) = P(P|H) \cdot P(H) / P(P)$

6. A plane has 300 seats. 60 of these are window seats. How many ways can we assign the seats for 200 passengers so that each window seat is occupied by a passenger?

A. $\frac{300! \cdot 200!}{(60!)^2 100!}$

(B.) $\frac{200! \cdot 240!}{100! \cdot 140!}$

C. $\frac{300! \cdot 240!}{140! \cdot 200!}$

D. $\frac{200! \cdot 240!}{60! \cdot 140!}$

E. $\frac{200! \cdot 240!}{(100!)^2 60!}$

$\binom{240}{100} \cdot 200!$

$\frac{240! \cdot 200!}{100! \; 140!}$

300

$\frac{240}{140} \cdot 200!$

Please go on to the next page...

3. A 1 meter glass rod falls onto the floor and is broken into two pieces. Assume that the breaking point is uniform between 0 and 1 meter. Given that the longer piece has length at least 0.7 meter, what is the probability that the shorter piece has length at least 0.2 meter?

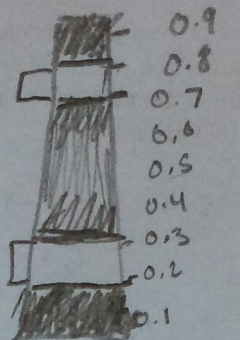
A. $\frac{0.1}{0.6}$

B. $\frac{0.2}{0.6}$

C. $\frac{0.3}{0.6}$

D. $\frac{0.4}{0.6}$

E. $\frac{0.5}{0.6}$



4. If A, B and C are sets, then $(A \cup B)^c \cup C^c =$

A. $A^c \cup B^c \cup C^c$

B. $(A \cap C)^c \cup (B \cap C)^c$

C. $(A \cup C)^c \cup (B \cup C)^c$

D. $(A \cap C)^c \cap (B \cap C)^c$

E. $(A \cup C)^c \cap (B \cup C)^c$

Please go on to the next page. . .

30

Total score: 30 points Time: 50 minutes

Full name: Brendon Daugherty (1 point)

Part I: Multiple choice. 3 points each

1. A fair six sided dice is rolled twice. Given that at least one of the results is 3, let p_1 be the probability that the sum of the results of the two rolls is 5; and p_2 be the probability that the sum of the results of the two rolls is 6. Which of the following statements is true?

   A. $p_1 = \frac{1}{11}$ and $p_2 = \frac{1}{11}$
   B. $p_1 = \frac{1}{3}$ and $p_2 = \frac{1}{6}$
   C. $p_1 = \frac{2}{11}$ and $p_2 = \frac{1}{11}$
   D. $p_1 = \frac{1}{6}$ and $p_2 = \frac{1}{6}$
   E. $p_1 = \frac{2}{11}$ and $p_2 = \frac{2}{11}$

2. How many ways can we assign 200 workers to 10 sites so that there are exactly 20 workers at each site?

   A. $\frac{200!}{(20!)^{10}}$
   B. $\frac{200!}{(10!)^{20}}$
   C. $\frac{200!}{10!20!}$
   D. 10^{20}
   E. 20^{10}