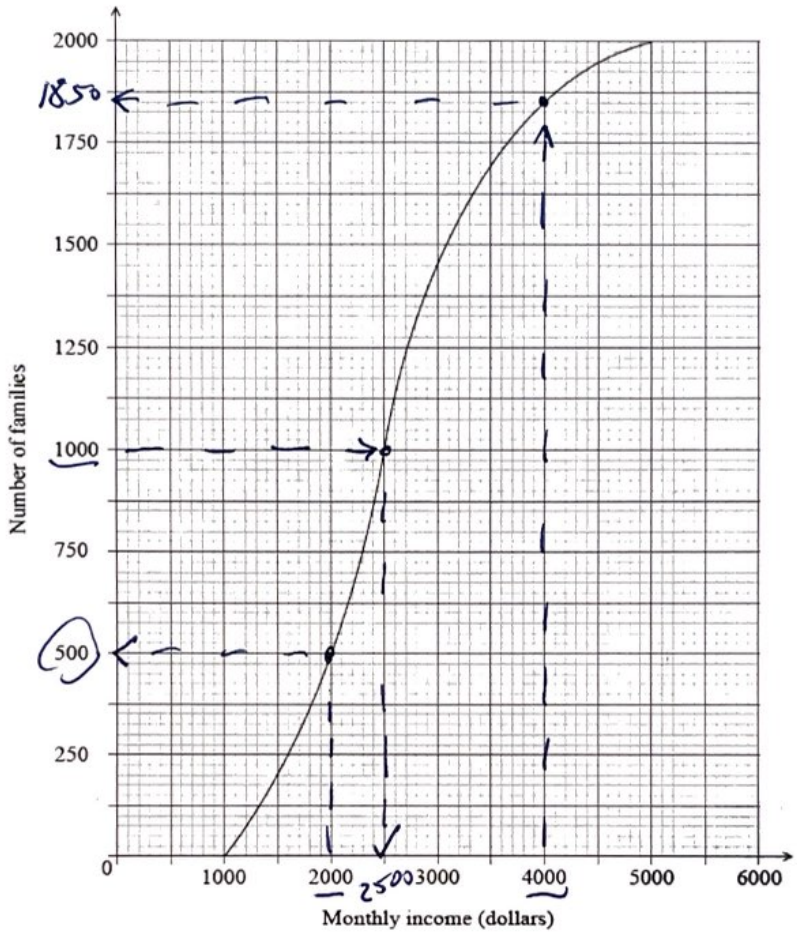
La Scuola d'Italia / Huson / IB Mathematics
8 January 2026

Name: SOLUTIONS

4.6 Classwork: Statistics and probability

1a. The following cumulative frequency graph shows the monthly income, I dollars, of 2000 families.



Find the median monthly income. *[2 marks]*

2500 dollars

1b. *[4 marks]*

(i) Write down the number of families who have a monthly income of 2000 dollars or less.

500 families

(ii) Find the number of families who have a monthly income of more than 4000 dollars.

2000 − 1850 = 150
1

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1c. The 2000 families live in two different types of housing. The following table gives information about the number of families living in each type of housing and their monthly income I.

	$1000 < I \leq 2000$	$2000 < I \leq 4000$	$4000 < I \leq 5000$
Apartment	436	765	28
Villa	64	p	122

Find the value of p. *[2 marks]*

$n = 436 + 765 + 28 + 64 + p + 122 = 2000$

$p = 585$

14d. *[2 marks]*

A family is chosen at random.

(i) Find the probability that this family lives in an apartment.

$P(A) = \frac{436+765+28}{2000} = \frac{1229}{2000}$

$= 0.6145$

≈ 0.615

(ii) Find the probability that this family lives in an apartment, given that its monthly income is greater than 4000 dollars.

$P(A \mid I > 4000) = \frac{28}{28+122} = \frac{28}{150}$

$= 0.1866\overline{6}$

≈ 0.187

14e. Estimate the mean monthly income for families living in a villa. *[2 marks]*

$\overline{I \mid V} = \frac{64}{64 \cdot 1500 + 585 \cdot 3000 + 122 \cdot 4500}{64 + 585 + 122}$

$= 3112.84\ldots \approx 3110$ dollars

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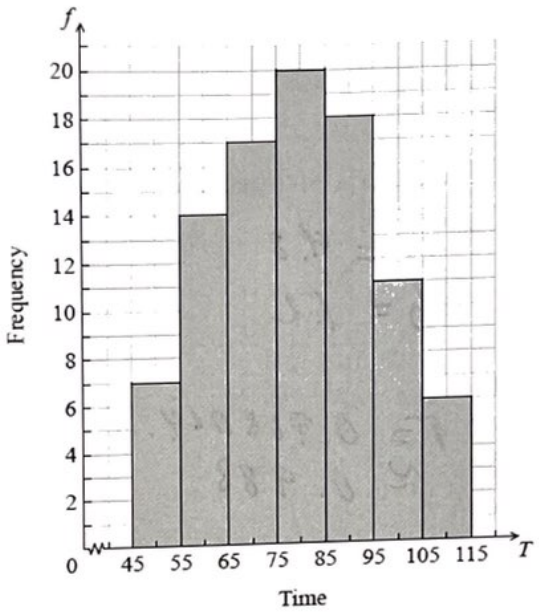
2a. The histogram below shows the time T seconds taken by 93 children to solve a puzzle. *[3 marks]*



The following is the frequency distribution for T.

Time	$45 \le T < 55$	$55 \le T < 65$	$65 \le T < 75$	$75 \le T < 85$	$85 \le T < 95$	$95 \le T < 105$	$105 \le T < 115$
Frequency	7	14	p	20	18	q	6

17 11

(i) Write down the value of p and of q.

$p = 17$, $q = 11$

(ii) Write down the median class.

$7 + 14 + 17 = 38$
$+ 20 = 58$

$\frac{93+1}{2} = 47$ $75 \le T < 85$

2b. A child is selected at random. Find the probability that the child takes less than 95 seconds to solve the puzzle. *[2 marks]*

$P(T < 95) = \frac{7+14+17+20+18}{93} = \frac{76}{93}$ (≈ 0.817)

2c. Consider the class interval $45 \le T < 55$.

(i) Write down the interval width.

$55 - 45 = 10$

(ii) Write down the mid-interval value. *[2 marks]*

50

2d. Hence find an estimate for the

(i) mean; $\bar{x} = 79.1398\ldots \approx 79.1$

(ii) standard deviation. $\sigma = 16.4386\ldots \approx 16.4$ *[4 marks]*

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3. The following table shows the sales, y millions of dollars, of a company, x years after it opened.

Time after opening (x years)	2	4	6	8	10
Sales (y millions of dollars)	12	20	30	36	52

The relationship between the variables is modelled by the regression line with equation $y = ax + b$.

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

$a = 4.8$

$b = 1.2$

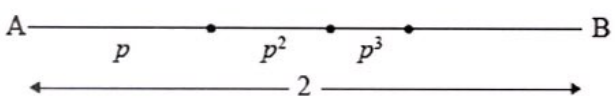
(ii) Write down the value of r. *[4 marks]*

$r = 0.988064...$

≈ 0.988

13. The following diagram shows [AB], with length 2 cm. The line is divided into an infinite number of line segments. The diagram shows the first three segments.

diagram not to scale



The lengths of the line segments are p cm, p^2 cm, p^3 cm, $\ldots$, where $0 < p < 1$.

Show that $p = \frac{2}{3}$. *[5 marks]*

geometric series

$u_1 = p$

$r = p$

$S_\infty = \frac{p}{1-p} = 2$

$p = 2 - 2p$

$3p = 2$

$p = \frac{2}{3}$