Normal

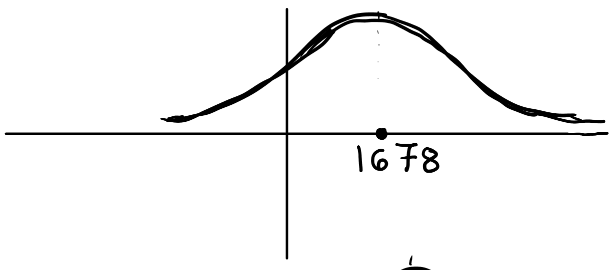
25 May 2023 08:37

2. In an insurance company, daily amount of claims is normally distributed with mean \$1678 with standard deviation \$500. Find the following:

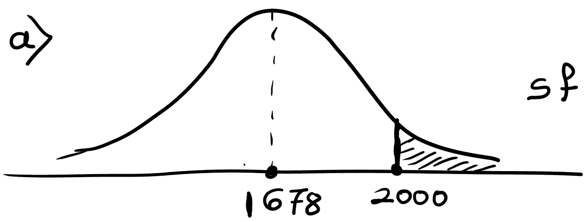
a) Probability that amounts exceeds \$2000

b) What is the minimum amount of claims for the top 10% of the daily claims?

c) Probability that the amount is between \$1000 and \$1900.



a)



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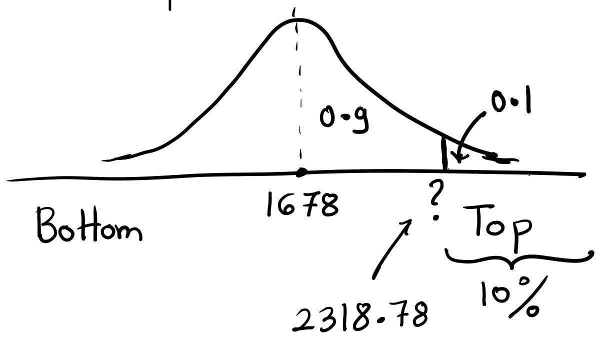
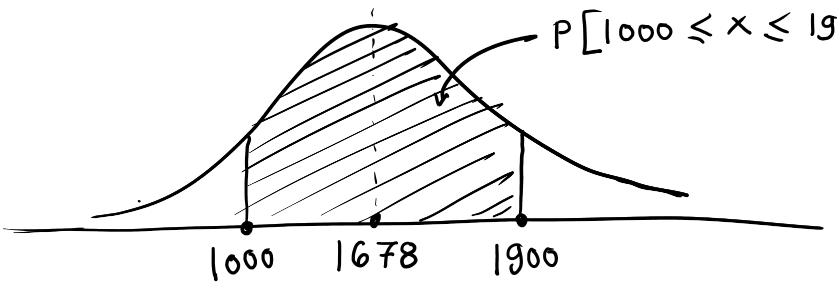
b)



What is the minimum amount of claims for the top 10% of the daily claims?

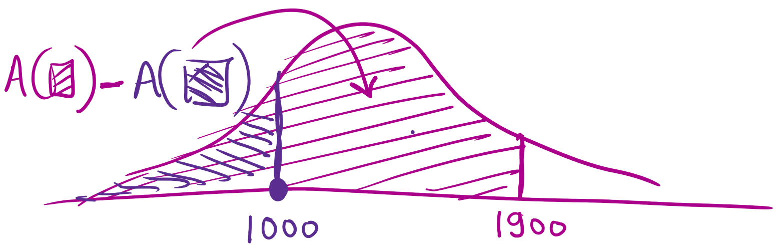
ppf (0.9, _ _)

c) Probability that the amount is between \$1000 and \$1900.



$$P[1000 \leq x \leq 1900] = \int_{1000}^{1900} f(x)\,dx$$

$$= P[x \leq 1900] - P[x \leq 1000]$$

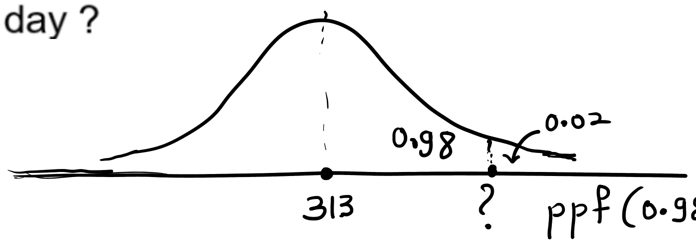


A fast-food restaurant sells As and Bs. On a typical weekday the demand for As is normally distributed with mean 313 and standard deviation 57; the demand for Bs is normally distributed with mean 93 and standard deviation 22.

A) How many As must the restaurant stock to be 98% sure of not running

22.

A) How many As must the restaurant stock to be 98% sure of not running out of stock on a given day ?

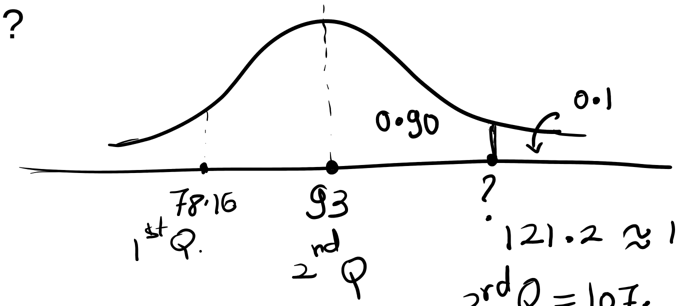


ppf (0.98, 313, 57)

ans = 430

A fast-food restaurant sells As and Bs. On a typical weekday the demand for As is normally distributed with mean 313 and standard deviation 57; the demand for Bs is normally distributed with mean 93 and standard deviation 22.

B) How many Bs must the restaurant stock to be 90% sure of not running out on a given day ?



ppf(0.9, 93, 22)

121.2 ≈ 121

3rd Q = 107.

A fast-food restaurant sells As and Bs. On a typical weekday the demand for As is normally distributed with mean 313 and standard deviation 57; the demand for Bs is normally distributed with mean 93 and standard deviation 22.

C) If the restaurant stocks 450 As and 150 Bs for a given day, what is the probability that it will run out of As or Bs (or both) that day ? Assume that the demand for As and Bs are probabilistically independent.

X_A : Demand of A $\qquad$ X_B : Demand of B

$X_A \sim$ Normal ($\mu = 313$, $\sigma^2 = 57^2$) $\qquad$ $X_B \sim$ Normal ($\mu = 93$, $\sigma^2 = 22^2$)

450 As $\quad$ A out of stock $\equiv X_A > 450$ $\qquad$ 150 Bs $\quad X_B > 150$

$P(X_A > 450$ or $X_B > 150$ or $X_A > 450 \cap X_B > 150)$ $\qquad$ $A \cup B$ actually

$$= P(X_A > 450) + P(X_B > 150) - \underbrace{P(X_A > 450 \cap X_B > 150)}_{P(X_A > 450) * P(X_B > 150)}$$

Joint & Marginal

25 May 2023 10:10

14. A Canadian business school summarized the gender and residency of its incoming class as follows:

	Residency					
Gender	**Canada**	**United States**	**Europe**	**Asia**	**Other**	
Male	125	18	17	50	8	218
Female	103	8	10	92	4	217
	228	26	27	142	12	435

Joint Probability Distribution

	Canada	US	Europe	Asia	Others
Male	0.28736	0.04138	0.03908	0.11494	0.01839
Female	0.23678	0.01839	0.02299	0.21149	0.0092

P(Male ∩ Canada)

P(Male ∩ Europe)

P(Female ∩ US)

	Canada	US	Europe	Asia	Others	
Male	0.28736	0.04138	0.03908	0.11494	0.01839	0.50115
Female	0.23678	0.01839	0.02299	0.21149	0.0092	0.49885
						1

Marginal Distribution of Gender

	Canada	US	Europe	Asia	Others	
Male	0.28736	0.04138	0.03908	0.11494	0.01839	0.50115
Female	0.23678	0.01839	0.02299	0.21149	0.0092	0.49885
	0.52414	0.05977	0.06207	0.32644	0.02759	1

Marginal Distribution of Country of Origin

	Canada	US	Europe	Asia	Others	
Male	0.28736	0.04138	0.03908	0.11494	0.01839	0.50115
Female	0.23678	0.01839	0.02299	0.21149	0.0092	0.49885
	0.52414	0.05977	0.06207	0.32644	0.02759	1

What is the probability that a female student is from outside Canada or the United States? 0.2436

Region	Book	DVD	Total
East	56	42	98
North	43	42	85
South	62	37	99
West	100	90	190
Total	261	211	472

a. Find the marginal probabilities that a sale originated in each of the four regions and the marginal probability of each type of sale (book or DVD).

b. Find the conditional probabilities of selling a book given that the customer resides in each region.

$P(Bk \mid E)$ $P(Bk \mid N)$ $P(Bk \mid S)$ $P(Bk \mid W)$

Region	Book		DVD			
E	$P(Book \cap E)$	0.118644068	$P(DVD \cap E)$	0.088983051	0.20763	→ $P(East)$
N	$P(Bk \cap N)$	0.091101695	$P(DVD \cap N)$	0.088983051	0.18008	$P(North)$
S	$P(Bk \cap S)$	0.131355932	$P(DVD \cap S)$	0.078389831	0.20975	$P(S)$
W	$P(Bk \cap W)$	0.211864407	$P(DVD \cap W)$	0.190677966	0.40254	$P(West)$
		0.552966102		0.447033898	1	

↓ $P(Book)$ ↓ $P(DVD)$

$$P(Bk \mid E) = \frac{P(Bk \cap E)}{P(E)} = \frac{0.118644}{0.20763} = 0.5714$$

$P(Bk \mid N) = 0.50588$ $P(Bk \mid S) = 0.6263$ $P(Bk \mid W) = 0.526316$

Region	Book		DVD			
E	$P(Book \cap E)$	0.118644068	$P(DVD \cap E)$	0.088983051	0.20763	→ $P(East)$
N	$P(Bk \cap N)$	0.091101695	$P(DVD \cap N)$	0.088983051	0.18008	$P(North)$
S	$P(Bk \cap S)$	0.131355932	$P(DVD \cap S)$	0.078389831	0.20975	$P(S)$
W	$P(Bk \cap W)$	0.211864407	$P(DVD \cap W)$	0.190677966	0.40254	$P(West)$
		0.552966102		0.447033898	1	

↓ $P(Book)$ ↓ $P(DVD)$

$P(Bk \mid E)$ = 0.1186 $P(DVD \mid E) = 0.0889$ Conditional Prob. Distribution of

$$P(Bk \mid E) = \frac{0.1186}{0.2076}$$

$$P(DVD \mid E) = \frac{0.0889}{0.2076}$$

Conditional Prob. Distribution of East Region

$$\underbrace{P(E \mid B) = \frac{P(E \cap Bk)}{P(Bk)} \quad P(W \mid Bk) = \frac{P(W \cap Bk)}{P(Bk)} \quad P(N \mid Bk) = \frac{P(N \cap Bk)}{P(Bk)} \quad P(S \mid Bk) = \frac{P(S \cap Bk)}{P(Bk)}}_{\text{Conditional Prob Dist of Book}}$$