Statistics & Mechanics Revision

Coded data will always be in the form $Y = aX + b$
If you can rewrite the equation given to you in this form, then finding the mean and standard deviation of your coded data becomes very simple.

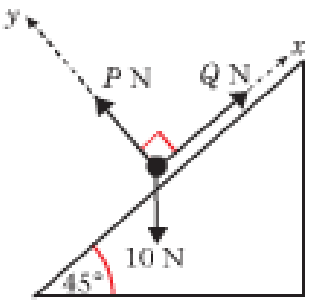
Mean of coded data: $\bar{Y} = a\bar{X} + b$

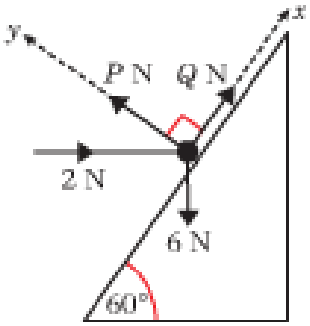
Standard deviation of coded data: $\sigma_y = a\sigma_x$

1) A meteorologist collected data on the annual rainfall, x mm, at six randomly selected places.
The data was coded using $s = 0.01x - 10$ and the following summations were obtained: $\sum s = 16.1, \quad \sum s^2 = 147.03$
Work out an estimate for the standard deviation of the actual annual rainfall.

2) The weekly income, i, of 100 women workers was recorded.
The data coded using $y = \frac{i-90}{100}$ and the following summations were obtained:
$\sum y = 131, \ \sum y^2 = 176.84$
Estimate the standard deviation of the actual women workers' weekly income.

3) Find P and Q in each of these diagrams (the particles are held in equilibrium)





4)

A particle is held at rest on a rough plane which is inclined to the horizontal at an angle α, where $\tan \alpha = 0.75$. The coefficient of friction between the particle and the plane is 0.5. The particle is released and slides down the plane. Find

a the acceleration of the particle,

b the distance it slides in the first 2 seconds.

Answers

1) $\sigma_s = \sqrt{\left(\frac{\sum s^2}{6}\right) - \left(\frac{\sum s}{6}\right)^2}$

$= \sqrt{\left(\frac{147.03}{6}\right) - \left(\frac{16.1}{6}\right)^2}$

$= 4.15989$

$\sigma_s = 0.01\ \sigma_x$

$\therefore \sigma_x = \frac{4.15989}{0.01} = 4.16\ (3\ s.f.)$

2) 22.9 3) a) $P = 7.07 \quad Q = 7.07$ b) $P = 4.73 \quad Q = 4.20$ 4) $1.96 m/s^2$ b) $3.9m$ *down plane*