The mean annual turnover rate of the 200-cc
that the stock of Bayer Aspirin turns over or
mean turnover has changed and is more than

A random sample of 25 of the 200-count Ba

Use the 0.1 significance level to test the hyp

H_0	○ **A.** $\bar{x}$ ○ **B.** p ○ **C.** $\bar{p}$ ○ **D.** μ	○ **A.** $>$ ○ **B.** $<$ ○ **C.** $\neq$ ○ **D.** $=$ ○ **E.** $\leq$ ○ **F.** $\geq$	
H_1	○ **A.** $\bar{x}$ ○ **B.** $\bar{p}$ ○ **C.** μ ○ **D.** p	○ **A.** $\geq$ ○ **B.** $=$ ○ **C.** $\leq$ ○ **D.** $<$ ○ **E.** $>$ ○ **F.** $\neq$	

$\alpha =$ ____ %

becomes

1. (1 pt) local/statistics09/hypothesis_mu_sigma_UpperTail.pg

The mean annual turnover rate of the 200-count bottle of Bayer Aspirin is 9 with a standard deviation of 0.4. (This indicates that the stock of Bayer Aspirin turns over on the pharmacy shelves an average of 9 times per year.) It is suspected that the mean turnover has changed and is more than 9.

A random sample of 40 of the 200-count Bayer Aspirin showed a mean of 9.04.

Use the 0.1 significance level to test the hypothesis that the turnover rate has increased.

H_0	A. $\bar{p}$	B. $\bar{x}$	C. μ	D. p	A. $\neq$	B. $<$	C. $>$	D. $=$	E. $\leq$ F. $\geq$	___
H_1	A. μ	B. p	C. $\bar{p}$	D. $\bar{x}$	A. $\leq$	B. $\neq$	C. $\geq$	D. $=$	E. $<$ F. $>$	___

$\alpha =$ ___ %

We reject if:	A. χ^2	B. t	C. z	D. F	A. $>$	B. $<$	C. $<$ *or* $>$ -/+	___

The value of the test statistic is ___

We

(incorrect)

Correct Answers:

- C
- E
- 9
- A
- F
- 9
- C
- A
- 1.28155156554455

Tables, in general, turn in to a real mess.

Note: The above graph will not indicate if you have more that one of the same point; check your data.

Fill in the ANOVA table. Use the F-test to determine if X has an influence on Y. Use a 0.05 significance.

ANOVA TABLE

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Regression	SSR	1	SSR/1	MSR/MSE
Error	SSE	n-2	SSE/(n-2) = MSE	
Total	SS total	n-1		

ANOVA TABLE FILL*IN*

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Regression	___	___	___	___
Error	___	___	___	
Total	___	___		

H_0	A. $\rho = 0$	B. X has no influence on Y	C. There is no slope in the population	D. All of the above
H_1	A. $\rho \neq 0$	B. There is a slope in the population	C. X has an influence on Y	D. All of the above

(incorrect)

Correct Answers:

- D
- D
- A
- 10.1280
- 216
- 1
- 216
- 4.76470588235294
- 136
- 3
- 45.3333333333333
- 352
- 4
- 5
- 4.76470588235294

The code is below.

(the storyline comes from Lind, Marchal, Wathen, Waite)

```
## DESCRIPTION
##  Statistics
## ENDDESCRIPTION

## KEYWORDS('Statistics','Distribution')
## Tagged by

## DBsubject('Statistics')
## DBchapter('Sampling Distributions and the Central Limit Theorem')
## DBsection('Sample Mean')
## Date('')
## Author('')
## Institution('CNA')
## TitleText1('')
## EditionText1('')
## AuthorText1('')
## Section1('')
## Problem1('')


#
# First comes some stuff that appears at the beginning of every problem
#

DOCUMENT();        # This should be the first executable line in the problem.

loadMacros(
"PG.pl",
"MathObjects.pl",
"PGbasicmacros.pl",
"PGchoicemacros.pl",
"PGanswermacros.pl",
"PGauxiliaryFunctions.pl",
"PGasu.pl",
"PGstatisticsmacros.pl",
"PGnumericalmacros.pl",
);

TEXT(beginproblem());

$alpha = list_random(0.01,0.05,0.10,0.20);
#upper tailed test
$zCritical = normal_distr(0.5 - $alpha);
$mean = random( 4, 10, 1);
$zTest = $zCritical;
while ( abs ($zTest - $zCritical) < 0.02){$zTest = random (0.5, 2.8, 0.1)};
$n = random (20,50,5);
#$sign = list_random(1,-1);
$sign = 1.0 ;
$sigma = list_random (0.3,0.4,0.5,0.6,0.7,0.8);

$xCritical = $mean + $sign * $zCritical * $sigma / sqrt $n;
```

```
#we round away from the critical values
####if($zTest * $sign > $zCritical * $sign){
####$xbar = int( 1.0 + 100 *  ($mean + $sign * $zTest * $sigma ))/100;
####} else {
####$xbar = int(  100 *  ($mean + $sign * $zTest * $sigma ))/100;}

$xbar = int(  100 *  ($mean + $sign * $zTest * $sigma/sqrt $n ))/100;
#recalculating z
$zTest = ($xbar - $mean)/($sigma / sqrt $n);

$mcnull = new_multiple_choice();
$mcnull->qa(
"",
"\( \mu \)"
);
$mcnull->extra(
"\( \bar x \)",
"\( p \)","\( \bar p \)",
);

$mcnullEQ = new_multiple_choice();
$mcnullEQ->qa(
"", "\( \le \)"

);
$mcnullEQ->extra(
"\( \ge \)",
"\( \ne \)","\( \gt \)","\( \lt \)" ,"\( = \)"
);

$mcalt = new_multiple_choice();
$mcalt->qa(
"",
"\( \mu \)"
);
$mcalt->extra(
"\( \bar x \)",
"\( p \)","\( \bar p \)",
);


$mcaltEQ = new_multiple_choice();
$mcaltEQ->qa(""
,
"\( \gt \)"
);
$mcaltEQ->extra(
"\( \le \)",
"\( = \)","\( \lt \)", "\( \ne \)","\( \ge \)"
);
```

```
##SETTING UP THE TABLE

@r1 = ("\(H_0\)", $mcnull->print_a() ,$mcnullEQ->print_a(),NAMED_ANS_RULE("mu1",6));
@r2 = ("\(H_1\)",$mcalt->print_a(),$mcaltEQ->print_a(),NAMED_ANS_RULE("mu2",6) );

$mcTestStatistic = new_multiple_choice();
$mcTestStatistic->qa(
"The test statistic is",
"\( z \)"
);
$mcTestStatistic->extra(
"\( t \)",
"\( F \)","\( \chi^2 \)",
);

# Test Statistics choices

$mctestEQ = new_multiple_choice();
$mctestEQ->qa(
"",
"\( \gt \)"
);
$mctestEQ->extra("\( \lt or \gt  \)". "    -/+"
,
"\( \lt \)"
);


@r3 = ("We reject if: ", $mcTestStatistic->print_a() ,$mctestEQ-
>print_a(),NAMED_ANS_RULE("zCrit",6));


$mcAR = new_multiple_choice();




## this is a two-tailed test
$testStatistic = 0; # for now
if( abs($zTest) >abs ($zCritical) ){$mcAR->qa(
"We",
"reject"
);
$mcAR->extra(
"do not reject"
);}
else{$mcAR->qa(
"We",
"do not reject"
);
$mcAR->extra(
```

```
"reject"
);}

BEGIN_TEXT
The mean annual turnover rate of the 200-count bottle of Bayer Aspirin is $mean with a standard deviation of $sigma. (This indicates that the stock of Bayer Aspirin turns over on the pharmacy shelves an average of $mean times per year.) It is suspected that the mean turnover has changed and is more than $mean. $PAR

A random sample of $n of the 200-count Bayer Aspirin showed a mean of $xbar.
$PAR
Use the $alpha significance level to test the hypothesis that the turnover rate has increased.


 $PAR




\{begintable(4)\}

\{row( @r1)\}
\{row( @r2)\}

\{endtable()\}


$PAR

$PAR
\(\alpha \) = \{NAMED_ANS_RULE("alpha",6)\} $PERCENT $BR


 $BR

\{begintable(4)\}
\{row( @r3)\}
\{endtable()\}
$PAR
The value of the test statistic is \{NAMED_ANS_RULE("zTest",6)\}  $PAR

\{$mcAR->print_q()\}
\{$mcAR->print_a()\}
$PAR
The p-value is \{NAMED_ANS_RULE("pValue",6)\}  $PERCENT

END_TEXT

#CHECKING FIRST ROW H0
ANS( radio_cmp( $mcnull->correct_ans() ) );
ANS( radio_cmp( $mcnullEQ->correct_ans() ) );
```

```
NAMED_ANS(mu1=>num_cmp( $mean, mode=>"arith", reltol=>.01));

#CHECKING SECOND ROW  H1
ANS( radio_cmp( $mcalt->correct_ans() ) );
ANS( radio_cmp( $mcaltEQ->correct_ans() ) );
NAMED_ANS(mu2=>num_cmp( $mean, mode=>"arith", reltol=>.01));

#checking alpha in percent
NAMED_ANS(alpha=>num_cmp( 100 * $alpha, mode=>"arith", reltol=>.01));

#CHECKING THIRD ROW
ANS( radio_cmp( $mcTestStatistic->correct_ans() ) );
ANS( radio_cmp( $mctestEQ->correct_ans() ) );
NAMED_ANS(zCrit=>num_cmp( $zCritical, mode=>"arith", reltol=>2));
#CHECKING FORTH ROW


NAMED_ANS(zTest=>num_cmp( $zTest, mode=>"arith", reltol=>2));

ANS( radio_cmp( $mcAR->correct_ans() ) );


$pValue =   normal_prob (abs($zTest),infty);
#$Tol = normal_prob ($zTest - 0.02,$zTest);
$Tol = 0.001;
NAMED_ANS(pValue=>num_cmp( 100 * $pValue, mode=>"arith", tolerance=>0.5,
tolType=>"absolute"));
ENDDOCUMENT();        # This should be the last executable line in the problem.
```