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Probability HW part 2

1.5: 1, 2, 3, 4, 5, 9, 10, 11, 12, 14, 15, 17, 18 a-b

1.5

1a) $P(2\text{ pictures}) = \frac{12}{52} \times \frac{11}{51} = \boxed{.0498}$

b) $P(2\text{ red}) = \frac{26}{52} \times \frac{25}{51} = \boxed{.2450}$

c) $P(1\text{ red} \cap 1\text{ black}) = P(\text{red}) \times P(\text{black} \mid \text{red}) + P(\text{black}) \times P(\text{red} \mid \text{black})$

$= \left(\frac{26}{52} \times \frac{26}{51} + \frac{26}{52} \cdot \frac{26}{51}\right) \times 2 = \boxed{0.5098}$

2a) $P(2\text{ pictures}) = \frac{12}{52} \times \frac{12}{52} = \boxed{.0533}$

b) $P(2\text{ red}) = \frac{26}{52} \times \frac{26}{52} = \boxed{.25}$

c) $P(1\text{ red} \cap 1\text{ black}) = \left(\frac{26}{52} \times \frac{26}{52}\right) + \left(\frac{26}{52} \times \frac{26}{52}\right) = \boxed{\frac{1}{2}}$

3a) $\boxed{\text{no.}}$ $P(\text{picture}) = \frac{12}{52}$, $P(\text{Picture} \mid \text{picture}) = \frac{11}{51}$

b) $P(H \cap P) = \frac{1}{4} \times \frac{3}{13} = \frac{3}{52}$, $P(H \cap P) = P(HP \cap P) + P(H!P \cap P)$

$= \left(\frac{3}{52} \times \frac{11}{51}\right) + \left(\frac{10}{52} \times \frac{12}{51}\right) = \frac{3}{52}$, $\boxed{\text{Because same, independant}}$

c) $P(r) = \frac{1}{2}$, $P(r \mid r) = \frac{11}{51}$. $\boxed{\text{Not independant}}$

d) $P(P \cap R) = \frac{3}{13} \times \frac{1}{4} = \frac{3}{52}$, $P(R \cap P) = P(RP \cap P) + P(R!P \cap P) = \frac{3}{52}$

$\boxed{\text{Because same, independant}}$

e) $\boxed{\text{NO.}}$ First card changes probability of second.

4) $P(4H) = \frac{13}{52} \times \frac{12}{51} \times \frac{11}{50} \times \frac{10}{49} = \boxed{0.00264}$

$P(4R) = \frac{26}{52} \times \frac{25}{51} \times \frac{24}{50} \times \frac{23}{49} = \boxed{0.055}$

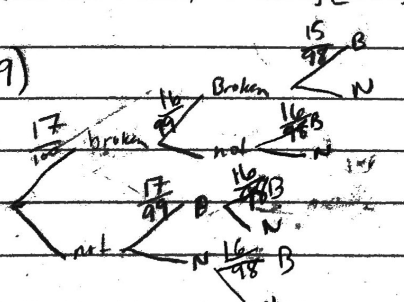
$P(4\text{ Diff suits}) = 1 \times \frac{39}{51} \times \frac{26}{50} \times \frac{13}{49} = \boxed{0.105}$

5) $P(4H) = \frac{13}{52} \times \frac{13}{52} \times \frac{13}{52} \times \frac{13}{52} = \boxed{\frac{1}{256}}$

$P(4R) = \left(\frac{26}{52}\right)^4 = \boxed{\frac{1}{16}}$

$P(4\text{ diff suits}) = 1 \times \frac{39}{52} \times \frac{26}{52} \times \frac{13}{52} = \boxed{\frac{3}{32}}$

9)



$P(\text{None Broken}) = \frac{83}{100} \cdot \frac{82}{99} \cdot \frac{81}{98} = \boxed{0.5682}$

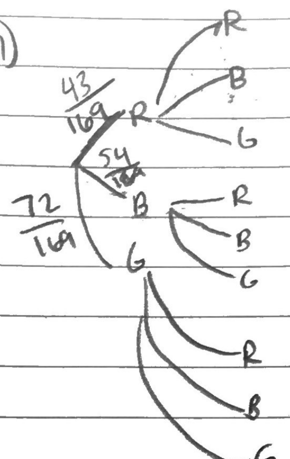
$P(\text{no more than } 1) = .5682 + .3578 = \boxed{0.9260}$

10, 11, 12, 14, 15, 17, 18a-b

10) $P(\text{None Broken}) = \frac{83}{100} \cdot \frac{83}{100} \cdot \frac{83}{100} = \boxed{0.5718}$

$P(\text{no more than } 1) = .5718 + .3513 = \boxed{0.9231}$

11)



$P(2G) = \frac{72}{169} \times \frac{71}{168} = \boxed{.180}$

$P(2 \text{ diff colors}) = 1 - P(2 \text{ same color})$

$= 1 - \left(.180 + \left(\frac{43}{169} \cdot \frac{42}{168}\right) + \left(\frac{54}{169} \cdot \frac{53}{168}\right)\right) = \boxed{0.656}$

12) $P(2G) = \left(\frac{72}{169}\right)^2 = \boxed{.182}$

$P(2 \text{ diff colors}) = 1 - P(2 \text{ same color}) = 1 - \left(.182 + \left(\frac{43}{169}\right)^2 + \left(\frac{54}{169}\right)^2\right) = \boxed{0.652}$

14) $1 + \frac{5}{6} + \frac{4}{6} + \frac{3}{6} + \frac{2}{6} + \frac{1}{6} = \frac{5}{324} = P(\text{each score once})$

$P(\text{no } 6\text{'s}) = \left(\frac{5}{6}\right)^7 = \boxed{0.279}$

15a) $\left(\frac{3}{6}\right)^5 = \boxed{\frac{1}{32}}$

b) $P(3 \text{ diff}) = 1 * \frac{5}{6} * \frac{4}{6} = \boxed{\frac{5}{9}}$

c) $P(2 \text{ black} \cap 1 \text{ red}) = \left(\frac{26}{52} \times \frac{26}{52} \times \frac{26}{52}\right)^3 = \boxed{\frac{3}{8}}$

d) $P(2 \text{ black} \cap 1 \text{ red}) = \left(\frac{26}{52} \times \frac{25}{51} \times \frac{26}{50}\right) + \left(\frac{26}{52} + \frac{26}{51} + \frac{25}{50}\right) + \left(\frac{26}{52} + \frac{26}{51} + \frac{25}{50}\right)$

$= \boxed{\frac{13}{34}}$

17) Not if a flood happens, because everyone in the area would be affected. They are not independent.

18a) $.88 \times .78 \times .92 \times .85 = \boxed{0.537}$

b) $P(\text{system works}) = 1 - P(\text{no components}) = 1 - ((1-.88) \times (1-.78) \times (1-.92) \times (1-.85)) = \boxed{0.9997}$

2.8 At Least One

In this example, you will discover the method of using the complement rule to find the probability of "at least one".

Now You Try 2.8.1. Suppose you want to flip a biased coin. The coin has a probability of .4 of being tails on any toss.

1. What do the probabilities of all the possible outcomes always have to add up to for any experiment?

   1

2. If the probability of getting tails on one coin toss is .4, then what does the probability of getting heads on one coin toss have to be?

   0.6

3. Suppose you want to flip the biased coin 4 times.

   (a) Fill in the probability table for the possible outcomes for four coin tosses. I've done most of them for you to save time.

Outcome	Probability	Outcome	Probability
HHHH	.1296	THHH	.0864
HHHT	.0864	THHT	.0576
HHTH	.0864	THTH	.0576
HHTT	.0576	THTT	.0384
HTHH	.0864	TTHH	.0576
HTHT	.0576	TTHT	.0384
HTTH	.0576	TTTH	.0384
HTTT	.0384	TTTT	.0256

   (b) If you add up the probabilities of all the possible outcomes, what do you get?

   1

   (c) Which outcomes are in the event "one head"?

   HTTT, THTT, TTHT, TTTH

   (d) What is the probability of getting exactly one head?

   Add them up P(exactly 1 head) = 0.1536

   (e) Which outcomes are in the event "two heads"?

   HHTT, HTHT, HTTH, THHT, THTH, TTHH

   (f) What is the probability of getting exactly two heads?

   P(2 heads) = 0.3456

   (g) Which outcomes are in the event "three heads"?

   HHHT, HHTH, HTHH, THHH

   (h) What is the probability of getting exactly three heads?

   P(3 heads) = 0.3456

	Probability
[illegible]	.0864

[illegible] heads?

HHHH

$P(4 \text{ heads}) = 0.1296$

[illegible] head"?

All except all Tails

(l) [illegible]

$\boxed{P(1 \text{ head}) = 0.9744}$

in "at least one head"?)

TTTT

(n) [illegible]

$\boxed{P(\text{no heads}) = 0.0256}$

what [illegible] have to be?

$P(1 \text{ head}) = 1 - .0256 = \boxed{0.9744}$

[illegible] by following [illegible]

$\boxed{3m \text{ to } 3o}$