1. A random sample of **36** life insurance policy holders showed that the average premiums paid on their life insurance policies was **$340** per year with a standard deviation of **$24**. Construct a 95% confidence interval for the population mean. $n = 36$ $\bar{x} = 340$ $\sigma =$ **or** $s = 24$
Because sample size is more than 30, then we use ___________________?
$\$332.16 < \mu < \$347.84$

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2. A random sample of **9** life insurance policy holders showed that the average premiums paid on their life insurance policies was **$340** per year with a standard deviation of **$24**. Construct a 95% confidence interval for the population mean. $n =$ $\bar{x} =$ $\sigma =$ **or** $s =$
Because sample size is less than 30, then we use ___________________?
$\$321.55 < \mu < \$358.45$

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3. A random sample of **9** life insurance policy holders showed that the average premiums paid on their life insurance policies was $340 per year and population standard deviation of **$24**. Construct a 90% confidence interval for the population mean. $n =$ $\bar{x} =$ $\sigma =$ **or** $s =$
Because sample size is less than 30, then then we use ___________________?
$\$325.12 < \mu < \$354.88$
Also by comparing problems 2 and 3, explain by **lowering the confidence level**, what happened to **error** (becomes **larger** or **smaller**) and the **confidence interval**(becomes **wider** or **narrower**)?

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4. A company that produces white bread is concerned about the distribution of the amount of sodium in its bread. The company takes a simple random sample of **16** slices of bread and computes the sample mean to be 100 milligrams of sodium per slice. Construct a 90% confidence interval for the unknown mean sodium level assuming that the sample standard deviation is 10 milligrams.
$n =$ $\bar{x} =$ $\sigma =$ **or** $s =$
Because sample size is less than 30, then we use ___________________?
$95.62 < \mu < 104.38$

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5. The football coach randomly selected eight players and timed how long it took to perform a certain drill. The times in minutes were: 12, 9, 13, 7, 8, 13, 16, 10. Assuming that the times follow a normal distribution, find a 90% confidence interval for the population mean. $n =$ $\bar{x} =$ $\sigma =$ **or** $s =$
Because sample size is _________, then we use ___________________?
$8.98 < \mu < 13.02$

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6. Important properties about the **relationship** between **sample size** and **confidence level** and ***increasing and decreasing margin of error***

$$E = z\frac{s}{\sqrt{n}}.$$

   a) As the ***sample size (n) decreases***, the ***margin of error (E) _______________***

   b) ***As the confidence level (C) decreases***, the ***margin of error (E) _______________***

Solutions

1. A random sample of 36 life insurance policy holders showed that the average premiums paid on their life insurance policies was \$340 per year with a standard deviation of \$24. Construct a 95% confidence interval for the population mean. $n = 36$ $\bar{x} = 340$ $s = 24$

Because sample size is more than 30, we use normal distribution

$E = z\left(s/\sqrt{n}\right) = 1.96\frac{24}{\sqrt{36}} = 7.84$ $\mu = 340 \pm 7.84$ $\$332.16 < \mu < \$347.84$

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2. A random sample of **9** life insurance policy holders showed that the average premiums paid on their life insurance policies was \$340 per year with a standard deviation of \$24. Construct a 95% confidence interval for the population mean. $n = 9$ $\bar{x} = 340$ $s = 24$

Because sample size is less than 30, we use t distribution (the table) with degree of freedom of 8 and 95% confidence level and we get $t = 2.306$

$E = t\left(s/\sqrt{n}\right) = 2.306\frac{24}{\sqrt{9}} = 18.45$ $\mu = 340 \pm 18.45$ $\$321.55 < \mu < \$358.45$

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3. A random sample of **9** life insurance policy holders showed that the average premiums paid on their life insurance policies was \$340 per year and standard deviation of \$24. Construct a 90% confidence interval for the population mean. $n = 9$ $\bar{x} = 340$ $s = 24$ ***Because sample size is less than 30, we use t distribution (the table) with degree of freedom of 15 and 90% confidence level and we get*** $t = 1.86$

$E = t\left(s/\sqrt{n}\right) = 1.86\frac{24}{\sqrt{9}} = 14.88$ $\mu = 340 \pm 14.88$ $\$325.12 < \mu < \$354.88$

By **lowering the confidence level error** becomes **smaller** and the **confidence interval** becomes **narrower**

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4. A company that produces white bread is concerned about the distribution of the amount of sodium in its bread. The company takes a simple random sample of **16** slices of bread and computes the sample mean to be **100** milligrams of sodium per slice. Construct a **90%** confidence interval for the unknown mean sodium level assuming that the sample standard deviation is **10** milligrams.

$n = 16$ $\bar{x} = 100$ $\sigma =$ **or** $s = 10$

Because sample size is less than 30, we use t distribution (the table) with degree of freedom of 24 and 90% confidence level and we get $t = 1.86$

$E = t\left(s/\sqrt{n}\right) = 1.753\frac{10}{\sqrt{16}} = 4.38$ $\mu = 100 \pm 4.38$ $95.62 < \mu < 104.38$

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5. The football coach randomly selected eight players and timed how long it took to perform a certain drill. The times in minutes were: 12, 9, 13, 7, 8, 13, 16, 10. Assuming that the times follow a normal distribution, find a 90% confidence interval for the population mean. $n = 8$ $\bar{x} = 11$ $s = 3.02$

Because sample size is less than 30, we use t distribution (the table) with degree of freedom of 9 and 90% confidence level and we get $t = 1.895$

$E = t\left(s/\sqrt{n}\right) = 1.895\frac{3.02}{\sqrt{8}} = 2.02$ $\mu = 11 \pm 2.02$ $8.98 < \mu < 13.02$

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6. Important properties about the **relationship** between **sample size** and **confidence level** and ***increasing and decreasing margin of error***

$$E = z\frac{s}{\sqrt{n}}.$$

c) As the ***sample size (n) decreases***, the ***margin of error (E) increases***

d) ***As the confidence level (C) decreases***, the ***margin of error (E) decreases***