アメリカ式統計学セミナー

4. 確率変数と確率分布

今日のコンテンツ

- 4-1 確率変数
- 4-2 期待値と分散
- 4-3 確率分布とヒストグラム
- 4-4 正規分布と t 分布

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・コイン投げの結果集計

1回目	2回目	3回目	4回目	5回目	6回目
表	裏	表	表	裏	裏

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結果は質的(数値でない)データのため、 平均や分散などが計算できない

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確率変数

確率変数



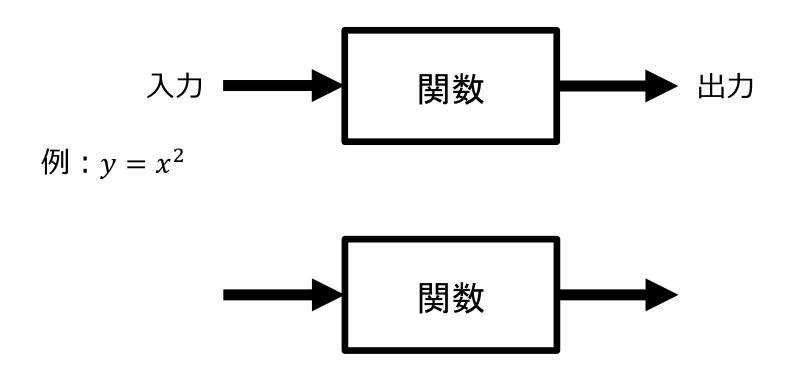
確率変数

標本空間上の確率変数 X とは、標本空間を**定義域**とし、実数を**値域**とする**関数**である。それぞれ決まった確率が与えられる。

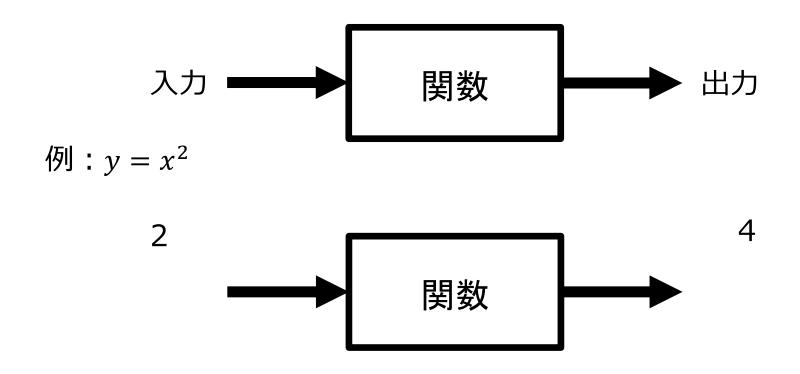


例: $y = x^2$

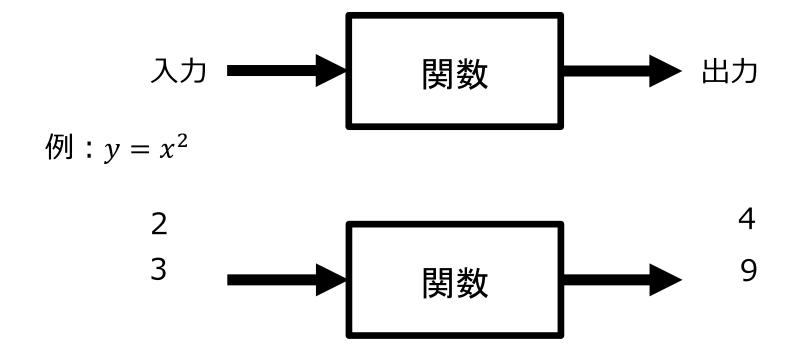
確率変数



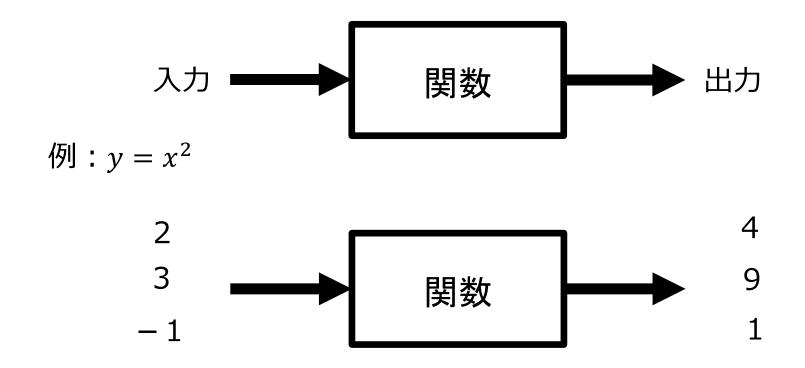
確率変数



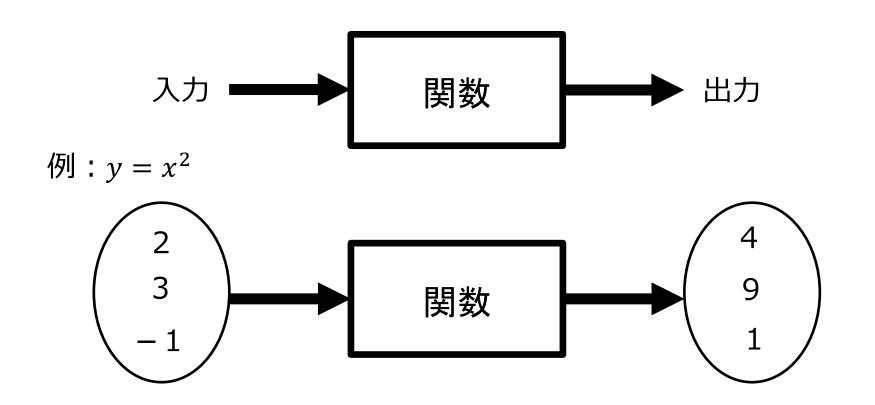
確率変数



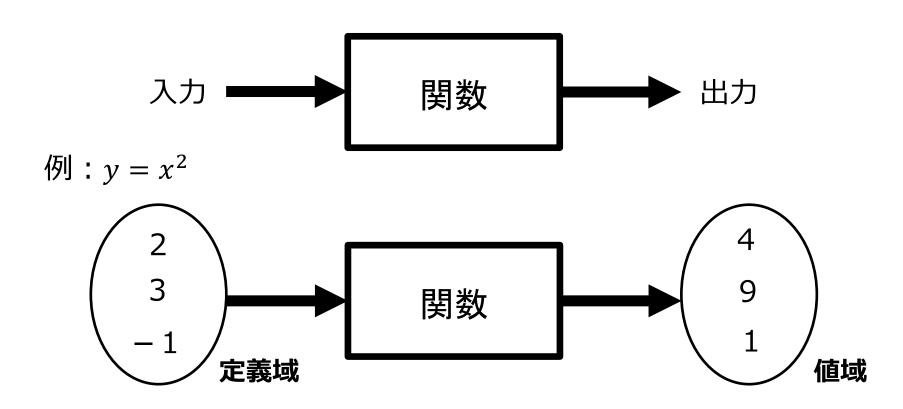
確率変数



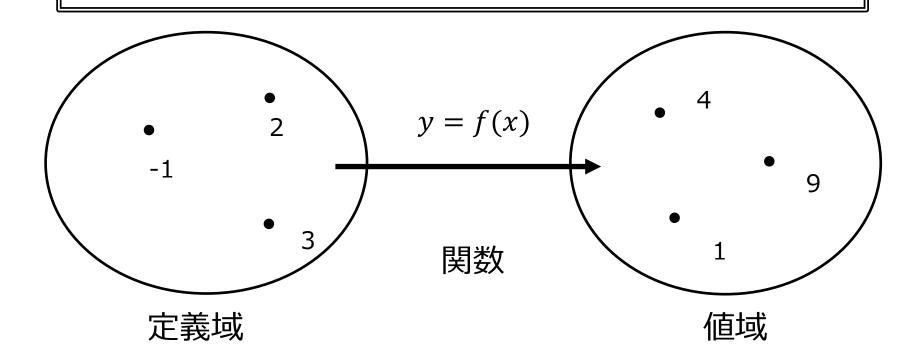
確率変数



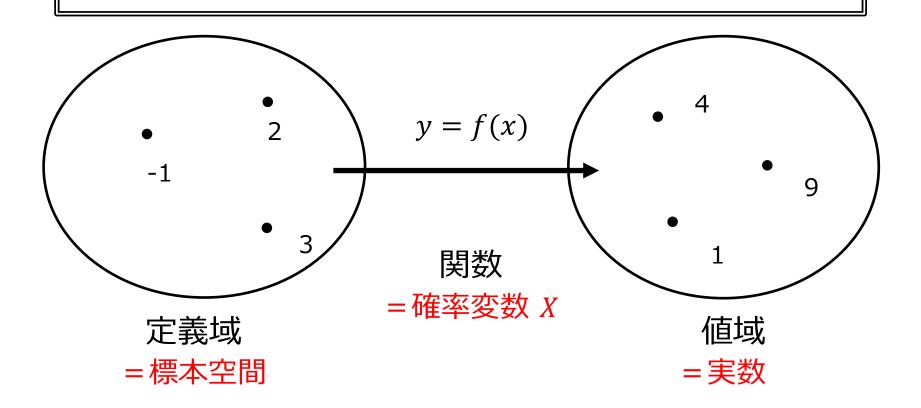
確率変数

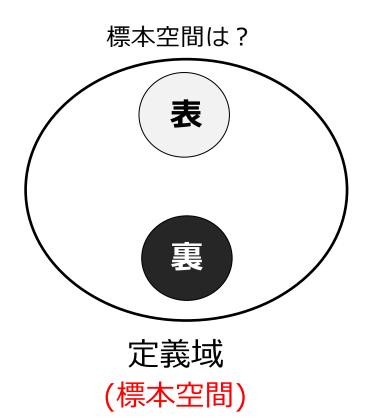


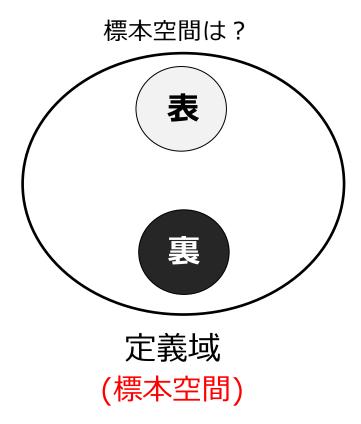
確率変数

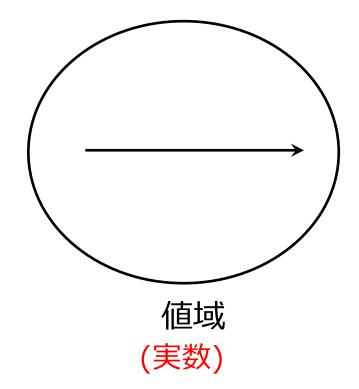


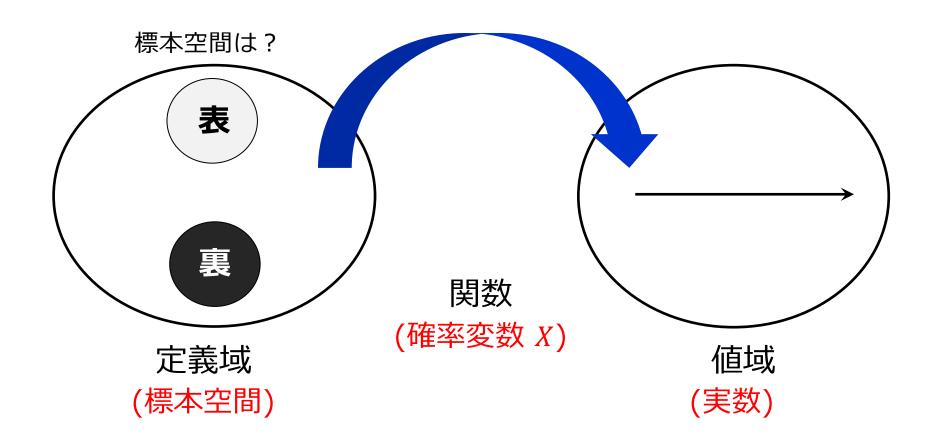
確率変数

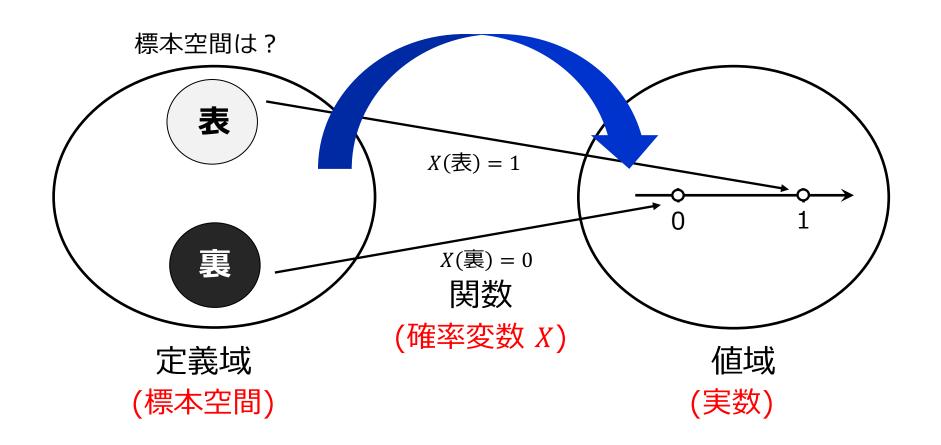


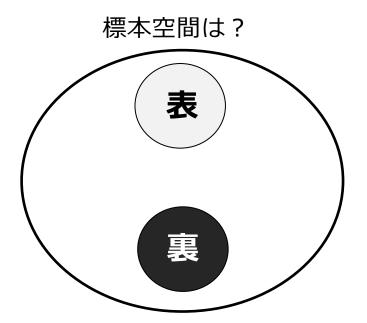


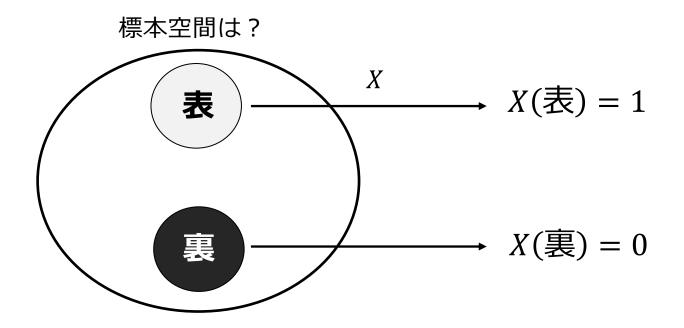


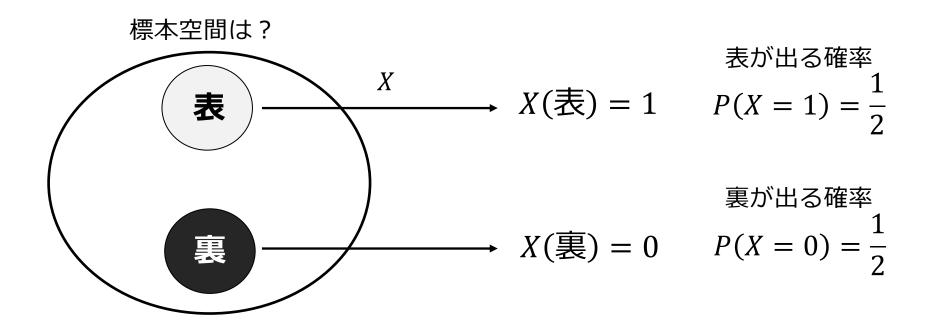












赤玉と青玉が1つずつ入っている袋から玉を取り出して戻す操作を2回繰り返す。



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標本空間は?

赤玉と青玉が1つずつ入っている袋から玉を取り出して戻す操作を2回繰り返す。



標本空間は?



 $S = \{ 赤赤, 赤青, 青赤, 青青 \}$

赤玉と青玉が1つずつ入っている袋から玉を取り出して戻す操作を2回繰り返す。



標本空間は?



 $S = \{ 赤赤, 赤青, 青赤, 青青 \}$

確率変数 X: **赤の出た数** とする

赤玉と青玉が1つずつ入っている袋から 玉を取り出して戻す操作を2回繰り返す。



標本空間は?



 $S = \{ 赤赤, 赤青, 青赤, 青青 \}$

確率変数 X: **赤の出た数** とする

$$X(赤赤)=2$$

$$X(赤青) = 1$$

$$X(赤赤) = 2$$
 $X(赤青) = 1$ $X(赤青) = 1$ $X(青青) = 0$

$$X$$
(青青) = 0

赤玉と青玉が1つずつ入っている袋から 玉を取り出して戻す操作を2回繰り返す。



標本空間は?



 $S = \{ \bar{s}, \bar{s$

確率変数 X:**赤の出た数** とする

X(赤赤) = 2 X(赤青) = 1 X(赤青) = 1 X(青青) = 0

それぞれの確率変数の確率は次のように書ける

赤玉と青玉が1つずつ入っている袋から 玉を取り出して戻す操作を2回繰り返す。



標本空間は?



 $S = \{ \bar{s}, \bar{s$

確率変数 X:**赤の出た数** とする

$$X(赤赤)=2$$

$$X($$
赤青 $) = 1$

$$X(赤赤) = 2$$
 $X(赤青) = 1$ $X(赤青) = 1$ $X(青青) = 0$

$$X$$
(青青) = 0

それぞれの確率変数の確率は次のように書ける

$$P(X = 2) = \frac{1}{4}$$
 $P(X = 1) = \frac{2}{4}$ $P(X = 0) = \frac{1}{4}$

$$P(X=1) = \frac{2}{4}$$

$$P(X=0)=\frac{1}{4}$$

赤玉と青玉が1つずつ入っている袋から玉を取り出して戻す操作を2回繰り返す。



標本空間は?



 $S = \{ 赤赤, 赤青, 青赤, 青青 \}$

確率変数 X: **赤の出た数** とする

X	0	1	2
P(X)	1/4	1/2	1/4

P(X):確率質量関数

コイン投げの試行を3回繰り返した時の、表の出る数を確率変数とする。 それぞれの確率を求め、確率質量関数の表を作成せよ。

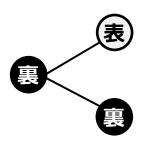
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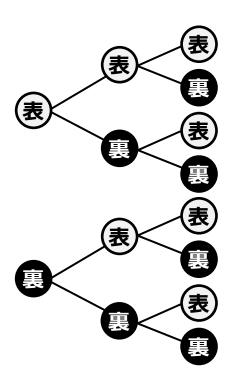


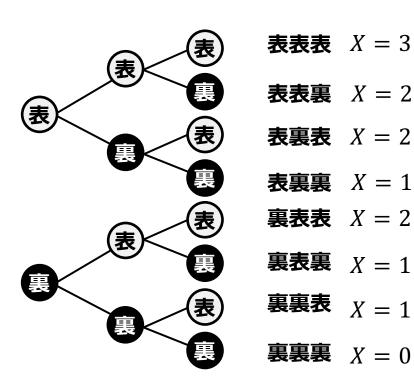


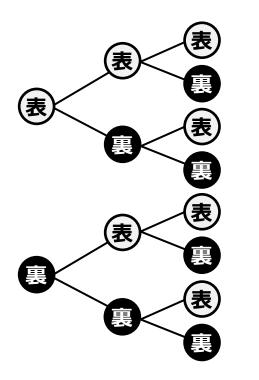
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表表表	X	=	3
	Λ	_	J

表表裏
$$X=2$$

表裏表
$$X=2$$

表裏裏
$$X=1$$

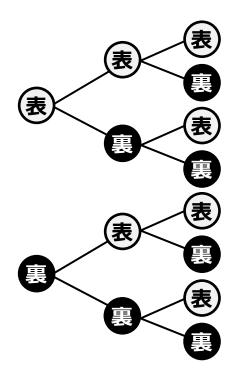
裏表表
$$X=2$$

裏表裏
$$X = 1$$

裏裏表
$$X=1$$

裏裏裏
$$X=0$$

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8



#	丰	丰	Y	_	2
衣	衣	衣	Λ	_	S

表表裏
$$X=2$$

表裏表
$$X=2$$

表裏裏
$$X=1$$

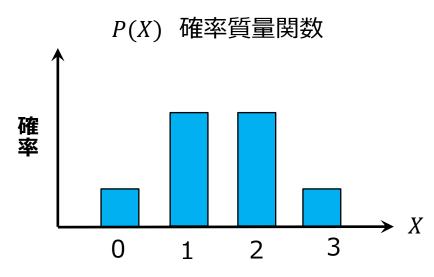
裏表表
$$X=2$$

裏表裏
$$X = 1$$

裏裏表
$$X=1$$

裏裏裏
$$X=0$$

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8



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確率質量関数

コイン投げの試行を3回繰り返した時の、表の出る数を確率変数とする。

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

確率質量関数

コイン投げの試行を3回繰り返した時の、表の出る数を確率変数とする。

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

・ 表が2回以上出る確率は?

$$P(X \ge 2) = \frac{4}{8}$$

確率質量関数

コイン投げの試行を3回繰り返した時の、表の出る数を確率変数とする。

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

・ 表が2回以上出る確率は?

$$P(X \ge 2) = \frac{4}{8}$$

・ 表が0回以上2回以下の確率は?

$$P(0 \le X \le 2) = \frac{7}{8}$$

(1)
$$0 \le P(x) \le 1$$

(2)
$$\sum_{i=1}^{n} p(x_i) = 1$$

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コイン投げの例

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

$$(1) \ 0 \le P(x) \le 1$$

コイン投げの例

(2)
$$\sum_{i=1}^{n} p(x_i) = 1$$

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

$$\sum_{i=1}^{4} p(x_i) = p(x_1) + p(x_2) + p(x_3) + p(x_4)$$

$$(1) \ 0 \le P(x) \le 1$$

コイン投げの例

(2)
$$\sum_{i=1}^{n} p(x_i) = 1$$

$$\sum_{i=1}^{4} p(x_i) = p(x_1) + p(x_2) + p(x_3) + p(x_4)$$

$$= p(X = 0) + p(X = 1) + p(X = 2) + p(X = 3) = 1$$

4. 確率変数と確率分布

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- 4-2 期待値と分散
- 4-3 確率分布とヒストグラム
- 4-4 正規分布と t 分布

確率変数の期待値

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

$$\mu = E[X] = \sum_{i=1}^{n} x_i \times p_i$$

確率変数の期待値

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

$$\mu = E[X] = \sum_{i=1}^{n} x_i \times p_i$$

確率変数の期待値 =

確率変数がとる値と、その値となる確率の積を全て足し合わせたもので、 確率変数の平均値を表す。

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

$$\mu = E[X] = \sum_{i=1}^{n} x_i \times p_i$$

平均値 = 期待値

平均値=期待値

確率変数の期待値 =

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

$$p_i = P(X = x_i) = \frac{n(x_i)}{n(S)}$$

確率変数の期待値

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

$$p_i = P(X = x_i) = \frac{n(x_i)}{n(S)}$$
全事象数

平均値=期待値

確率変数の期待値

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

$$p_i = P(X = x_i) = \frac{n(x_i)}{n(S)}$$
 $X = x_1$ となるずータが $n(x_i)$ 個全事象数

確率変数の期待値 =

確率変数がとる値と、その値となる確率の積を全て足し合わせたもので、 確率変数の平均値を表す。

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

平均値 =

確率変数の期待値 =

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

確率変数の期待値 =

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

平均値 =
$$\frac{\vec{\mathcal{F}} - \mathcal{P}$$
の合計 $= \frac{x_1 + \dots + x_1 + x_2 + \dots + x_n + \dots + x_n}{\mathbf{全}\vec{\mathcal{F}} - \mathcal{P}$ 数 $\mathbf{\mathcal{E}}$

確率変数の期待値

平均値=期待値

確率変数の期待値

平均値=期待値

確率変数の期待値

確率変数の期待値

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

平均値 =
$$\frac{\ddot{\mathcal{F}} - \mathcal{P}$$
の合計 $= \frac{x_1 \cdot n(x_1) + x_2 \cdot n(x_2) + \dots + x_n \cdot n(x_n)}{2}$ $= \frac{x_1 \cdot n(x_1) + x_2 \cdot n(x_2) + \dots + x_n \cdot n(x_n)}{n(S)}$

確率変数の期待値

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

平均値 =
$$\frac{\vec{\mathcal{F}} - \mathcal{P}$$
の合計 $}{2\vec{\mathcal{F}} - \mathcal{P}$ 数 = $\frac{x_1 \cdot n(x_1) + x_2 \cdot n(x_2) + \dots + x_n \cdot n(x_n)}{n(S)}$

確率変数の期待値

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

平均値 =
$$\frac{\vec{\mathcal{F}} - \mathcal{P}$$
の合計 $}{\mathbf{2}\vec{\mathcal{F}} - \mathcal{P}$ 数 = $\frac{x_1 \cdot n(x_1) + x_2 \cdot n(x_2) + \dots + x_n \cdot n(x_n)}{n(S)}$

$$= x_1 \cdot p_1 + x_2 \cdot p_2$$

確率変数の期待値

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

平均値 =
$$\frac{\ddot{\mathcal{F}} - \mathcal{P} \mathcal{O}$$
合計 = $\frac{x_1 \cdot n(x_1) + x_2 \cdot n(x_2) + \dots + x_n \cdot n(x_n)}{\mathbf{n}(S)}$ = $\frac{x_1 \cdot p_1 + x_2 \cdot p_2 + \dots + x_n \cdot p_n}{\mathbf{n}(S)}$

確率変数の期待値 =

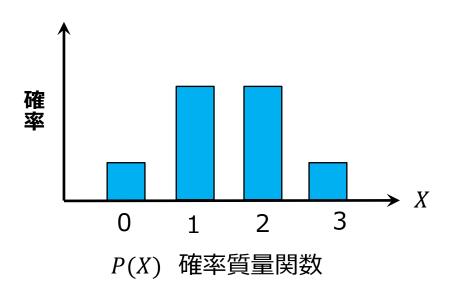
X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

平均値 =
$$\frac{\vec{\mathcal{F}} - \mathcal{P}$$
の合計 $}{\mathbf{2}\vec{\mathcal{F}} - \mathcal{P}$ 数 = $\frac{x_1 \cdot n(x_1) + x_2 \cdot n(x_2) + \dots + x_n \cdot n(x_n)}{n(S)}$ = $x_1 \cdot p_1 + x_2 \cdot p_2 + \dots + x_n \cdot p_n =$ 期待値

確率変数の期待値 =

確率変数の期待値

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

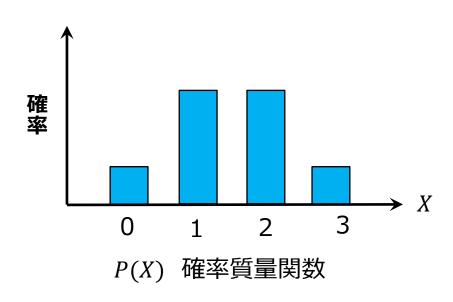


確率変数の期待値

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

$$\mu = E[X]$$

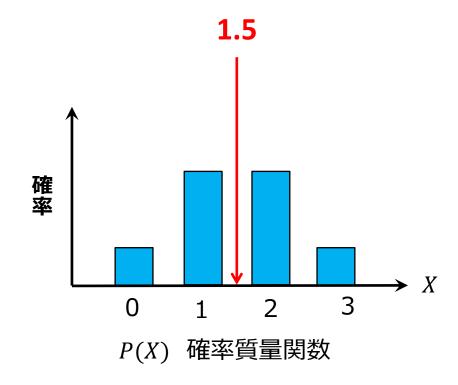
$$= 0 \times \frac{1}{8} + 1 \times \frac{3}{8} + 2 \times \frac{3}{8} + 3 \times \frac{1}{8}$$



確率変数の期待値

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

$$\mu = E[X]$$
= $0 \times \frac{1}{8} + 1 \times \frac{3}{8} + 2 \times \frac{3}{8} + 3 \times \frac{1}{8}$
= 1.5



サイコロの出る目を確率変数とする時、確率変数Xの期待値を求めよ。

サイコロの出る目を確率変数とする時、確率変数Xの期待値を求めよ。

X	1	2	3	4	5	6
P(X)	1/6	1/6	1/6	1/6	1/6	1/6

サイコロの出る目を確率変数とする時、確率変数Xの期待値を求めよ。

X	1	2	3	4	5	6
P(X)	1/6	1/6	1/6	1/6	1/6	1/6

$$E[X] = \sum_{k=1}^{6} k \cdot P(X = k)$$

確率変数の期待値

サイコロの出る目を確率変数とする時、確率変数Xの期待値を求めよ。

X	1	2	3	4	5	6
P(X)	1/6	1/6	1/6	1/6	1/6	1/6

$$E[X] = \sum_{k=1}^{6} k \cdot P(X = k)$$

$$= 1 \cdot \frac{1}{6} + 2 \cdot \frac{1}{6} + 3 \cdot \frac{1}{6} + 4 \cdot \frac{1}{6} + 5 \cdot \frac{1}{6} + 6 \cdot \frac{1}{6}$$

確率変数の期待値

サイコロの出る目を確率変数とする時、確率変数Xの期待値を求めよ。

X	1	2	3	4	5	6
P(X)	1/6	1/6	1/6	1/6	1/6	1/6

$$E[X] = \sum_{k=1}^{6} k \cdot P(X = k)$$

$$= 1 \cdot \frac{1}{6} + 2 \cdot \frac{1}{6} + 3 \cdot \frac{1}{6} + 4 \cdot \frac{1}{6} + 5 \cdot \frac{1}{6} + 6 \cdot \frac{1}{6}$$

$$= \frac{21}{6} = 3.5$$

確率変数の分散 =

「確率変数の取り得る値と期待値の差の2乗」と「確率」の積を全て足し合わせたもの。

X	x_1	x_2	•••	x_n
P(X)	p_1	p_2	•••	p_n

$$\sigma^2 = V[X] = \sum_{i=1}^n (x_i - \mu)^2 \times p_i$$

確率変数の分散 =

確率変数の分散

$$V[X] = \sum_{i=1}^{4} (x_i - \mu)^2 \times p_i$$

確率変数の分散

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

$$V[X] = \sum_{i=1}^{4} (x_i - \mu)^2 \times p_i$$

確率変数の分散

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8
$(x_i-\mu)$	-1.5	-0.5	0.5	1.5

$$V[X] = \sum_{i=1}^{4} (x_i - \mu)^2 \times p_i$$

確率変数の分散

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8
$(x_i-\mu)$	-1.5	-0.5	0.5	1.5
$(x_i-\mu)^2$	2.25	0.25	0.25	2.25

$$V[X] = \sum_{i=1}^{4} (x_i - \mu)^2 \times p_i$$

確率変数の分散

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8
$(x_i-\mu)$	-1.5	-0.5	0.5	1.5
$(x_i-\mu)^2$	2.25	0.25	0.25	2.25
$(x_i-\mu)^2\times p_i$	0.28125	0.09375	0.09375	0.28125

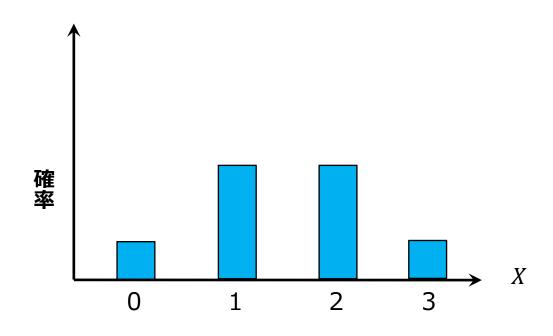
$$V[X] = \sum_{i=1}^{4} (x_i - \mu)^2 \times p_i$$

確率変数の分散 =

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8
$(x_i-\mu)$	-1.5	-0.5	0.5	1.5
$(x_i-\mu)^2$	2.25	0.25	0.25	2.25
$\overline{(x_i - \mu)^2 \times p_i}$	0.28125	0.09375	0.09375	0.28125

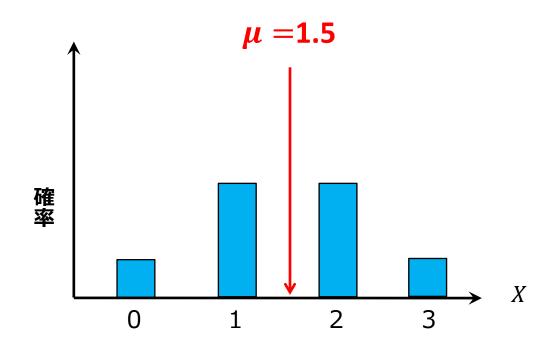
$$V[X] = \sum_{i=1}^{4} (x_i - \mu)^2 \times p_i = 0.75$$

確率変数の期待値と分散



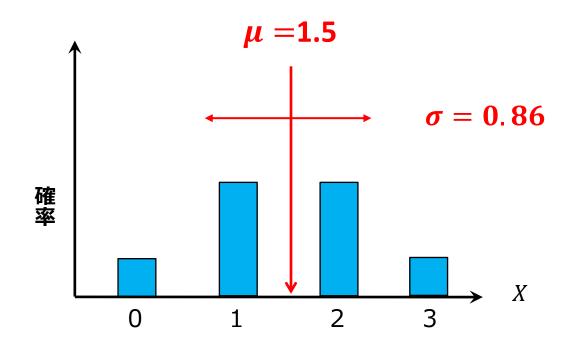
P(X) 確率質量関数

確率変数の期待値と分散



P(X) 確率質量関数

確率変数の期待値と分散

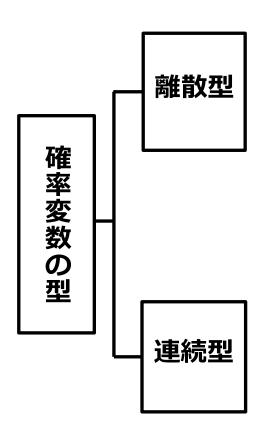


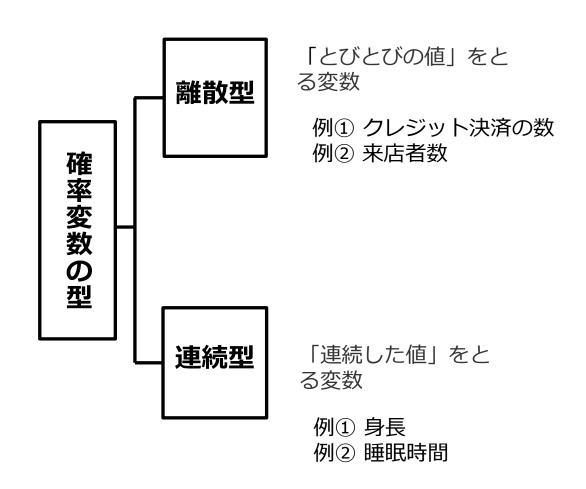
P(X) 確率質量関数

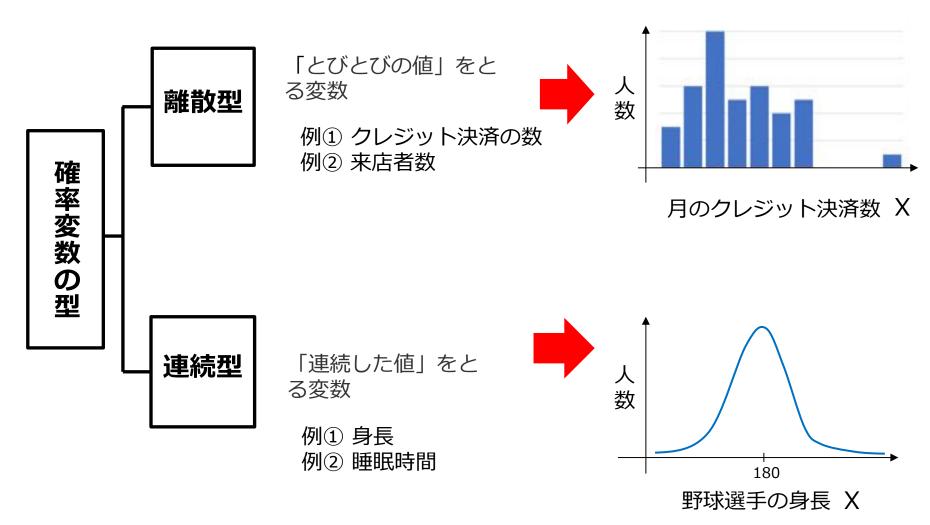
4. 確率変数と確率分布

今日のコンテンツ

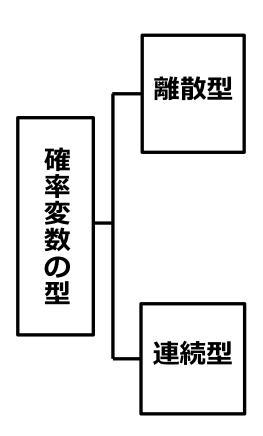
- 4-1 確率変数
- 4-2 期待値と分散
- 4-3 確率分布とヒストグラム
- 4-4 正規分布と t 分布

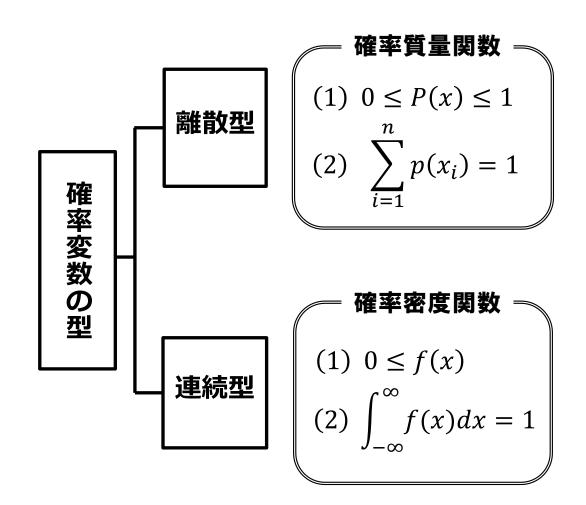




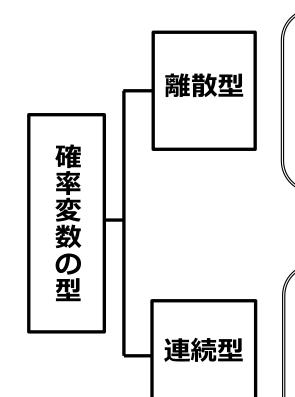


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期待値と分散



確率質量関数

- (1) $0 \le P(x) \le 1$
- $(2) \quad \sum p(x_i) = 1$

$\mu = E[X] = \sum_{i=1}^{\infty} x_i \times p_i$

$$\sigma^2 = V[X] = \sum_{i=1}^n (x_i - \mu)^2 \times p_i$$

確率密度関数

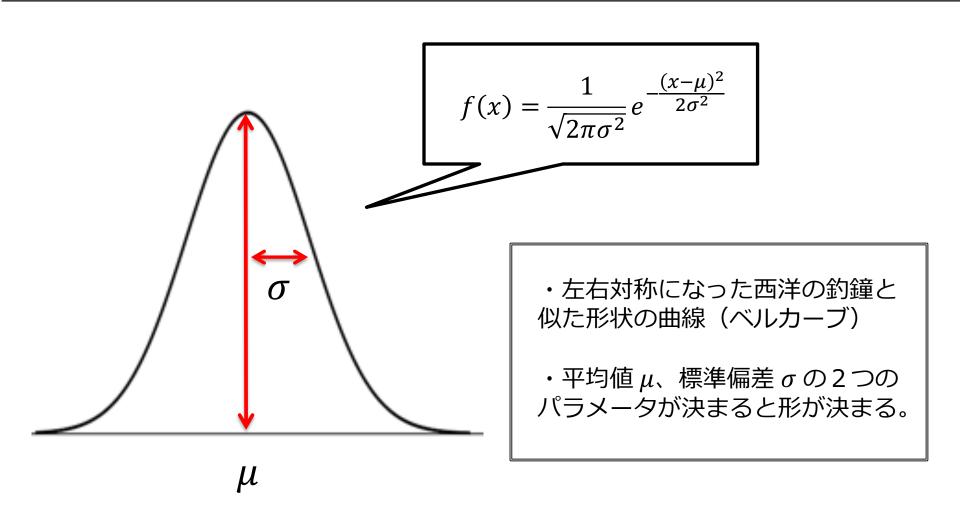
- (1) $0 \le f(x)$
- $(2) \int_{-\infty}^{\infty} f(x) dx = 1$

$$\mu = E[X] = \int_{-\infty}^{\infty} x f(x) dx$$

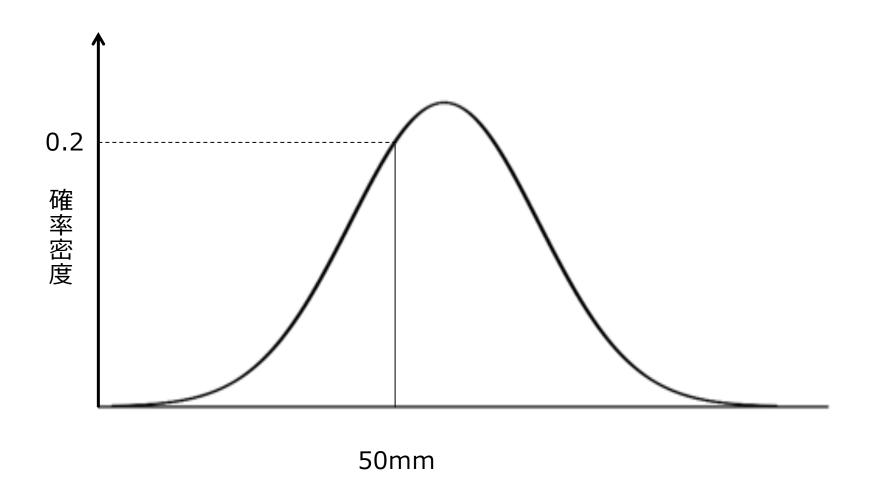
$$\sigma^{2} = V[X]$$

$$= \int_{-\infty}^{\infty} (x - \mu)^{2} f(x) dx$$

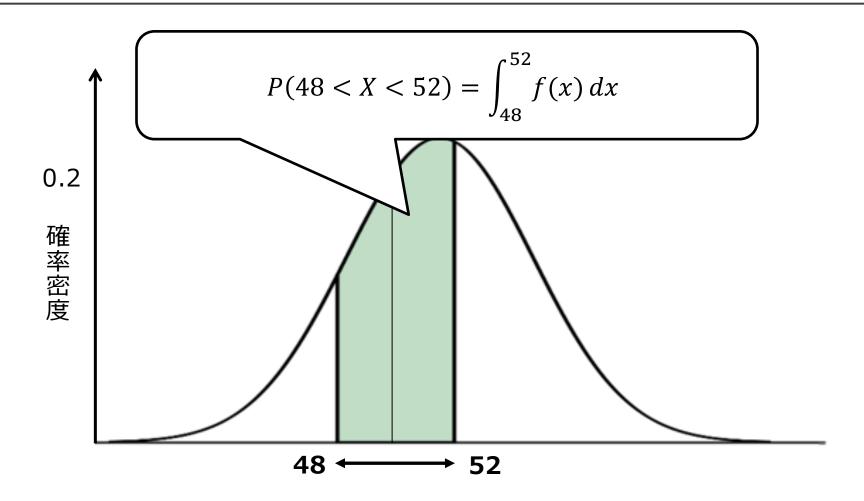
確率密度関数:正規分布



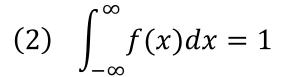
確率密度関数と確率

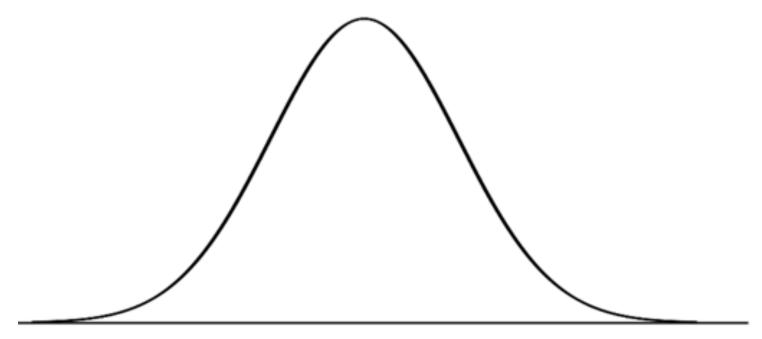


確率密度関数と確率

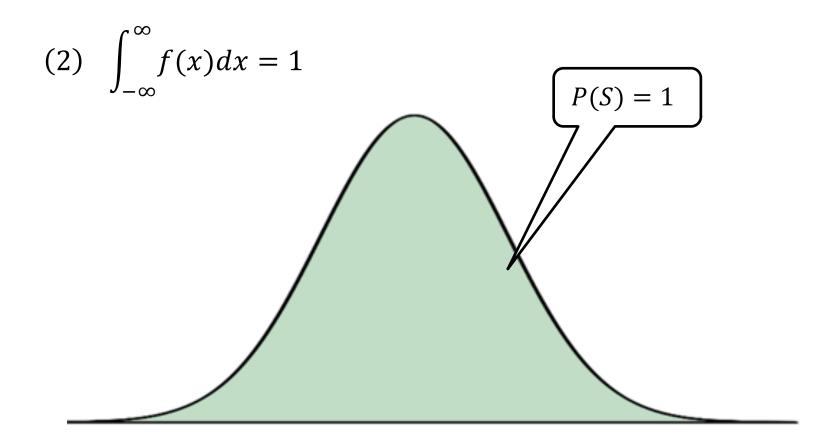


正規分布の面積の総和は?





正規分布の面積の総和は?



箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

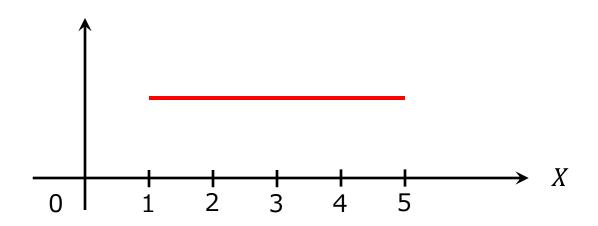
X は1~5までの実数をとるので**連続分布**

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

X は1~5までの実数をとるので**連続分布** どのカードも**一様に同じ確率**。

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

X は1~5までの実数をとるので連続分布 どのカードも一様に同じ確率。

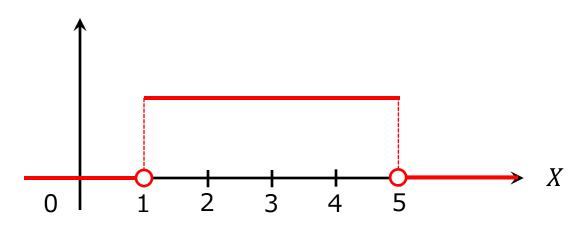


箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

X は1~5までの実数をとるので**連続分布**

どのカードも一様に同じ確率。

1未満の数、5より大きな数を引く確率は0

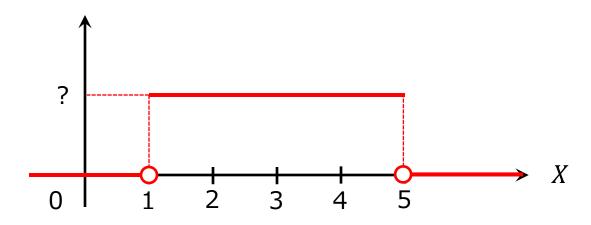


箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

X は1~5までの実数をとるので**連続分布**

どのカードも一様に同じ確率。

1未満の数、5より大きな数を引く確率は0



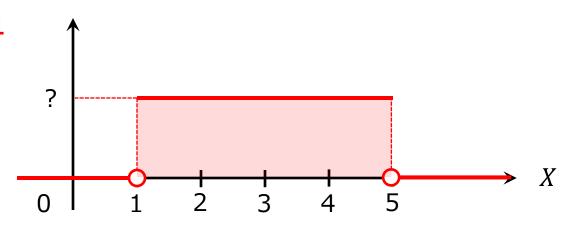
箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

X は1~5までの実数をとるので**連続分布**

どのカードも一様に同じ確率。

1未満の数、5より大きな数を引く確率は0

全確率=面積は1



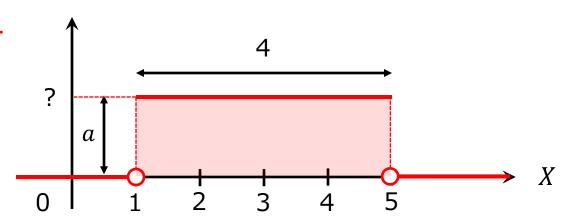
箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

X は1~5までの実数をとるので**連続分布**

どのカードも一様に同じ確率。

1未満の数、5より大きな数を引く確率は0

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箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

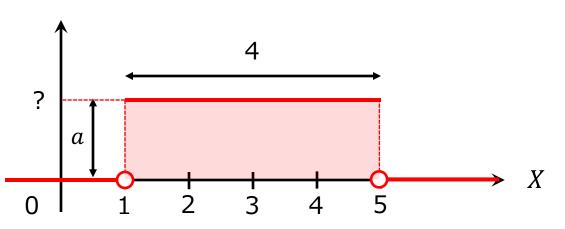
X は1~5までの実数をとるので**連続分布**

どのカードも一様に同じ確率。

1未満の数、5より大きな数を引く確率は0

全確率=面積は1

$$a \times 4 = 1$$

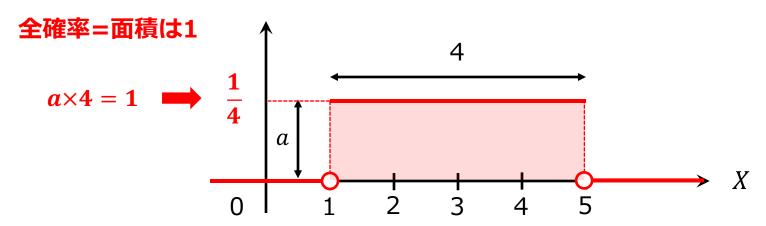


箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

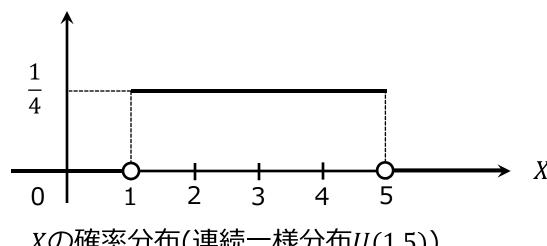
X は1~5までの実数をとるので**連続分布**

どのカードも一様に同じ確率。

1未満の数、5より大きな数を引く確率は0



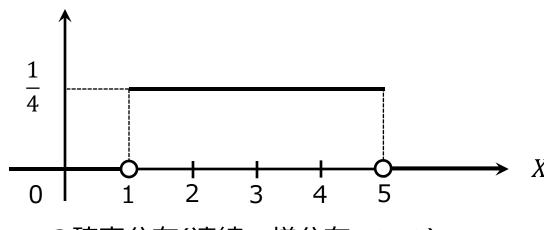
箱の中に1~5までの実数の番号がついたカードが入っている。その中から 取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。



Xの確率分布(連続一様分布U(1,5))

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

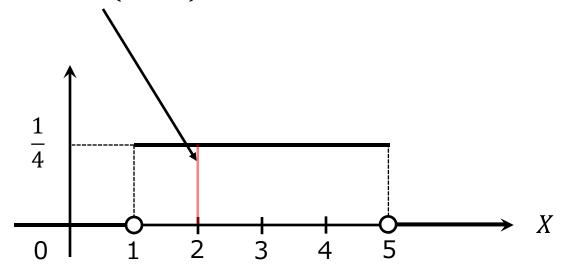
2のカードを引く確率 P(X=2)



Xの確率分布(連続一様分布U(1,5))

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

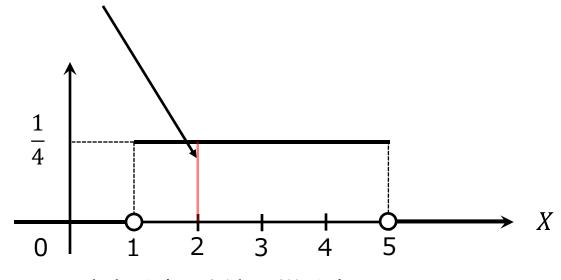
2のカードを引く確率 P(X=2)



Xの確率分布(連続一様分布U(1,5))

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

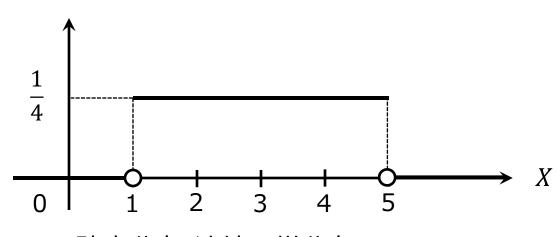
2のカードを引く確率 P(X=2)=0 (測れない)



Xの確率分布(連続一様分布U(1,5))

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

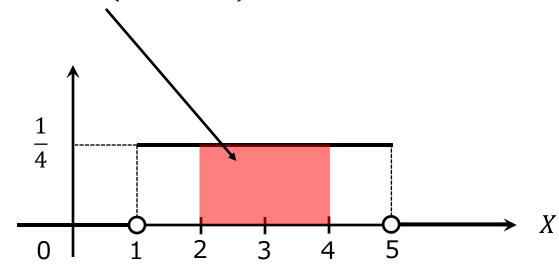
 $2\sim4$ のカードを引く確率 $P(2 \le X \le 4)$



Xの確率分布(連続一様分布U(1,5))

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

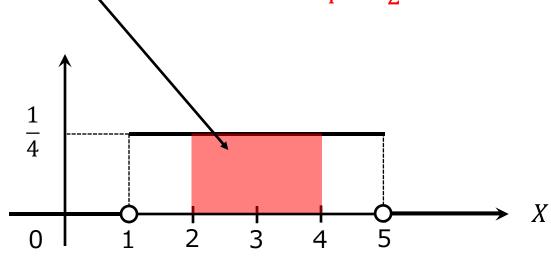
 $2\sim 4$ のカードを引く確率 $P(2 \le X \le 4)$



Xの確率分布(連続一様分布U(1,5))

箱の中に1~5までの実数の番号がついたカードが入っている。その中から取り出したカード番号をXとするとき、Xの確率分布はどのようになるか。

2~4のカードを引く確率 $P(2 \le X \le 4) = 2 \times \frac{1}{4} = \frac{1}{2}$



Xの確率分布(連続一様分布U(1,5))

データの持つ情報を数値やグラフを使って表現する

データの持つ情報を数値やグラフを使って表現する

株価

224.63

215.53

210.94

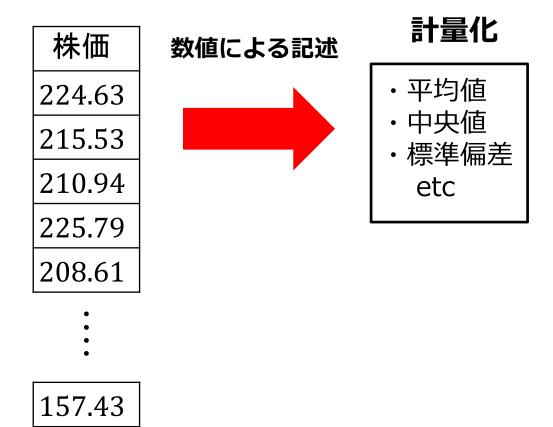
225.79

208.61

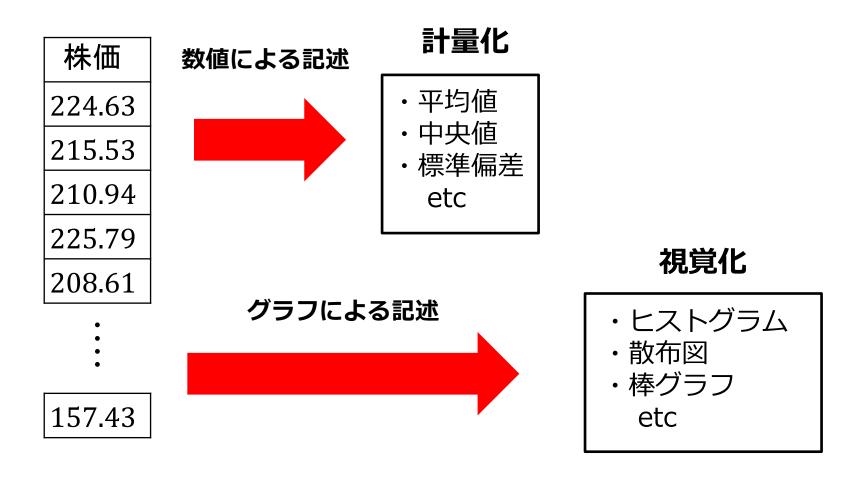
•

157.43

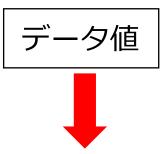
データの持つ情報を数値やグラフを使って表現する



データの持つ情報を数値やグラフを使って表現する

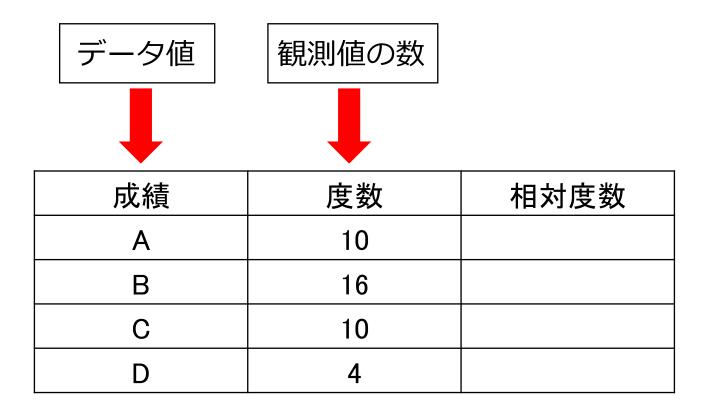


度数分布表(質的データの場合)



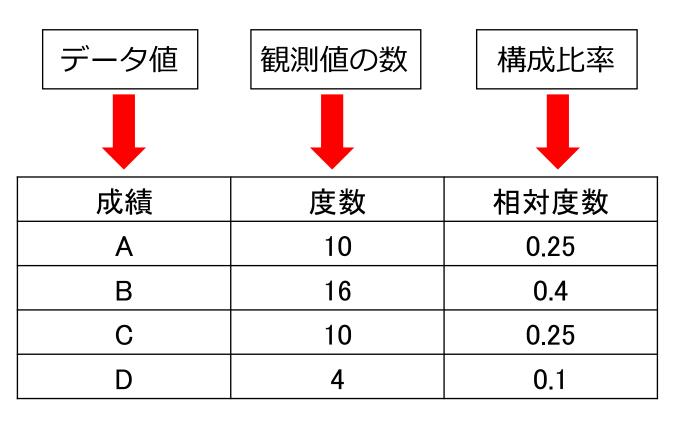
成績	度数	相対度数
Α		
В		
С		
D		

度数分布表(質的データの場合)



合計 40

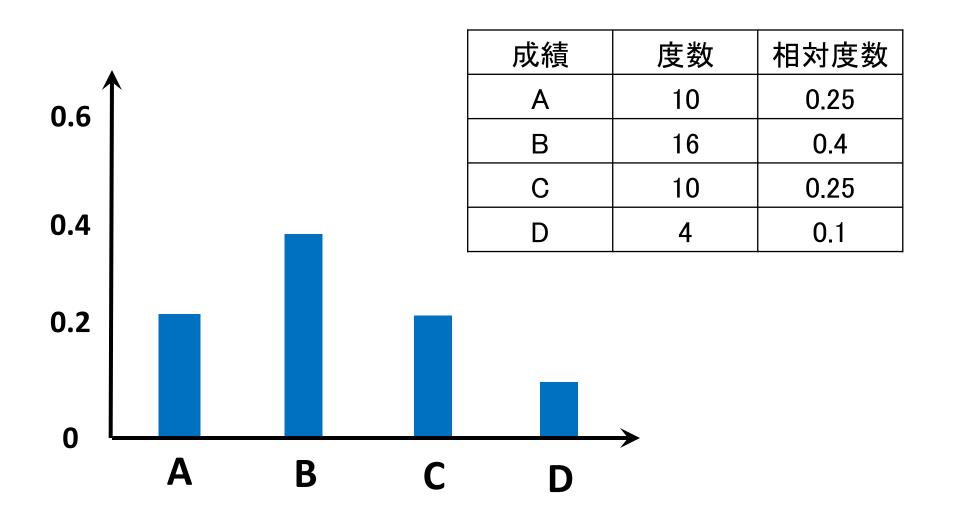
度数分布表(質的データの場合)



合計 40

合計 1

ヒストグラム(質的データの場合)



度数分布表 (量的データの場合)

株価

24.5

15.3

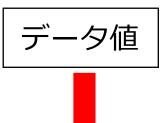
10.9

5.79

24.5

•

48.4



区間	度数	相対度数
10-20		
20-30		
30-40		
40-50		

度数分布表(量的データの場合)

データ値 観測値の数 株価 24.5 区間 度数 相対度数 15.3 10 10.9 10-20 5.79 20-30 16 30-40 24.5 10 40-50 4

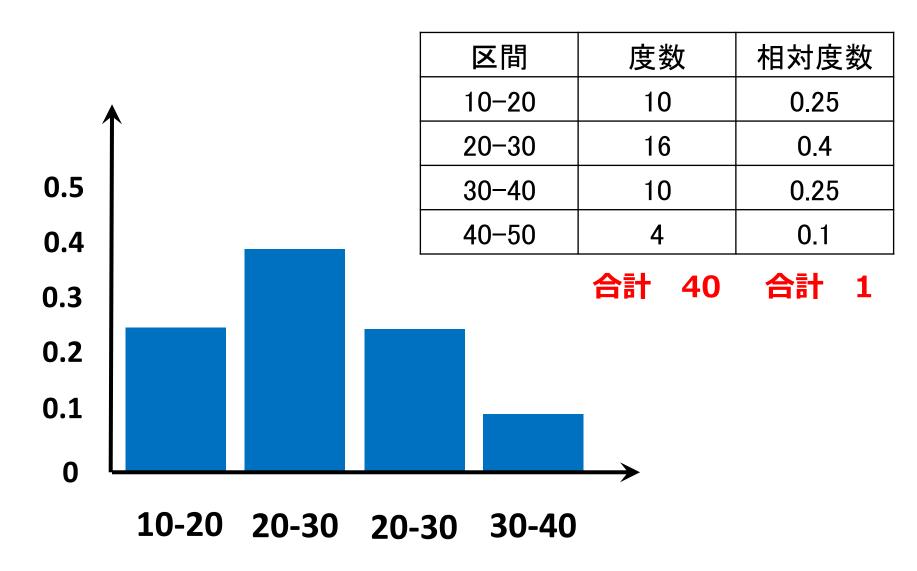
合計 40

48.4

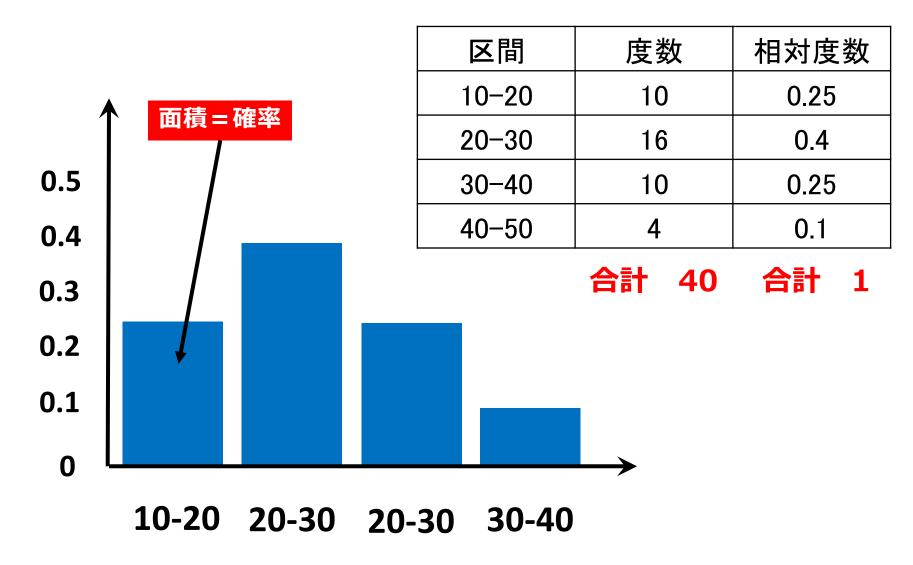
度数分布表(量的データの場合)

	データ値	観測値の数	構成比率
株価			
24.5			
15.3	区間	度数	相対度数
10.9	10–20	10	0.25
5.79	20-30	16	0.4
24.5	30-40	10	0.25
•	40-50	4	0.1
48.4		合計 40	合計 1

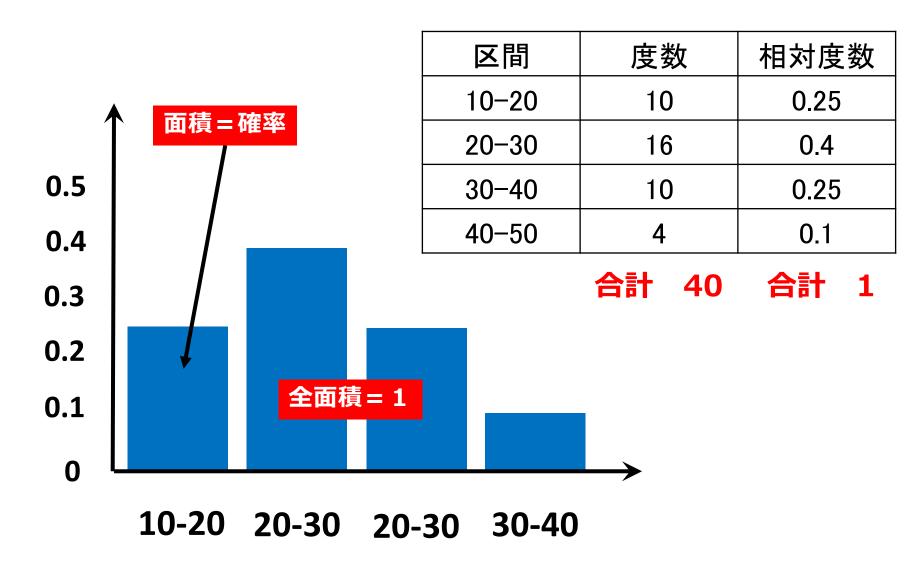
ヒストグラム(量的データの場合)



ヒストグラム(量的データの場合)



ヒストグラム(量的データの場合)



ヒストグラムの意味

ヒストグラムの3つの構成要素

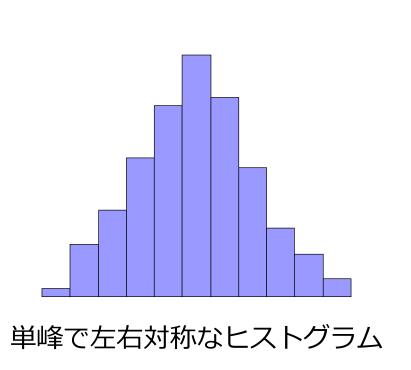
- ・横軸 データの数値軸
 ・棒の高さ 起こりやすさ(注目すべき事柄)
 ・棒の面積 割合・度数

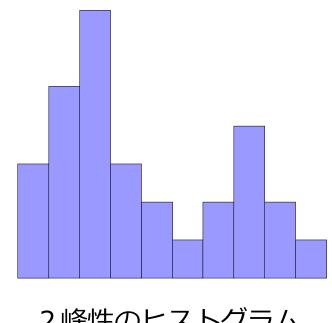
区間幅が同じであれば、高さと面積が対応

軸が異なる場合、注意が必要(練習問題参照)

分布のチェックポイント

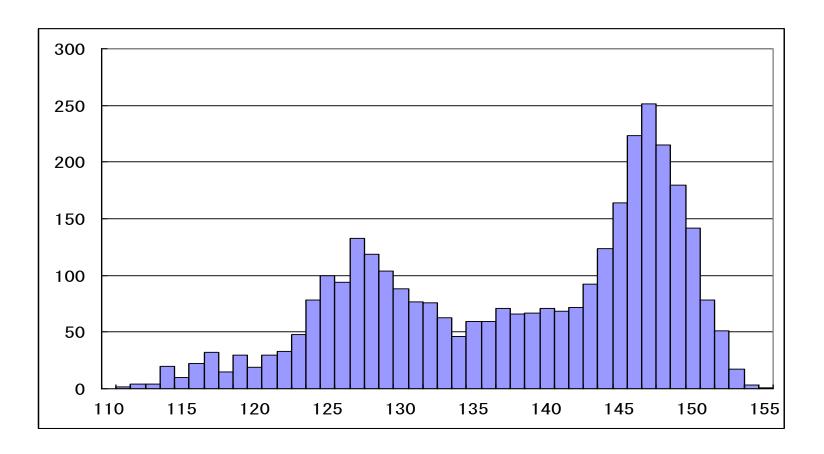
「単峰」か「多峰」 か?





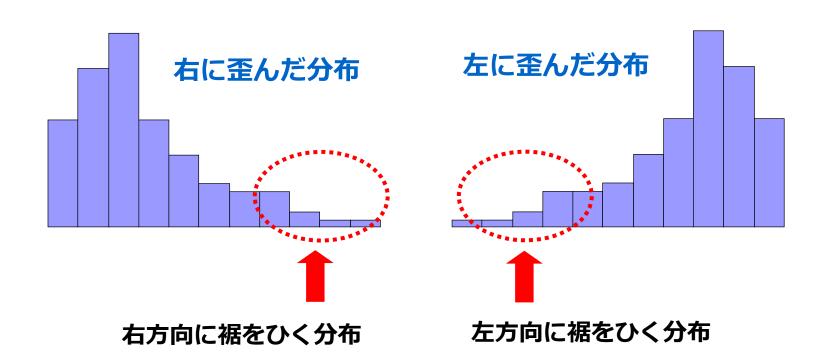
2峰性の例

松坂投手の球速のヒストグラム

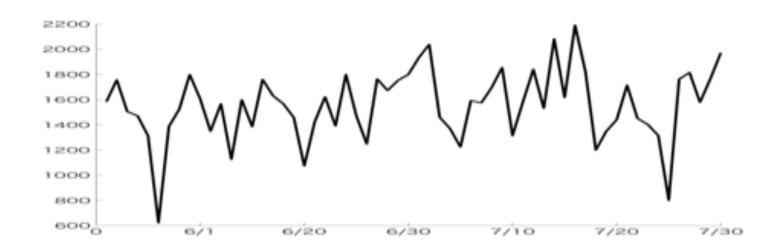


分布のチェックポイント

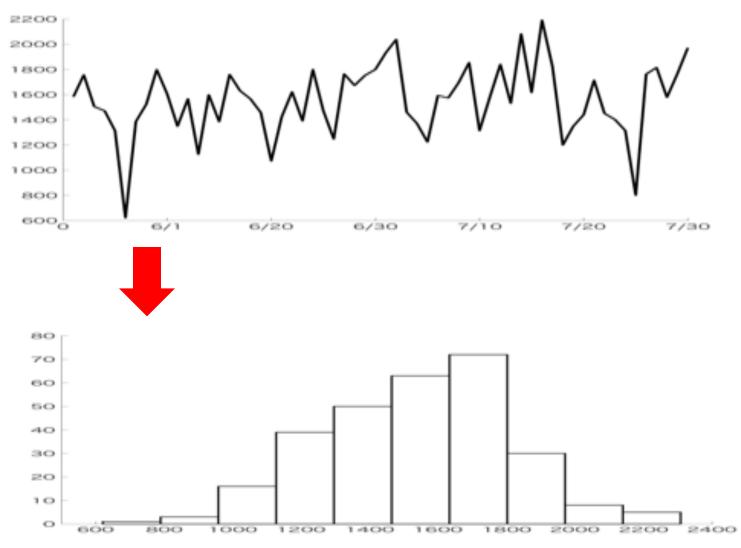
「対称」か「非対称」か?



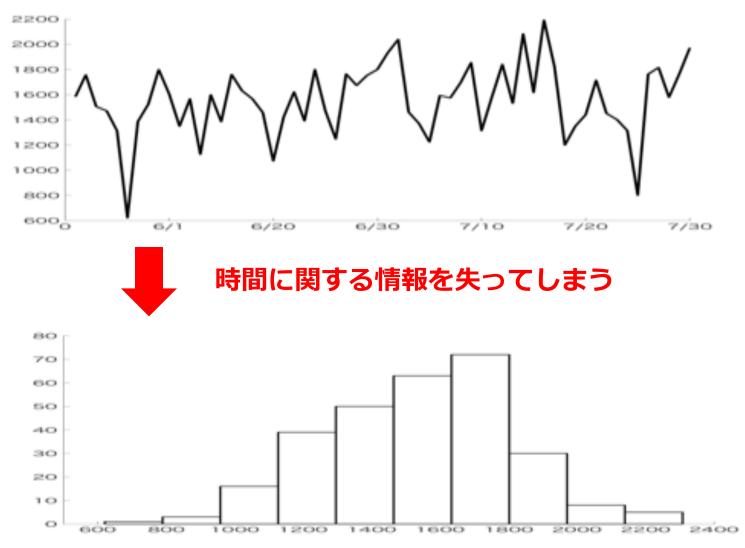
ヒストグラムを使った分析例



ヒストグラムを使った分析例



ヒストグラムを使った分析例



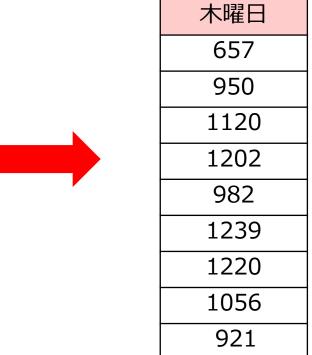
日付	応募者数
6月1日	657
6月2日	814
6月3日	718
6月4日	554
6月5日	569
6月6日	664
6月7日	1059
6月8日	950

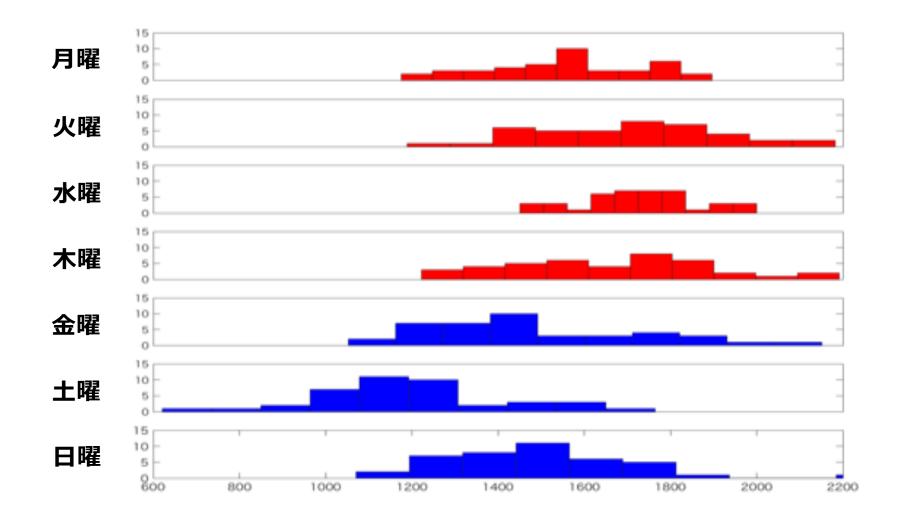
日付	応募者数	曜日
6月1日	657	木曜
6月2日	814	金曜
6月3日	718	土曜
6月4日	554	日曜
6月5日	569	月曜
6月6日	664	火曜
6月7日	1059	水曜
6月8日	950	木曜

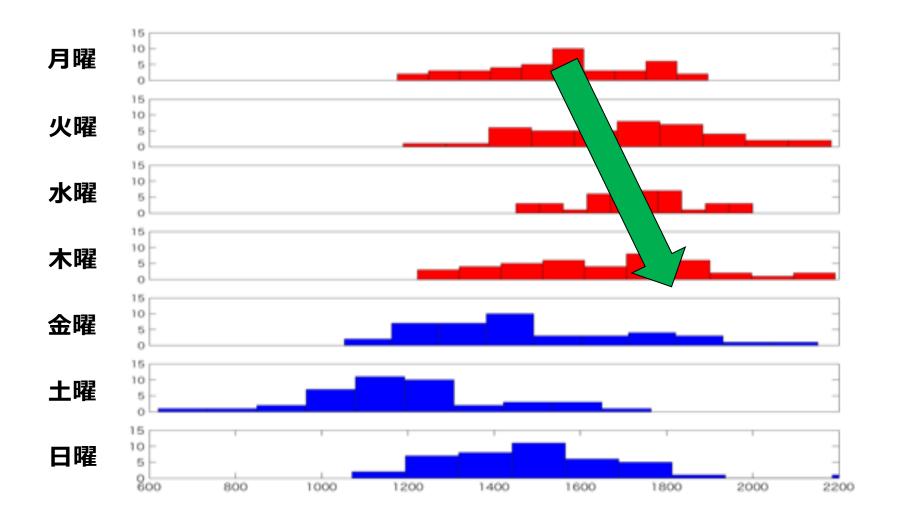
日付	応募者数	曜日
6月1日	657	木曜
6月2日	814	金曜
6月3日	718	土曜
6月4日	554	日曜
6月5日	569	月曜
6月6日	664	火曜
6月7日	1059	水曜
6月8日	950	木曜

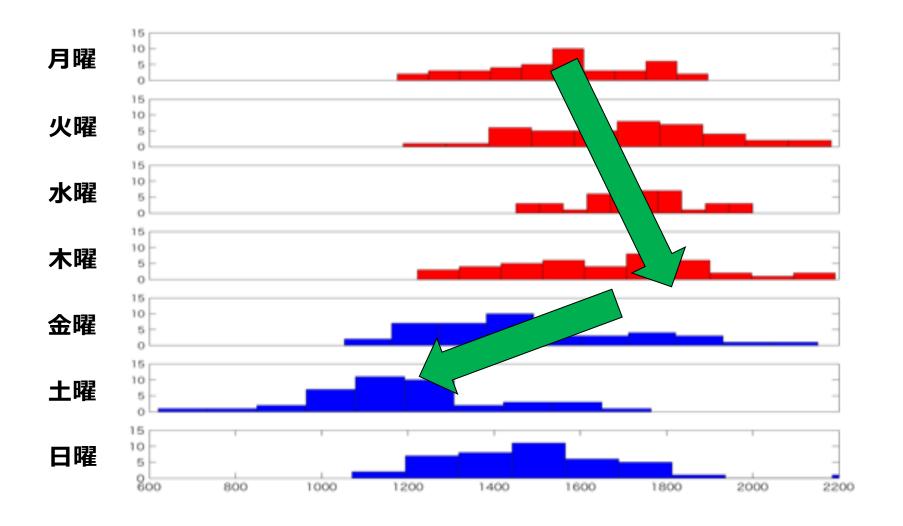
日付	応募者数	曜日
6月1日	657	木曜
6月2日	814	金曜
6月3日	718	土曜
6月4日	554	日曜
6月5日	569	月曜
6月6日	664	火曜
6月7日	1059	水曜
6月8日	950	木曜

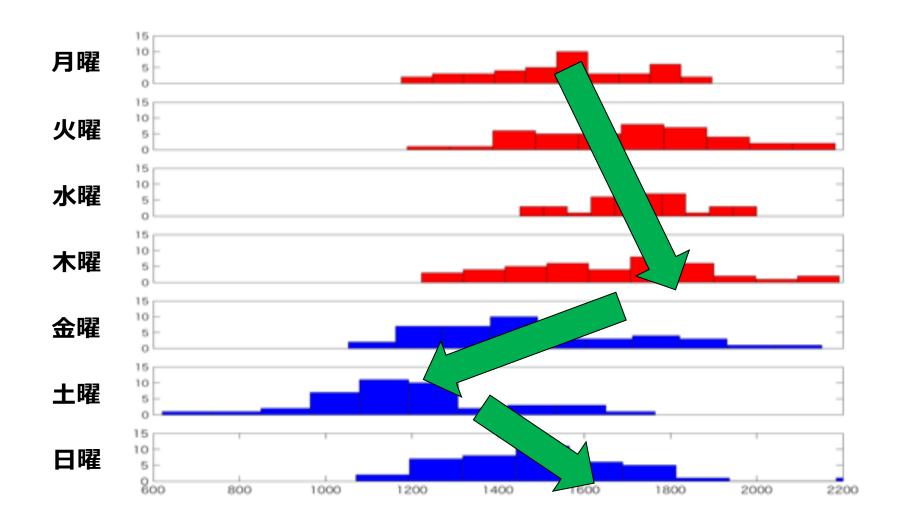
曜日毎のデータに分解











ここまでは集計だけの分析

確率の概念を応用すると、何が出来るのか?

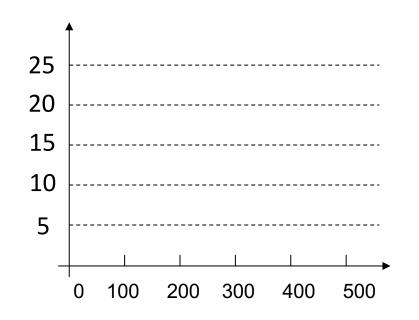
確率論

確率の公理

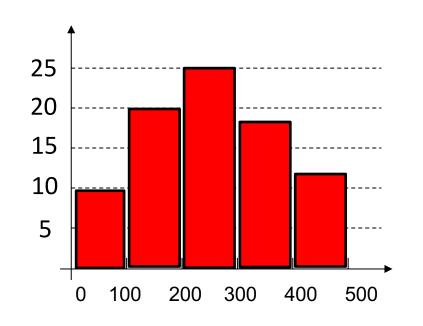
- (1) $0 \le P(A) \le 1$
- (2) P(S) = 1, $P(A^c) = 1 P(A)$
- (3) A₁, A₂…A_nが排反事象なら

$$P(\bigcup_{i=1}^{\infty} A_i) = \sum_{i=1}^{\infty} P(A_i)$$

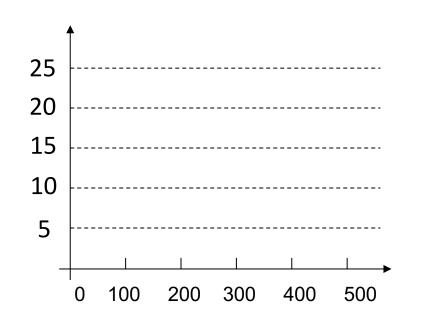
範囲	度数
0 -100	10
100 – 200	20
200 - 300	25
300 – 400	18
400 - 500	12



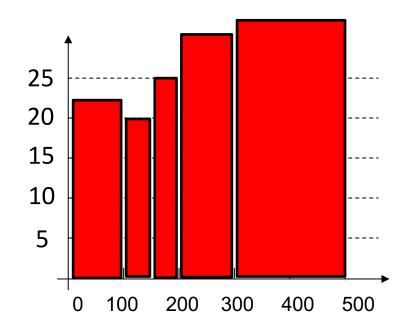
範囲	度数
0 -100	10
100 – 200	20
200 – 300	25
300 – 400	18
400 - 500	12

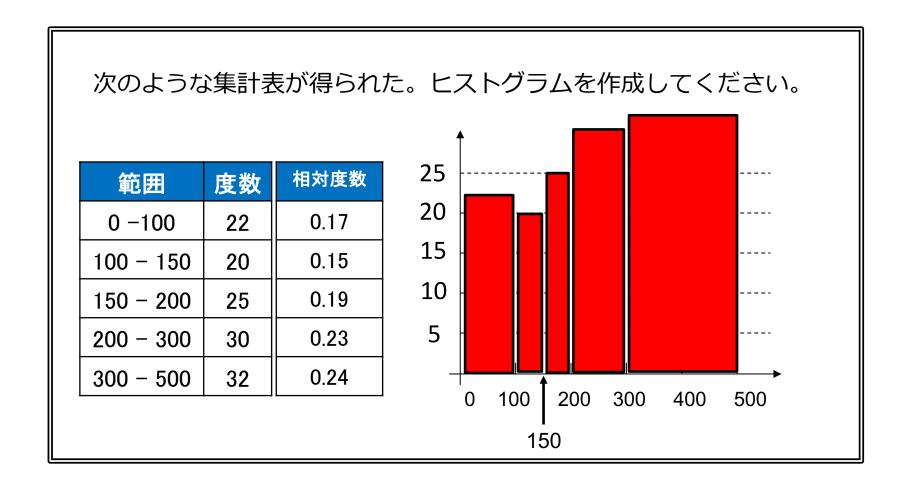


範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

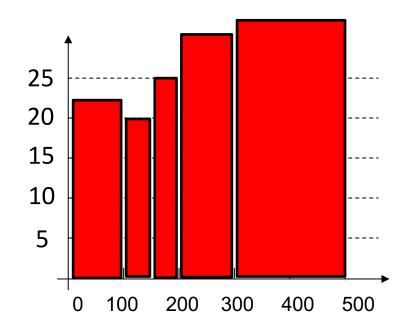


範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

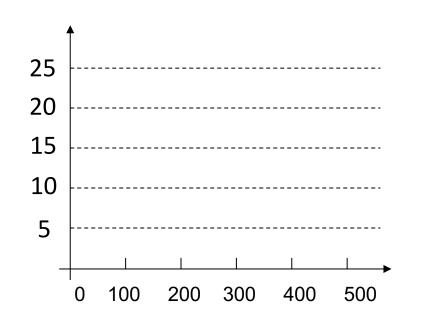




範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

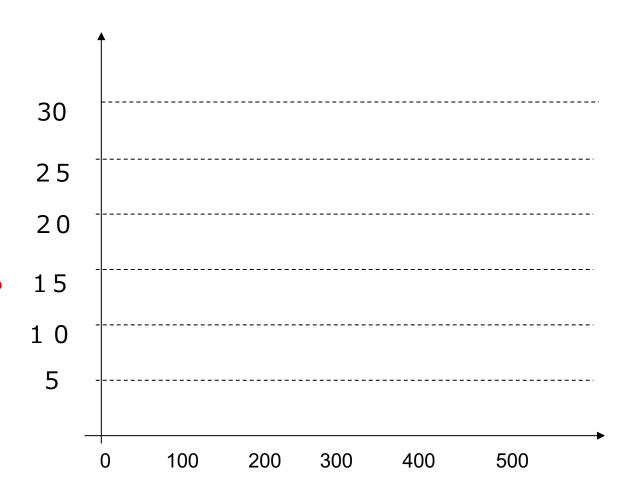


範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32



範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

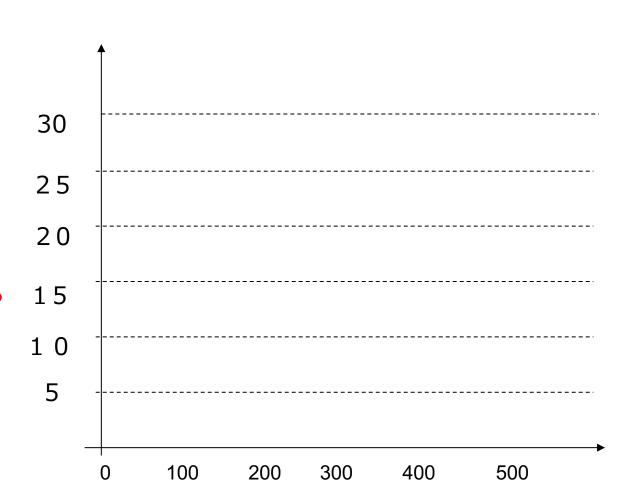
範囲が一番小さいのは?



範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

範囲が一番小さいのは?

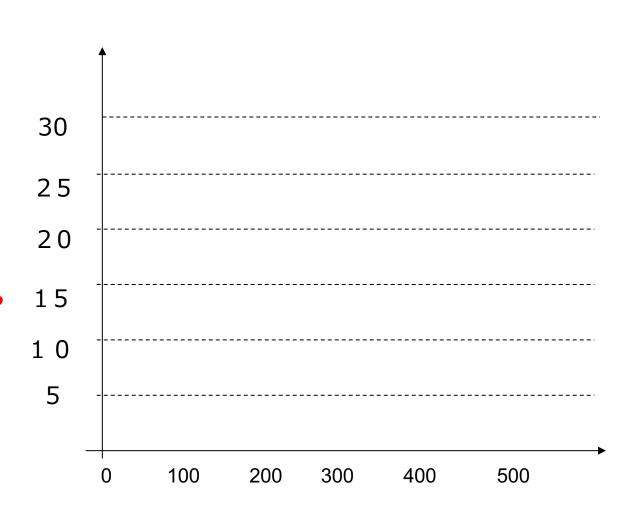
幅=50



範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

範囲が一番小さいのは?

幅=50



範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

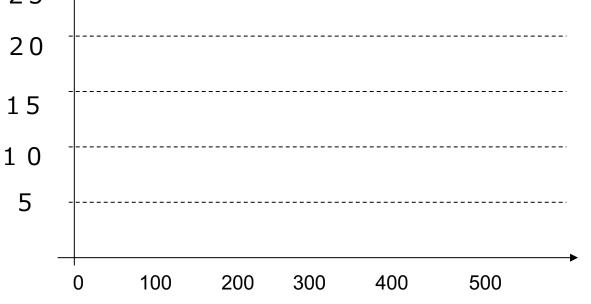


範囲が一番小さいのは?

幅=50 = 幅="1"

1

(この幅を基準にとする)

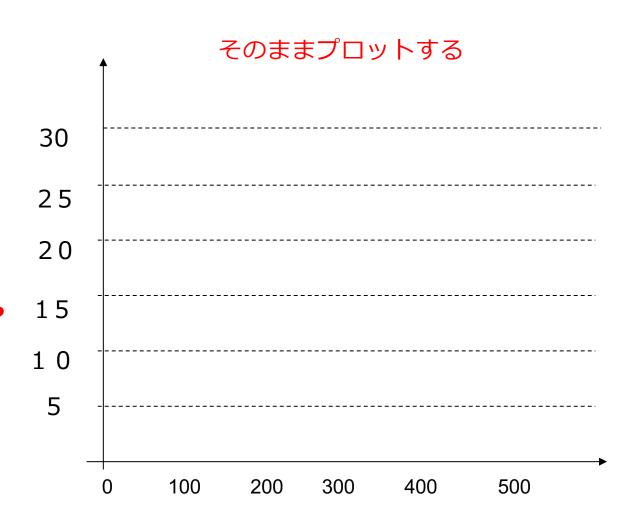


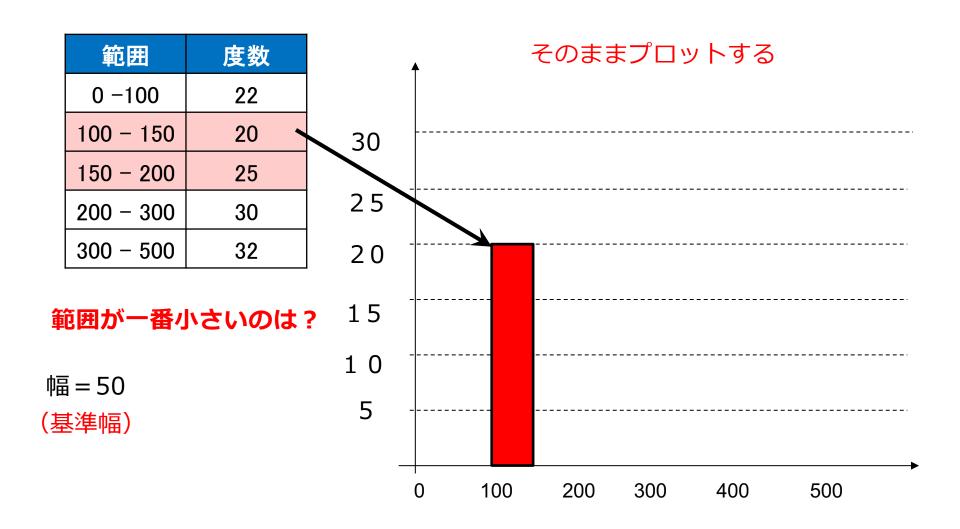
範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 - 300	30
300 - 500	32

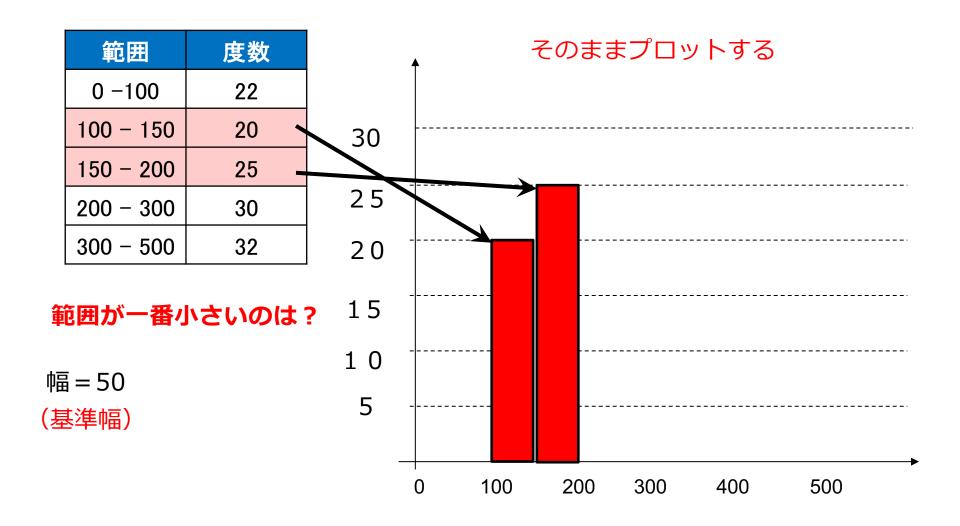
範囲が一番小さいのは?

幅=50

(基準幅)

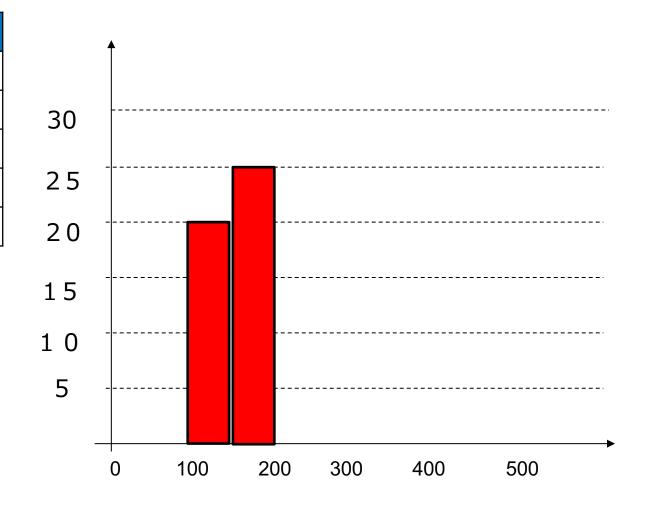






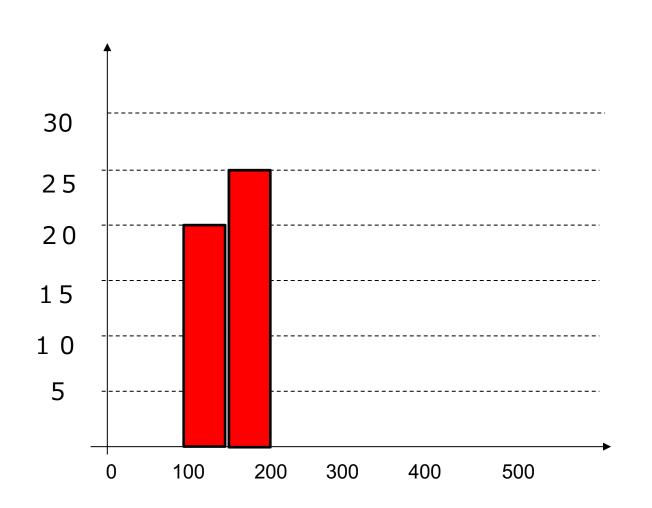
範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

幅 = 50 (基準幅)



範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

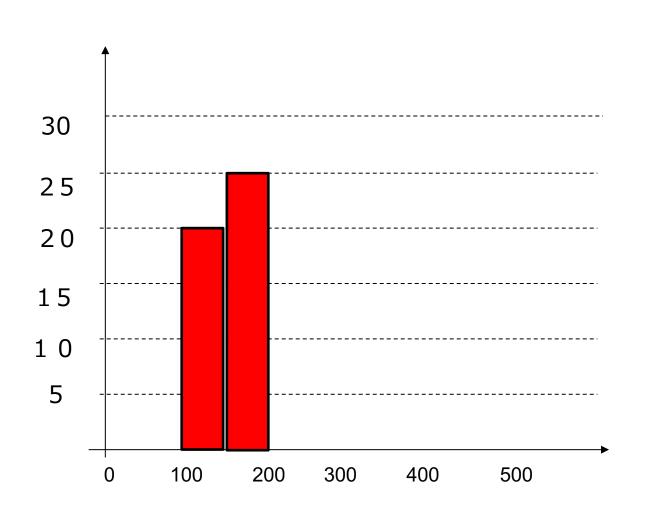
幅 = 100 (基準幅の 2 倍)

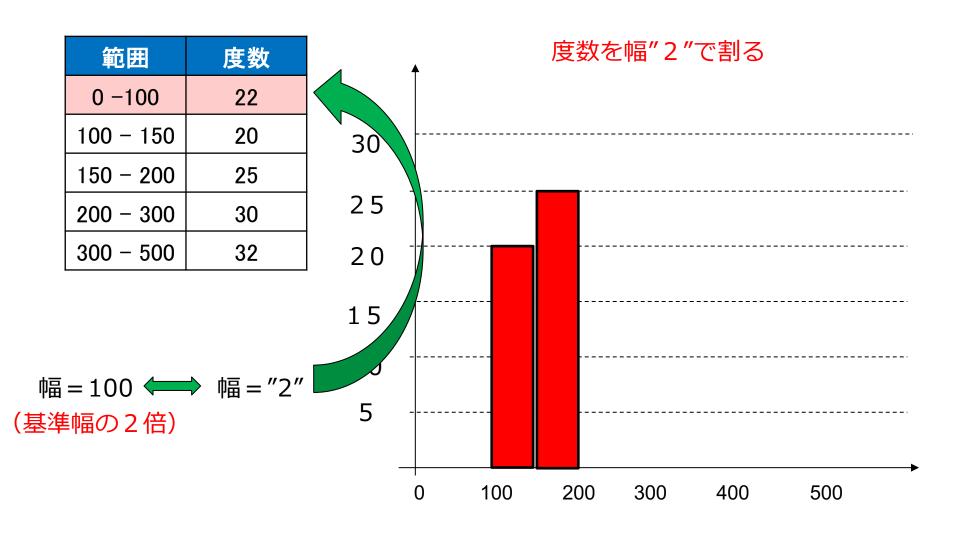


範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 – 300	30
300 - 500	32

幅=100 ← 幅="2"

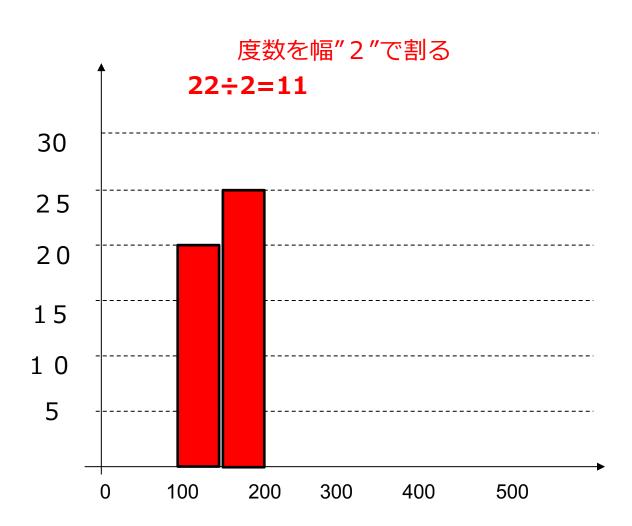
(基準幅の2倍)

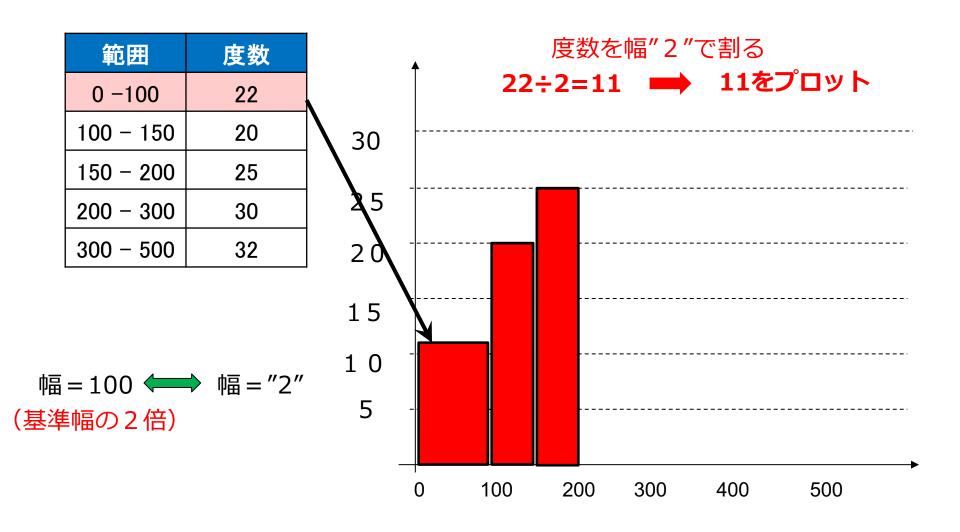




範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 - 300	30
300 - 500	32



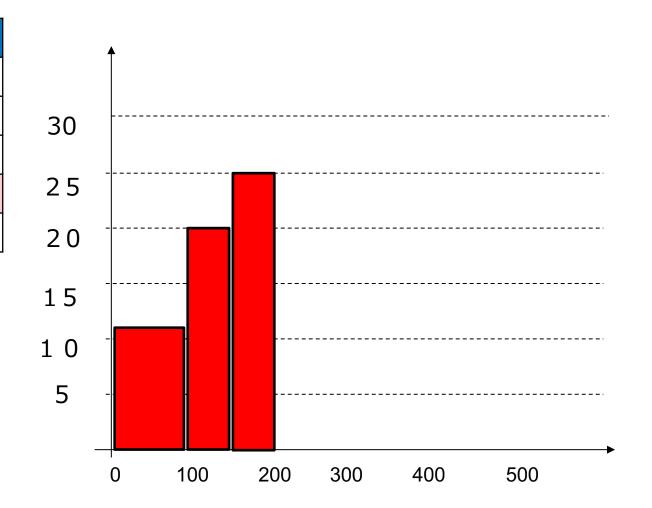


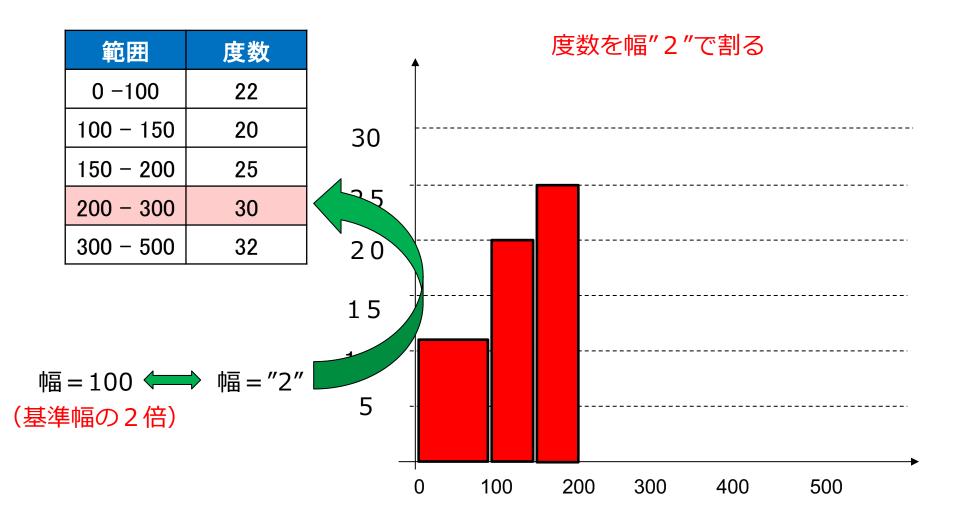


範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 - 300	30
300 - 500	32

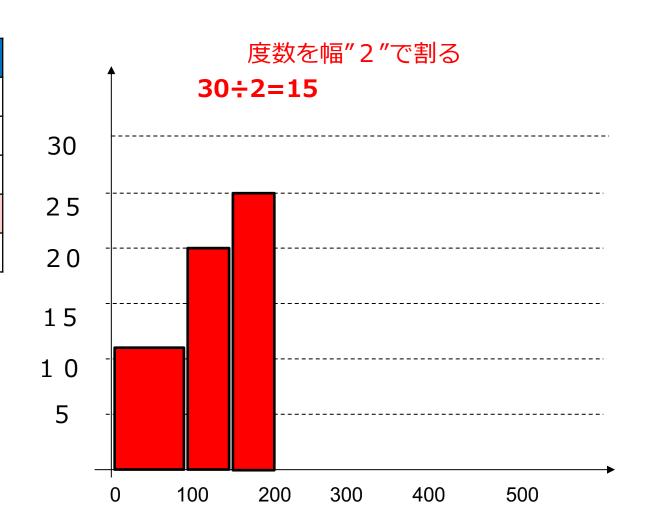
幅=100 ← 幅="2"

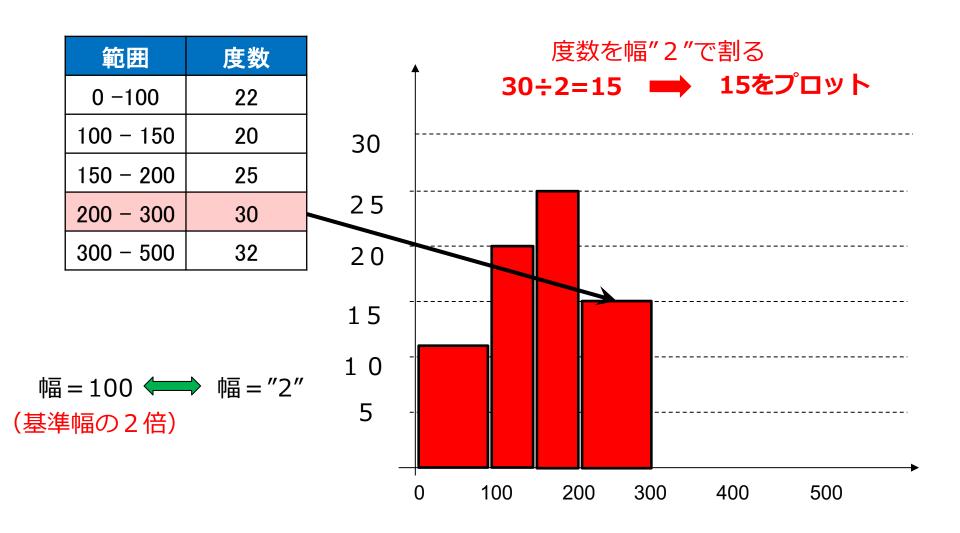
(基準幅の2倍)





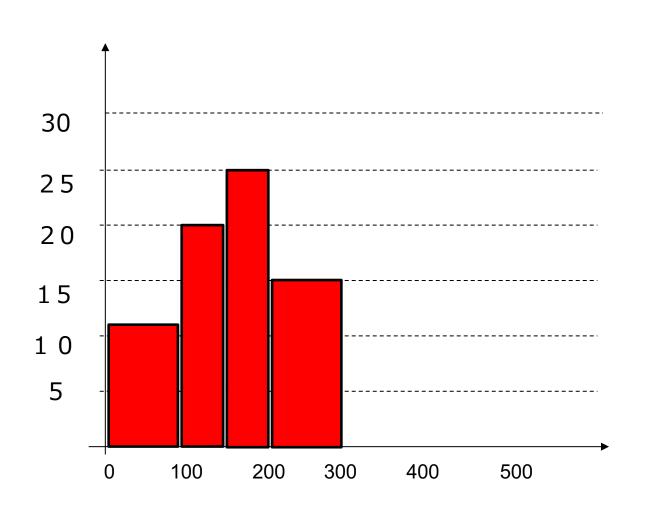
範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 - 300	30
300 - 500	32

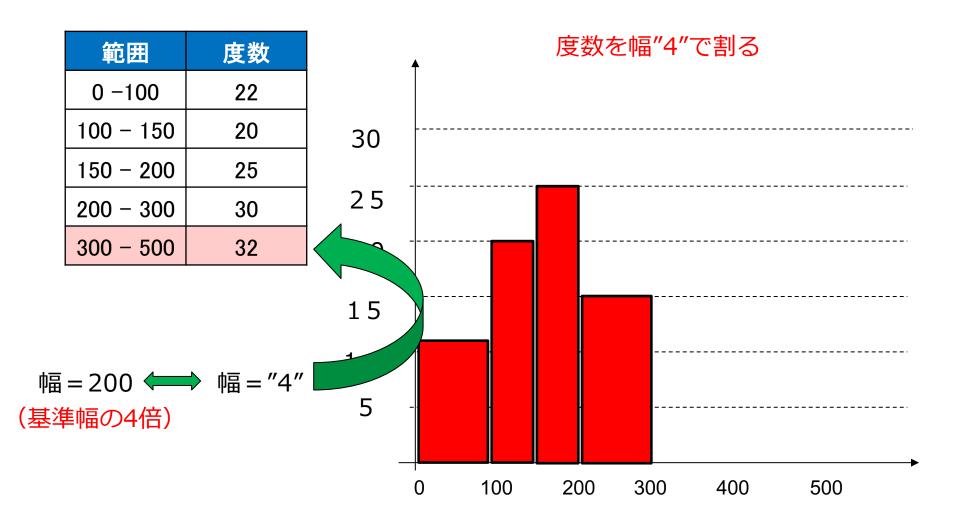




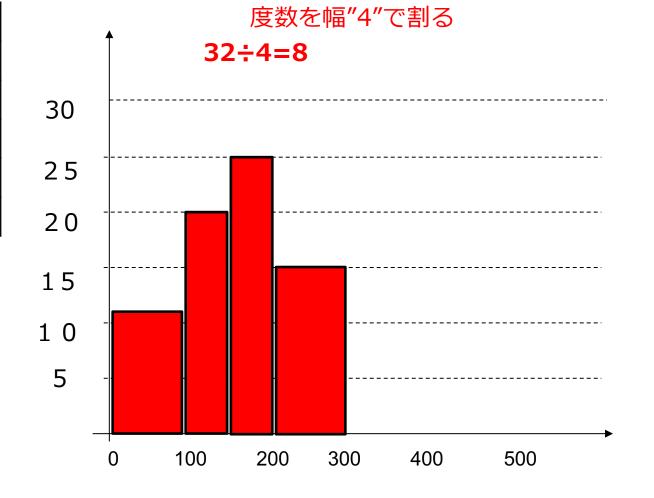
範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 - 300	30
300 - 500	32

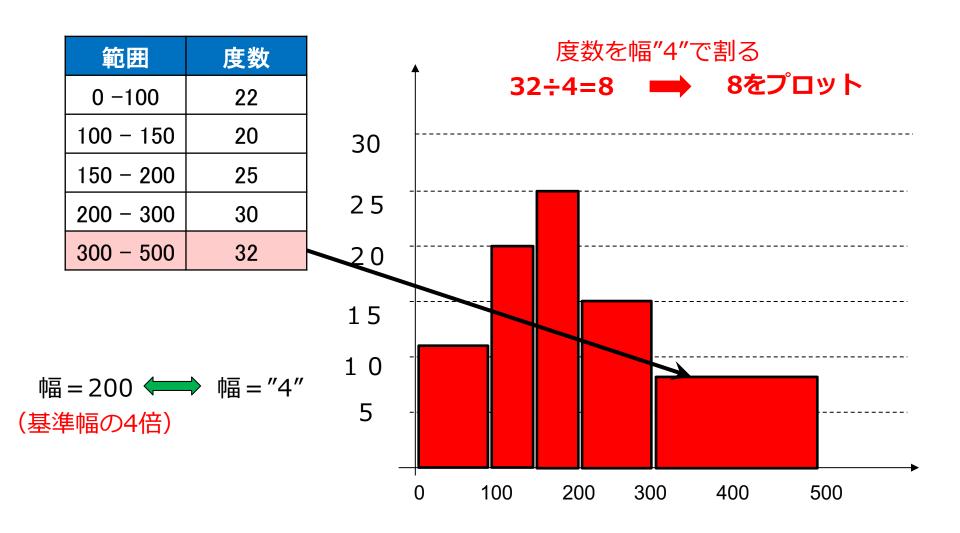
幅=200



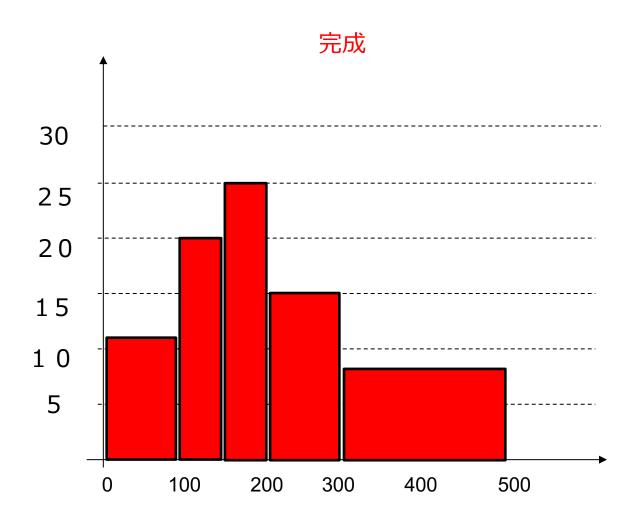


範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 - 300	30
300 - 500	32





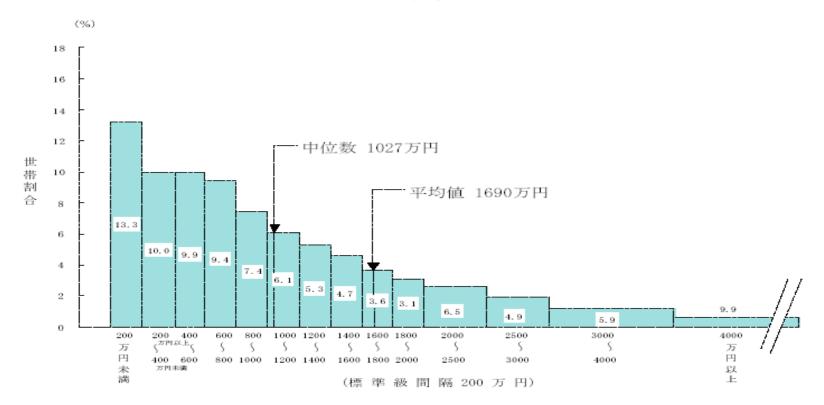
範囲	度数
0 -100	22
100 – 150	20
150 – 200	25
200 - 300	30
300 - 500	32



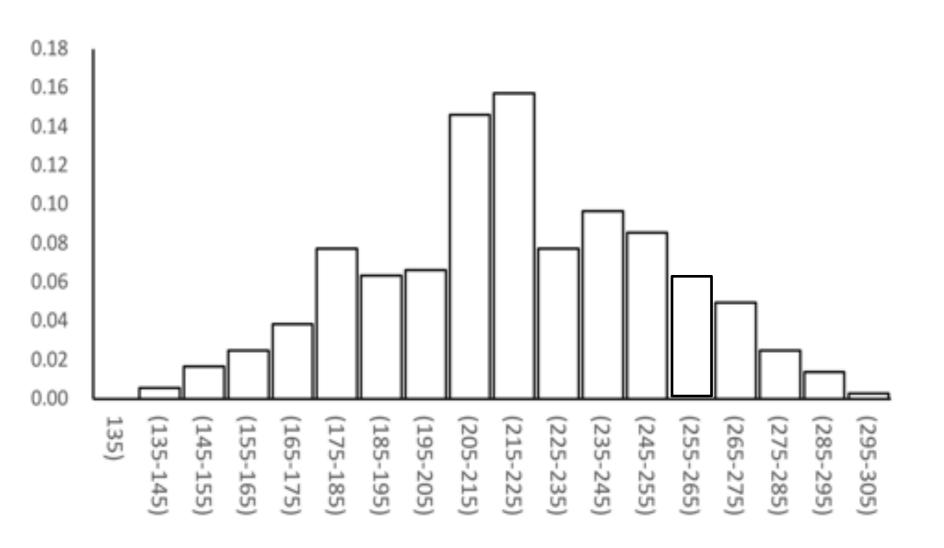
歪んだ分布の例

世帯貯蓄金額のヒストグラム

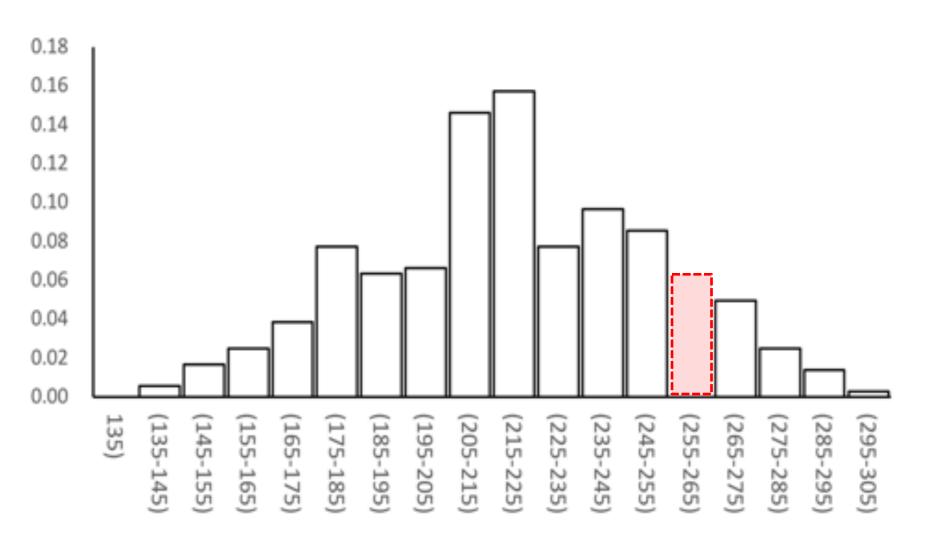
(全世帯)



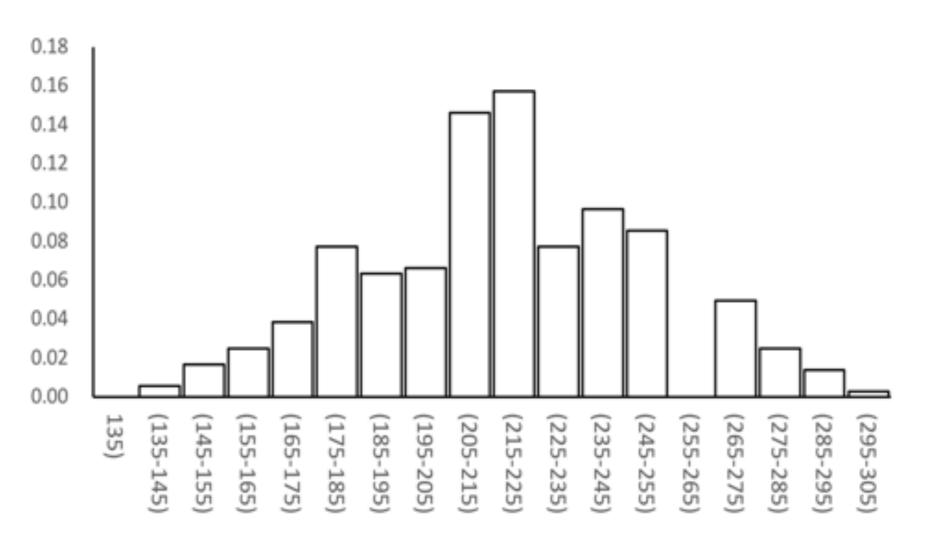
データが欠損してる場合?



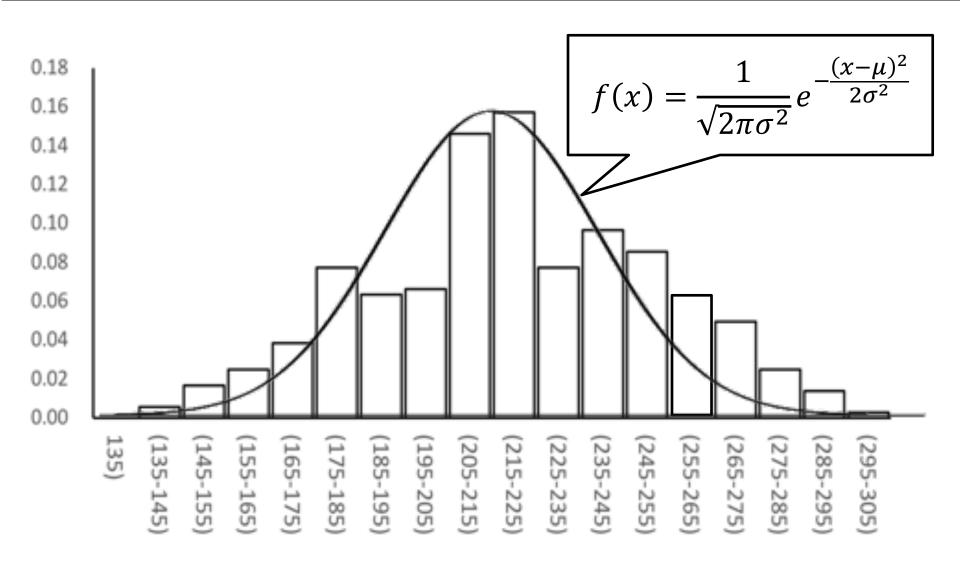
データが欠損してる場合?



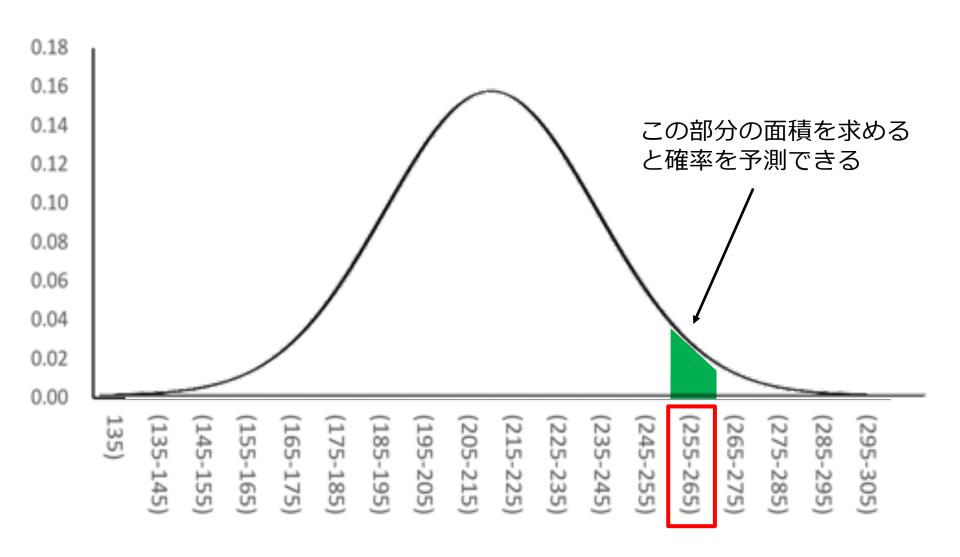
データが欠損してる場合?



分布を使って近似する



データが欠損してる場合?

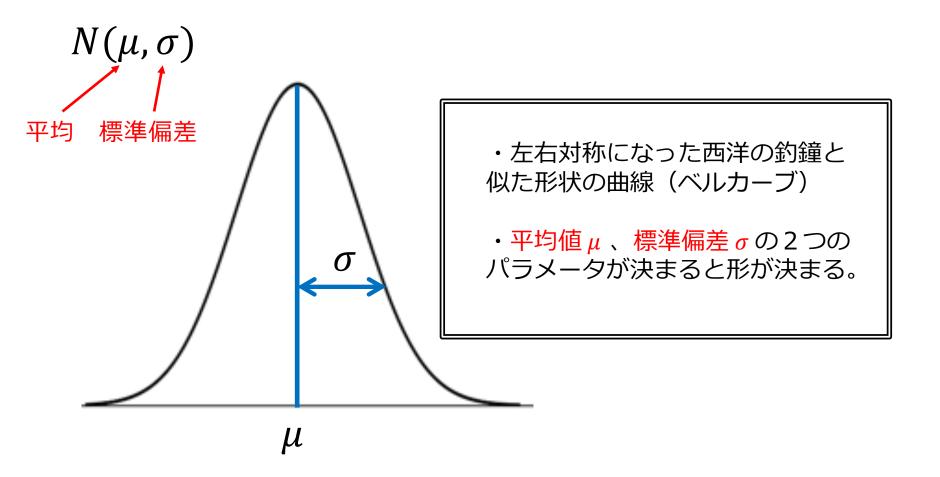


4. 確率変数と確率分布

今日のコンテンツ

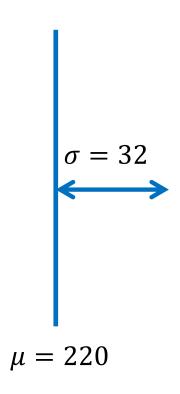
- 4-1 確率変数
- 4-2 期待値と分散
- 4-3 確率分布とヒストグラム
- 4-4 正規分布と t 分布

正規分布 $N(\mu, \sigma)$

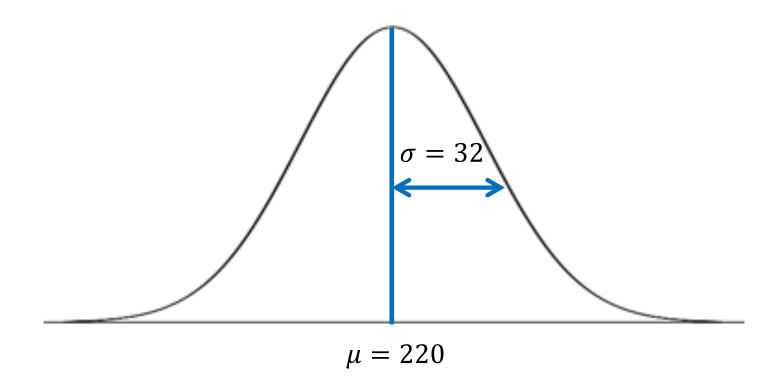


N(220,32)

N(220,32)

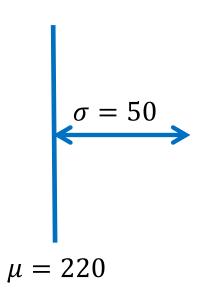


N(220,32)

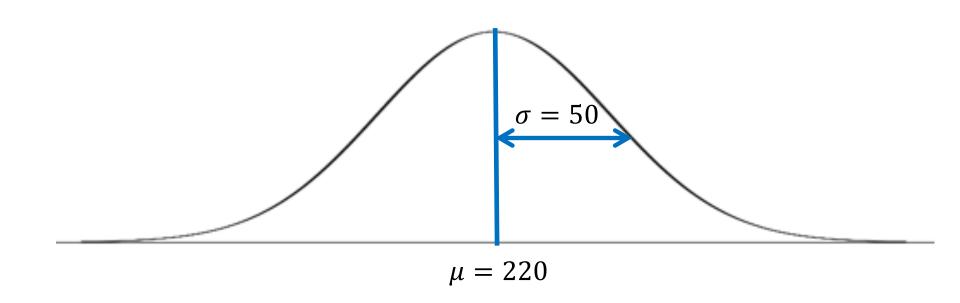


N(220,50)

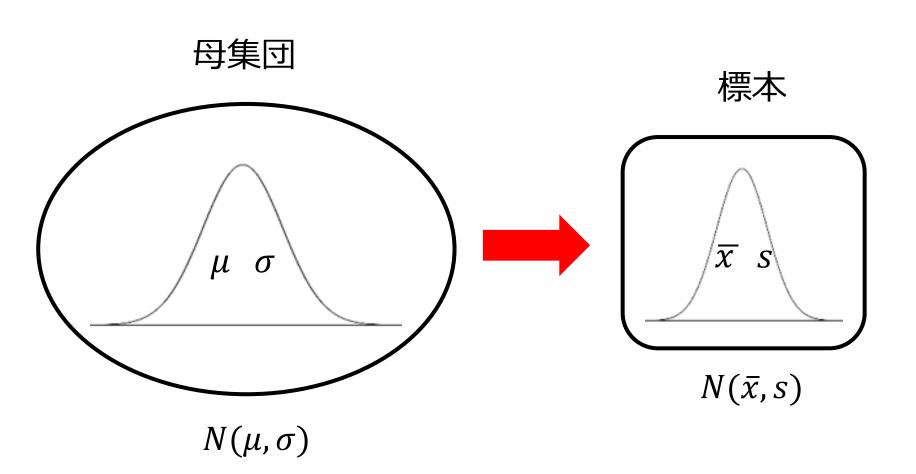
N(220,50)



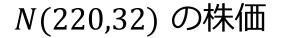
N(220,50)

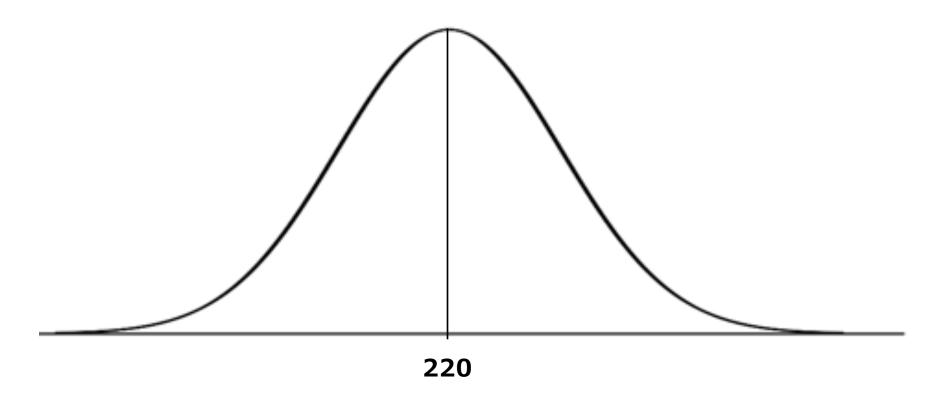


記号の使い方に関するルール



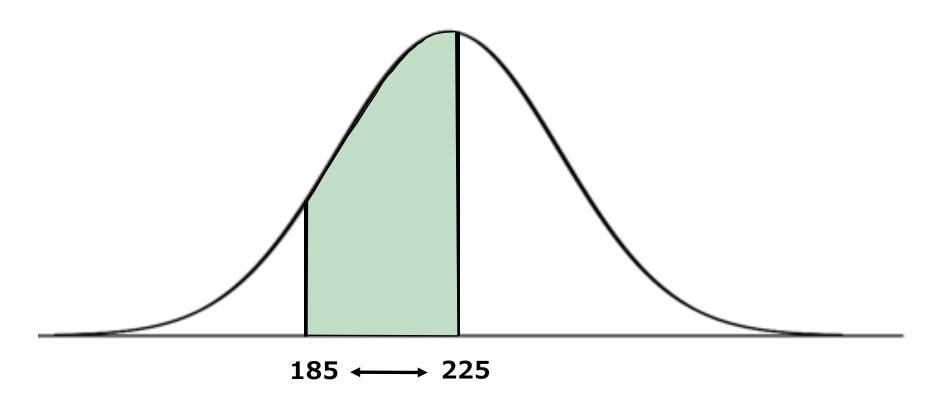
株価が185円から225円の間にある確率は?





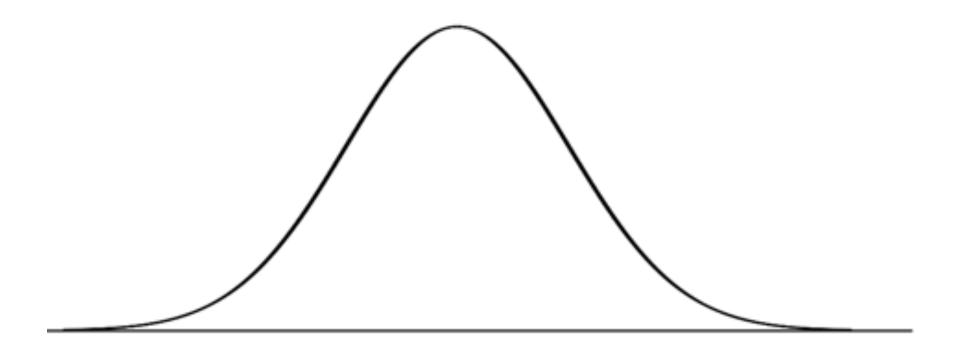
株価が185円から225円の間にある確率は?

N(220,32) の株価

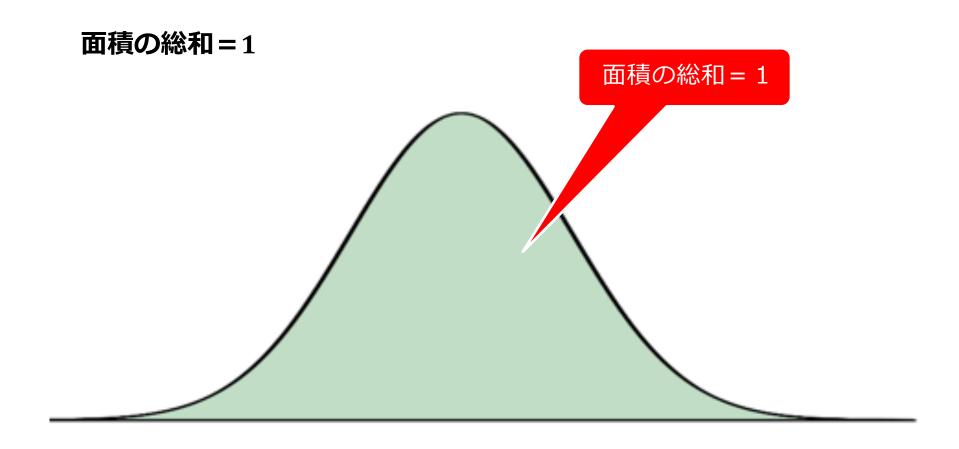


正規分布の面積の総和は?

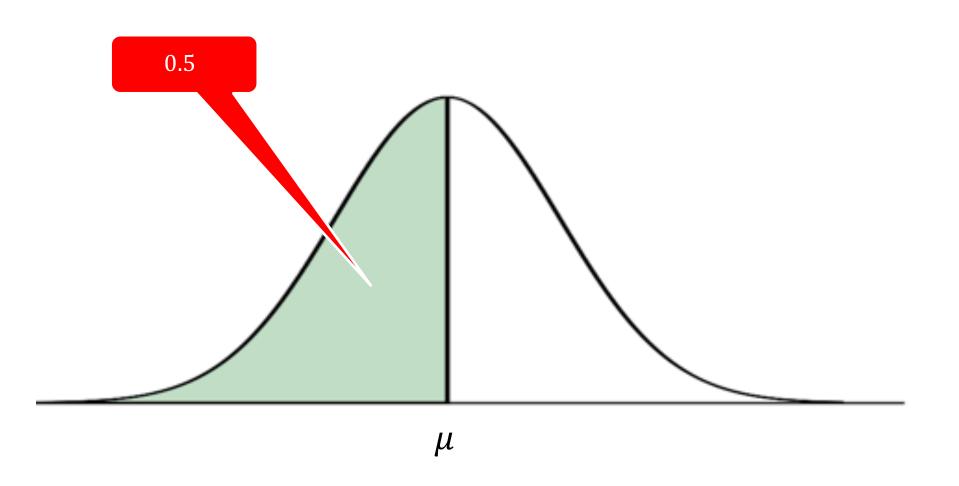
面積の総和=1



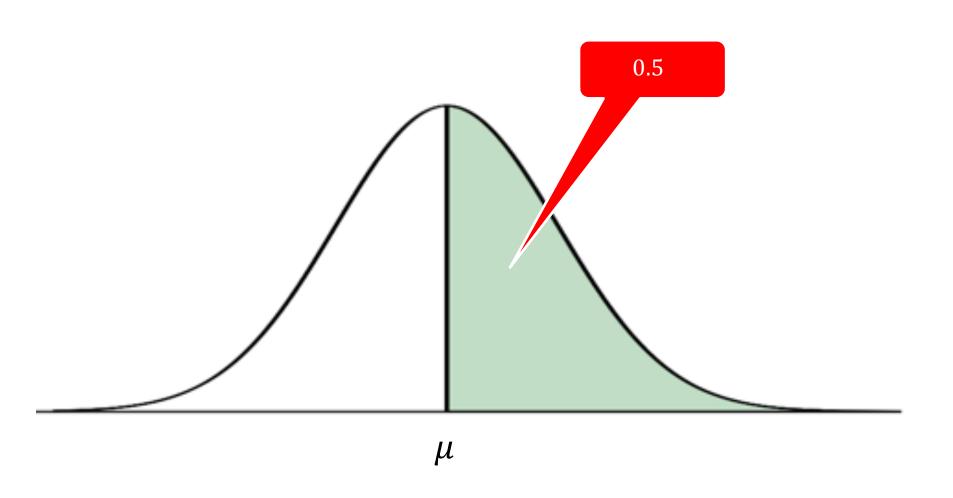
正規分布の面積の総和は?



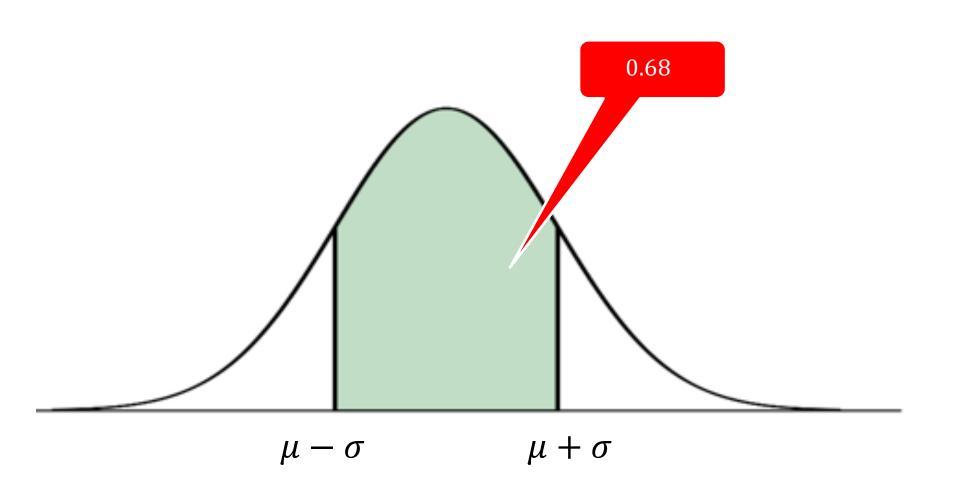
次の面積を求めよ

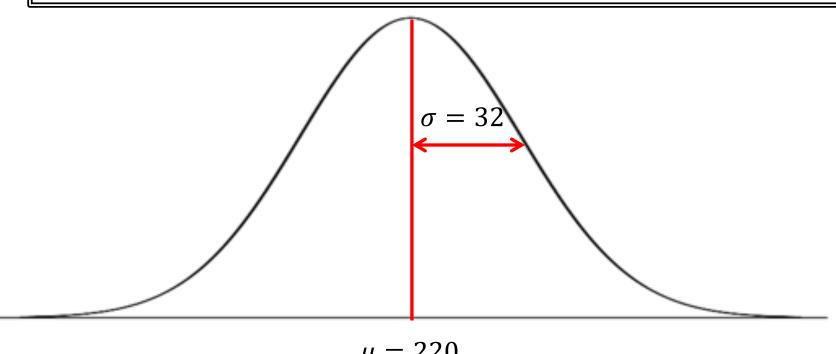


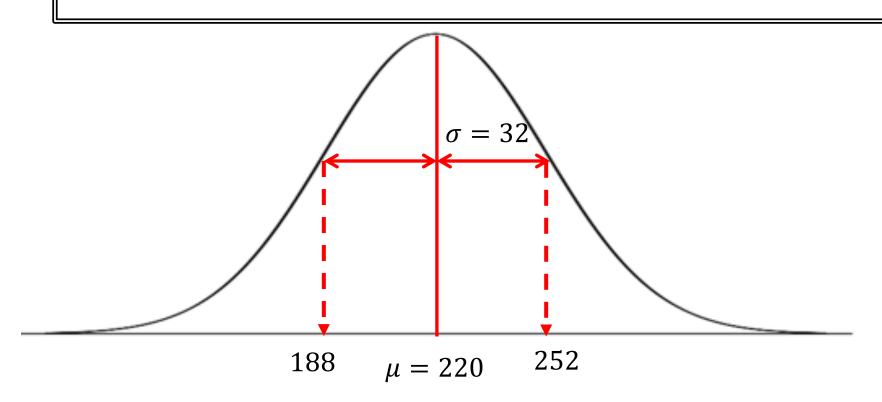
次の面積を求めよ

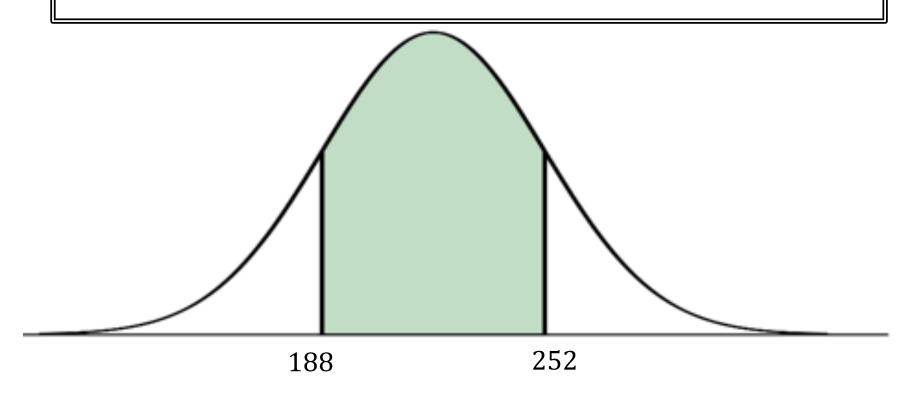


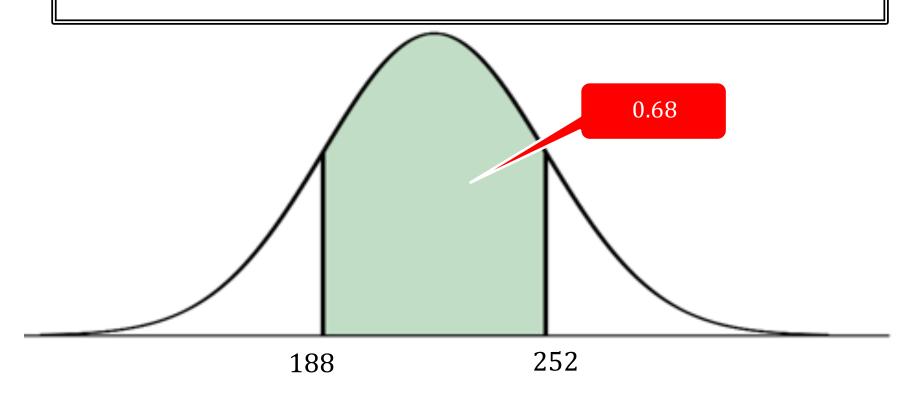
次の面積は?(1σルール)



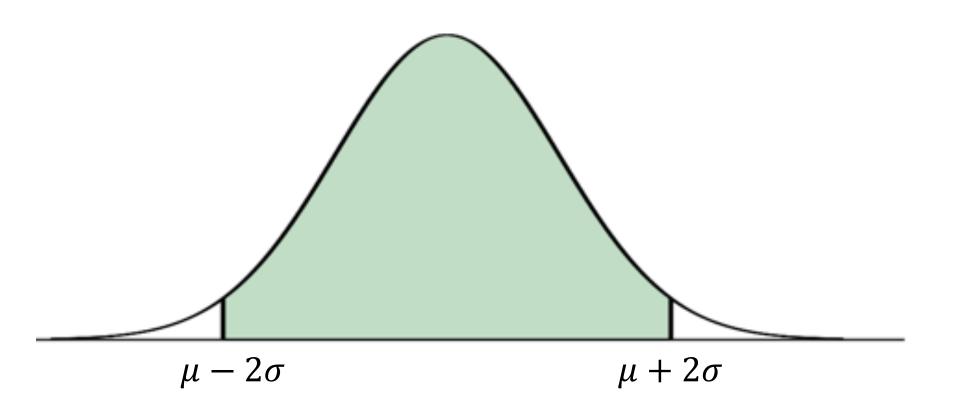




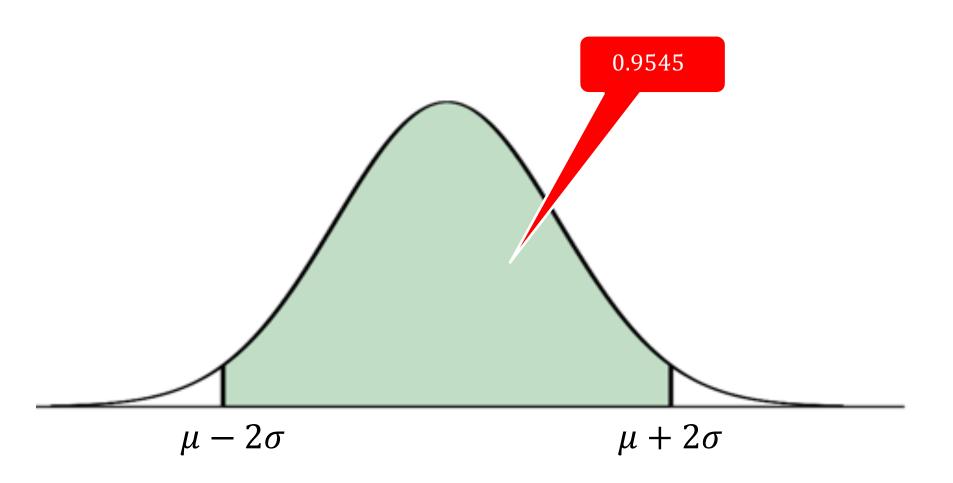




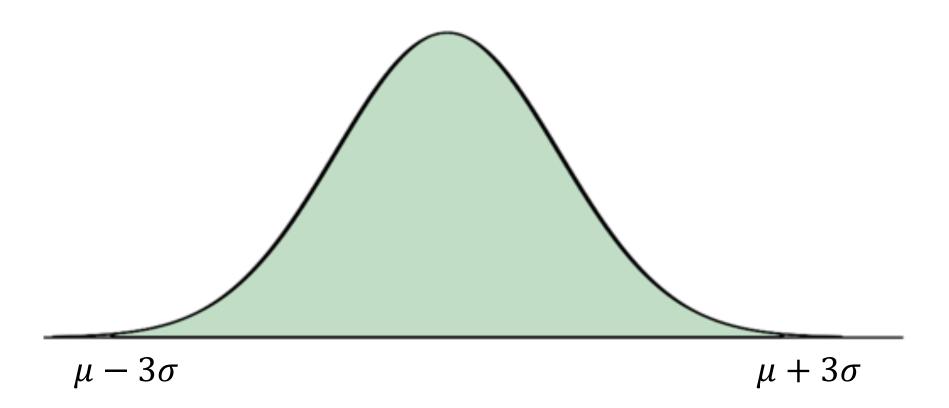
次の面積は? (2σルール)



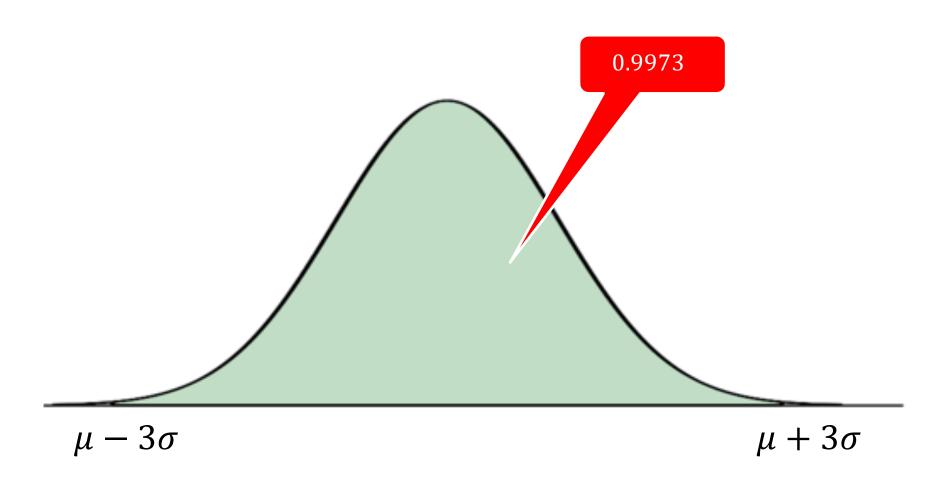
次の面積は? (2σルール)

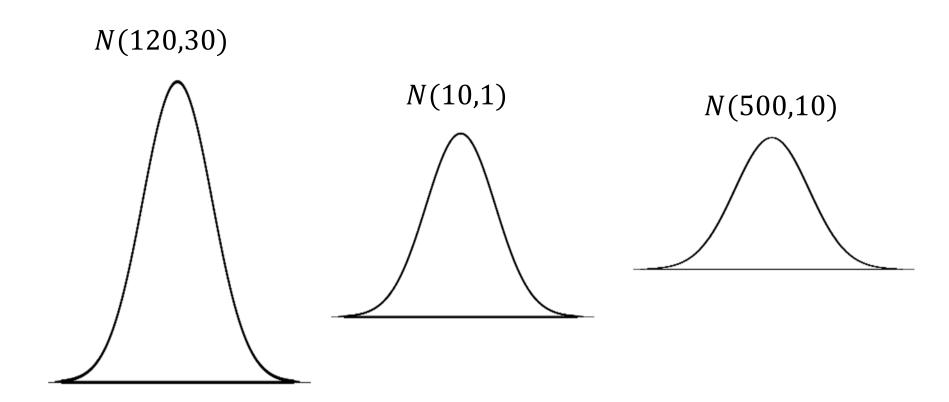


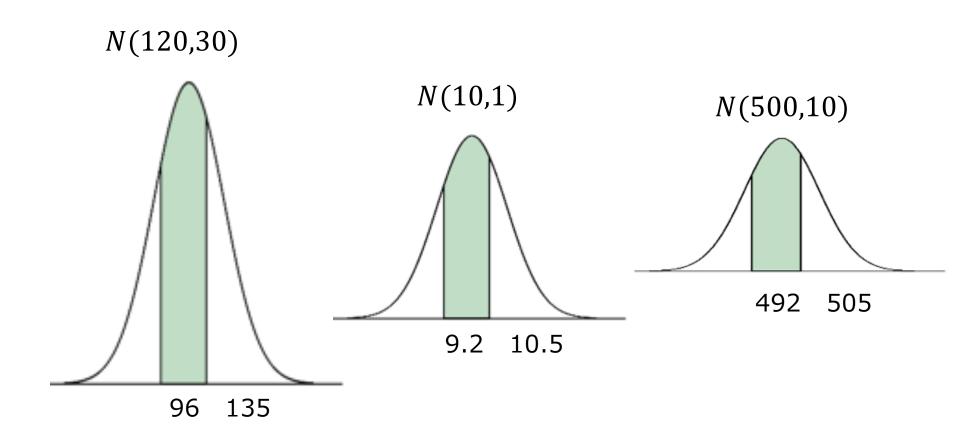
次の面積は? (3σルール)

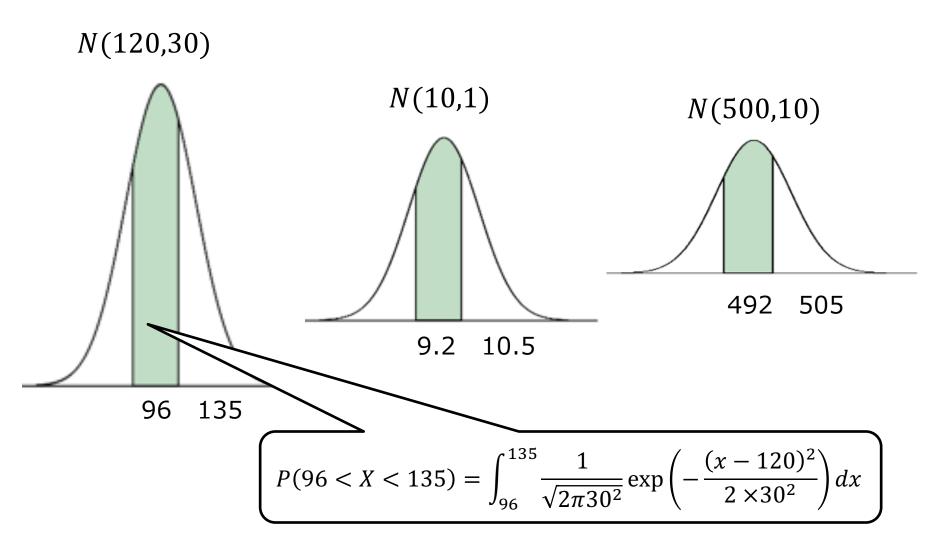


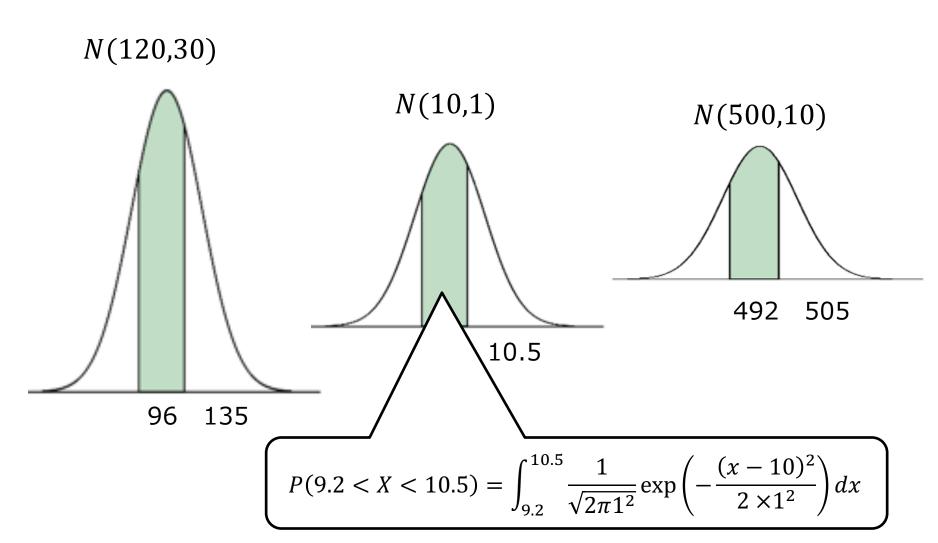
次の面積は? (3σルール)

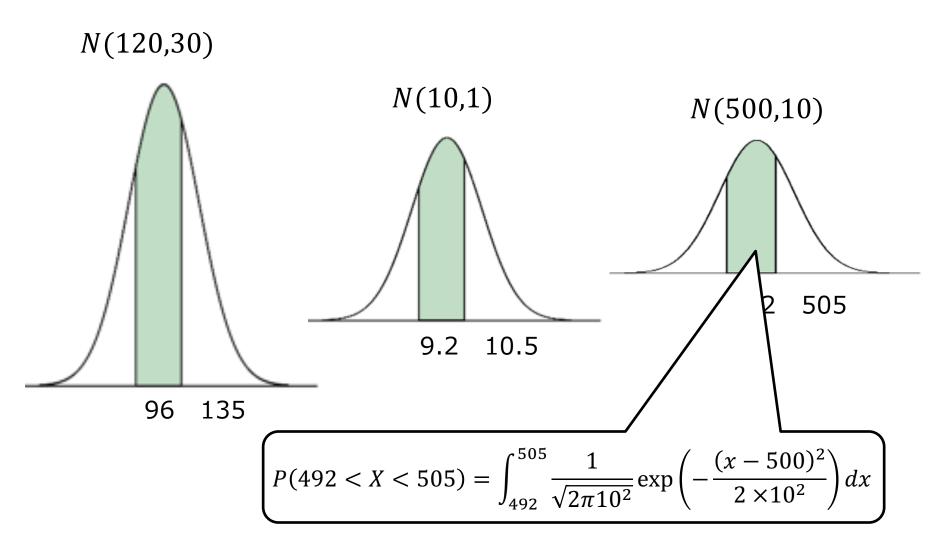




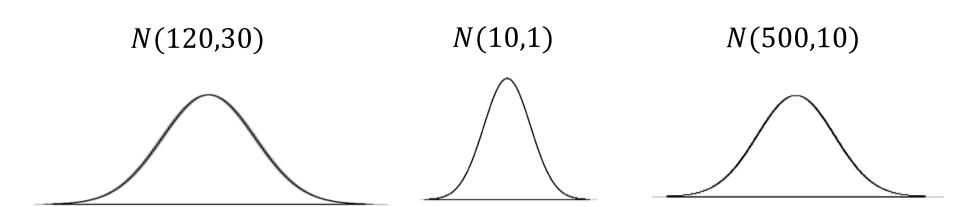




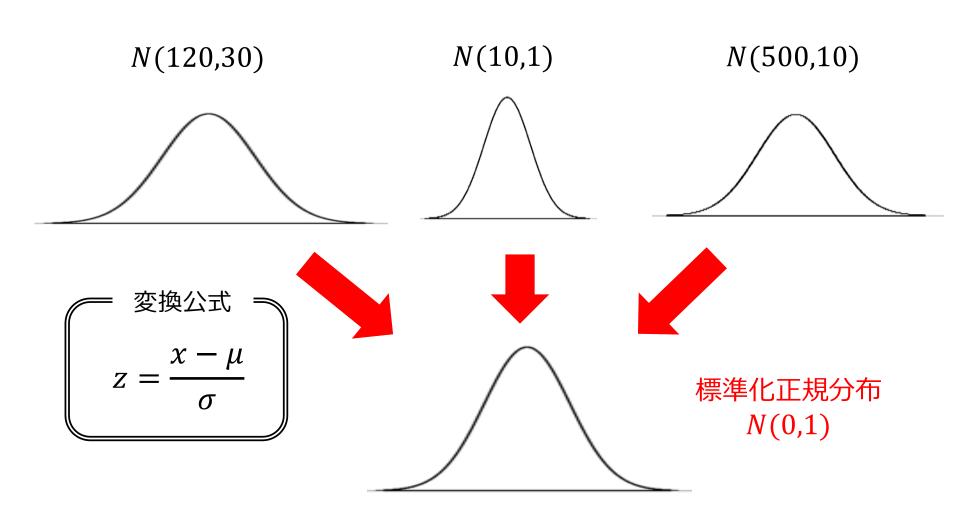




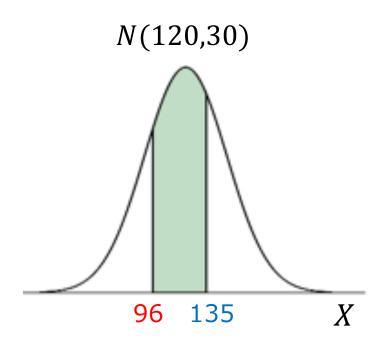
一つの正規分布に統一する

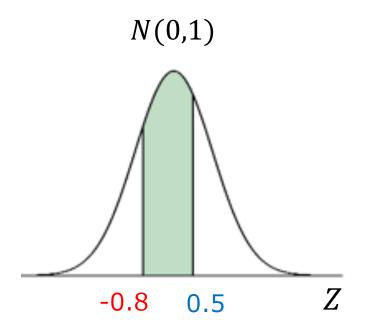


一つの正規分布に統一する

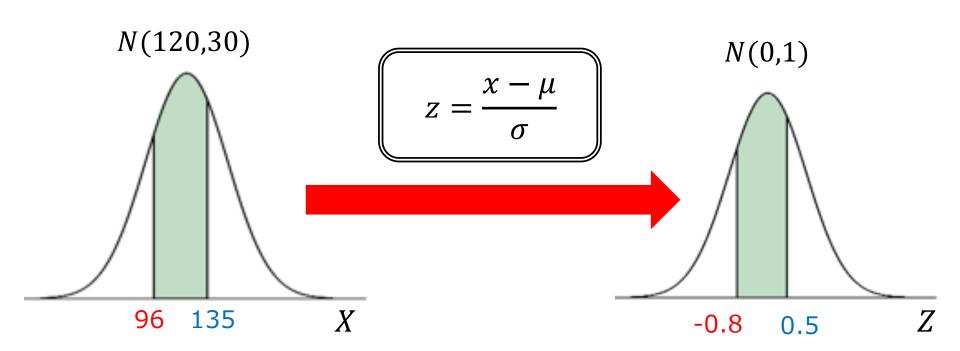


標準化正規分布に変換する

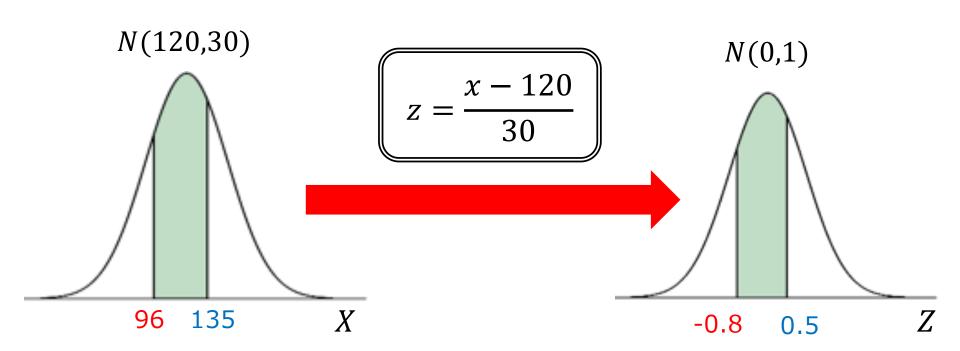




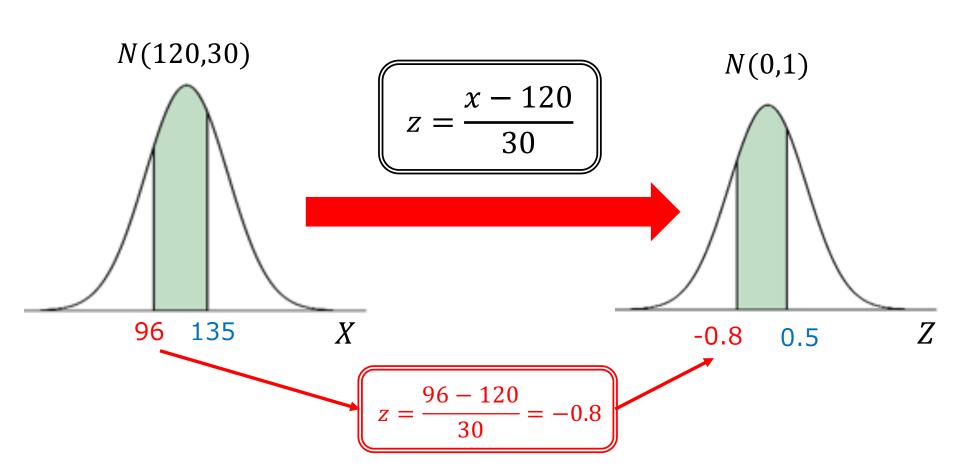
標準化正規分布に変換する



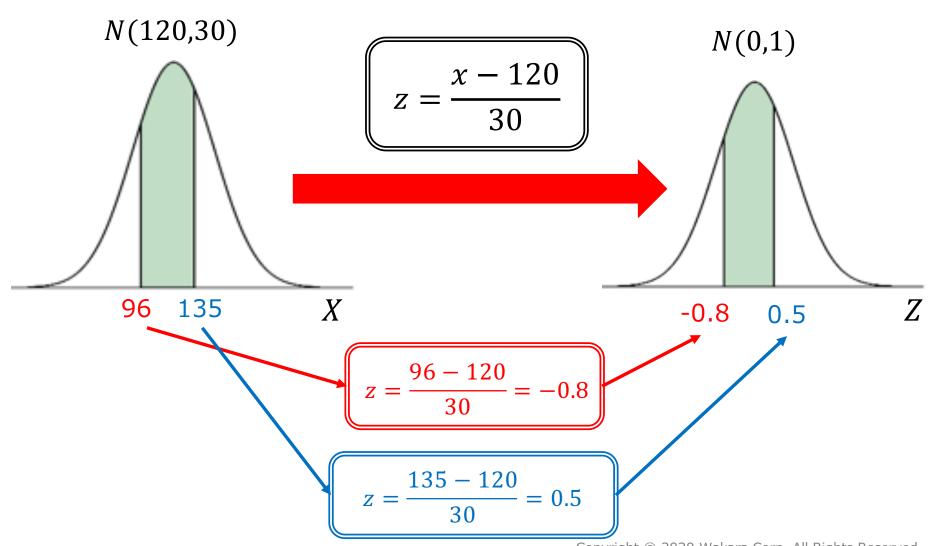
標準化正規分布に変換する



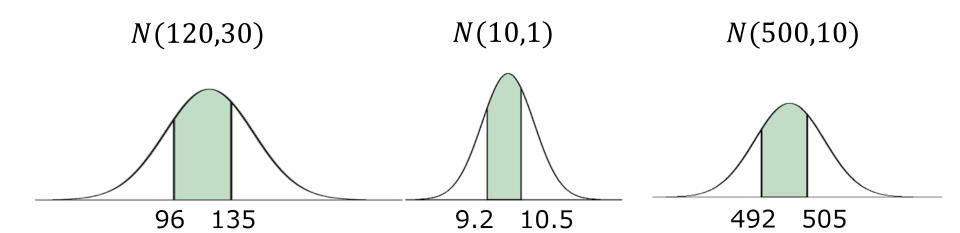
標準化正規分布に変換する

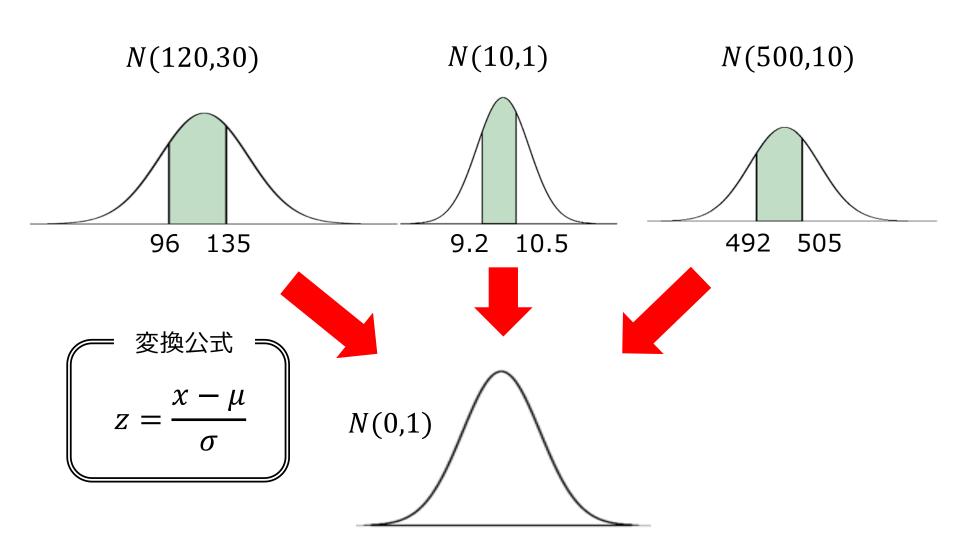


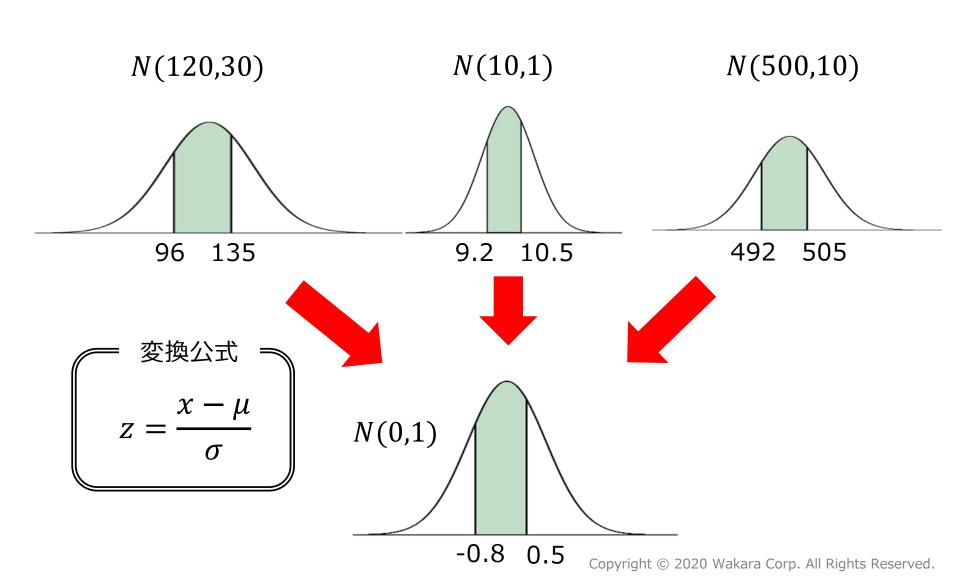
標準化正規分布に変換する

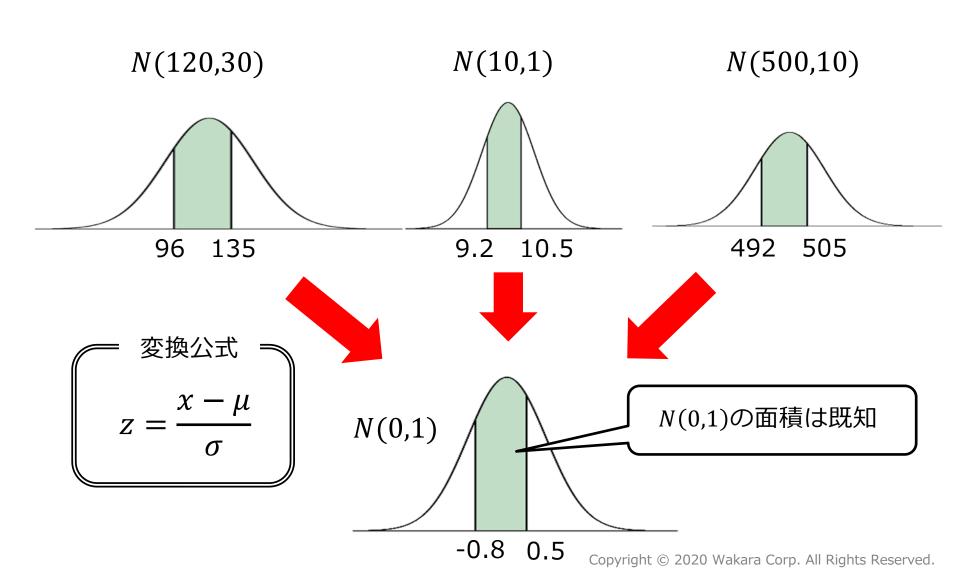


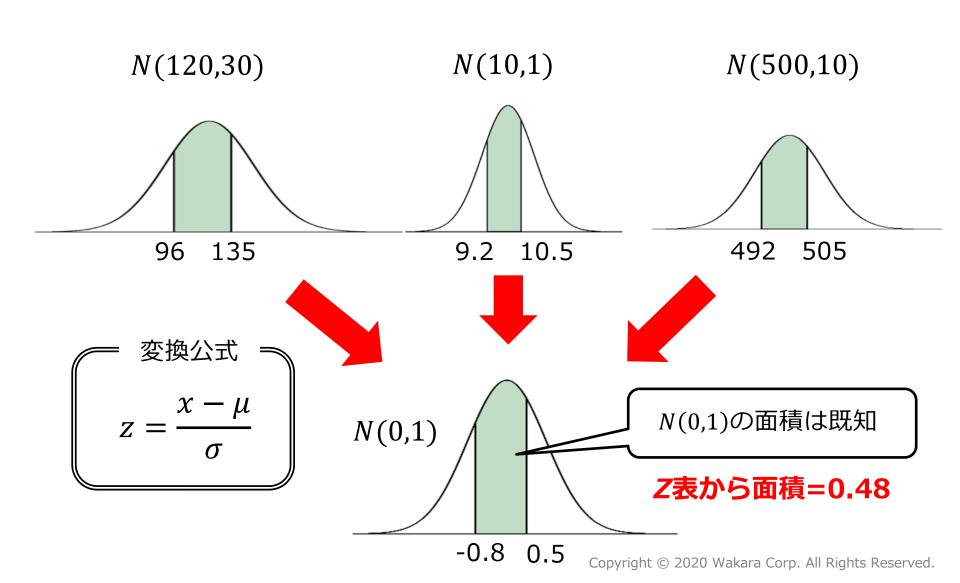
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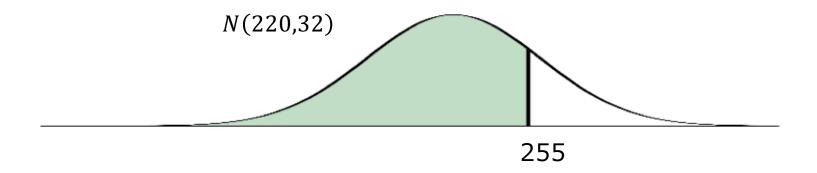


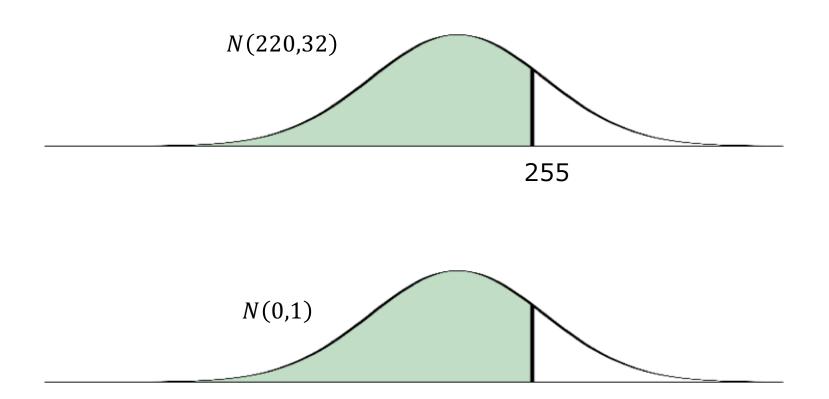


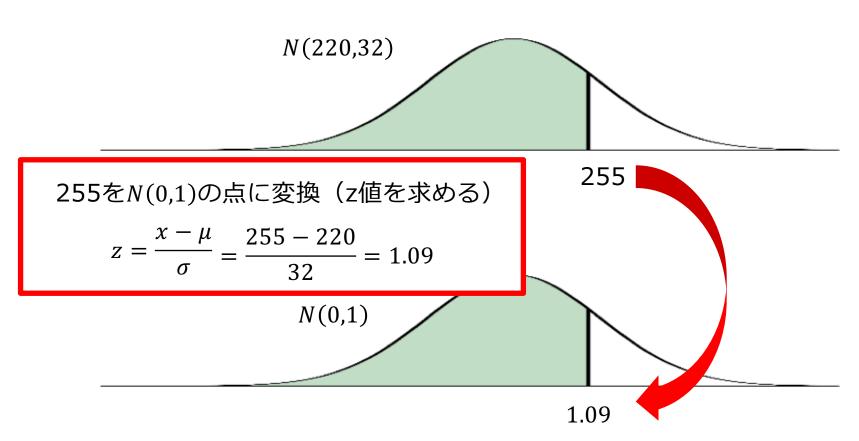






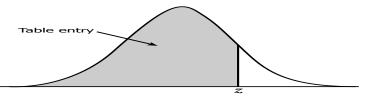






Standard Normal Probabilities

z = 1.09

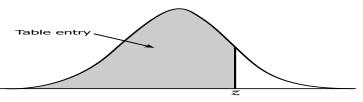


z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Standard Normal Probabilities

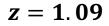
z = 1.09

= 1.0 + 0.09

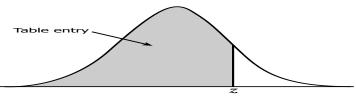


z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998







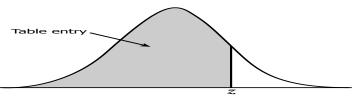


z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6328	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7251	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998



z = 1.09

= (1.0) + (0.09)

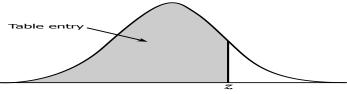


	.00	.01	.02	.03	.04	.05	.06	.07	.08	<u></u>
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.551	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6328	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7231	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998



z = 1.09

= (1.0) + (0.09)

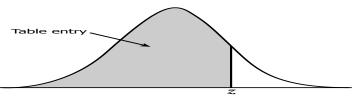


			~							
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	<u>.09</u>
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5 59
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6 41
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6 17
0.4	.6554	.6591	.6 528	.6664	.6700	.6736	.6772	.6808	.6844	.6
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7.24
0.6	.7257	.7251	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7.49
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7 52
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8733
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	4									.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

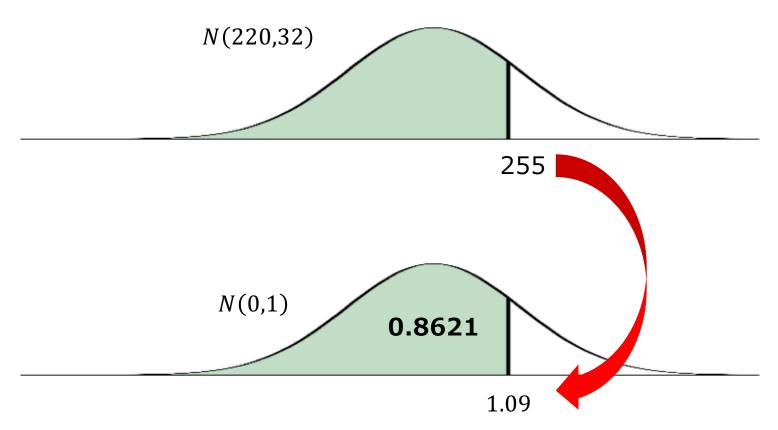


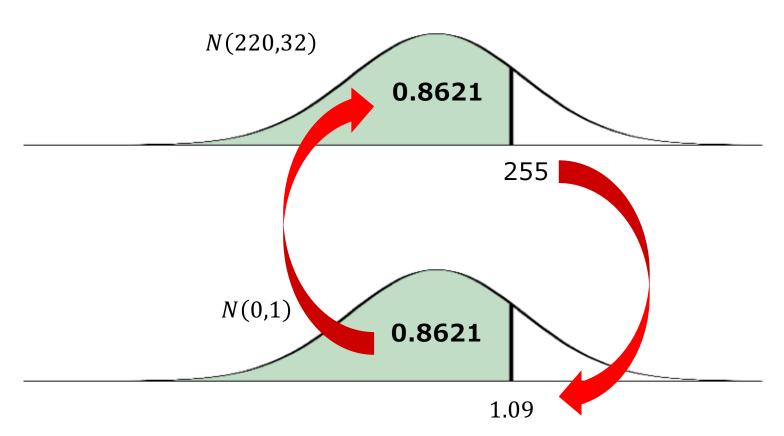
z = 1.09

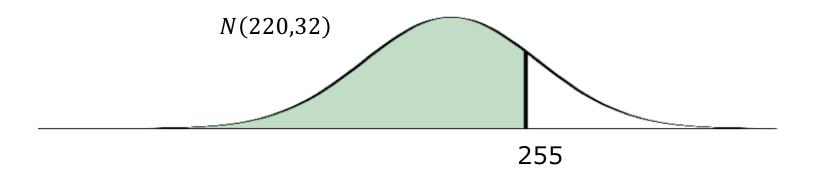
= (1.0) + (0.09)

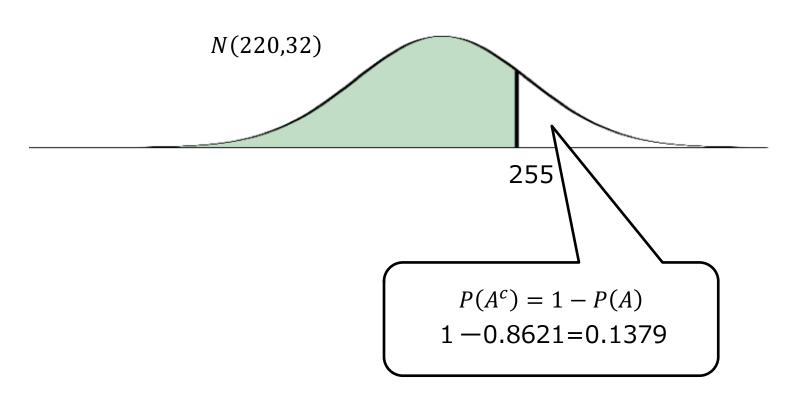


0.0	z	.00	.01	.02	.03	.04	.05	.06	.07	.08	e <u>o</u>
0.2	0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5 59
0.3	0.1	.5398	.5438	.5478	.551	.5557	.5596	.5636	.5675	.5714	.5753
0.4	0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6 41
0.5	0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	
0.6	0.4	.6554	.6591	.6 528	.6664	.6700	.6736	.6772	.6808	.6844	
0.7 .7580 .7611 .7642 .7673 .7704 .7734 .7764 .7794 .7823 .752 .8849 .7910 .7939 .7967 .7995 .8023 .8051 .8078 .8106 .833 .941 .7910 .7939 .7967 .7995 .8023 .8051 .8078 .8106 .833 .909 .8115 .8340 .8365 .8365 .8106 .8212 .8238 .8264 .8289 .8315 .8340 .8365 .8365 .8365 .8366 .8238 .8238 .8249 .8289 .8315 .8340 .8365 .8369 .8365 .8368 .829 .8749 .8770 .8790 .8810 .8210 .7007 .7120 .8200 .8	0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	
0.8	0.6	.7257	.7231	.7324	.7357	.7389	.7422	.7454	.7486	.7517	
0.9	0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7 52
1.0 1.1 1.8643 1.8665 1.8686 1.8708 1.8729 1.870 1.8700 1.8870 1.8870 1.8870 1.8889 1.8889 1.8888 1.8907 1.8925 1.8944 1.8962 1.8980 1.8997 1.9015 1.3 1.9032 1.9049 1.9066 1.9082 1.9099 1.9115 1.9131 1.9147 1.9162 1.9177 1.9192 1.9207 1.9222 1.9236 1.9251 1.9265 1.9265 1.9279 1.9292 1.9306 1.9319 1.5 1.9332 1.9345 1.9357 1.9370 1.9382 1.9394 1.9406 1.9418 1.9429 1.9441 1.9484 1.9495 1.7 1.9554 1.9564 1.9564 1.9573 1.9582 1.9599 1.9608 1.9616 1.9625 1.9633 1.8 1.9641 1.9649 1.9656 1.9664 1.9671 1.9678 1.9686 1.9693 1.9699 1.9767 1.9767 1.9772 1.9778 1.9783 1.9783 1.9783 1.9783 1.9783 1.9814 1.9826 1.9830 1.9821 1.9826 1.9830 1.9834 1.9838 1.9844 1.9848 1.9841 1.9844 1.9857 1.22 1.9861 1.9864 1.9868 1.9871 1.9875 1.9878 1.9813 1.9814 1.9814 1.9814 1.9814 1.9913 1.9916 1.9913 1.9916 1.9913 1.9916 1.9963 1.9964 1.9965 1.9966 1.9967 1.9965 1.9966 1.9967 1.9968 1.9966 1.9967 1.9968 1.9968 1.9981 1.9990 1.9911 1.9913 1.9916 1.9962 1.9981 1.9990 1.9911 1.9913 1.9916 1.9962 1.9981 1.9982 1.9982 1.9983 1.9984 1.9984 1.9985 1.9985 1.9986 1.9987 1.9999 1.9991 1.9996 1.	0.8	.7881	.7910	.7939	.7967	.7995	.8023		.8078	.8106	.8733
1.1 .8643 .8665 .8686 .8708 .8729 .8749 .8770 .8790 .8810 .8925 1.2 .8849 .8869 .8888 .8907 .8925 .8944 .8962 .8980 .8997 .9015 1.3 .9032 .9049 .9066 .9082 .9099 .9115 .9131 .9147 .9162 .9177 1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9508 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9696 .9761 .9761 2.0 .9772	0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	دەدە.
1.1 1.8849											
1.3 .9032 .9049 .9066 .9082 .9099 .9115 .9131 .9147 .9162 .9177 1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9788 .9803 .9881 .9812 .9817 2.1 .9821	1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790		
1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9857 2.2 .9861 .9864 .9868		.8849	.8869	.8888		.8925	.8944	.8962	.8980	.8997	
1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9535 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.3 .9893 .9946 .9948	1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920			.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	
1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9841 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938	1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9913 .9913 .9913 .9913 .9913 .9913 .9913 .9913 .9913 .9914 .9914 .9945 .9929 .9931 .9932 .9934 .9936 .9955 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9974	1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966	1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9844 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9973 .9980 .9986	1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9913 .9913 .9913 .9913 .9913 .9914 .9913 .9929 .9931 .9932 .9934 .9936 .9934 .9934 .9934 .9932 .9934 .9936 .9934 .9934 .9932 .9934 .9936 .9934 .9934 .9934 .9949 .9951 .9952 .9952 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 .9964 .9962 .9963 .9963 .9964 .9972 .9973 .9973 .9974 .9972 .9973 .9974 .9974 .9986 .9986 .9986 .9986 .9986 .9986 .9986 .9986 .9986 .9986 <td>1.9</td> <td>.9713</td> <td>.9719</td> <td>.9726</td> <td>.9732</td> <td>.9738</td> <td>.9744</td> <td>.9750</td> <td>.9756</td> <td>.9761</td> <td>.9767</td>	1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9913 .9916 2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0	2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9963 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9999 .9990 .9990 3.1 .9990 .9991 .9991 .9994	2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9994 .9994 .9995 .9995 .9995 3.2 .9995 .9995 .9996 .9996 .9996	2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	
2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9994 .9994 .9994 .9995 .9995 .9995 .9996 .999	2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9999 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9993 .9993 .9995 3.2 .9993 .9995 .9996 .999	2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9993 .9993 3.2 .9993 .9993 .9994 .9994 .9994 .9994 .9995 .9995 .9996	2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9990 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9993 .9993 .9995 3.2 .9995 .9995 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996	2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	
2.9 .9981 .9982 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9992 .9993 .9993 .9994 .9994 .9994 .9994 .9994 .9995 .9995 .9996 <td>2.7</td> <td>.9965</td> <td>.9966</td> <td>.9967</td> <td>.9968</td> <td>.9969</td> <td>.9970</td> <td>.9971</td> <td>.9972</td> <td>.9973</td> <td>.9974</td>	2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
3.0 .9987 .9987 .9987 .9988 .9988 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9992 .9993 .9993 .9993 3.2 .9993 .9994 .9994 .9994 .9994 .9994 .9995 .9995 .9996	2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9993 .9993 .9993 3.2 .9993 .9994 .9994 .9994 .9994 .9995 .9995 .9995 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9997	2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.2 .9993 .9994 .9994 .9994 .9994 .9994 .9995 .9995 .9995 3.3 .9995 .9995 .9996 .9996 .9996 .9996 .9996 .9996 .9997	3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.3 .9995 .9995 .9996 .9996 .9996 .9996 .9996 .9997	3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
	3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.4 .9997 .9997 .9997 .9997 .9997 .9997 .9997 .9997 .9998	3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996			
	3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

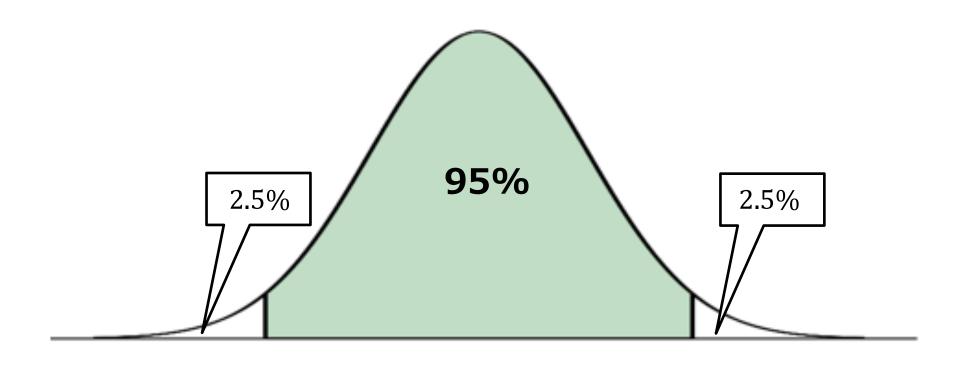




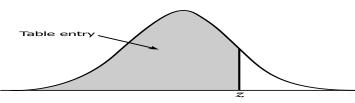




問題:zの値を特定せよ

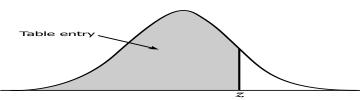


Standard Normal Probabilities



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

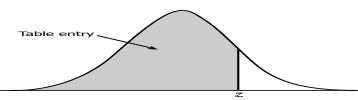
Standard Normal Probabilities



0.975を探す!

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

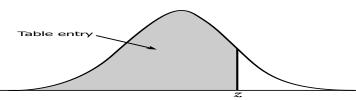
Standard Normal Probabilities



0.975を探す!

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	. 2000	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798		.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

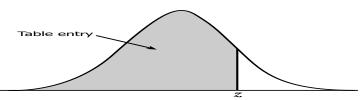
Standard Normal Probabilities



0.975を探す!

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5/36	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.64 06	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.71 <mark>2</mark> 3	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.74 <mark>5</mark> 4	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.77 <mark>64</mark>	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.83 15	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.85 <mark>54</mark>	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.89 <mark>6</mark> 2	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.92 79	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.94 06	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.95 15	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.96 08	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	. 2000	.9693	.9699	.9706
1.9						~~~	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798		.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

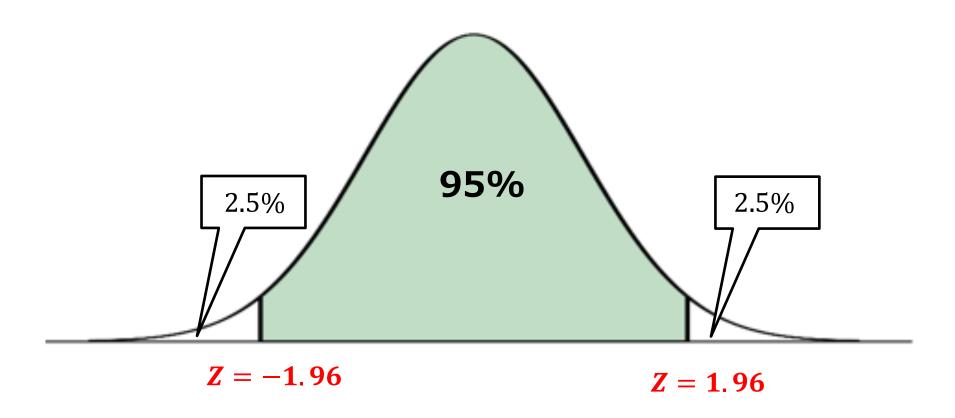
Standard Normal Probabilities



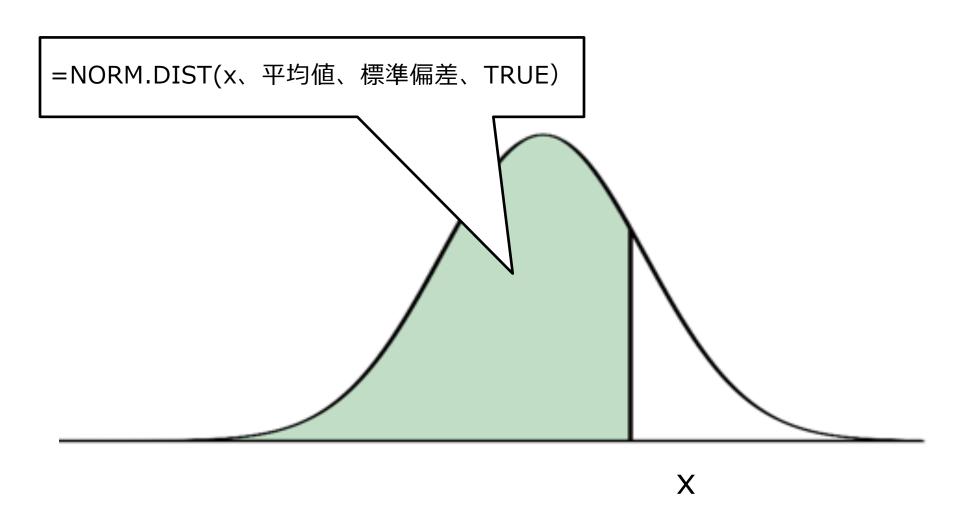
0.975を探す! Z = 1.96

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5/36	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.64 06	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.71 <mark>2</mark> 3	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.74 <mark>5</mark> 4	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.77 <mark>64</mark>	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.83 15	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.85 <mark>54</mark>	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.89 <mark>6</mark> 2	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.92 79	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.94 06	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.95 15	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.96 08	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	. 2000	.9693	.9699	.9706
1.9						~~~	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798		.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

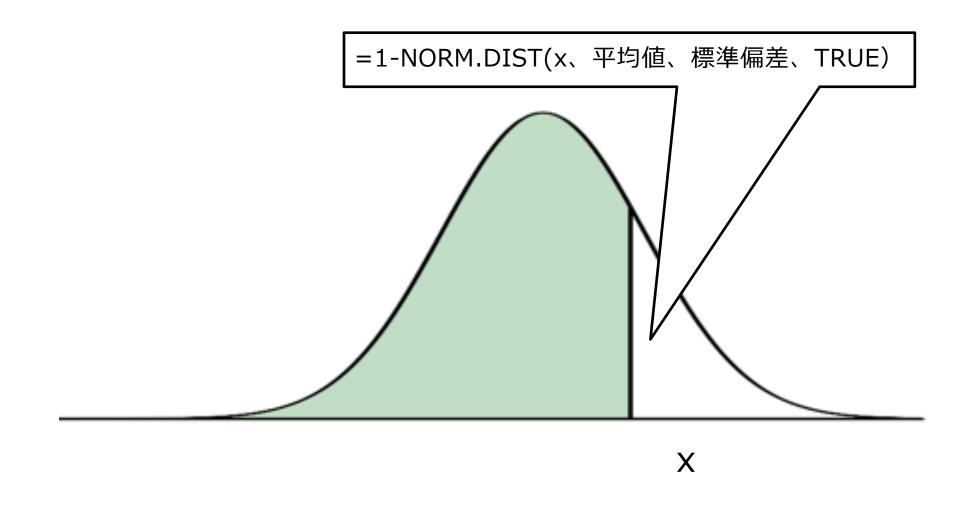
z=1.96は重要な数値!



エクセル関数を使った確率の求め方



エクセル関数を使った確率の求め方

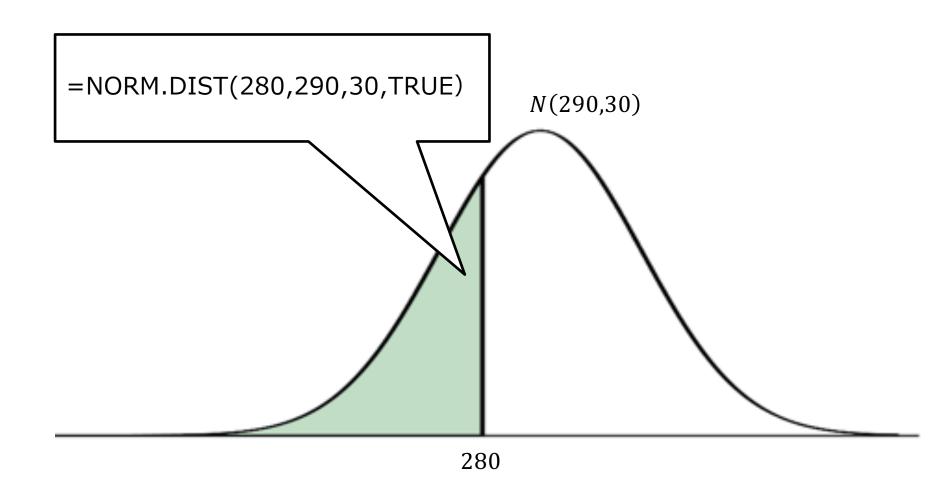


問題1(Excel)演習

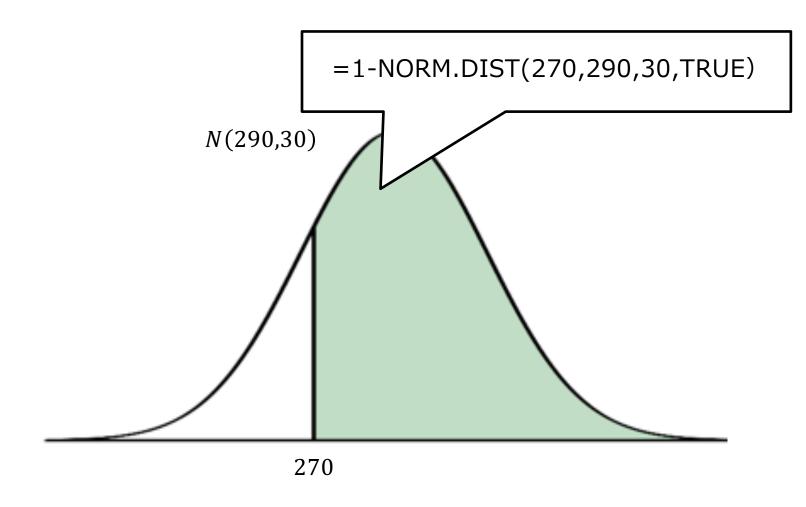
株価Aは平均株価が290円、標準偏差が30円の正規分布に従い、変動することがわかっています。この時、

- (1) 株価Aが280円以下を変動する確率を求めよ。
- (2) 株価Aが270円以上を変動する確率を求めよ。

株価Aが280円以下を変動する確率



株価Aが270円以上を変動する確率

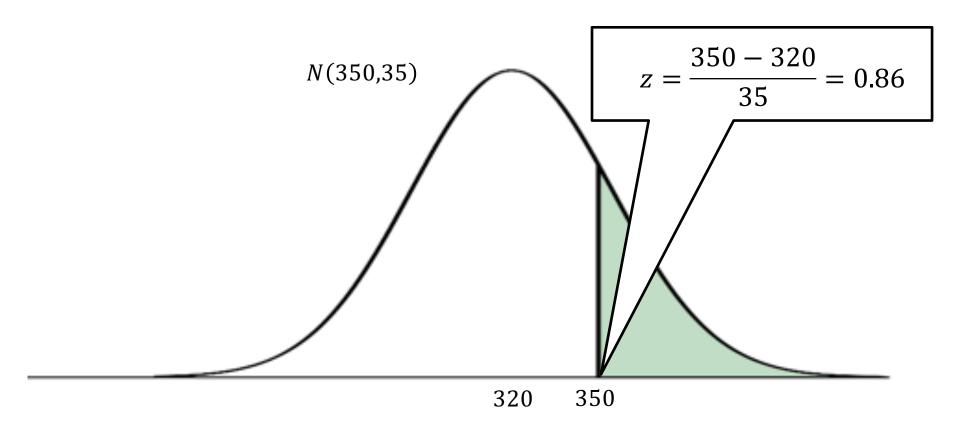


問題

ある企業がイベントを開催すると、過去のデータから来客数の平均が 320人、標準偏差が35人であることが分かっている。 この企業が開催する次回のイベントで

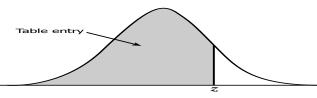
- (1) 来客数が350人以上である確率を求めよ。
- (2) 客数が300人以下である確率を求めよ。

350人以上の確率(z表を使った求め方)



350人以上の確率(z表を使った求め方)

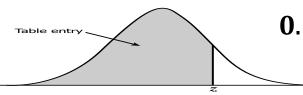
Standard Normal Probabilities



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

350人以上の確率(z表を使った求め方)

Standard Normal Probabilities

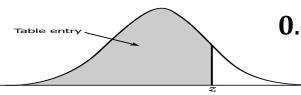


0.86 = 0.8 + 0.06

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

350人以上の確率(z表を使った求め方)

Standard Normal Probabilities

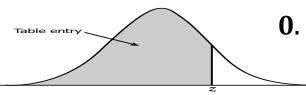


0.86 = 0.8 + 0.06

0.0 .5000 .5040 .5080 .5120 .5160 .5199 .5239 .5279 .5319 .5359 0.1 .5398 .5438 .5478 .5517 .5556 .5665 .5714 .5753 0.2 .5793 .5832 .5871 .5910 .5948 .5987 .66 26 .6064 .6103 .6141 0.3 .6179 .6215 .6255 .6293 .6331 .6368 .66 26 .6443 .6480 .6815 0.4 .6554 .6591 .6628 .6664 .6700 .6736 .612 .6808 .6844 .6879 0.5 .6915 .6915 .6950 .6985 .7019 .7024 .7088 .7127 .7464 .7740 .7540 .7540 .7540 .7549 .7454 .7744 .7754 .7823 .7852 .8389 .8151 .8381 .8051 .8051 .8051 .8081 .8081 .8081 .8081 .8081 .8081 </th <th>z</th> <th>.00</th> <th>.01</th> <th>.02</th> <th>.03</th> <th>.04</th> <th>.05</th> <th>.06</th> <th>.07</th> <th>.08</th> <th>.09</th>	z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.2	0.0	.5000	.5040	.5080	.5120	.5160	.5199	.52 <mark>3</mark> 9	.5279	.5319	.5359
0.3	0.1	.5398	.5438	.5478	.5517	.5557	.5596	.56 36	.5675	.5714	.5753
0.4	0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.5	0.3	.6179	.6217	.6255	.6293	.6331	.6368	.64 06	.6443	.6480	.6517
0.6	0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6	.6808	.6844	.6879
0.6	0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7 .3	.7157	.7190	.7224
0.8	0.6	.7257	.7291	.7324	.7357	.7389	.7422		.7486	.7517	.7549
0.9 8159 .8166 .8212 .8238 .8264 .8289 .8315 .8340 .8365 .8389 1.0 .8413 .8438 .8461 .8485 .8508 .8531 .8554 .8577 .8599 .8621 1.1 .8643 .8665 .8686 .8708 .8729 .8749 .8770 .8790 .8810 .8830 1.2 .8849 .8869 .8888 .8907 .8925 .8944 .8962 .8980 .8997 .9015 1.3 .9032 .9049 .9066 .9082 .9099 .9115 .9131 .9147 .9162 .9177 1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9535 .9545 1.7	0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
1.0 .8413 .8438 .8461 .8485 .8508 .8531 .8554 .8577 .8599 .8621 1.1 .8643 .8665 .8686 .8708 .8729 .8749 .8770 .8790 .8810 .8830 1.2 .8849 .8869 .8888 .8907 .8925 .8944 .8962 .8980 .8997 .9015 1.3 .9032 .9049 .9066 .9082 .9099 .9115 .9131 .9147 .9162 .9177 1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9686 .963 .9699 .9706 1.8 .9641	0.8							.8051	.8078	.8106	.8133
1.1 .8643 .8665 .8686 .8708 .8729 .8749 .8770 .8790 .8810 .8830 1.2 .8849 .8869 .8888 .8907 .8925 .8944 .8962 .8980 .8977 .9015 1.3 .9032 .9049 .9066 .9082 .9099 .9115 .9131 .9147 .9162 .9177 1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9586 .9693 .9766 2.0 .9772 .9778	0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.2 .8849 .8869 .8888 .8907 .8925 .8944 .8962 .8980 .8997 .9015 1.3 .9032 .9049 .9066 .9099 .9115 .9131 .9147 .9162 .9177 1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .941 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9761 2.0 .9772 .9778 .978 .9788 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9868 .9871	1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.3 .9032 .9049 .9066 .9082 .9099 .9115 .9131 .9147 .9162 .9177 1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9535 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9810 .9812 .9817 2.1 .9821 .9864		.8643	.8665	.8686	.8708	.8729	.8749		.8790	.8810	.8830
1.4 .9192 .9207 .9222 .9236 .9251 .9265 .9279 .9292 .9306 .9319 1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.3 .9893	1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.5 .9332 .9345 .9357 .9370 .9382 .9394 .9406 .9418 .9429 .9441 1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9554 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9788 .9793 .9798 .9803 .9801 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9857 2.2 .9861 .9864 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.4 .9918 .9920 .9922 .9925	1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.6 .9452 .9463 .9474 .9484 .9495 .9505 .9515 .9525 .9535 .9545 1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9878 .9881 .9884 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920	1.4	.9192	.9207	.9222	.9236	.9251	.9265		.9292	.9306	
1.7 .9554 .9564 .9573 .9582 .9591 .9599 .9608 .9616 .9625 .9633 1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941	1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.8 .9641 .9649 .9656 .9664 .9671 .9678 .9686 .9693 .9699 .9706 1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9897 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9913 .9913 .9913 .9913 .9913 .9913 .9914 .9936 .9927 .9929 .9931 .9932 .9934 .9936 .9934 .9936 .9934 .9936 .9934 .9934 .9934 .9935 .9963 .9964 .9946 .9948 .9949	1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.9 .9713 .9719 .9726 .9732 .9738 .9744 .9750 .9756 .9761 .9767 2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9841 .9884 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9913 .9913 .9913 .9913 .9914 .9914 .9914 .9914 .9927 .9929 .9931 .9932 .9934 .9936 .9934 .9936 .9934 .9936 .9934 .9936 .9934 .9936 .9936 .9931 .9932 .9934 .9936 .9936 .9946 .9948 .9949 .9951 .9952 .9966 .9966 .9966 .9966 .9966 .9966	1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
2.0 .9772 .9778 .9783 .9788 .9793 .9798 .9803 .9808 .9812 .9817 2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9844 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9913 .9913 .9913 .9913 .9914 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 .9936 .9934 .9936 .9934 .9936 .9934 .9936 .9934 .9936 .9934 .9936 .9934 .9936 .9948 .9949 .9951 .9952 .9963 .9964 .9948 .9949 .9951 .9952 .9963 .9964 .9966 .9963 .9964 .9964 .9961 .9962 .9963 .9964 .9977 .9977 .9978	1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
2.1 .9821 .9826 .9830 .9834 .9838 .9842 .9846 .9850 .9854 .9857 2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987	1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.2 .9861 .9864 .9868 .9871 .9875 .9878 .9881 .9884 .9887 .9890 2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920 .9922 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9968 .9969 .9970 .9971 .9972 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9989	2.0	.9772	.9778	.9783	.9788	.9793	.9798				
2.3 .9893 .9896 .9898 .9901 .9904 .9906 .9909 .9911 .9913 .9916 2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9954 2.7 .9965 .9966 .9967 .9968 .9959 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9989 .9989 .9989 .9999 .9993 .9993 3.1 .9990 .9991 .9991	2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.4 .9918 .9920 .9922 .9925 .9927 .9929 .9931 .9932 .9934 .9936 2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9968 .9969 .9970 .9971 .9972 .9973 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9999 .9990 .9993 3.1 .9990 .9991 .9991 .9994 .9994 .9995 .9995 .9995 .9995 .9996 .9996 .9996 .9996 .9996 .9996 <td>2.2</td> <td>.9861</td> <td>.9864</td> <td>.9868</td> <td>.9871</td> <td>.9875</td> <td>.9878</td> <td>.9881</td> <td>.9884</td> <td>.9887</td> <td>.9890</td>	2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.5 .9938 .9940 .9941 .9943 .9945 .9946 .9948 .9949 .9951 .9952 2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9995 .9995 3.2 .9993 .9994 .9994 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 <td>2.3</td> <td>.9893</td> <td>.9896</td> <td>.9898</td> <td>.9901</td> <td>.9904</td> <td>.9906</td> <td>.9909</td> <td>.9911</td> <td>.9913</td> <td>.9916</td>	2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.6 .9953 .9955 .9956 .9957 .9959 .9960 .9961 .9962 .9963 .9964 2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9992 .9992 .9992 .9993 .9993 .9993 3.2 .9993 .9995 .9996 .999	2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.7 .9965 .9966 .9967 .9968 .9969 .9970 .9971 .9972 .9973 .9974 2.8 .9974 .9975 .9976 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9993 .9993 .9993 3.2 .9993 .9993 .9994 .9994 .9994 .9994 .9996	2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.8 .9974 .9975 .9976 .9977 .9977 .9978 .9979 .9979 .9980 .9981 2.9 .9981 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9990 .9990 .9990 3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9993 .9993 3.2 .9993 .9994 .9994 .9994 .9995 .9995 .9996	2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.9 .9981 .9982 .9982 .9983 .9984 .9984 .9985 .9985 .9986 .9986 3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9989 .9990 .9990 3.1 .9990 .9991 .9991 .9992 .9992 .9992 .9992 .9993 .9993 3.2 .9993 .9994 .9994 .9994 .9995 .9995 .9995 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996 .9996	2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
3.0 .9987 .9987 .9988 .9988 .9989 .9989 .9989 .9990 .9990 .9990 3.1 .9990 .9991 .9991 .9992 .9992 .9992 .9993 .9993 .9993 3.2 .9993 .9994 .9994 .9994 .9994 .9994 .9995 .9995 .9996 <td>2.8</td> <td>.9974</td> <td>.9975</td> <td>.9976</td> <td>.9977</td> <td>.9977</td> <td>.9978</td> <td>.9979</td> <td>.9979</td> <td>.9980</td> <td>.9981</td>	2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
3.1 .9990 .9991 .9991 .9991 .9992 .9992 .9992 .9993 .9993 .9993 3.2 .9993 .9994 .9994 .9994 .9994 .9995 .9995 .9995 3.3 .9995 .9995 .9996 .9996 .9996 .9996 .9996 .9996	2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.2 .9993 .9994 .9994 .9994 .9994 .9994 .9995 .9995 .9995 3.3 .9995 .9995 .9996 .9996 .9996 .9996 .9996 .9996 .9997	3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.3 .995 .995 .995 .996 .996 .996 .996 .996	3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
	3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.4 .9997 .9997 .9997 .9997 .9997 .9997 .9997 .9997 .9998	3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
	3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

350人以上の確率(z表を使った求め方)

Standard Normal Probabilities

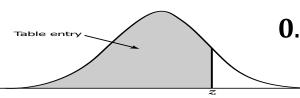


0.86 = 0.8 + 0.06

z_	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.52 <mark>3</mark> 9	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7 .3	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734		.7794	.7823	.7852
8.0							.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	0215	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

350人以上の確率(z表を使った求め方)

Standard Normal Probabilities

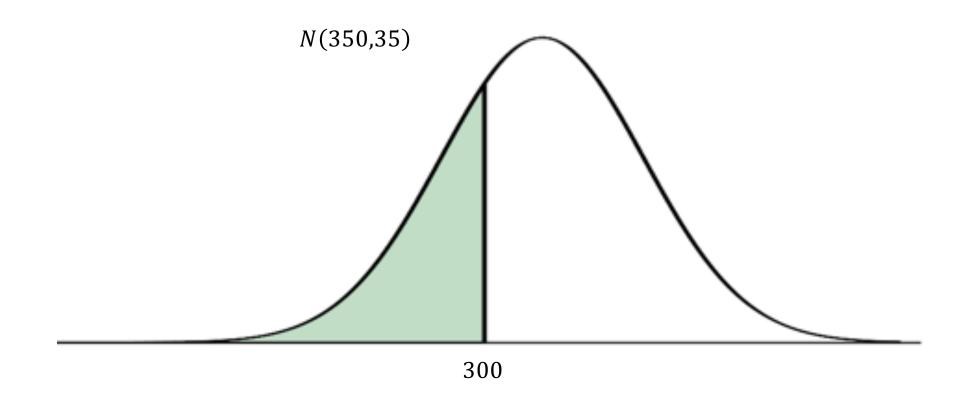


0.86 = 0.8 + 0.06

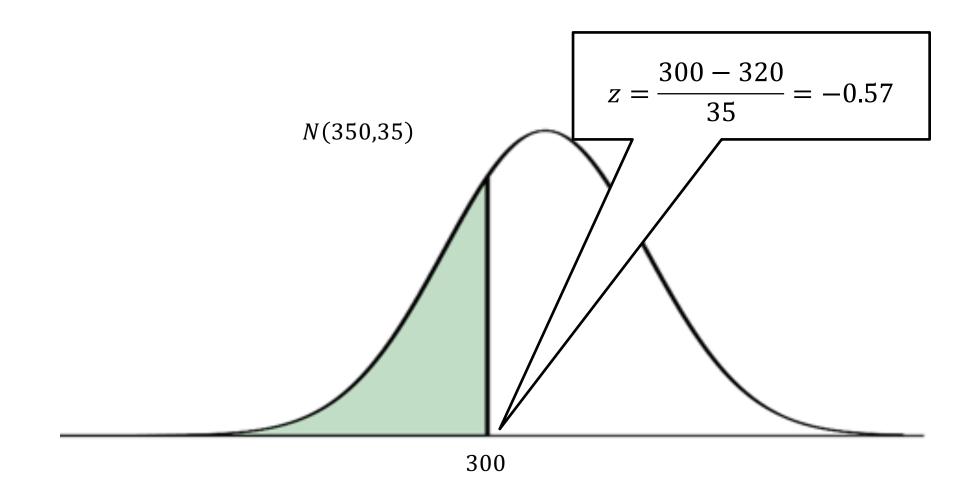
1 - 0.8051 = 0.1949

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.52 <mark>3</mark> 9	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.56 36	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.67 72	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7 .3	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734		.7794	.7823	.7852
0.8							.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	0245	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

300人以下の確率(z表を使った求め方)

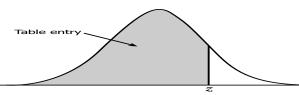


300人以下の確率(z表を使った求め方)



300人以下の確率(z表を使った求め方)

Standard Normal Probabilities



0.57 = 0.5 + 0.07

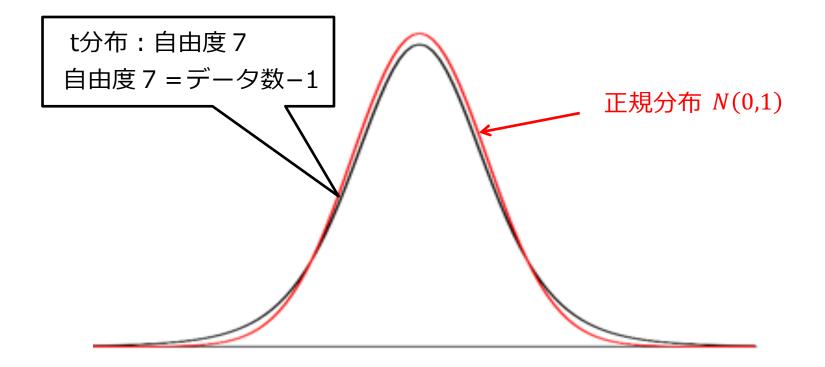
1 - 0.7157 = 0.2843

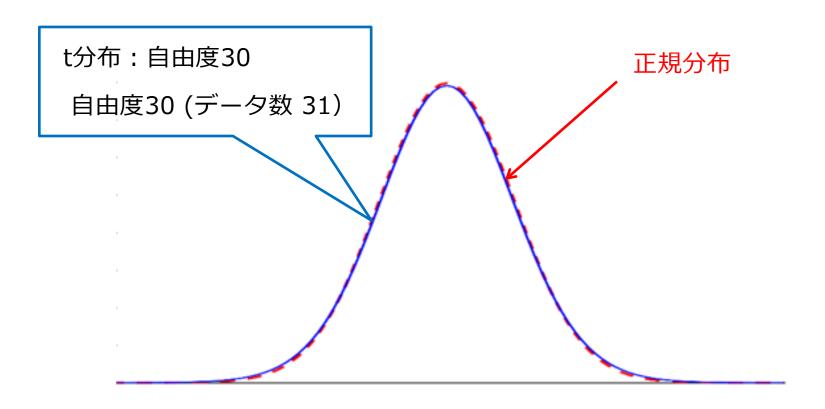
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.56 <mark>75</mark> .6 74	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.64 43	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772		.6844	.6879
0.5								.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454		.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

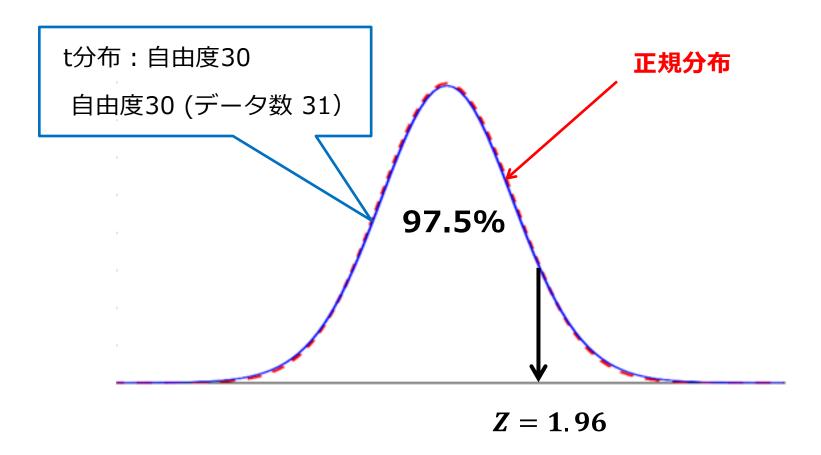
t分布とは?

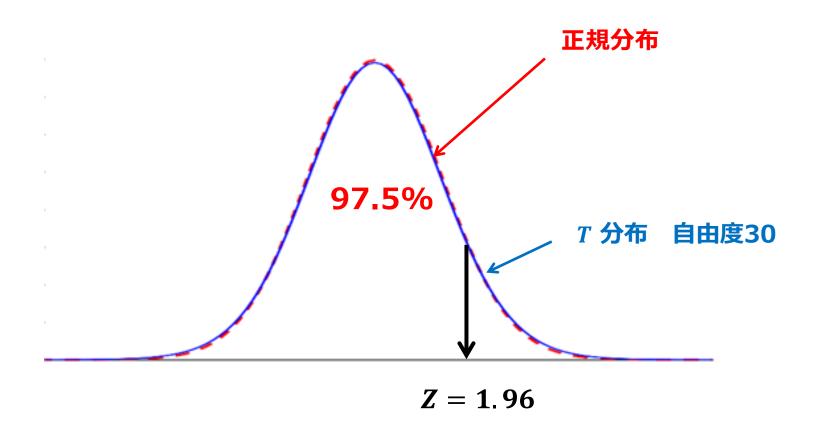
確率変数の期待値

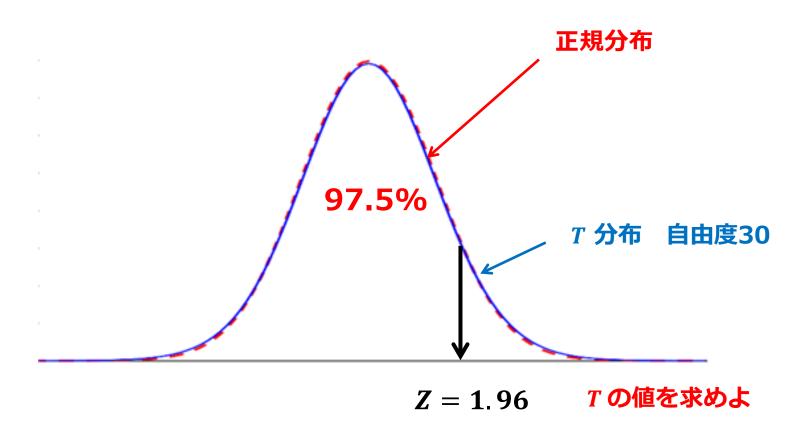
正規分布する母集団(平均と分散が未知)からで小さい標本サイズを用いて母集団平均を推定する問題に利用される分布。





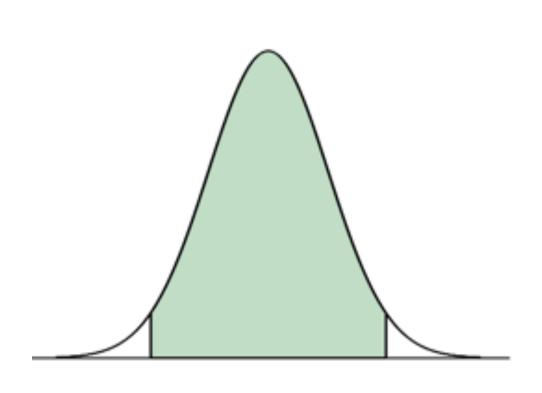






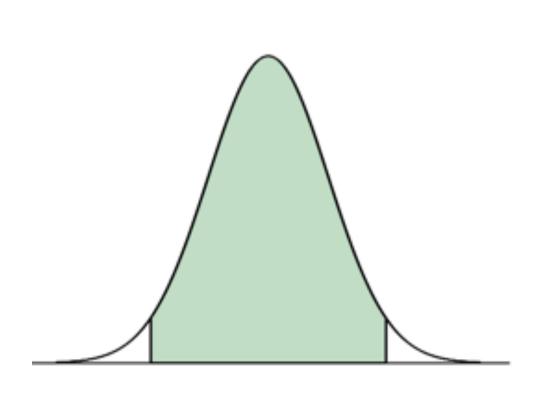
t分布表(危険率α、両側)

自由库			œ.	
7	0.1	0.05	0.02	0.01
1	6.314	12.706	31.821	63.657
2	2.920	4.303	6.965	9.925
3	2.353	3,182	4.541	5.841
4	2.132	2.776	3.747	4.604
5	2.015	2.571	3.365	4.032
6	1.943	2.447	3.143	3.707
7	1.895	2.365	2.998	3.499
8	1.860	2.306	2.896	3.355
9	1.833	2.262	2.821	3.250
10	1.812	2.228	2.764	3.169
11	1.796	2.201	2.718	3.106
12	1.782	2.179	2.681	3.055
13	1.771	2.160	2.650	3.012
14	1.761	2.145	2.624	2.977
15	1.753	2.131	2.602	2.947
16	1.746	2.120	2.583	2.921
17	1.740	2.110	2.567	2.898
18	1.734	2.101	2.552	2.878
19	1.729	2.093	2.539	2.851
20	1.725	2.086	2.528	2.845
21	1.721	2.080	2.518	2.831
22	1.717	2.074	2.508	2.819
23	1.714	2.069	2.500	2.807
24	1.711	2.064	2.492	2.797
25	1.708	2.060	2.485	2.787
20	1.700	2.056	2.470	2.770
26	1.706	2.056	2.479	2.779
27	1.703	2.052	2.473	2.771
28	1.701	2.048	2.467	2.763
29 30	1.699	2.045	2.462	2.758
30	1.697	2.042	2.457	2.750



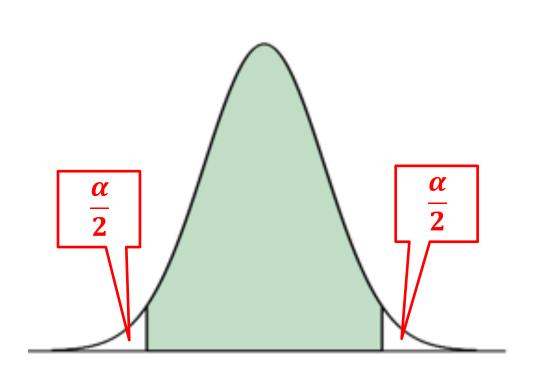
t分布表(危险率α、両侧)

自由底			α	
t	0.1	0.05	0.02	0.01
- 1	6.314	12.706	31.821	63.657
2	2.920	4.303	6.965	9.925
3	2.353	3,182	4.541	5.841
4	2.132	2.776	3.747	4.604
5	2.015	2.571	3.365	4.032
6	1.943	2.447	3.143	3.707
7	1.895	2.365	2.998	3.499
8	1.860	2.306	2.896	3.355
9	1.833	2.262	2.821	3.250
10	1.812	2.228	2.764	3.169
11	1.796	2.201	2.718	3.106
12	1.782	2.179	2.681	3.055
13	1.771	2.160	2.650	3.012
14	1.761	2.145	2.624	2.977
15	1.753	2.131	2.602	2.947
16	1.746	2.120	2.583	2.921
17	1.740	2.110	2.567	2.898
18	1.734	2.101	2.552	2.878
19	1.729	2.093	2.539	2.851
20	1.725	2.086	2.528	2.845
		2.000	0.510	0.001
21	1.721	2.080	2.518	2.831
22	1.717	2.069	2.508	2.819
24	1.714	2.069	2.492	2.797
25	1.708	2.064	2.492	2.787
20	1.708	2.060	2.485	2.787
26	1.706	2.056	2.479	2.779
27	1.703	2.052	2.473	2.771
28	1.701	2.048	2.467	2.763
29	1.699	2.046	2.462	2.758
30	1.697	2.043	2.457	2.750
30	1.007	2.042	2.407	2.750

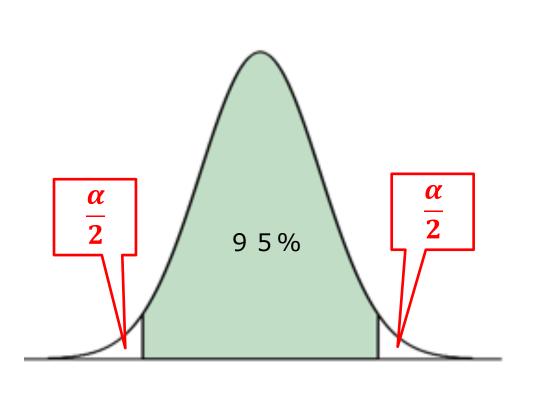


440	2 MBC 7 46	生除率a.	2005 ARM 1
1 23 41	1-800 1 20	TE, DESE ARROY CO.	. PAUTING /

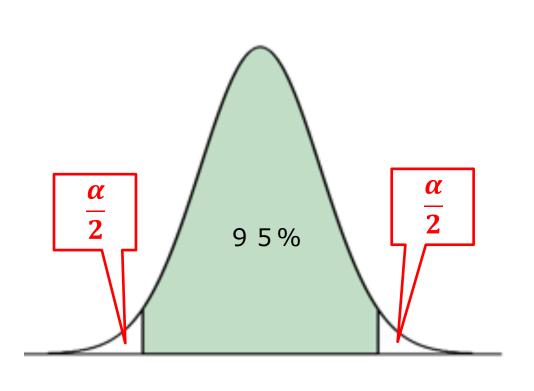
自由底			α		
f	0.1	0.05		02	0.01
1	6.314	12.70€	3	1.821	63.657
2	2.920	4.303		8.965	9.925
3	2.353	3.182	2 4	4.541	5.841
4	2.132	2.770		3.747	4.604
5	2.015	2.571	1 :	3.365	4.032
6	1.943	2.447		3.143	3.707
7	1.895	2.368		2.998	3.499
8	1.860	2.306		2.896	3.355
9	1.833	2.262		2.821	3.250
10	1.812	2.220	, ,	2.764	3.169
11	1.796	2.201		2.718	3.106
12	1.782	2.179		2.681	3.055
13	1.771	2.160		2.650	3.012
14	1.761	2.145		2.624	2.977
15	1.753	2.131	1 :	2.602	2.947
16	1.746	2.120		2.583	2.921
17	1.740	2.110		2.567	2.898
18	1.734	2.101		2.552	2.878
19	1.729	2.093		2.539	2.851
20	1.725	2.086	, ,	2.528	2.845
21	1.721	2.080		2.518	2.831
22	1.717	2.074		2.508	2.819
23	1.714	2.069		2.500	2.807
24	1.711	2.064		2.492	2.797
25	1.708	2.060		2.485	2.787
20	1.706	2.000	, ,	2.460	2.767
26	1.706	2.056		2.479	2.779
27	1.703	2.052		2.473	2.771
28	1.701	2.048	_	2.467	2.763
29	1.699	2.045		2.462	2.758
30	1.697	2.042		2.457	2.750
30	1.007	2.042			2.750

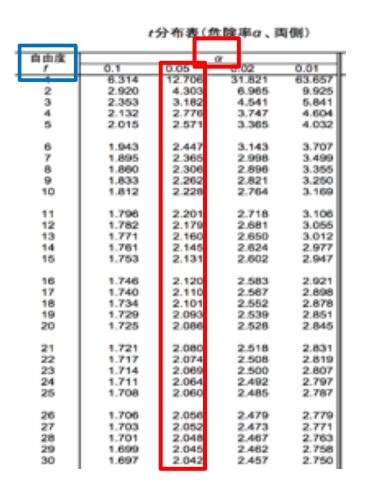


	ti	分布表(危险率a、p	100)
自由度			or	
f	0.1	0.05	0.02	0.01
- 1	6.314	12.706	31.821	63.657
2	2.920	4.303	6.965	9.925
3	2.353	3.182	4.541	5.841
4	2.132	2.776	3.747	4.604
5	2.015	2.571	3.365	4.032
6	1.943	2.447	3.143	3.707
7	1.895	2.365	2.998	3.499
8	1.860	2.306	2.896	3.355
9	1.833	2.262	2.821	3.250
10	1.812	2.228	2.764	3.169
11	1.796	2.201	2.718	3.106
12	1.782	2.179	2.681	3.055
13	1.771	2.160	2.650	3.012
14	1.761	2.145	2.624	2.977
15	1.753	2.131	2.602	2.947
			0.500	
16	1.746	2.120	2.583	2.921
17	1.740	2.110	2.567	2.898
18	1.734	2.101	2.552	2.878
19	1.729	2.093	2.539	2.851
20	1.725	2.086	2.528	2.845
21	1.721	2.080	2.518	2.831
22	1.717	2.074	2.508	2.819
23	1.714	2.069	2.500	2.807
24	1.711	2.064	2.492	2.797
25	1.708	2.060	2.485	2.787
20	1.706	2.000	2.400	2.707
26	1.706	2.056	2.479	2.779
27	1.703	2.052	2.473	2.771
28	1.701	2.048	2.467	2.763
29	1.699	2.045	2.462	2.758
30	1.697	2.042	2.457	2.750
5-5		2.0-72	2.70	2

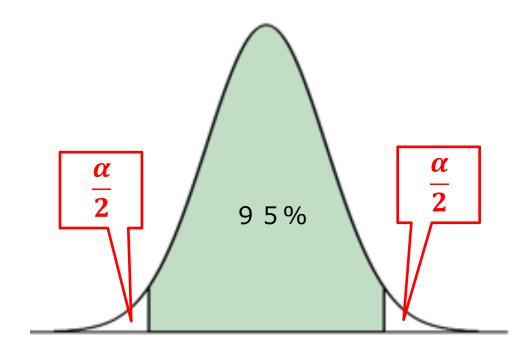


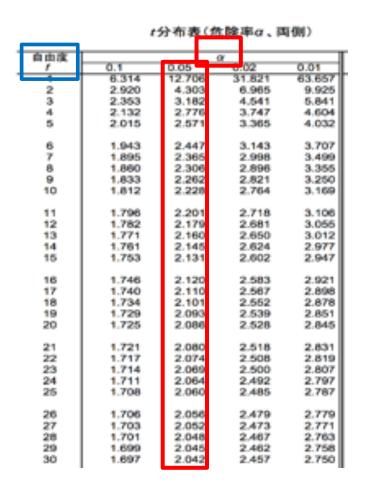
	es	分布表(佐陰率a、p	100)
自由度		_	α	
r	0.1	0.05	0.02	0.01
	6.314	12.706	31.821	63.657
2	2.920	4.303	6.965	9.925
3	2.353	3.182	4.541	5.841
4	2.132	2.776	3.747	4.604
5	2.015	2.571	3.365	4.032
6	1.943	2.447	3.143	3.707
7	1.895	2.365	2.998	3.499
8	1.860	2.306	2.896	3.355
9	1.833	2.262	2.821	3.250
10	1.812	2.228	2.764	3.169
11	1.796	2.201	2.718	3.106
12	1.782	2.179	2.681	3.055
13	1.771	2.160	2.650	3.012
14	1.761	2.145	2.624	2.977
15	1.753	2.131	2.602	2.947
16	1.746	2.120	2.583	2.921
17	1.740	2.110	2.567	2.898
18	1.734	2.101	2.552	2.878
19	1.729	2.093	2.539	2.851
20	1.725	2.086	2.528	2.845
21	1.721	2.080	2.518	2.831
22	1.717	2.074	2.508	2.819
23	1.714	2.069	2.500	2.807
24	1,711	2.064	2.492	2.797
25	1.708	2.060	2.485	2.787
26	1.706	2.056	2.479	2.779
27	1.703	2.052	2.473	2.771
28	1.701	2.048	2.467	2.763
29	1.699	2.045	2.462	2.758
30	1.697	2.042	2.457	2.750
		2.0		2



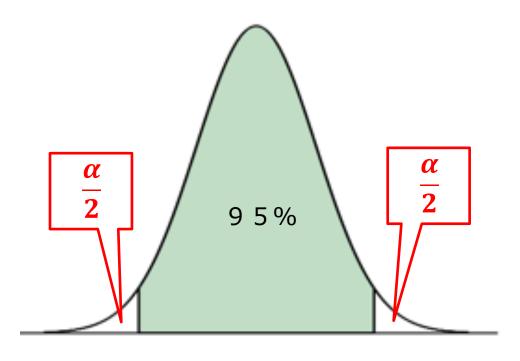


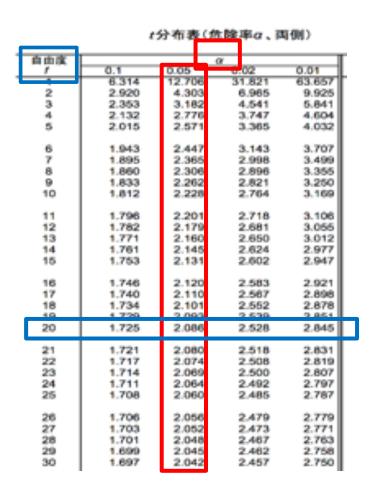
自由度:データ数-1



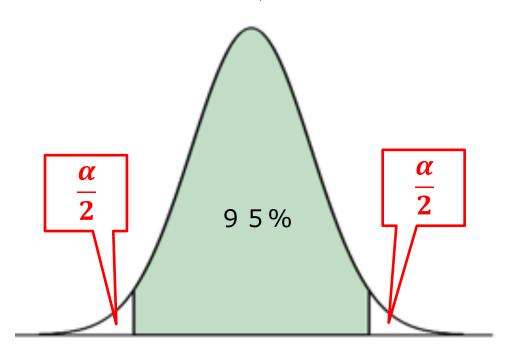


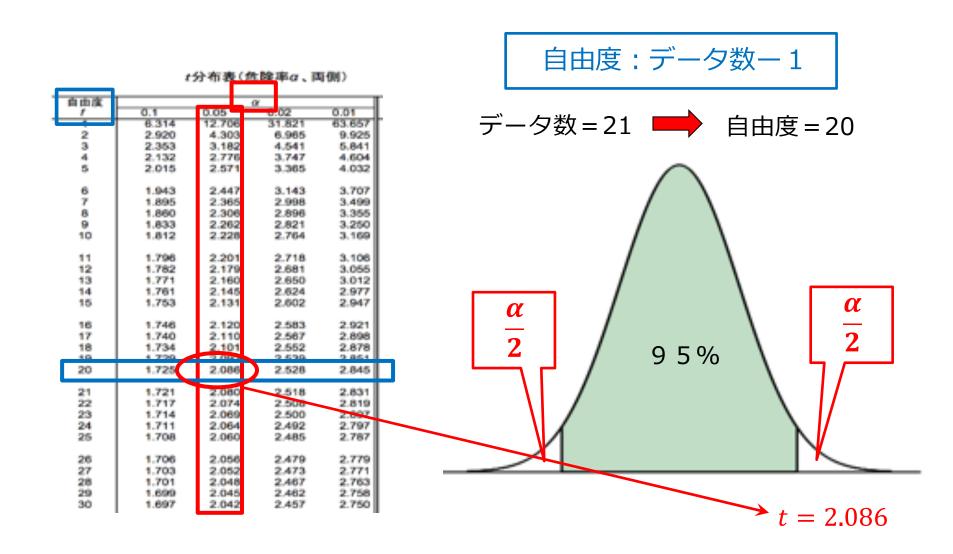
自由度:データ数-1







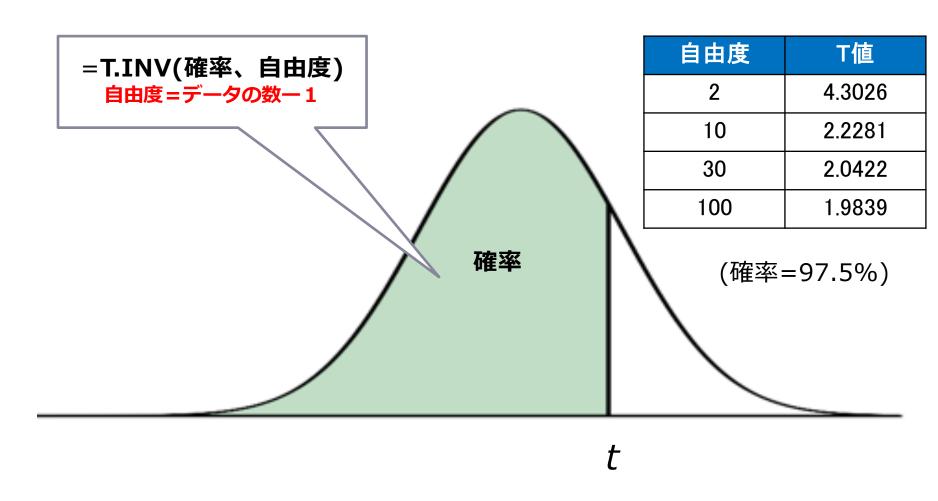




問題: それぞれt値を求めよ(95%)

データ数	T値
3	
11	
31	
101	

エクセル関数を使ったt値、z値の求め方



エクセル関数を使ったz値の求め方

