Name: Solutions

5.0C Calculator practice: Linear regression, systems of equations, cosine rule, frequency table statistics

1. Apply the law of cosines, $c^2 = a^2 + b^2 - 2ab\cos\theta$.

   (a) $a = 12.3$, $b = 14.7$, $\theta = 71°$. Find the third side length, c. [3]

   (b) $a = 11.4$, $b = 17.1$, $c = 16.0$. Find $\hat{C}$ (the angle opposite side c). [3]

Working:

a) $c = \sqrt{12.3^2 + 14.7^2 - 2(12.3)(14.7)\cos 71°}$

$= 15.800254... \approx 15.8$

b) $\hat{C} = \cos^{-1}\left(\frac{11.4^2 + 17.1^2 - 16^2}{2(11.4 \times 17.1)}\right)$

$= 64.74035... \approx 64.7°$

Answers:

(a) 15.8

(b) 64.7°

2. Perform a linear regression on the data in the table, finding $y = ax + b$.

x	17	18	17	19	23	15	16
y	71.1	78.6	69.2	71.2	80.5	55.7	58.4

   (a) Write down the value of a, b. [3]

   (b) Write down the correlation coefficient r. [1]

   (c) Use your regression line to estimate y for $x = 22$. [2]

Working:

Answers:

(a)(i) $a = 2.91$

(ii) $b = 17.3$

(b) $r = 0.813$

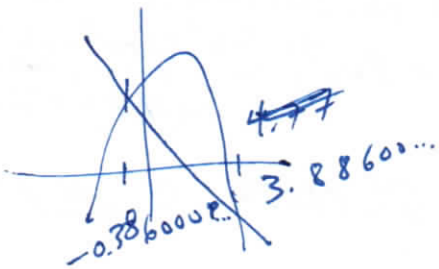
(c) $y = 81.3$

3. Find the solutions for the system, the value(s) for x such that $f(x) = g(x)$. Sketch the graph to show working.

   (a) $f(x) = -2x^2 + 5x + 7$

   $y = -2x + 4$ [3]

Working:



Answers:

(a) $x = -0.386, 3.89$

4. The data for $n = 50$ are shown in the frequency table below.

x	$15 \leq x < 25$	$25 \leq x < 35$	$35 \leq x < 40$	$70 \leq x < 90$
Frequency	k	21	16	8

(a) Find the value of k. [1]

(b) Estimate the mean $\overline{x}$. [2]

(c) Estimate the standard deviation of the data, σ. [2]

Working:

a) $k + 21 + 16 + 8 = 50$

$k = 5$

Answers:

(a) 5

(b) 39.4

(c) 18.4