

# Method for business



work The file supermarket contains records of 50 supermarket check-out employees, selected at random. In particular, the variable blips contains the average number of items processed using an electronic scanner (blips) per minute during a two hour test period. The file also includes data on each employee's age, the number of months they have worked at the supermarket, the employee's grade (0 = trainee, 1 = staff, 2 = supervisor) and the age they left full time education ( 16, 18 or 21).

1.

(i) Use a computer to calculate a 95% confidence interval for the mean number of items processed by an employee per minute. Clearly identify the interval calculated.

Using SPSS software, the average number of items processed by an employee per minute is 9.9. In addition to that, at 95% the level of confidence is between 9.3 and 10.6 number of items processed by the check-out worker.

(ii) Write a few sentences explaining what the interval calculated in part (i) represents.

Confidence limits for the mean are an interval estimate for the mean.

Interval estimates are often desirable because the estimate of the mean varies from sample to sample. Instead of a single estimate for the mean, a confidence interval generates a lower and upper limit for the mean. The interval estimate gives an indication of how much uncertainty there is in our estimate of the true mean. The narrower the interval, the more precise is our estimate (Snedecor and Cochran, 1989).

Confidence limits are expressed in terms of a confidence coefficient.

Although the choice of confidence coefficient is somewhat arbitrary, in

practice 90%, 95%, and 99% intervals are often used, with 95% being the most commonly used.

(iii) Now calculate a 90% confidence interval for the same mean.

Now, the confidence interval is between 9.4 and 10.5 number of items processed by the check-out employee.

(iv) Which confidence interval is wider? Is this what you would expect intuitively? Why or why not?

The first one, the 95% confidence interval, is wider. The intuition is the more the percentage of confidence interval, the wider the boundaries obtained. If we consider the Gauss bell or normal curve, as the point of analysis, when the limits are closer to the mean, the interval confidence is narrower (90% compared to 95%).

(v) If you had calculated the confidence intervals using tables rather than a computer, would they have differed from those above? If so, explain how and why.

No. In the case of calculating a confidence interval at 95%, the parameter  $z$  used both by tables and spss is 1.96; therefore we will obtain the same results.

2.

The workers' union claims that the average number of items processed averages 10 per minute. Do the data support this claim?

Hypotheses Statement ( $\alpha = 0.05$ )

$H_0$  = The average number of items processed is 10 per minute

$H_1$  = The average number of items processed is different from 10 per minute

Sample statistics

N

Mean

St. Dev.

Error

blips

50

9. 9290

2. 21141

. 31274

Prueba para una muestra

Test value = 10

t

D. F.

P value

Mean difference

95% confidence interval

Inferior

Superior

blips

-. 227

49

. 821

-. 07100

-. 6995

. 5575

As  $p\text{-value} > \alpha$ , not reject  $H_0$

There is statistical evidence to support that the average number of items processed is 10 per minute, with a significance level of 5%.

Head Office, however, state that the target of an average 10.5 items per minute is not being achieved. Do the data support their statement

Hypotheses Statement ( $\alpha = 0.05, 0.10$ )

$H_0$  = The average number of items processed is 10.5 per minute

$H_1$  = The average number of items processed is different from 10.5 per minute

Prueba para una muestra

Test value = 10.5

t

D. F.

P value

Mean difference

95% confidence interval

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Inferior

blips

-1.826

49

.074

-.57100

-1.1995

.0575

When  $\alpha = 0.05$ , not reject  $H_0$ , however when  $\alpha = 0.10$ , reject  $H_0$

There is statistical evidence to support that the average number of items processed is 10.5 per minute, with a significance level of 5%. Nevertheless, when the significance level of reference is 10%, the situation changes, and there is statistical evidence to support that the average number of items processed is different from 10.5 per minute.

3. Use SPSS to calculate correlation coefficients between the average number of blips and

(i) the employee's age

Correlaciones

blips

ageyears

<https://assignbuster.com/method-for-business/>

blips

Correlacin de Pearson

1

. 350(\*)

Sig. (bilateral)

. 013

N

50

50

ageyears

Correlacin de Pearson

. 350(\*)

1

Sig. (bilateral)

. 013

N

50

50

\* La correlacin es significativa al nivel 0, 05 (bilateral).

As the above results show, there is a significant and positive correlation between the average number of blips and the employee's age. It is 35% and significant at 0. 05 level. These results give the idea that the more years that employees have, the faster they are in processing number of blips.

(ii) the number of months they have worked

Correlaciones

blips

months

blips

Correlacin de Pearson

1

. 704(\*\*)

Sig. (bilateral)

. 000

N

50

50

months

Correlacin de Pearson

. 704(\*\*)

1

Sig. (bilateral)

. 000

N

50



50

\*\* La correlacin es significativa al nivel 0, 01 (bilateral).

The results outline that there is a significant and positive relationship between the average number of blips and the number of months check-out employees have worked. Comparing to the relationship between blips and age, this correlation is stronger. It is 70% and is significant at 0. 01 level. Furthermore, results give the idea that the more experience the check-out employees have at this job, the faster they are in processing number of blips.

4.

Use simple linear regression to assess whether the average number of blips can be predicted by

(i) age

$$Y = b_0 + b_1 \text{AgeYears} + e$$

$$Y(\text{blips}) = 7.729 + 0.074 \text{AgeYears} + e$$

(ii) number of months they have worked.

$$Y = b_0 + b_1 \text{Months} + e$$

$$Y(\text{blips}) = 8.093 + 0.085 \text{Months} + e$$

## REFERENCES

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Snedecor, George W. and Cochran, William G. (1989), Statistical Methods, Eighth Edition, Iowa State University Press.

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## APPENDIXES

Table 1: Confidence interval of number of products processed by check-out worker during one minute at 95%

Statistics

Error .

blips

Mean

9. 9290

. 31274

Confidence interval at 95%

Lower bound

9. 3005

Upper boundr

10. 5575

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Table 2: Confidence interval of number of products processed by check-out worker during one minute at 90%

Statistics

Error .

blips

Mean

9. 9290

. 31274

Confidence interval at 90%

Lower bound

9. 4047

Upper boundr

10. 4533