set up your answers

$n = 15$
$r = 4$

1. You have gone to the local buffet where you have 15 different dishes to choose from. You know that you only will only be able to eat 4 dishes before you are too full.

a. How many different possible dish combinations do you have to choose from if you will not eat the same dish more than once in your choice of 4 and the order you eat those dishes does matter to you?

no repeats order matters

$$P^{15}_{4} = \frac{15!}{(15-4)!} = \frac{15!}{11!} = 15 \cdot 14 \cdot 13 \cdot 12 = 32,760$$

b. How many different possible dish combinations do you have if you will not eat the same dish more than once and the order you eat your 4 dishes does not matter to you?

no repeats order does not matter

$$C^{15}_{4} = \frac{15!}{4!(11!)} = 1365$$

c. How many different possible dish combination do you have if you are willing to have the same dish multiple times and the order you eat it in is important?

Repeats order matters

$$15^4 = 50,625$$

2. You just went and bought a car off e-bay. As you are driving it home you know there is a .2 probability that one of the fuses will blow, there is also a .6 probability that a light in the car will go out. You also know that given you have a light burn out that the probability a fuse has burned out is .25.

a. What is the probability that your fuse will go out and that a light will go out?

even' A - fuse blows $P(A) = .2$

B - light goes out $P(B) = .6$

$P(A \mid B) = .25$

$P(A \cap B) = P(B)\,P(A \mid B) =$

$.6\,(.25) = .15$

b. What is the probability that your fuse or a light or both will go out?

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= .2 + .6 - .15 = .65$

c. Is the event of a light burning out and a fuse going out mutually exclusive? Independent? Be sure to tell me why.

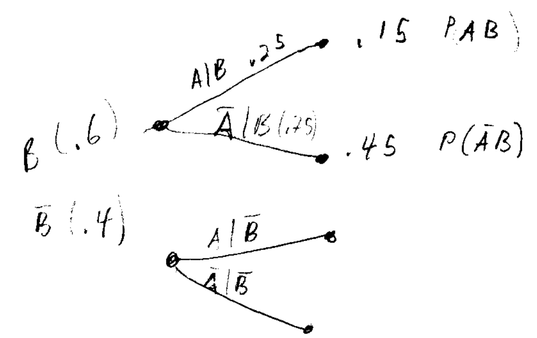
they are not mutually exclusive because the intersection is not zero

they are not independent because the conditional probability of $A \mid B$ is not zero

d. What is the probability that a fuse has burned out on the drive home given that you did not observe a light go out?

$$P(A \mid \bar{B}) = \frac{P(A \cap \bar{B})}{P(\bar{B})} = \frac{.05}{.4} = .125$$

	B	$\bar{B}$	
A	.15	.05	.2
$\bar{A}$	.45	.35	.8
	.6	.4	



rough so do chart

3. A survey was done in 1997 where high school students were asked if they were regular smokers. 36% of the students said that they were regular smokers.

a. If you were ask 10 high schoolers in 1997 whether they were smokers or not,

give exact use table to see if you were close to right

$n=10$

smokers not

$p=.36$ $.64$

1. What is the probability that 7 would have said that they were smokers?

$$P(x=7) = \binom{10}{7} .36^7 .64^3 = .0247$$

120

$\frac{10!}{7!(3!)}$

10·9·8

3·2

2. What is the probability that 2 or more said they were smokers?

space

$$P(x \geq 2) = 1 - P(x=0) - P(x=1)$$

$$1 - \binom{10}{0} .36^0 .64^{10} - \binom{10}{1} .36^1 .64^9 = 1 - .011529215 - .06485 = .92362$$

b. If you were to go and ask a 100 high schoolers in 1997 if they were smokers for not,

1. What is the expected number of high schoolers that would answer that they were smokers and the standard deviation?

$n=100$

$p=.36$

$q=.64$

$$E(x) = \mu = 100(.36) = 36$$

$$\sigma = \sqrt{100(.36)(.64)} = 4.8$$

2. If you don't know the shape of the distribution that was related to this random variable, at least how many observations would you see with in 2 standard deviations of the mean? (give the number of observations)

$(1 - \frac{1}{2^2}) = 3/4$ I would expect to see at least 75 of these observation to be with in 2 s.d. of the mean

c. You went out again in 2001 and polled another 100 high schoolers. 22 of those polled said they were smokers. Would this be an unusual finding if the actual probability of being a smoker were still 36%? Provide a reason why.

$\bar{x} = 36$

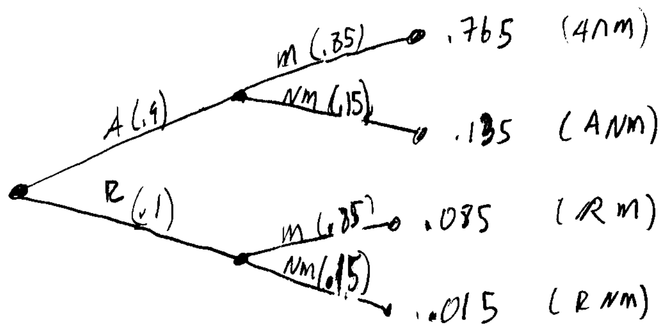
$$z\text{-score} = \frac{22-36}{4.8} = -2.9166$$

it is unlikely being almost 3 s.d away from the mean

Tchebysheff says at least 89% of obs lie with in 3 s.d. - so this is still an unlikely observation

4. One half of a Roman army is on the south side of a valley while the other half is on the north side. In the valley an enemy army waits. The general of the Romans is on the north side of the valley and must decide whether of not to attack in the morning. He is usually looking for a fight so the probability that he orders an attack is 0.9. Once he has made a decision he must send a messenger to the army on the south side of the valley to coordinate an attack or a retreat. The messenger could get caught and the probability that he does not get to the southern army is ~~.2.~~ .15

a. Draw the probability tree associated with this example.



b. What is the probability that the south army gets a message and the charge is to attack?

$$P(Am) = .765$$

c. Given that the messenger is caught and the south army gets no message, what is the probability that the General has ordered the army to retreat?

$$P(R\ |NM) = \frac{P(R)\,P(NM|R)}{P(R)(P(NM|R)) + P(A)(P(NM|A))} = \frac{.015}{.015 + .135} = .1$$

d. What if the situation were changed and the General was only going to send a message if the decision was to attack (so if the decision were to retreat no messenger would be sent). What is the probability now that if no message is received by the south army that the order was to retreat?