SOLUTIONS

3. [Maximum mark: 6]

In an arithmetic sequence, $u_1 = -5$ and $d = 3$.

(a) Find u_8. [2]

(b) Find the value of n for which $u_n = 67$. [4]

(a) $u_8 = -5 + (8-1)(3)$

$= 16$

(b) $u_n = -5 + (n-1)(3) = 67$

$3n = 75$

$n = 25$

4. [Maximum mark: 6]

Let $b = \log_2 a$, where $a > 0$. Write down each of the following expressions in terms of b.

(a) $\log_2 a^3$ [2]

(b) $\log_2 8a$ [2]

(c) $\log_8 a$ [2]

(a) $3b$

(b) $3 + b$

(c) $\log_8 a = \dfrac{\log_2 a}{\log_2 8}$

$= \dfrac{1}{3}b$

2. [Maximum mark: 6]

The following table shows the hand lengths and the heights of five athletes on a sports team.

Hand length (x cm)	21.0	21.9	21.0	20.3	20.8
Height (y cm)	178.3	185.0	177.1	169.0	174.6

The relationship between x and y can be modelled by the regression line with equation $y = ax + b$.

(a) (i) Find the value of a and of b.

(ii) Write down the correlation coefficient. [4]

(b) Another athlete on this sports team has a hand length of 21.5 cm. Use the regression equation to estimate the height of this athlete. [2]

(a) i) $a = 9.91045... \approx 9.91$

$b = -31.3194... \approx -31.3$

ii) $r = 0.986418...$

≈ 0.986

(b) $y = 9.9104...(21.5) + -31.319...$

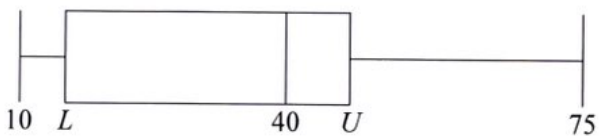
$= 181.755...$

≈ 182 cm (~~181.765~~ 181.765 with rounded values)

4. [Maximum mark: 5]

A research student weighed lizard eggs in grams and recorded the results. The following box and whisker diagram shows a summary of the results where L and U are the lower and upper quartiles respectively.

diagram not to scale



The interquartile range is 20 grams and there are no outliers in the results.

(a) Find the minimum possible value of U. [3]

(b) Hence, find the minimum possible value of L. [2]

(a) $IQR = 20$

$75 \leq U + (1.5)(20)$

$U \geq 45$

(b) $L \geq 45 - 20 = 25$

5. [Maximum mark: 6]

The sum of an infinite geometric sequence is 33.25. The second term of the sequence is 7.98. Find the possible values of r.

geometric

$u_2 = u_1 r = 7.98$

$u_1 = 7.98 / r$

$S_\infty = u_1 \frac{1}{1-r} = 33.25$

$\frac{7.98}{r}\left(\frac{1}{1-r}\right) = 33.25$

$\frac{7.98}{33.25} = r - r^2$

$r^2 - r + 0.24 = 0$

$r = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(0.24)}}{2(1)}$

$= \frac{1 \pm 0.2}{2}$

$= 0.6, 0.4$

Do **not** write solutions on this page.

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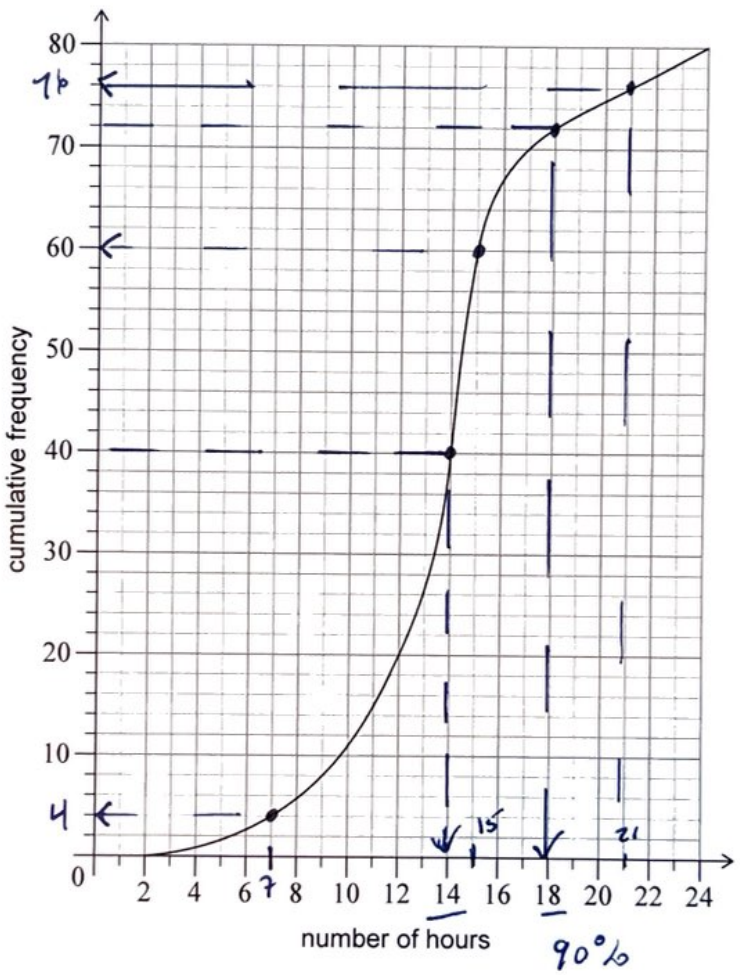
Section B

Answer **all** questions in the answer booklet provided. Please start each question on a new page.

7. [Maximum mark: 14]

A large school has students from Year 6 to Year 12.

A group of 80 students in Year 12 were randomly selected and surveyed to find out how many hours per week they each spend doing homework. Their results are represented by the following cumulative frequency graph.



(This question continues on the following page)

3.10 Test — Solutions

pg 8 # 7 A large school...

7 a) Median 14 hours

b) $10\% \times 80 = 8$

$80 - 8 = 72$

18 hours

(c) $p = 60 - 4 = 56$

$q = 80 - 76 = 4$

Check $4 + 56 + 16 + 4 = 80$ ✓

(d) $P(h > 15) = \frac{16+4}{80} = 0.25$

$320 \cdot 0.25 = 80$ students

(e) i) Year 12 students may not be representative of homework across all ages

ii) Random samples should be selected from all the years

3.10 Test: Statistics Solutions

Pg 9 #8 parabola

8. a) $f(x) = x^2 - 4x - 5$

$= (x-5)(x+1)$

$x = -1, 5$

b) $x = \frac{-1+5}{2} = 2$

$x = 2$

(c) i) $h = 2$

ii) $f(2) = 2^2 - 4(2) - 5 = -9$

$k = -9$

d) x: $-2-3 = -5$

y: $-9+6 = -3$

$(-5, -3)$