

Coefficient of Correlation [If the interval is given]:

$$r(x, y) = \frac{\text{Cor}(x, y)}{\sigma_x \sigma_y}$$

where  $\text{Cor}(x, y) = \frac{\sum xy}{n} - \bar{x}\bar{y}$ ,  $\bar{x} = \frac{\sum x}{n}$ ,  $\bar{y} = \frac{\sum y}{n}$

$$\sigma_x = \sqrt{\frac{\sum x^2}{n} - \bar{x}^2}$$

$$\sigma_y = \sqrt{\frac{\sum y^2}{n} - \bar{y}^2}$$

1) Calculate the correlation coefficient for the following heights (in inches) of father's  $x$  and their son's  $y$

$x$ :	65	66	67	67	68	69	70	72
$y$ :	67	68	65	68	72	72	69	71

$x$	$y$	$x^2$	$y^2$	$xy$
65	67	4225	4489	4355
66	68	4356	4624	4488
67	65	4489	4225	4355
67	68	4489	4624	4556
68	72	4624	5184	4896
69	72	4761	5184	4968
70	69	4900	4761	4830
72	71	5184	5041	5112
$\Sigma x = 544$	$\Sigma y = 552$	$\Sigma x^2 = 37028$	$\Sigma y^2 = 38132$	$\Sigma xy = 37560$

Here  $n=8$ ,  $\bar{x} = \frac{\Sigma x}{n} = \frac{544}{8} = 68$ ,  $\bar{y} = \frac{\Sigma y}{n} = \frac{552}{8} = 69$

$\bar{x}\bar{y} = (68)(69) = 4692$

$\text{Cov}(x, y) = \frac{\Sigma xy}{n} - \bar{x}\bar{y} = \frac{37560}{8} - 4692 = 3$

$\sigma_x = \sqrt{\frac{\Sigma x^2}{n} - \bar{x}^2} = \sqrt{\frac{37028}{8} - (68)^2} = 2.121$

$\sigma_y = \sqrt{\frac{\Sigma y^2}{n} - \bar{y}^2} = \sqrt{\frac{38132}{8} - (69)^2} = 2.345$

$\rho = \frac{\text{Cov}(x, y)}{\sigma_x \sigma_y} = \frac{3}{(2.121)(2.345)} = 0.6032$