Regression

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Applications

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Mousetrap Car

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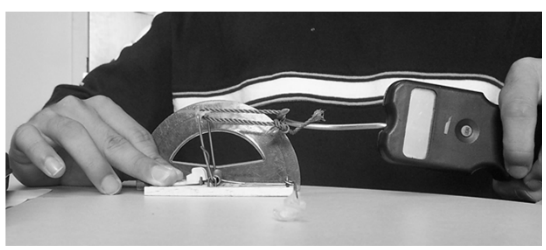
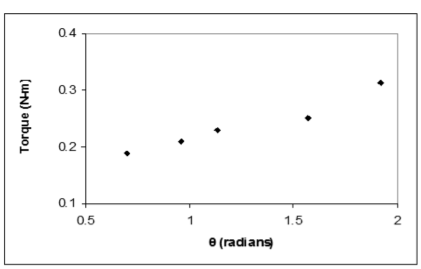
Torsional Stiffness of a Mousetrap Spring





$$T = k_0 + k_1\,\theta$$

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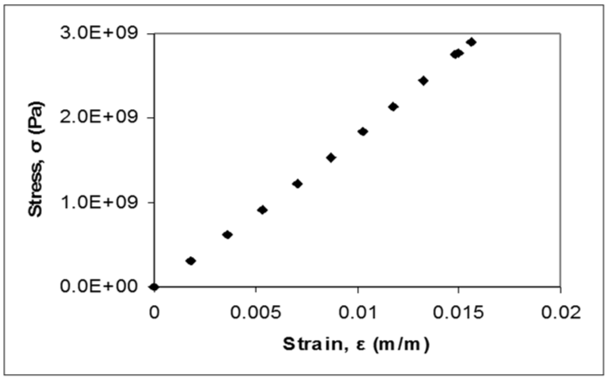
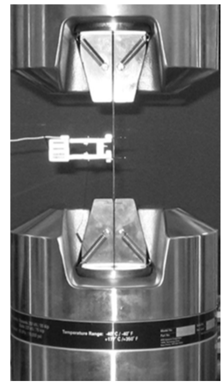
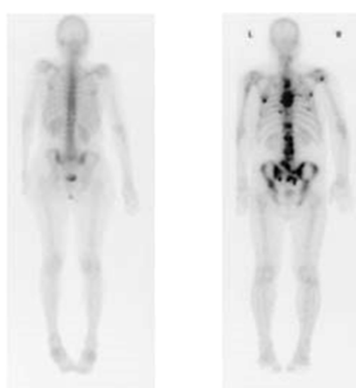
Stress vs Strain in a Composite Material



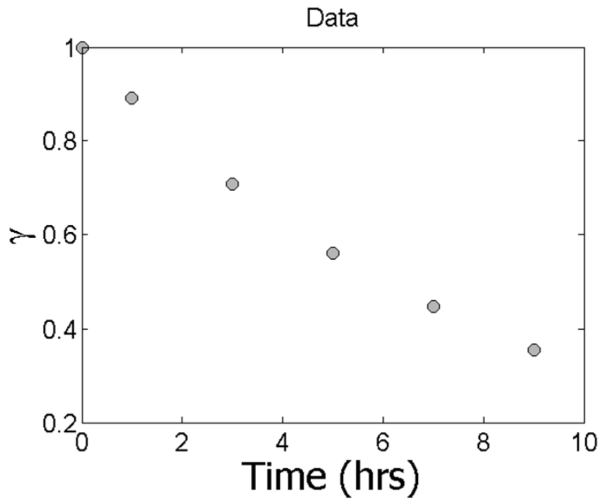


$$\sigma = E\varepsilon$$

A Bone Scan



Radiation intensity from Technitium-99m



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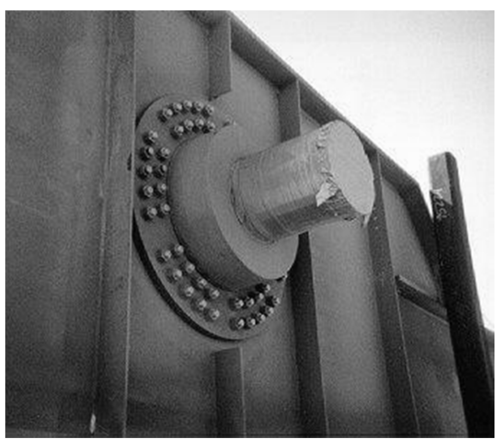
Trunnion-Hub Assembly



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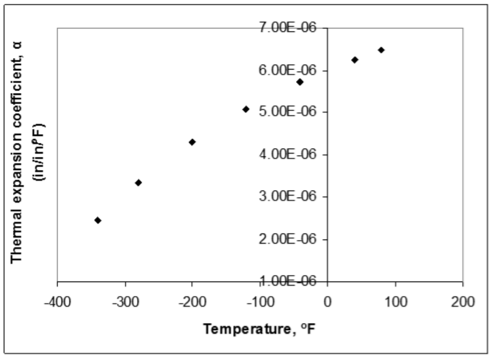
Thermal Expansion Coefficient Changes with Temperature?



$$\alpha = a_0 + a_1 T + a_2 T^2$$

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Pre-Requisite Knowledge

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This rapper's name is

A. Da Brat
B. Shawntae Harris
C. Ke$ha
D. Ashley Tisdale
E. Rebecca Black

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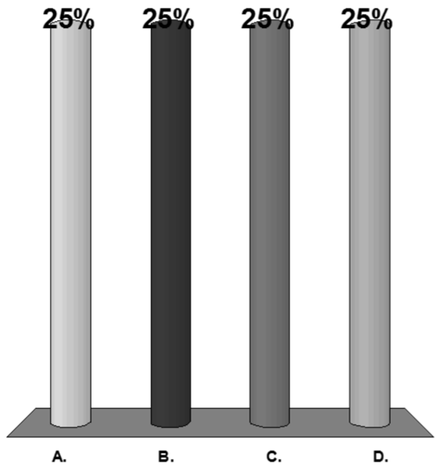
Close to half of the scores in a test given to a class are above the

A. average score
B. median score
C. standard deviation
D. mean score



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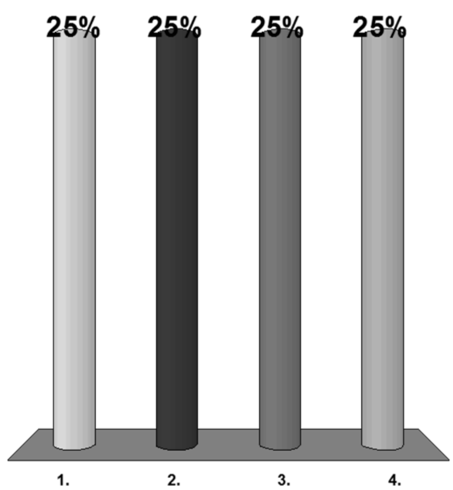
The average of the following numbers is

2	4	10	14

1. 4.0
2. 7.0
3. 7.5
4. 10.0



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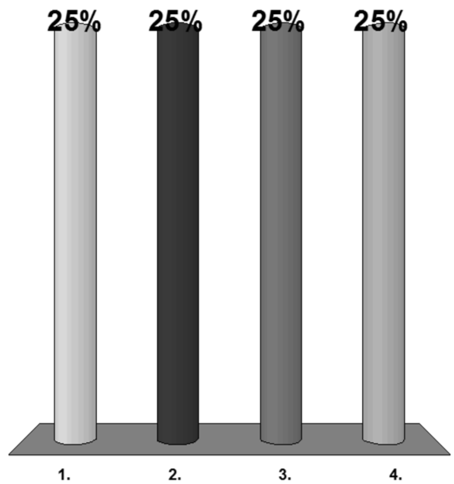
The average of 7 numbers is given 12.6. If 6 of the numbers are 5, 7, 9, 12, 17 and 10, the remaining number is

1. -47.9
2. -47.4
3. 15.6
4. 28.2



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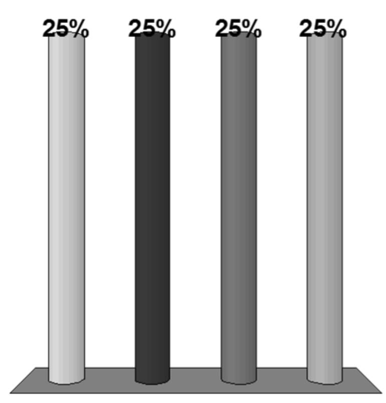
Given $y_1, y_2, \ldots\ldots\ldots\ldots y_n$, the standard deviation is defined as

A. . $\sum_{i=1}^{n}\left[y_i-\bar{y}\right]^2/n$

B. . $\sqrt{\sum_{i=1}^{n}\left[y_i-\bar{y}\right]^2/n}$

C. . $\sum_{i=1}^{n}\left[y_i-\bar{y}\right]^2/(n-1)$

D. . $\sqrt{\sum_{i=1}^{n}\left[y_i-\bar{y}\right]^2/(n-1)}$



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6.03
Linear Regression

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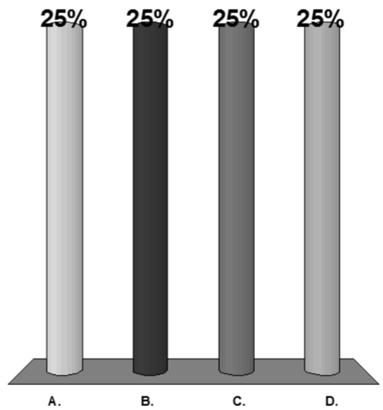
Given (x_1,y_1), (x_2,y_2),……….. (x_n,y_n), best fitting data to $y=f(x)$ by least squares requires minimization of

A. $\sum_{i=1}^{n}\left[y_i - f(x_i)\right]$

B. $\sum_{i=1}^{n}\left|y_i - f(x_i)\right|$

C. $\sum_{i=1}^{n}\left[y_i - f(x_i)\right]^2$

D. $\sum_{i=1}^{n}\left[y_i - \bar{y}\right]^2,\ \bar{y} = \frac{\sum_{i=1}^{n} y_i}{n}$



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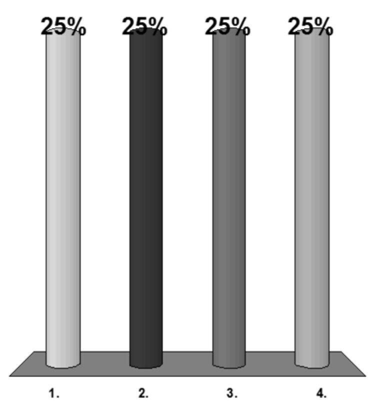
The following data

x	1	20	30	40
y	1	400	800	1300

is regressed with least squares regression to $y=a_1x$. The value of a_1 most nearly is

A. 27.480
B. 28.956
C. 32.625
D. 40.000



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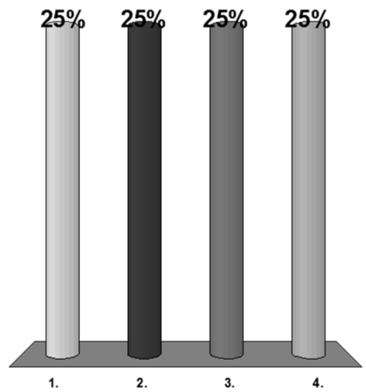
A scientist finds that regressing y *vs* x data given below to straight-line $y=a_0+a_1x$ results in the coefficient of determination, r^2 for the straight-line model to be **zero.**

x	1	3	11	17
y	2	6	22	?

The missing value for y at x=17 most nearly is

A. -2.444
B. 2.000
C. 6.889
D. 34.00



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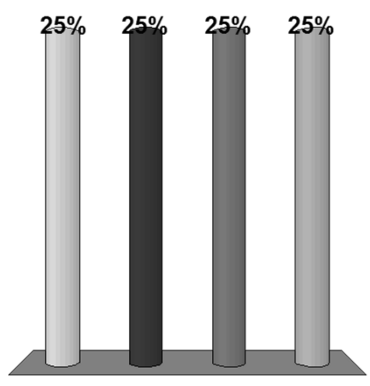
A scientist finds that regressing y *vs* x data given below to straight-line $y=a_0+a_1x$ results in the coefficient of determination, r^2 for the straight-line model to be **one**.

x	1	3	11	17
y	2	6	22	?

The missing value for y at x=17 most nearly is

A. -2.444
B. 2.000
C. 6.889
D. 34.00



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The following data

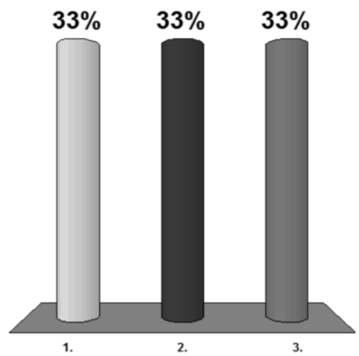
x	1	20	30	40
y	1	400	800	1300

is regressed with least squares regression to a straight line to give y=-116+32.6*x*. The **observed** value of y at *x*=20 is

A. -136

B. 400

C. 536



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The following data

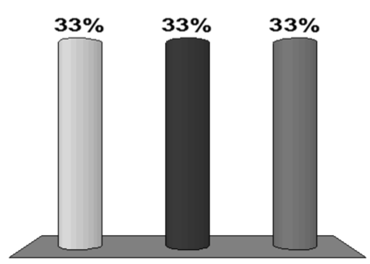
x	1	20	30	40
y	1	400	800	1300

is regressed with least squares regression to a straight line to give y=-116+32.6*x*. The **predicted** value of y at *x*=20 is

A. -136

B. 400

C. 536



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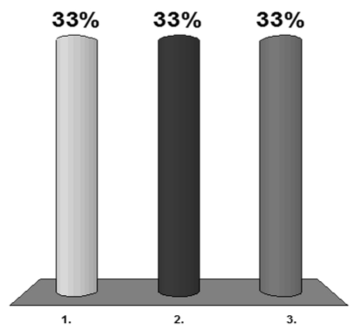
The following data

x	1	20	30	40
y	1	400	800	1300

is regressed with least squares regression to a straight line to give y=-116+32.6*x*. The **residual** of y at *x*=20 is

1. -136
2. 400
3. 536



THE END

6.04
Nonlinear Regression

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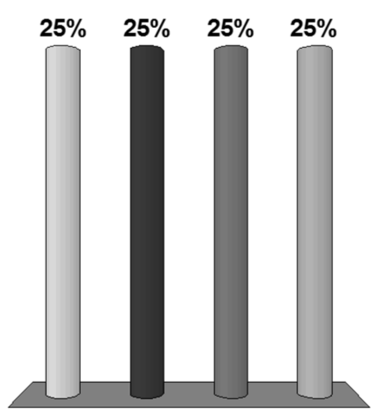
When transforming the data to find the constants of the regression model $y=ae^{bx}$ to best fit (x_1,y_1), (x_2,y_2),……….. (x_n,y_n), the sum of the square of the residuals that is minimized is

A. $\sum_{i=1}^{n}\left(y_i - ae^{bx_i}\right)^2$

B. $\sum_{i=1}^{n}\left(\ln(y_i) - \ln a - bx_i\right)^2$

C. $\sum_{i=1}^{n}\left(y_i - \ln a - bx_i\right)^2$

D. $\sum_{i=1}^{n}\left(\ln(y_i) - \ln a - b\ln(x_i)\right)^2$



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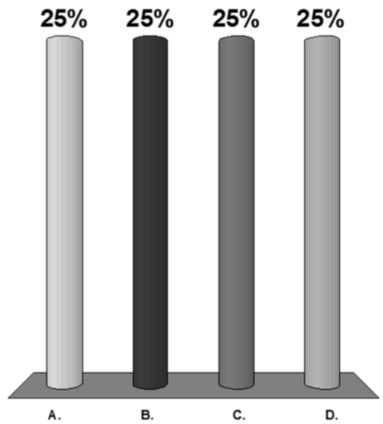
When transforming the data for stress-strain curve $\sigma = k_1 \varepsilon e^{-k_2 \varepsilon}$ for concrete in compression, where σ is the stress and ε is the strain, the model is rewritten as

A. $\ln \sigma = \ln k_1 + \ln \varepsilon - k_2 \varepsilon$

B. $\ln \frac{\sigma}{\varepsilon} = \ln k_1 - k_2 \varepsilon$

C. $\ln \frac{\sigma}{\varepsilon} = \ln k_1 + k_2 \varepsilon$

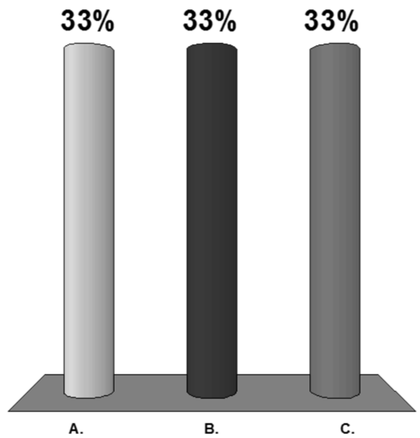
D. $\ln \sigma = \ln(k_1 \varepsilon) - k_2 \varepsilon$



6.05 Adequacy of Linear Regression Models

The case where the coefficient of determination for regression of *n* data pairs to a straight line is **one** if

A. none of data points fall exactly on the straight line
B. the slope of the straight line is zero
C. all the data points fall on the straight line



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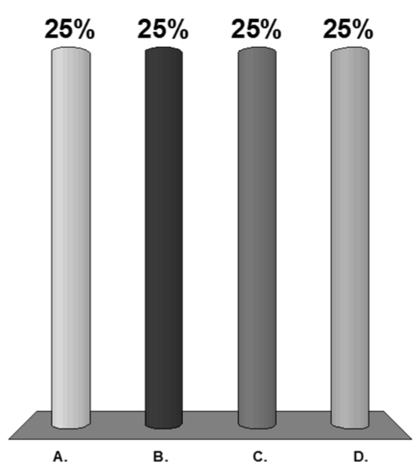
The case where the coefficient of determination for regression of *n* data pairs to a general straight line is **zero** if the straight line model

A. has zero intercept
B. has zero slope
C. has negative slope
D. has equal value for intercept and the slope



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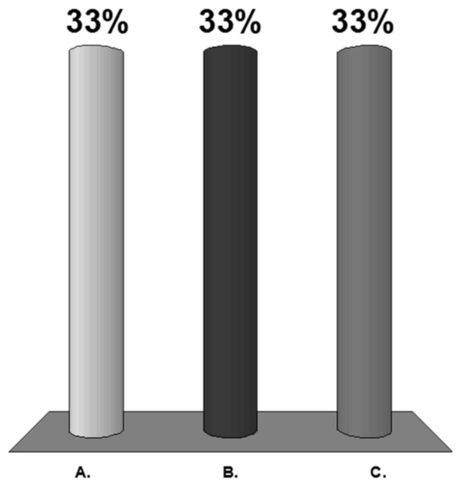
The coefficient of determination varies between

A. -1 and 1
B. 0 and 1
C. -2 and 2



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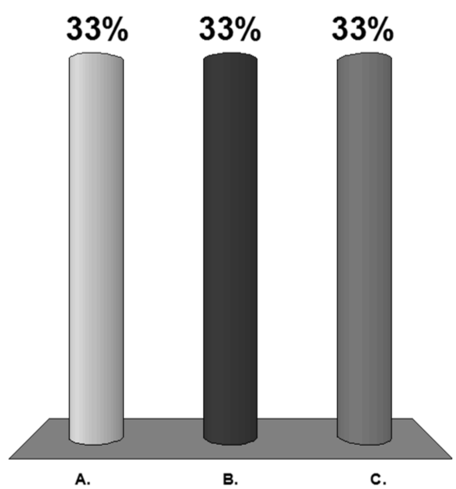
The correlation coefficient varies between

A. -1 and 1
B. 0 and 1
C. -2 and 2



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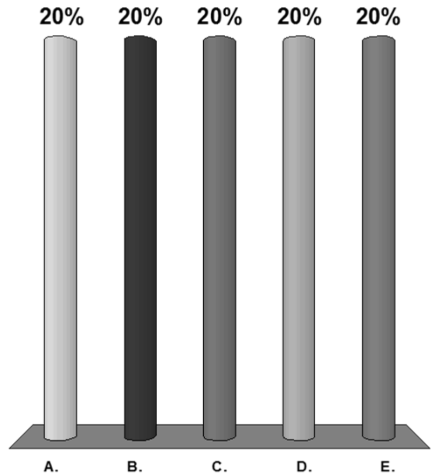
If the coefficient of determination is 0.25, and the straight line regression model is y=2-0.81x, the correlation coefficient is

A. -0.25
B. -0.50
C. 0.00
D. 0.25
E. 0.50



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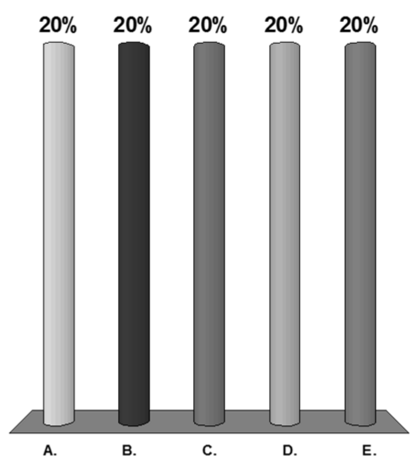
If the coefficient of determination is 0.25, and the straight line regression model is y=2-0.81x, the strength of the correlation is

A. Very strong
B. Strong
C. Moderate
D. Weak
E. Very Weak



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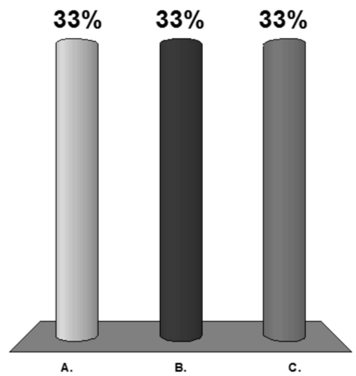
If the coefficient of determination for a regression line is 0.81, then the percentage amount of the original uncertainty in the data explained by the regression model is

A. 9
B. 19
C. 81



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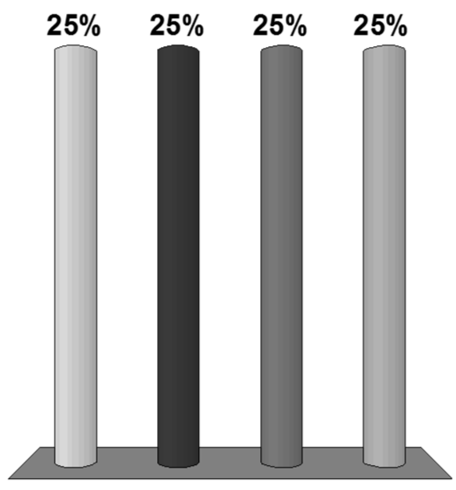
The percentage of scaled residuals expected to be in the domain [-2,2] for an adequate regression model is

A. 85
B. 90
C. 95
D. 100



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