DISCRETE PROBABILITY DISTRIBUTIONS (Chapter 5)

General Distribution (pages 259 - 266)

Probability: use x and P(x) specific to problem

Expected Value (Mean): $\mu = E(X) = \sum[X \cdot P(X)]$ **where** $\begin{cases} X = \text{value of random variable} \\ P(X) = \text{probability of } X \end{cases}$
(pages 260, 264)

Variance*: $\sigma^2 = \sum[X^2 \cdot P(X)] - \mu^2$

Binomial Distribution (pages 270 - 276)

Probability: **(1)** $P(\text{exactly } x) = {}_nC_x \cdot p^x \cdot q^{n-X}$ **where** $\begin{cases} n = \text{no. of trials} \\ X = \text{no. of successes} \\ p = \text{prob. of success} \\ q = \text{prob. of failure} \end{cases}$

(2) Use Table B (pages 768 - 773) for individual x values
Add up values in Table B for cumulative x values

(3) TI 83/84: use binompdf (n, p, x) or binomcdf (n, p, x)

Expected Value (Mean): $\mu = n \cdot p$

Variance*: $\sigma^2 = n \cdot p \cdot q$

Poisson Distribution (pages 384 - 286)

Probability:

(1) $P(\text{exactly } x) = \dfrac{e^{-\lambda}\lambda^X}{X!}$ **where** $\begin{cases} \lambda = \text{mean no. of occurences per unit} \\ X = \text{no. of successes} \\ e = 2.718\ldots\ (\text{constant}) \end{cases}$

(2) Use Table C (pages 774 – 780) for individual x values
Add up values in Table C for cumulative x values

(3) TI 83/84: use poissonpdf (λt, x) or poissioncdf (λt, x)

Expected Value (Mean): $\mu = \lambda t$ (not in book)

Variance*: $\sigma^2 = \mu = \lambda t$ (not in book)

NOTE: If using binomial and $n \cdot p < 5$ or $n \cdot q < 5$, use Poisson (see page 286, example 5-29)

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*standard deviation is **always** the square root of the variance

NORMAL DISTRIBUTION (Chapter 6)

z-value: $z = \frac{X - \mu}{\sigma}$ **(use for individual data value when data is normally distributed)**

$z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$ **(use when applying Central Limit Theorem about sample mean When variable is normally distributed or n $\geq$ 30**

Find data value given z (inside out problems): $x = z \times \sigma + \mu$

To determine if data is normally distributed:

1. **Find Pearson's index of skewness:** $PI = \frac{3(\bar{X} - \text{median})}{s}$

   If $-1 < PI < 1$**, then data is not skewed.**
   If $PI \leq -1$ **or** $PI \geq 1$**, then data is significantly skewed.**

2. **Check for outliers (page 152).**

To use Normal Approximation to the Binomial Distribution (p. 342)

1. **Proceed only if** $n \bullet p \geq 5$ **and** $n \bullet q \geq 5$**. Can't use this method if not true!**
2. **Let mean** $\mu = n \bullet p$ **and standard deviation** $\sigma = \sqrt{n \bullet p \bullet q}$**.**
3. **Write the problem in probability notation, using X.**
4. **Rewrite the problem by using the continuity correction factor (fudge factor – see below), and show the corresponding area under the normal distribution.**
5. **Find the corresponding z values.**
6. **Find the solution.**

CONTINUITY CORRECTION FACTOR
(easier version of page 342)

Binomial (When finding….)	Normal (Do this to data value on curve), which will increase area under curve.
P(X =)	Add 0.5 to both sides
P(X ≥)	Add 0.5 to left side
P(X >)	Add 0.5 to right side
P(X ≤)	Add 0.5 to right side
P(X <)	Add 0.5 to left side