Interpercentile Range

(E) **2** The table shows the monthly income for workers in a factory.

Monthly income, x (£)	$900 \leqslant x < 1000$	$1000 \leqslant x < 1100$	$1100 \leqslant x < 1200$	$1200 \leqslant x < 1300$
Frequency	3	24	28	15

a Calculate the 34% to 66% interpercentile range. **(3 marks)**

b Estimate the number of data values that fall within this range. **(2 marks)**

$\Sigma f = 70$

34% of 70 = 23.8

66% of 70 = 46.2

34^{th} percentile $= \dfrac{23.8 - 3}{24} \times 100 + 1000 = £1087$

66^{th} percentile $= \dfrac{46.2 - 27}{28} \times 100 + 1100 = £1169$

Interpercentile Range = £1169 − £1087

= £82

Estimated number of data values

= 46.2 − 23.8 = 22.4 so 22

Exercise 2E - Mean and Standard Deviation

$\bar{x} = \frac{\Sigma x}{n}$ Variance $\sigma^2 = \frac{\Sigma(x-\bar{x})^2}{n}$

Standard deviation $\sigma = \sqrt{\frac{(x-\bar{x})^2}{n}}$

OR $\sigma = \sqrt{\frac{\Sigma x^2}{n} - \bar{x}^2}$

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1) $\Sigma x = 24$ $\Sigma x^2 = 78$ $n = 8$

a) Mean $\frac{\Sigma x}{n} = \frac{24}{8} = 3$

b) variance $= \frac{\Sigma x^2}{n} - \bar{x}^2 = \frac{78}{8} - 3^2$

$= 0.75$

c) s.d. $= \sqrt{0.75} = 0.866$

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5)

(E) 5 Nahab asks the students in his year group how much pocket money they get per week. The results, rounded to the nearest pound, are shown in the table.

Number of £s	8	9	10	11	12
Frequency	14	8	28	15	20

a Use your calculator to work out the mean and standard deviation of the pocket money. Give units with your answer. **(3 marks)**

b How many students received an amount of pocket money more than one standard deviation above the mean? **(2 marks)**

$\bar{x} = 10.22352941 = £10.22$ to 4 s.f.

$\sigma = 1.349304575 = £1.349$ to 4 s.f

$\bar{x} + \sigma = 10.22 + 1.349$

$= £11.569$

$£11.50 \leq £12 < £12.50$

less than $£11.57 = \frac{57-50}{100} \times 12$

20 people increases by £1

1 person increases by 5pen

1 person → £11.55
2 persons → £11.60

18 or 19 above

E/P 7 A certain type of machine contained a part that tended to wear out after different amounts of time. The time it took for 50 of the parts to wear out was recorded. The results are shown in the table.

Lifetime, h (hours)	$5 < h \leqslant 10$	$10 < h \leqslant 15$	$15 < h \leqslant 20$	$20 < h \leqslant 25$	$25 < h \leqslant 30$	TOT
Frequency	5	14	23	6	2	50
mid pt	7.5	12.5	17.5	22.5	27.5	
Freq × midpt	37.5	175	402.5	135	55	805

The manufacturer makes the following claim:

90% of the parts tested lasted longer than one standard deviation below the mean.

Comment on the accuracy of the manufacturer's claim, giving relevant numerical evidence.

Problem-solving

You need to calculate estimates for the mean and the standard deviation, then estimate the number of parts that lasted longer than one standard deviation below the mean.

(5 marks)

Est for $\bar{x} = \frac{805}{50} = 16.1$

Est for $\Sigma x^2 = 5 \times 7.5^2 + 14 \times 12.5^2 + 23 \times 17.5^2 + 6 \times 22.5^2 + 2 \times 27.5^2 = 14062.5$

Est for σ $= \sqrt{\frac{14062.5}{50} - 16.1^2} = 4.69$

$\bar{x} - \sigma = 16.1 - 4.69 = 11.41$

90% were over 10 hrs (5 out of 50 not)

so claim not justified