EXERCISE CH 6

EXERCISE 6-1 /322

- *find the probabilities for each ,using the standard normal distribution.*

28. $P(0 < z < 1.96)$=

0.9750 - 0.5= 0.4750

34. $P(z < -1.77)$=0.0384

35. $P(-2.07 < z < 1.88)$

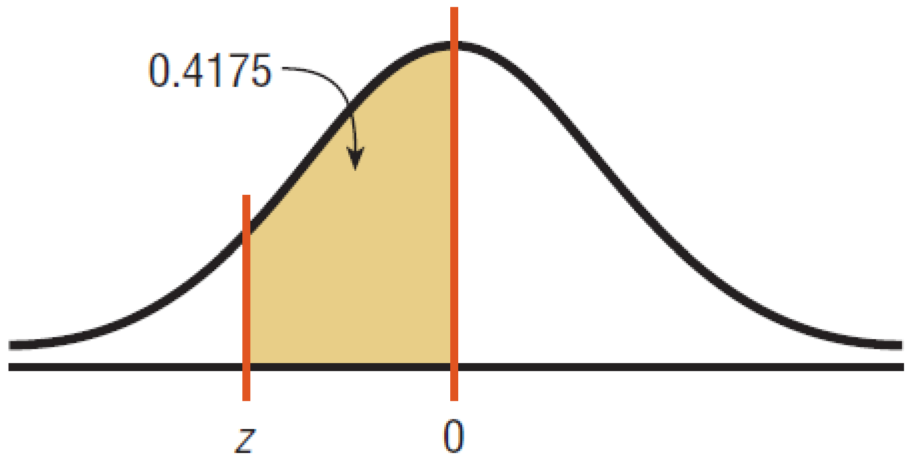
0.9699- 0.0192= 0.9507

40. $P(z > -1.43)$

= 1 - 0.0764 = 0.9236

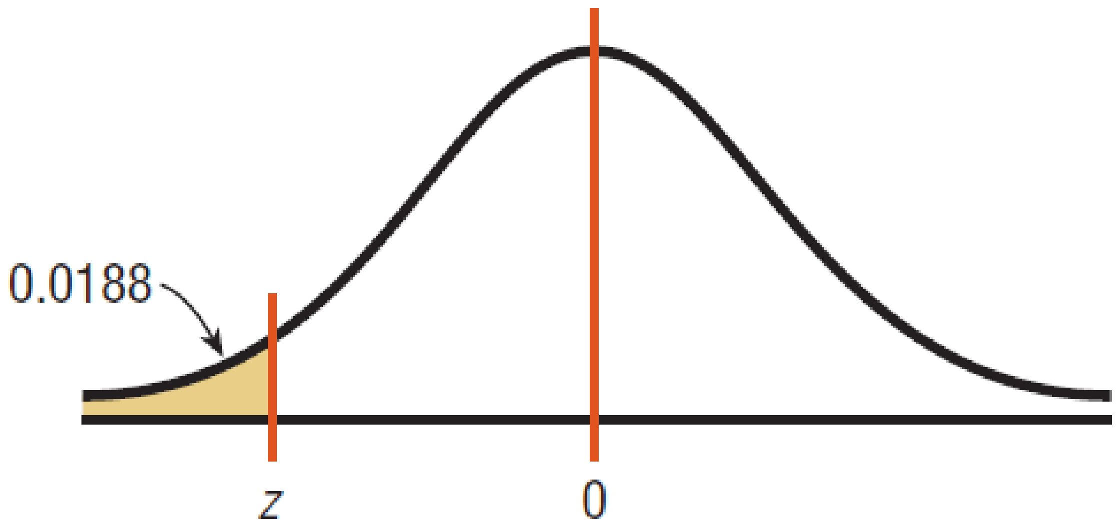
- *find the z value that corresponds to the given area.*

41.



- *Area (left)=0.5000-0.4175*= 0.0825
- Z=-1.39

43.



Z=- 2.08

- **47.** Find the *z* value to the left of the mean so that:

b. 82.12% of the area under the distribution curve lies to the right of it.

Area (left)=1- 0.8212=0.1788

z=-0.92

- **48.** Find the *z* value to the right of the mean so that *b*. 69.85% of the area under the distribution curve lies to the left of it.

Area (left)=0.6985

Z=0.52

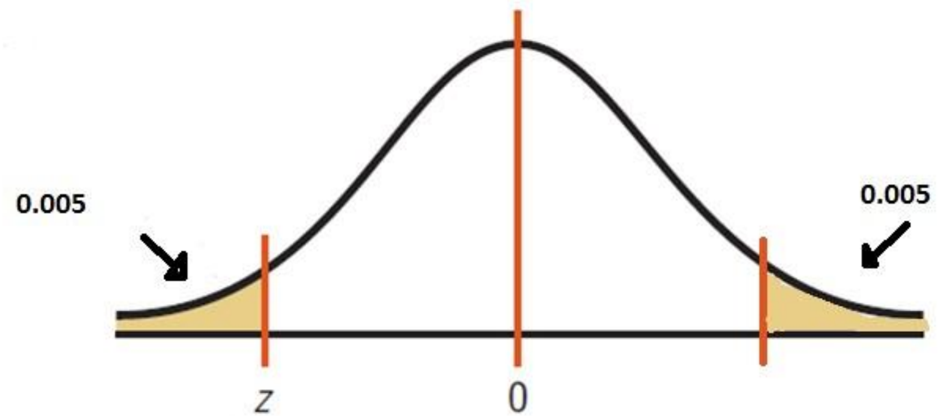
49. Find two z values, one positive and one negative, that are equidistant from the mean so that the areas in the two tails add to the following values.

c. 1%

Area in one tail=0.005

Area left z =0.005

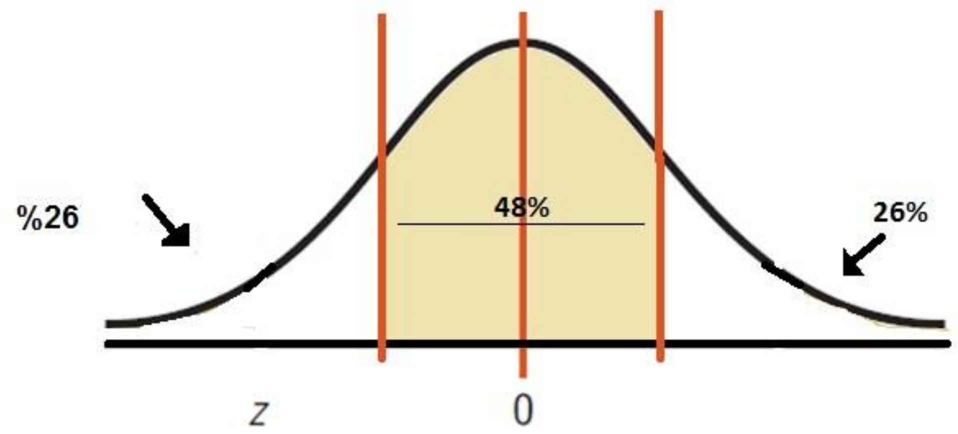
Z= + 2.58 , - 2.58



50. Find two z values so that 48% of the middle area is bounded by them.

Area left z =0.2600

Z= -0.64,+0.64



EXERCISE 6-2 /337

- **5. Chocolate Bar Calories** The average number of

calories in a 1.5-ounce chocolate bar is 225. Suppose that the distribution of calories is approximately normal with sd= 10. Find the probability that a randomly selected chocolate bar will have

- *a.* Between 200 and 220 calories

$$Z = \frac{200-225}{10} = -2.5 \qquad Z = \frac{220-225}{10} = -0.5$$

P(- 2.5 < Z < - 0.5) =0.3085 - 0.0062 = 0.3023 or 30.23%

- *b.* Less than 200 calories

$$Z = \frac{200-225}{10} = -2.5$$

P(Z < - 2.5) =0.0062

8. Doctoral Student Salaries Full-time Ph.D. students receive an average of $12,837 per year. If the average salaries are normally distributed with a standard deviation of $1500, find these probabilities.

a. The student makes more than $15,000.

$$Z = \frac{15000 - 12837}{1500} = 1.44$$

P(Z > 1.44) =1 - 0.9251 = 0.0749

b. The student makes between $13,000 and $14,000.

$$Z = \frac{13000 - 12837}{1500} = 0.11 \qquad Z = \frac{14000 - 12837}{1500} = 0.78$$

P(0.78 < Z < 0.11) =0.7823 - 0.5438 = 0.2385 or 23.85%

15. Jobs for Registered Nurses The average annual number of jobs available for registered nurses is 103,900. If we assume a normal distribution with a standard deviation of 8040, find the probability that

a. More than 100,000 jobs are available for RNs

$Z = -0.49$

$P(z > -0.49) = 1 - 0.3121 = 0.6879$

b. More than 80,000 but less than 95,000 jobs are available for RNs.

$P(80,000 < X < 95,000)$

$Z=2.97,$

$Z=1.1$

$P(2.97 < z < 1.11) = 0.1335 - 0.0015 = 0.1320$

- **19. New Home Sizes** A contractor decided to build homes that will include the middle 80% of the market. If the average size of homes built is 1810 square feet, find the maximum and minimum sizes of the homes the contractor should build. Assume that the standard deviation is

92 square feet and the variable is normally distributed.

$Z = \pm 1.28$

$x = -1.28(92) + 1810 = 1692.24$

$X = 1.28(92) + 1810 = 1927.76$

- **22. Reading Improvement Program** To help students improve their reading, a school district decides to implement a reading program. It is to be administered to the bottom 5% of the students in the district, based on the scores on a reading achievement exam. If the average score for the students in the district is 122.6, find the cutoff score that will make a student eligible for the program. The standard deviation is 18. Assume the variable is normally distributed.

1- area left = 0.05

2- $Z = -1.645$

$x = -1.645(18) + 122.6 = 92.99$

- **24.Ages of Amtrak Passenger Cars** The average age of Amtrak passenger train cars is 19.4 years. If the distribution of ages is normal and 20% of the cars are older than 22.8 years, find the standard deviation.

1- z

Area left = 0.2000

Z=-0.84

X=Z.s+mean

- 22.8= 0.84*s + 19.4
- s= 4.048

26. High School Competency Test A mandatory competency test for high school sophomores has a normal distribution with a mean of 400 and a standard deviation of 100.

a. The top 3% of students receive $500. What is the minimum score you would need to receive this award?

1- area left =1-0.03=0.97

2- z= 1.88.

3- X=1.88(100)+ 400= 588

b. The bottom 1.5% of students must go to summer school. What is the minimum score you would need to stay out of this group?

1- area left = 0.015

Z= - 2.17.

z=- 2.17(100) +400 = 183

- **36.** In a normal distribution, find μ when s is 6 and 3.75% of the area lies to the left of 85.

EXERCISE 6-3 /352

- **8. Glass Garbage Generation** A survey found that the American family generates an average of 17.2 pounds of glass garbage each year. Assume the standard deviation of the distribution is 2.5 pounds. Find the probability that the mean of a sample of 55 families will be between 17 and 18 pounds.

$$Z = \frac{\overline{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{17 - 17.2}{\frac{2.5}{\sqrt{55}}} = -0.59$$

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{18 - 17.2}{\frac{2.5}{\sqrt{55}}} = 2.37$$

P(- 0.59 < Z < 2.37) =0.9911 - 0.2776= 0.7135

- **15. Cost of Overseas Trip** The average overseas trip cost is $2708 per visitor. If we assume a normal distribution with a standard deviation of $405, what is the probability that the cost for a randomly selected trip is more than $3000? If we select a random sample of 30 overseas trips and find the mean of the sample, what is the probability that the mean is greater than $3000?

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{3000 - 2708}{\frac{405}{\sqrt{30}}} = 0.72$$

P(z > 0.72) =1 - 0.7642 =0.2358

16. Cell Phone Lifetimes A recent study of the lifetimes of cell phones found the average is 24.3 months. The standard deviation is 2.6 months. If a company provides its 33 employees with a cell phone, find the probability that the mean lifetime of these phones will be less than 23.8 months. Assume cell phone life is a normally distributed variable.

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{23.8 - 24.3}{\frac{2.6}{\sqrt{33}}} = -1.10$$

P(z < 1.10)= 0.1357 or 13.57%

18. Medicare Hospital Insurance The average yearly Medicare Hospital Insurance benefit per person was $4064 in a recent year. If the benefits are normally distributed with a standard deviation of $460, find the probability that the mean benefit for a random sample of 20 patients is

a. Less than $3800

b. Z= - 2.57 = 0.0051 or 0.51%

b. More than $4100

z= 0.35 =1 - 0.6368 =0.3632

- **22. Systolic Blood Pressure** Assume that the mean systolic blood pressure of normal adults is 120 millimeters of mercury (mm Hg) and the standard deviation is 5.6. Assume the variable is normally distributed.

a. If an individual is selected, find the probability that the individual's pressure will be between 120 and 121.8 mm Hg.

P(0 <Z< 0.32) = 0.6255 - 0.5 = 0.1255

b. If a sample of 30 adults is randomly selected, find the probability that the sample mean will be between 120 and 121.8 mm Hg.

P(0 <Z< 1.76) = 0.9608 - 0.5= 0.4608

c. Why is the answer to part *a* so much smaller than the answer to part *b*?

$$\sigma_{\bar{x}} < \sigma_x$$

- **23. Cholesterol Content** The average cholesterol content of a certain brand of eggs is 215 milligrams, and the standard deviation is 15 milligrams. Assume the variable is normally distributed.

a. If a single egg is selected, find the probability

that the cholesterol content will be greater than

220 milligrams.

$$Z = \frac{x-\mu}{\sigma} = \frac{220-215}{15} = 0.33$$

P(Z< 0.33)= 1- 0.6293 = 0.3707

b. If a sample of 25 eggs is selected, find the probability that the mean of the sample will be larger than 220 milligrams.

$$Z = \frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}} = \frac{220-215}{\frac{15}{\sqrt{25}}} = 1.67$$

P(Z< 1.67) =1 - 0.9525= 0.0475

Ch 6

[1] Normal Distribution
التوزيع الطبيعي

A) معالم التوزيع

[1] μ معلمة موقع

[2] σ معلمة الشكل

[2] خصائص توزيع
7 خصائص

[3] Standard Normal Dist
حالة خاصة من توزيع طبيعي
$\mu = 0 , \sigma = 1$

[4] find area — مساحة تحت المنحنى

[1] $x \to z = \frac{x-\mu}{\sigma}$

[2] $-3 \le z \le 3$

[4] الرسم

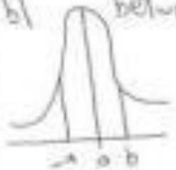
[5] تحديد المساحة المطلوبة وحساباتها حل

* المطلوب مساحة

a) Left
ما تقع من جدول

$\Phi(a)$

b) between



$\Phi(b) - \Phi(-a)$

c) right

$1 - \Phi(a)$

* a or −a نفس الطريقة

* area as probability

القيمة الحرجة

[5] find z

one z / two z (middle)

[1] area (left)

[1] = 1 − area(middle)

[2] البحث داخل الجدول $= \frac{1 - area(middle)}{2}$ = area left

[3] z

[6] Application

[1] $x \to z = \frac{x-\mu}{\sigma}$

[2] الرسم

[3] تحديد مساحة (left, right, between)

[4] ايجاد القيمة الاحتمالية

[7] find x (قيمة متغير)

[1] area (left) [2] z

[3] $x = z\sigma + \mu$

[8] Central Limit

[1] * Sampling dist

* $\mu_{\bar{x}} = \mu_x$
* $\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}}$
* $\sigma_{\bar{x}} < \sigma_x$

[2] $S.E = \frac{\sigma_x}{\sqrt{n}}$

[3] find probability of mean $P(\bar{x})$

[1] $\bar{x} \to z$
$z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_x/\sqrt{n}}$

[2] الرسم

[3] تحديد مساحة

[4] ايجاد