AP Statistics
Module 5 Free Response and Essay Tips

Below you will find a breakdown of different AP topics for this module. The sections include expectations for answering questions over each topic and examples of how these areas should be handled:

BASICS FOR BINOMIAL and GEOMETRIC DISTRIBUTIONS

Actual AP Exam Expectations	Notes
1. Define symbols appropriately	X = number of successes n = number of trials P = probability of success for an individual trial Q = probability of failure for an individual trial = (1-p)
2. Finding probability of **exactly 1** X value	*2^{nd} VARS -> **binomialpdf**(n,p,X) *2^{ND} VARS -> **geompdf**(p,X) *here X represents # of trials until success
3. Save rounding for the last step	It is best not to round numbers at intermediate steps in a calculation. Wait until the end to round and then do not round too much. Do not use less than 4 places after the decimal at all times. The more you round, the more incorrect your answer becomes.
4. Use the correct distribution	*Use binomial when you are given success or failure, a set number of trials, and a finite variable *Use geometric when you are given success or failure, a set number of trials until success, and a finite variable

BINOMIAL DISTRIBUTIONS

Actual AP Exam Expectations	Notes
1. conditions	1) each outcome is either a success or failure 2) all trials are independent 3) there are a fixed number of **n** trials 4) the probability of success **P** is the same for each trial
2. Mean (expected value)	n*p when asked to find this value, **round up** if the answer is a decimal
3. Standard deviation	$\sqrt{n * p(1-p)}$

4. Finding cumulative probability for a range of X values	$(X < \#)$ = binomcdf(n, p, # - 1) $(X \leq \#)$ = binomcdf(n, p, #) $(X > \#)$ = 1 - binomcdf(n, p, #) $(X \geq \#)$ = 1 – binomcdf(n, p, # - 1)

- To “describe” the binomial distribution, use **B(n,p)**
- The shape of the distribution becomes more normal as n increases and p gets closer to .5

- Here is a video specific to this topic. It includes examples and how to be most successful on the AP exam for the topic.

5.1 – 5.4: Binomial Distributions
https://sas.elluminate.com/p.jnlp?psid=2014-12-14.0627.M.02B50E368656D296A2DCBFED1F5B9E.vcr&sid=679

GEOMETRIC DISTRIBUTIONS

1. conditions	1) each outcome is either a success or failure 2) all trials are independent 3) no set number of trials (looking for # of trials until success) 4) the probability of success **P** is the same for each trial
2. Mean (expected value)	$\frac{1}{p}$ when asked to find this value, **round up** if the answer is a decimal
3. Standard deviation	$\frac{\sqrt{(1-p)}}{p}$
4. Finding cumulative probability for a range of X values	$(X < \#)$ = geomcdf (p, # - 1) $(X \leq \#)$ = geomcdf (p, #) $(X > \#)$ = 1 – geomcdf (p, #) $(X \geq \#)$ = 1 – geomcdf (p, # - 1)

- The shape of the geometric distribution is skewed right and becomes less skewed as p increases.
- To “describe” the geometeric distribution, use **G(x,P)**
- Here is a video specific to this topic. It includes examples and how to be most successful on the AP exam for the topic.

5.5-5.6 Geometric Distributions
https://sas.elluminate.com/site/external/jwsdetect/playback.jnlp?psid=2014-12-14.0704.M.02B50E368656D296A2DCBFED1F5B9E.vcr&sid=679

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NORMAL APPROXIMATION FOR SAMPLE PROPORTIONS

1. Conditions	1) the population > 10n 2) np>10 and n(1-p)>10 , where n is sample size and p is population proportion
2. Mean (expected value)	p
3. Standard deviation	$\sqrt{\frac{p(1-p)}{n}}$
4. Finding cumulative probability for a range of X values	$(X < \#)$ = normalcdf (0, $\hat{p}$, mean, st dev) $(X \leq \#)$ = normalcdf (0, $\hat{p}$, mean, st dev) $(X > \#)$ = 1 – normalcdf ($\hat{p}$,1, mean, st dev) $(X \geq \#)$ = 1 – normalcdf ($\hat{p}$,1, mean, st dev)

- **The Central Limit Theorem:** Whenever the sample size is large, the sampling distribution of the mean will be close to normal with a mean of mu and a standard deviation of sigma divided by the square root of the sample size.
- To "describe" the normal distribution, use **N(mean,std dev)**
- Here is a video specific to this topic. It includes examples and how to be most successful on the AP exam for the topic.

5.8-5.12 Normal Approximations, Sample Means, and Sample Proportions
https://sas.elluminate.com/site/external/jwsdetect/playback.jnlp?psid=2014-12-14.0806.M.02B50E368656D296A2DCBFED1F5B9E.vcr&sid=679

NORMAL APPROXIMATION FOR SAMPLE MEANS

1. Conditions	1) The population is normal. 2) The population's shape is unknown but the sample size is large. 3) At this point, large is any sample size of 30 or more.
2. Mean (expected value)	μ
3. Standard deviation	$\frac{\sigma}{\sqrt{n}}$
4. Finding cumulative probability for a range of X values	$(X < \#)$ = normalcdf(0, $\bar{x}$, μ, sd) $(X \leq \#)$ = normalcdf(0, $\bar{x}$, μ, sd) $(X > \#)$ = 1 – normcdf($\bar{x}$, 99, μ, sd) $(X \geq \#)$ = 1 – normcdf($\bar{x}$, 99, μ, sd) *Remember to use the standard deviation of the sample, and not for the population!