discussed high level strats w/ ta323

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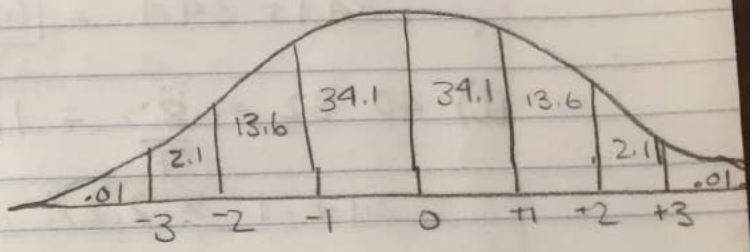
pset #3

1. mean = $n \cdot p$ std = $\sqrt{(n-p)(1-p)}$

(a) mean = $100 \times .5$ std = $\sqrt{(100 \cdot .5)(1-.5)}$
mean = 50 std = 5

i) $55 - 50 = 5$
→ 1 standard dev.
$13.6 + 2.1 + .1 =$ **15.8%**



ii) 60 successes : 2 std above
60 failures : 2 std below

$(2.1 + 0.1) + (2.1 + 0.1) =$ **4.4%**

iii) $65 - 50 = \frac{15}{5} = 3$ std = **.1%**

iv) $60 - 50 = \frac{10}{5} = 2$ std

$34.1 + 13.6 =$ **47.7%**

v) $75 - 50 = 25/5 = 5$ std
$50 - 25 = 25/5 = 5$ std
100%

(b) mean = $64 \cdot .5$ std = $\sqrt{(64 \cdot (.5)(1-.5)}$

mean = 32 std = 4

i) $36 - 32 \cdot 4 = 1$ std

$32 - 28 = 4 = 1$ std

$34.1 + 34.1 =$ **68.2%**

ii) $40 - 32 = \frac{8}{4} = 1$ std

$2.1 + .1 = 2.2\%$

iii) $44 - 32 = \frac{12}{4} = 3$ std

$32 - 20 = \frac{12}{4} = 3$ std

$.01 + .01 =$ **.2%**

iv) $40 - 32 = \frac{8}{4} = 2$ std

$34.1 + 13.6 =$ **47.7%**

v) $52 - 32 = \frac{20}{4} = 5$ std = **0%**

(c) mean = 180 (1/6) = 30 std = $\sqrt{((180)(1/6))(5/6)}$

std = 5

i) 30 = mean

50%

ii) 35 - 30 = 5 → 1 std

30 - 25 = 5 → 1 std

34.1 + 34.1 = 68.2%

iii) $\frac{40-30}{5} = \frac{10}{5}$ = 2 std

2.1 + .1 = 2.2%

iv) $\frac{45-30}{5} = \frac{15}{5}$ = 3 std

34.1 + 13.6 + 2.1 = 49.8%

v) $\frac{30-5}{5} = \frac{25}{5}$ = 5 std

0%

(d) 90% of mean is within 1.645 standard devs

a) 1.645(5) = 8.225

50 - 8.225 = 41.775, 50 + 8.225 = 58.225

b) 1.645(5) = 6.58

32 - 6.58 = 25.42, 32 + 6.58 = 38.58

c) 1.645(5) = 8.225

30 - 8.225 = 21.775, 30 + 8.225 = 38.225

2 (a) i) $E[ax + bx] = \frac{ax+bx}{2}$

$$E[ax+bx] = \sum_s p(s)(ax(s) + bx(s))$$
$$= a \sum p(s)\, x(s) + b \sum_s p(s)\, x(s)$$
$$= a\, E[x] + b\, E[x]$$

$$a\, E[x] = a\mu$$
$$E[ax+bx] = a\mu + b\mu$$

ii) $V[X_1 + X_2] = E[(X_1 + X_2)^2] - (E[X_1] + E[X_2])^2$

$$= E[X_1^2] + 2E[X_1 X_2] + E[X_2^2] - E[X_1]^2 - 2E[X_1]E[X_2]E[E_{X_2}]^2$$
$$= E[X_1^2] - E[X_1]^2 + E[E_2^2] - E[X_2]^2$$
$$= V[X_1] + V[X_2]$$

$$V[X_1] = \sigma_1^2$$

$$V[X_1 + X_2] = \sigma_1^2 + \sigma_2^2$$

iii) $E[X] = \sum x(s)\, p(s)$
$$= E(1/n \sum x_i)$$
$$= 1/25 \left(\sum_{i=1}^{25} [x_i]\right)$$
$$= (1/25)\left(\sum E[x_i]\right)$$
$$= 1/25 \sum u$$

$$\sigma = [X_1 + X_2 + \ldots + X_{25}] = \sqrt{V[X_1] + V[X_2] + \ldots + V[X_{25}]}$$

(b) i) $\frac{3(256)}{65536} = \boxed{.0117}$

ii) $\frac{3(25)}{625} = \boxed{.12}$

iii) $\frac{3(8)}{64} = \boxed{.375}$

iv) $\frac{3(3)}{9} = \boxed{1}$

(c) $65536 \frac{\text{queries}}{\text{sec}} \left(\frac{60 \text{ secs}}{1 \text{ min}}\right)\left(\frac{60 \text{ min}}{1 \text{ hr}}\right)\left(\frac{24 \text{ hr}}{1 \text{ day}}\right)$

$= \boxed{5,662,310,400 \text{ queries/day}}$

$5662310400 \frac{\text{queries}}{\text{day}} \left(\frac{30 \text{ day}}{1 \text{ month}}\right)$

$= \boxed{169,869,312,000 \text{ queries/month}}$

$169869312000 \text{ queries/month} \left(\frac{12 \text{ months}}{1 \text{ year}}\right)$

$= \boxed{2,038,431,744,000 \text{ queries/year}}$

cont'd →

$$\sqrt{\frac{\left(\frac{60\,sec}{min}\right)\left(\frac{60\,min}{hr}\right)\left(\frac{24\,hrs}{day}\right) \times 256}{5,662,310,400}}$$

$$= \boxed{0.00000013}$$

$$\sqrt{\frac{\left(\frac{60\,sec}{min}\right)\left(\frac{60\,min}{hr}\right)\left(\frac{24\,hr}{day}\right)\left(\frac{30\,day}{month}\right) \times 256}{169,869,312,000}}$$

$$= \boxed{.000024}$$

$$\sqrt{\frac{\left(\frac{60\,sec}{min}\right)\left(\frac{60\,min}{hr}\right)\left(\frac{24\,hr}{day}\right)\left(\frac{30\,day}{month}\right)\left(\frac{12\,month}{year}\right) \times 256}{2,038,431,744,000}}$$

$$= \boxed{.0000007}$$

3 (a) mean = $100 \times 14 \times .5$
= 700

std = $\sqrt{(1400)(.5)(.5)}$
= 18.71

$.531 \times 1400 = 743.4$
$743.4 - 700 = \frac{43.4}{18.71} = 2.32$ std dev

1 - zscore @ 2.32 = **.010175**

(b) i) $1.645(18.71) = 30.78$
$700 + 30.78 =$ **730.78**

ii) $\frac{730.78}{1400} =$ **.522**

iii) $1 - (.9)^2 =$ **.19**

iv) std = $\sqrt{(700)(.5)(.5)} = 13.23$

$1.645(13.23) = 21.76$
$700 + 21.76 =$ **721.76**

v) $\frac{721.76}{1400} =$ **.516**

vi) $1 - (.9)^4 =$ **.3439**