Review for Quiz **6B** You can practice by changing the numbers!

X	0	1	2	3	4
P(X)	0.5	0.1	0.2	0.1	0.1

1. Calculate the mean value of x.

$\mu_x = 0(.5)+1(.1)+2(.2)+3(.1)+4(.1) = 1.2$

2. Interpret the mean value of x in the context of the problem (quiz will tell you the topic of the distribution) The average score of the event x over many trials will be 1.2

3. What is the probability that a random x exceeds the mean number of x?

$P(2)+P(3)+P(4) = .2+.1+.1 = .4$

4. Calculate the standard deviation of x.

Variance $= (0-1.2)^2(.5)+(1-1.2)^2(.1)+(2-1.2)^2(.2)+(3-1.2)^2(.1)+(4-1.2)^2(.1) = 1.96$

$\sigma_x = 1.4$

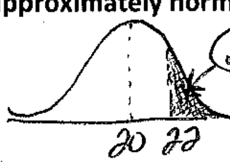
5. Multiply each x by 4 and find the *mean and standard deviation* of the new distribution.

x	0	4	8	12	16
P(x)	.5	.1	.2	.1	.1

Use same methods or calc method to find $\mu_x = 4.8$ $\sigma_x = 5.6$

The distribution of x is approximately normal with a mean of 20 and a standard deviation of 1.3.

6. P(x>22)



$Z = \frac{22-20}{1.3} = 1.538$

Use table or calculator

normalcdf(22, high #, 20, 1.3)

any very high number can represent the end of the curve

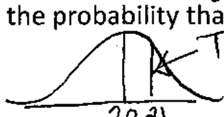
7. Where is the 85th percentile?

invNorm(.85) = 1.036 = Z for 85th percentile

$\frac{x-20}{1.3} = 1.036$ ← solve for x

85th percentile is 21.3468

8. What is the probability that x is EXACTLY 21 minutes. Explain.



This is a line which has no area so probability is zero!

A game is played where you roll a die. You win $5 if you roll a 2 or 3. You win $2 if you roll a 1. Any other roll you pay $1.

9. What is the expected value of this game if you play over a long period of time?

x	(+) Win 5.00	(+) Win 2.00	(−) Lose 1.00
P(x)	2/6	1/6	3/6

$2/6(5.00) + 1/6(2.00) + 3/6(-1.00)$

1.50

10. Is this a fair game? Explain.

No, expected value of a fair game is zero, this game favors the person rolling the die.

11. P(x) = .35, you are doing 5 trials.

(a) Does X describe a binomial setting or a geometric setting? Justify your answer.

binomial ← fixed # of trials $\quad P(x) = .35, \; P(\text{not } x) = .65$

Success $\quad$ Failure

Trials Independent

(b) Compute the mean and standard deviation x.

$\mu_x = np = 5(.35) = \underline{1.75}$

$\sigma_x = \sqrt{np(1-p)} = \sqrt{5(.35)(1-.35)} = \underline{1.0665}$

(c) Find the probability that x occurs at least 3 times.

$P(X=k) = \binom{n}{k} p^k (1-p)^{n-k}$

$P(x=3) = \binom{5}{3}(.35^3)(.65)^2 = .18114$, $P(x=4) = \binom{5}{4}(.35^4)(.65^1) = .04877$, $P(x=5) = \binom{5}{5}(.35)^5(.65)^0 = .00525$

$\binom{5}{3} = {}_5C_3 = 10$ $\quad \binom{5}{4} = {}_5C_4 = 5$

$P(x \geq 3) = .18114 + .04877 + .00525 = .23516$

Check answer with 1-binomcdf(5, .35, 2)

Now let's suppose we keep trying until x occurs.

(d) Find the probability that x occurs on the fourth attempt.

$(.65)(.65)(.65)(.35) = .096$

(e) Find the probability that x occurs **after** the third attempt.

1 − P(on 1st) − P(on 2nd) − P(on 3rd)

$1 - .35 - (.65)(.35) - (.65)(.65)(.35) = .274625$

Check with 1-geometcdf(.35, 3)