1) 32 cheerleaders from Kentucky get on a bus. 18 of these cheerleaders have buck teeth. 23 of them have hairy legs. Every one of the 32 cheerleaders has either buck teeth or hairy legs. How many have both buck teeth and hairy legs?

$n(B \cup H) = n(B) + n(H) - n(B \cap H)$

$32 = 18 + 23 - n(B \cap H)$

$\Rightarrow n(B \cap H) = 18 + 23 - 32 = 9$

a) 5

b) 11

(c) 9

d) 13

e) 10

f) None of the above.

---

2) A fair coin is tossed 5 times. What is probability of getting all heads (i.e. 5 heads in a row)?

2^5 = # possible outcomes all equally likely.

Answer: $1/2^5 = 1/32$

a) 1/24

b) 1/20

c) 1/10

d) 1/128

(e) 1/32

f) None of the above.

3) Let S be a probability space with $A, B \subset S$. Suppose that $Pr[A] = .6$, $Pr[B] = .4$, and $Pr[A \cap B] = .2$.

Find $Pr[A' \cup B]$.

a) .4

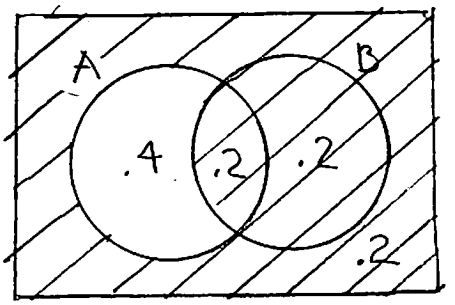
b) .6

c) .9

d) .7

e) .3

f) None of the above.



///= $A' \cup B$

.2+.2+.2=.6

---

4) Three distinct square tiles have to be painted, each with a **different** color. There are 5 colors of paint available (red, green, white, blue, and yellow). In how many ways can this be done? Note: It matters which tile is which color.

Example: One way is to paint tile 1 red, tile 2 blue, tile 3 green.

a) 60

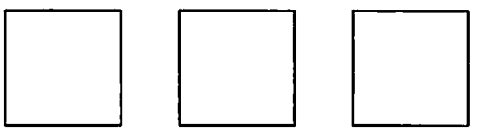
b) 6

c) 120

d) 24

e) 42

f) None of the above.



5 choices for the color of the first tile.
4 choices for the color of the second tile.
3 choices for the color of the third tile.

$5 \cdot 4 \cdot 3 = 60$

(i.e. $P(5,3)$)

5) From a pool of 5 boys and 6 girls, one boy and one girl are to be selected to appear on a TV show. Additionally the boy will wear either a red hat or a blue hat on the show. In how many ways can this be done?

Example: One way is to select girl 3, boy 1, and have the boy wear a red hat: G3B1R. Order of choice or decision doesn't matter.

MULTIPLICATION PRINCIPLE

$5 \cdot 6 \cdot 2 = 60$

a) 31

b) 60

c) 30

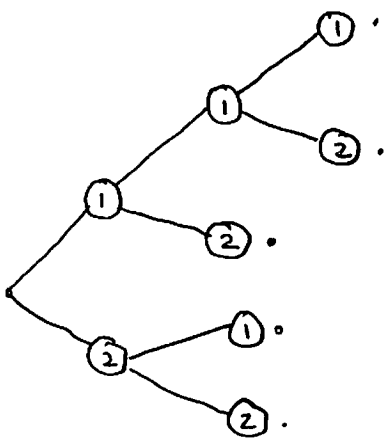
d) 32

e) 12

f) None of the above.

---

6) A hat contains 10 poker chips each worth \$1, and 10 poker chips each worth \$2. One chip after another is drawn out. The values of the chips are recorded in the order that they are drawn. If the **total value** of the recorded chips is \$3 or more, the process is terminated. How many outcomes are there in the corresponding sample space? Hint: Draw a tree. Work carefully!



Example: On possible outcome is 21, first draw out a \$2 chip, then a \$1 chip. The process was terminated since the total value recorded is 3 which is greater than or equal to 3. Another possible outcome is 12.

a) 7

b) 6

c) 5

d) 9

e) 8

f) None of the above.

7) Seven pool balls, numbered 1 thru 7, lie on a pool table (4 odd numbered and 3 even numbered). One ball is drawn off at random, and not replaced. Then another is drawn off at random. What is the probability that the first ball drawn is even numbered, and the second is odd numbered.

a) 9/42 = 3/14

b) 12/42 = 2/7

c) 12/49

d) 24/42 = 4/7

e) 18/42 = 3/7

f) None of the above.

$4 \cdot 3 = 12$ ways to choose an even then an odd.

$7 \cdot 6$ ways to choose 2 balls keeping track of order.

Answer: $\frac{12}{7 \cdot 6} = \frac{12}{42} = \frac{2}{7}$

---

8) From a group of 6 employees, 2 are selected to be transferred, and one is selected to be the new manager. In how many ways can this be done?

Example: One way is to transfer employees 4 and 6 (order doesn't matter here), and make employee 3 the new manager.

a) 72

b) 96

c) 60

d) 78

e) 64

f) None of the above.

① $C(6,2)$ = # ways to select 2 to be transferred

② after ①, there are only 4 employees "left". Choose 1 to be manager. There are 4 ways to do this.

Answer: $C(6,2) \cdot 4 = \frac{6 \cdot 5}{2} \cdot 4 = 60$

9) 1 boy and 3 girls line up, one after the other, to get in the movie theatre. In how many ways can this be done so that the boy is NOT first in line?

Example: One way is G3, G1, B, G2. where G3 is first, G2 is second etc.

a) 22

b) 18

c) 21

d) 26

e) 24

f) None of the above.

(A) $4! = \#$ of ways to line up with NO constraints.

(B) $3! = \#$ of ways to line up with the boy first.

(B) corresponds to those configurations NOT wanted

Answer: $4! - 3! = 24 - 6 = 18$

10) A jar contains 4 green marbles and 2 blue marbles. Two of these marbles are selected at random from the jar, one after the other, without replacement. What is the probability that both marbles drawn are green?

a) 2/5

b) 8/15

c) 1/12

d) 1/16

e) 1/5

f) None of the above.

ways to get 2 Green $= C(4,2)$

ways to draw any two $= C(6,2)$

$$\frac{C(4,2)}{C(6,2)} = \frac{4 \cdot 3/2!}{6 \cdot 5/2!} = \frac{12}{30} = \frac{2}{5}$$

13) How many 7 letter words can be formed using the letters AAAABBC that start with the letter B?

Example: BCAABAA is a seven letter word with 4 A's, 2 B's and one C, and starts with B.

a) 32

b) 30

c) 64

d) 62

e) 24

f) None of the above.

B _ _ _ _ _ _

PLACE 4A's, 1B, 1C in here

$\frac{6!}{4!1!1!} = \frac{6!}{4!} = 6 \cdot 5 = 30$

14) A jar contains 1 red, 2 green, and 2 yellow marbles. Two of these marbles are selected at random from the jar, one after the other, without replacement. What is the probability that the two marbles drawn are the same color?

a) .2

b) .5

c) .32

d) .4

e) .3

f) None of the above.

ways to draw 2 G = 1
ways to draw 2 Y = 1
ways to draw any 2 = C(5,2) = 10

Answer: $\frac{1+1}{C(5,2)} = \frac{2}{10} = .2$