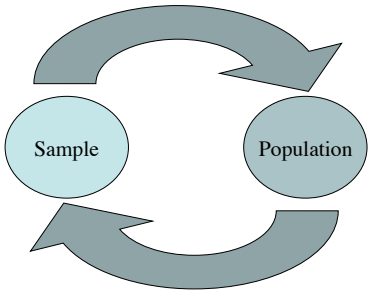
Chapter 6: Probability

1

Inferential Statistics

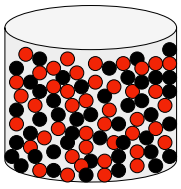


Probability

2

Population 1

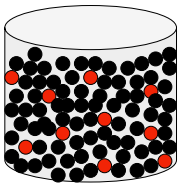
50 black marbles
50 red marbles



P(black) = .50

Population 2

90 black marbles
10 red marbles



P(black) = .90

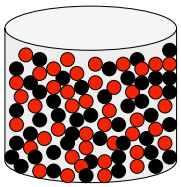
3

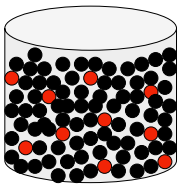
Population 1

50 black marbles
50 red marbles

Population 2

90 black marbles
10 red marbles





Sample of n = 4 selected. All 4 marbles are black. Which population did it come from?

4

$$\text{Probability of A} = \frac{\text{Number of outcomes classified as A}}{\text{Total number of possible outcomes}}$$

5

Probability is Proportion

- Coin tosses -- p (heads) = ?
- Cards
- p (King of Hearts) = ?
- p (ace) = ?
- p (red ace) = ?

6

6, 6, 7, 7, 7, 7, 8, 8, 8, 9

7

x	f
9	1
8	3
7	4
6	2

8

Random Sample

1. Each individual in the population has an equal chance of being selected.
2. If more than one individual is selected, there must be constant probability for each and every selection.

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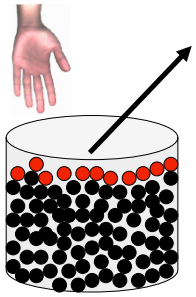
Biased Sample



10

What do we mean by a constant probability?

- Imagine selecting two cards from a deck
- First pick: P(Jack) = ?
- Second pic: P(Jack) = ? (It depends)
- Sampling with replacement (put the first card picked back in the deck)

11

Probabilities for a range of scores

- In statistics we are often interested in computing probabilities for a range of scores from a distribution
- For example what is the probability of a score greater than 4?
- $P(x > 4) = ?$
- $P(x < 3) = ?$

12

1, 1, 2, 3, 3, 4, 4, 4, 5, 6

x	f
6	1
5	1
4	3
3	2
2	1
1	2

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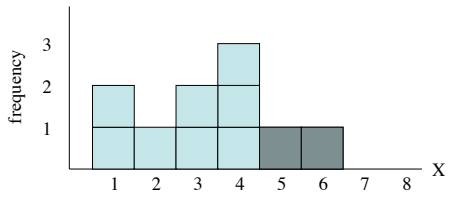
What is the probability of a score greater than 4?

$P(x > 4) = ?$



$P(x > 4) = .20$

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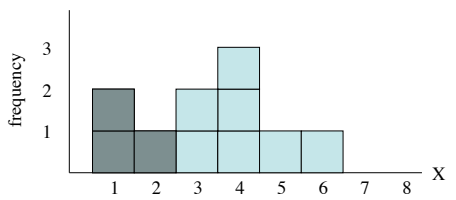
What is the probability of a score less than 3?

$P(x < 3) = ?$



$P(x < 3) = .30$

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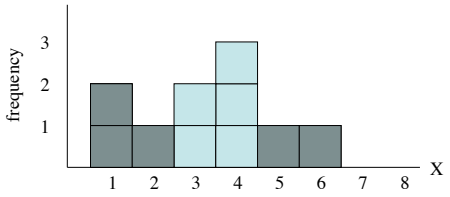
What is the probability of a score less than 3 or greater than 4?

P(x < 3 or x > 4) = ?



P(x < 3 or x > 4) = .50

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So the proportion of area corresponding to a range of scores is the probability of selecting a score within that range

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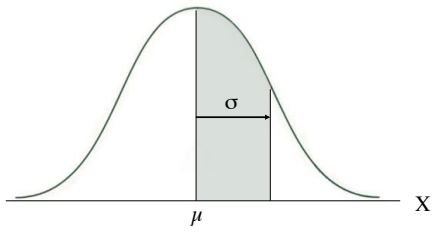

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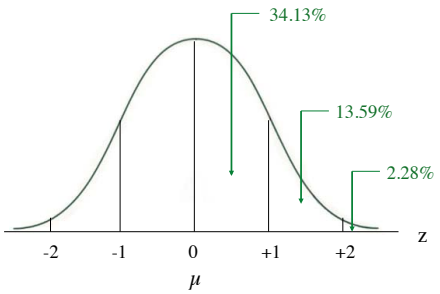
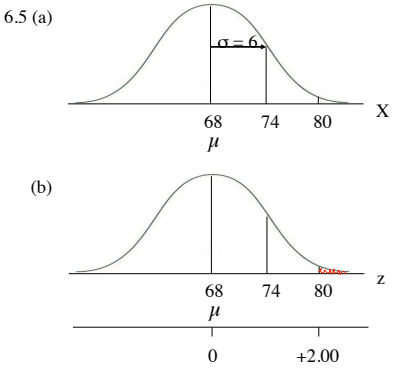
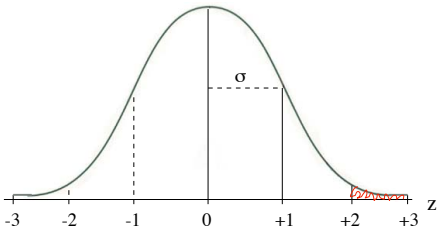

34.13%
13.59%
2.28%
z
-2
-1
0
+1
+2
μ

19

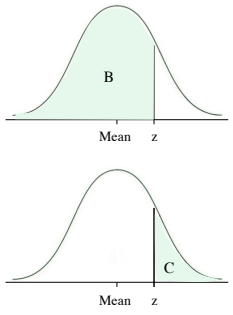

6.5 (a)
σ = 6
X
68
74
80
μ
(b)
z
68
74
80
μ
0
+2.00

20


σ
z
-3
-2
-1
0
+1
+2
+3

21

(A) z	(B) Proportion in Body	(C) Proportion in Tail
0.00	0.5000	0.5000
0.01	0.5040	0.4960
0.02	0.5080	0.4920
0.03	0.5120	0.4880
0.21	0.5832	0.4168
0.22	0.5871	0.4129
0.23	0.5910	0.4090
0.24	0.5948	0.4052
0.25	0.5987	0.4013
0.26	0.6026	0.3974
0.27	0.6064	0.3936
0.28	0.6103	0.3897
0.29	0.6141	0.3859



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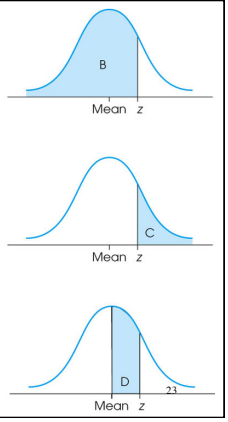
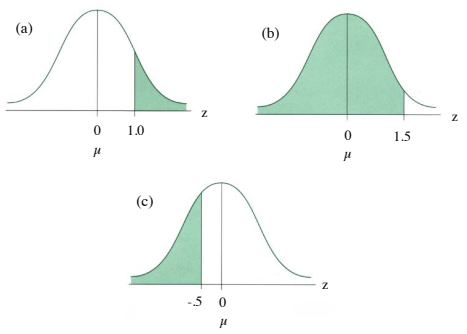
(A) z	(B) Proportion in body	(C) Proportion in tail	(D) Proportion between mean and z
0.00	.5000	.5000	.0000
0.01	.5040	.4960	.0040
0.02	.5080	.4920	.0080
0.03	.5120	.4880	.0120
0.21	.5832	.4168	.0832
0.22	.5871	.4129	.0871
0.23	.5910	.4090	.0910
0.24	.5948	.4052	.0948
0.25	.5987	.4013	.0987
0.26	.6026	.3974	.1026
0.27	.6064	.3936	.1064
0.28	.6103	.3897	.1103
0.29	.6141	.3859	.1141
0.30	.6179	.3821	.1179
0.31	.6217	.3783	.1217
0.32	.6255	.3745	.1255
0.33	.6293	.3707	.1293
0.34	.6331	.3669	.1331



23



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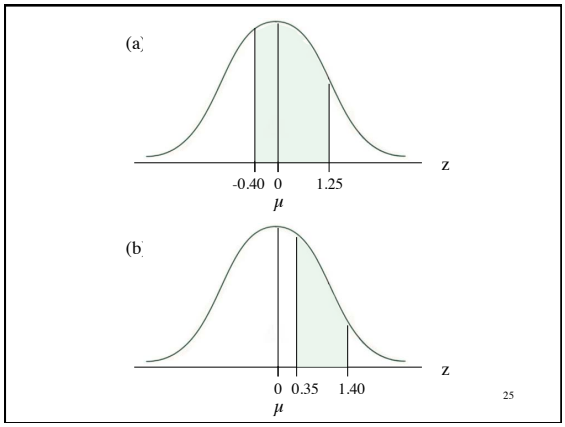
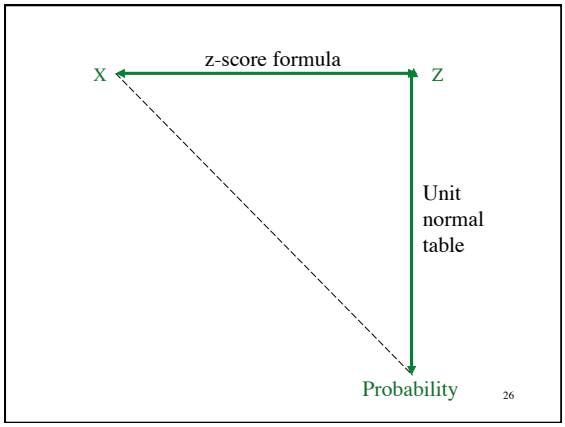

(a)
z
-0.40 0 1.25
μ
(b)
z
0 0.35 1.40
μ

25


z-score formula
X
Z
Unit
normal
table
Probability

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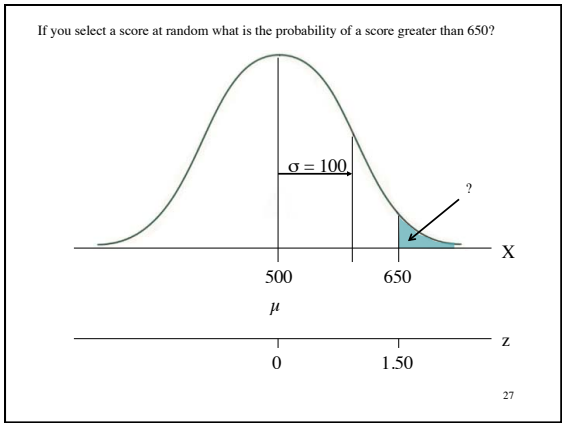
If you select a score at random what is the probability of a score greater than 650?
σ = 100
?
X
500
650
μ
z
0
1.50

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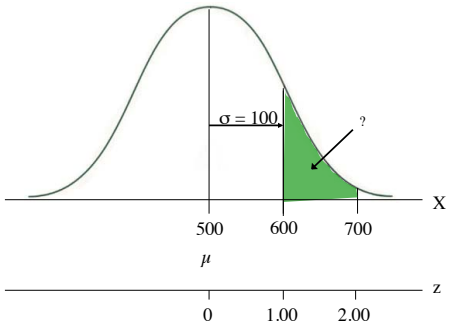
If you select a score at random what is the probability of a score between 600 and 700?



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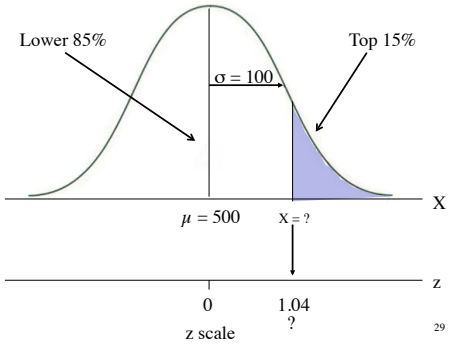
Find the 85th percentile score for this distribution



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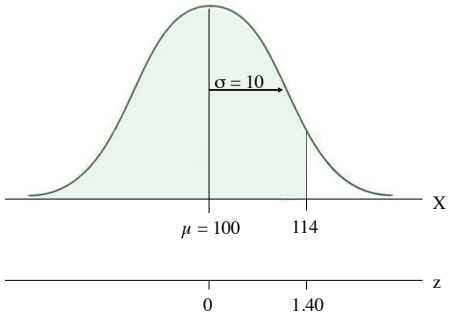
If you select a score at random what is the probability of a score less than 114?



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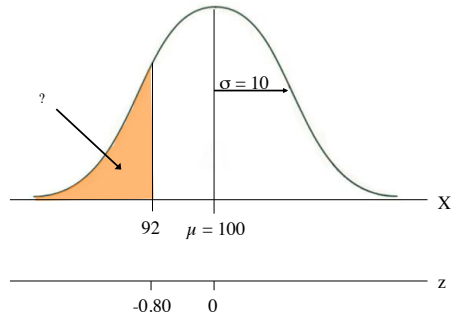
If you select a score at random what is the probability of a score less than 92?



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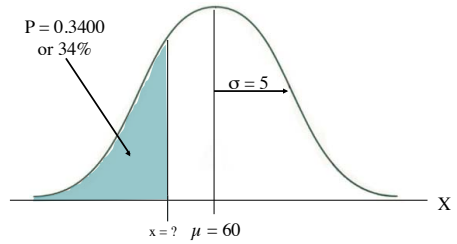
Find the 34th percentile score for this distribution



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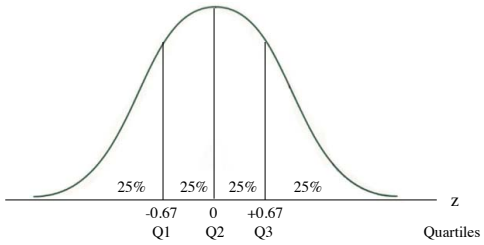
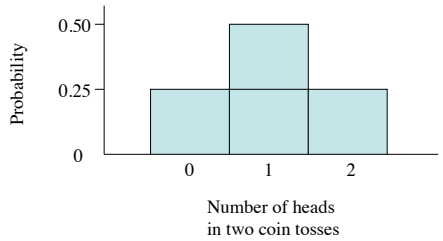


33



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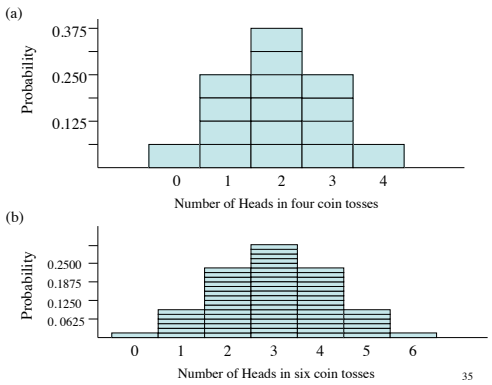

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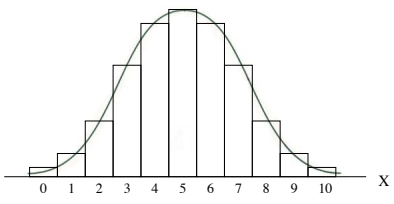
The Relationship Between the Binomial Distribution and the Normal Distribution



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