# Normal Distributions

## Normal Probability

- Find
  - Area under the curve, probability, percentile, percent
- Standard Normal Distribution
  - Mean = 0    SD = 1

| Conditions | Probability | Calculator Input | | Key Phrases |
|---|---|---|---|---|
| - Continuous Data<br>- Symmetrical<br>- Mean in Middle<br>- Data Separated by Standard Deviation<br>- Area Adds to 1 | - $P(X < x)$<br>- $P(X \leq x)$ | - $2^{nd}$ > Vars<br>- 2: normalcdf | - Lower: -1E99<br>- Upper: X<br>- Mean: μ<br>- SD: σ | - Less Than<br>- At Most<br>- Fewer Than<br>- X or Less |
| | - $P(X > x)$<br>- $P(X \geq x)$ | | - Lower: X<br>- Upper: 1E99<br>- Mean: μ<br>- SD: σ | - Greater Than<br>- At Least<br>- More Than<br>- X or More |
| | - $P(X \leq x \leq Y)$<br>- $P(X < x < Y)$ | | - Lower: X<br>- Upper: Y<br>- Mean: μ<br>- SD: σ | - Between |
| | - $P(x < X \ or \ x > Y)$<br>- $P(x \leq X \ or \ x \geq Y)$ | | 1 – "Between" | - Tails<br>- Less than X or Greater than Y |
| | Differs by Less | | - Lower: $\mu - X$<br>- Upper: $\mu + X$<br>- Mean: μ<br>- SD: σ | - Differs by Less Than X<br>- Differs by Fewer Than X |
| | Differs by More | | - 1 – "Differs by Less"<br>- 2 * normalcdf a tail | - Differs by Greater Than X<br>- Differs by More Than X |

# invNorm

- Find
  - Z-score
  - Measurements

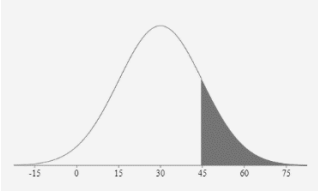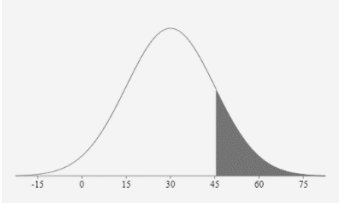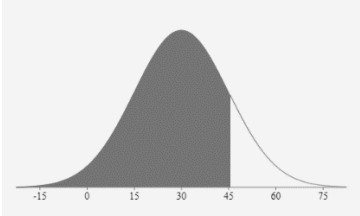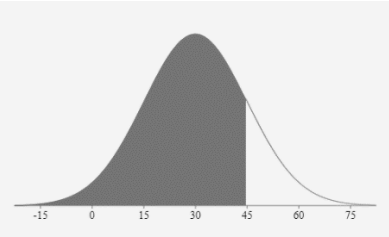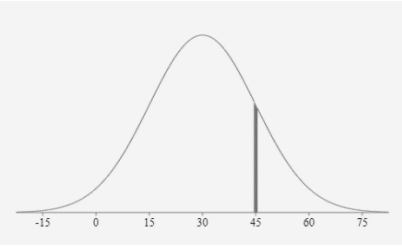| Conditions | Direction | Calculator Input | | | Key Phrases |
|---|---|---|---|---|---|
| | | • 2$^{nd}$ > Vars<br>• 3: invNorm | **Ti-83** | **Ti-84** | |
| • Continuous Data<br>• Symmetrical<br>• Mean in Middle<br>• Data Separated by Standard Deviation<br>• Area Adds to 1 | Left | | p, μ, σ | • Area: p<br>• Mean: μ<br>• SD: σ<br>• Left | • To the Left<br>• Bottom %<br>• Percentile<br>• Less Than |
| | Right | | (1-p), μ, σ | • Area: p<br>• Mean: μ<br>• SD: σ<br>• Right | • To the Right<br>• Top %<br>• More Than |
| | Between -z and z | | • $\left(\frac{1-p}{2}\right), 0,1$ Gives -z<br>• z = -z * -1 | • Area: p<br>• Mean: 0<br>• SD: 1<br>• Center | • Between<br>• This is ONLY z-scores |
| | Left -z and Right z | | • $(\frac{p}{2}, 0,1)$ Gives -z<br>• z = -z * -1 | • Area: 1-p<br>• Mean: 0<br>• SD: 1<br>• Center | • Left of -z Plus Right of z<br>• This is ONLY z-scores |

- Approximating a Binomial Distribution
    - MUST follow the binomial distribution rules:
        - Fixed number of trials: n
        - Independent trials
        - Two outcomes: success and failure
        - Probability for success is the same every time: p
        - $np \geq 10$ $\qquad$ $n(1-p) \geq 10$
    - $\mu = np$
    - $\sigma = \sqrt{np(1-p)}$
    - MUST use continuity corrections
        - After the continuity correction, this is the same as normalcdf

| | | Examples of Continuity Correction | | |
|---|---|---|---|---|
| Statement | Symbol | Graph | | Area |
| • At least 45<br>• 45 or more<br>• No fewer than 45 | ≥45 |  | | Right of 44.5 |
| • More than 45<br>• Greater than 45 | >45 |  | | Right of 45.5 |
| • At most 45<br>• No more than 45 | ≤45 |  | | Left of 45.5 |
| • Less than 45<br>• Fewer than 45 | <45 |  | | Left of 44.5 |
| • Exactly 45<br>• Equal to 45 | =45 |  | | Between 44.5 and 45.5 |