① X = # male babies born in hospital A

Y = " " " " " " B

STEP 1: What is the distribution of X and Y?

$X \sim BIN(100, .5)$

$Y \sim$?

STEP 2: What probability do we need to find?

$P(X \leq 40)$

$P(Y \leq ?)$

STEP 3: How do we find the probability?

Ans: Normal approximation of Binomial probs.

$$P(X \leq 40)$$

$$= P\left[Z \leq \sqrt{100}\left(\frac{\frac{40}{100} - .5}{\sqrt{.5 \times .5}}\right)\right]$$

$$= P\left[Z \leq \frac{-10(.1)}{.5}\right]$$

$$= P[Z \leq -2]$$

$$= ?$$

(2) X = # of students in a class of size 12 who suffer from disease A.

Y = # of students in a class of size 120 who suffer from disease A.

STEP 1: What is the distribution of X and Y?

STEP 2: What is the probability we need to find?

STEP 3: How do we find the probability?

(3) H = Health Score

$H \sim N(\mu = 0,\ \sigma^2 = 4)$

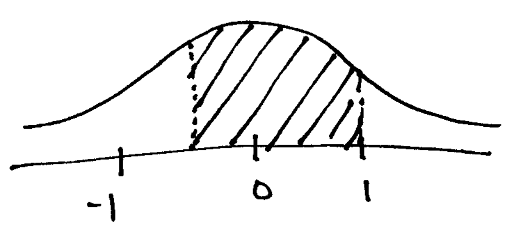
GOAL: Find $P(-1 < H \le 2)$

STEP 1: Standardize to Z

$$P(-1 < H \le 2) = P\left(\frac{-1-\overset{\mu}{0}}{\underset{\sigma}{2}} < Z \le \frac{2-0}{2}\right)$$

$$= P\left(-\tfrac{1}{2} < Z \le 1\right)$$

STEP 2: Sketch normal curve and shade region



STEP 3: Note that ~~the shaded region~~ we can find the area of the shaded region by finding

$$P(Z \le 1) - P\left(Z \le -\tfrac{1}{2}\right)$$

4 X = # of aces in 15 rolls of a die.

STEP 1: What is the distribution of X?

Binomial? Poisson? Normal?

STEP 2: What probability must we find?

$$P(\underbrace{\qquad\qquad}_{\text{what goes in here?}})$$

STEP 3: How do we find this probability?

Table? approximation?

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Males	Females
$X \sim N(\mu = 3800, \sigma = 485)$	$Y \sim N(3656, \sigma = 448)$

75th percentile is the value, call it $X_{.75}$, so that

$$P(X \leq x_{.75}) = .75$$

STEP 1: Standarize

$$P\left(\frac{X - 3800}{485} \leq \underbrace{\frac{x_{.75} - 3800}{485}}_{\text{call this } q}\right) = .75$$

$$P(Z \leq q) = .75$$

STEP 2: Look on page 2 of z-table to find q.

$$q = 0.6745$$

STEP 3: Find $x_{.75}$

$$0.6745 = \frac{x_{.75} - 3800}{485}$$

$$0.6745(485) + 3800 = x_{.75}$$

$$\boxed{4127.132 = x_{.75}}$$

⑥. X = weight of randomly selected infant.

Goal: $P(X < 3000)$.

Trick: Law of Total Probability

$$P(X<3000) = P(\text{Female})\,P(X<3000 \mid \text{Female}) + P(\text{Male})\,P(X<3000 \mid \text{Male})$$

Note: $P(\text{Male}) = .4$

$P(\text{Female}) = .6$

$$P(X<3000 \mid \text{Female}) = P\left(\frac{X-3656}{448} < \frac{3000-3656}{448}\right)$$

$$= P(Z < -1.46) = ?$$

$$P(X<3000 \mid \text{Male}) = ?$$

"Hard - Not on quiz"

7 X = # of randomly selected ball

What is the population mean of X ?

What is the population variance of X ?

X	$P(x)$	$xP(x)$	$(x-\mu)^2$	$(x-\mu)^2 P(x)$
1	$1/3$	$1/3 = 3/9$	9.6721	3.2240
4	$1/3$	$4/3 = 12/9$	0.0121	0.0040
6	$2/9$	$4/3 = 12/9$	3.5721	0.7938
10	$1/9$	$10/9$	34.6921	3.8547

$$\mu = \frac{3+12+12+10}{9}$$

$$= 4.11$$

$$\sigma^2 = 7.8765$$

GOAL: $P(\bar{X} < 3)$

$$\approx P\left[Z < \left(\frac{3-4.11}{\sqrt{7.8765}}\right)\sqrt{100}\right]$$

$$= P(Z < -3.94)$$

= really, really small.

(8) Mean of A = 0

Mean of B = 3

variance of A = variance of B

(9) mean of A = mean of B = 0

variance of A < variance of B

(10)

Area of C

$$P(X \leq 3000)$$

$$= P\left(\frac{X-3800}{485} \leq \frac{3000-3800}{485}\right)$$

$$= P(Z \leq -1.65)$$

$$= 0.0495$$

Area of D

$$P(3000 < X \leq 4500)$$

$$= P\left(\frac{3000-3800}{485} < Z \leq \frac{4500-3800}{485}\right)$$

$$= P(-1.65 < Z \leq 1.44)$$

$$= P(Z \leq 1.44) - P(Z \leq -1.65)$$

$$= 0.9251 - 0.0495$$

$$= 0.8756$$

(11) X = # of mistakes per lecture

STEP 1: What is the distribution of X?

$X \sim POI(\mu = 4)$

STEP 2: What probability do we need to find?

$P(X \leq 3)$

STEP 4: How do we find the probability?

w/ tables.

From table

X	P(x)
0	0.0183
1	0.0733
2	0.1465
3	0.1954

$\boxed{0.4335} = P(X \leq 3)$

$P(X \leq 3) = P(X=0) + P(X=1) + P(X=2) + P(X=3)$