STATISTICS (Q 7, PAPER 2)

2006

7 (a) The mean of the five numbers 2, 4, 7, 8, 9 is 6.
Calculate the standard deviation of the five numbers, correct to one decimal place.

(b) The number of new cars in various price ranges sold by a retailer in one month is recorded in the following table:

Price (€1000's)	10 – 15	15 – 20	20 – 25	25 – 30	30 – 50
Number sold	5	15	25	15	20

[Note: 15 – 20 means at least 15 but less than 20, etc.]

(i) Draw a histogram to represent the data.

(ii) By taking the data at the mid-interval values, calculate the mean price per car.

(iii) Copy and complete the following cumulative frequency table:

Price (€1000's)	< 15	< 20	< 25	< 30	< 50
Number sold					

(iv) Draw the cumulative frequency curve (ogive).

(v) Using your curve, estimate how many of the cars sold were priced between the mean and the median.

SOLUTION

7 (a)

STEPS
1. Find the mean.
2. Draw up a table of x, d and d^2.
3. Apply the standard deviation formula.

1. This is done for you.
$\bar{x} = 6$

2.

The deviation, d, is given by the formula:
$d = (x - \bar{x}) = (\text{Number} - \text{Mean})$.
To work out d, get the difference between each number, x, and the mean, $\bar{x}$.

x	d	d^2
2	–4	16
4	–2	4
7	1	1
8	2	4
9	3	9
		34

3. $\sigma = \sqrt{\frac{34}{5}} = 2.6$

$$\sigma = \sqrt{\frac{\text{Sum of (Deviations)}^2}{\text{Number of numbers}}} = \sqrt{\frac{\sum d^2}{N}}$$

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7 (b) (i)

Price (€1000's)	10 – 15	15 – 20	20 – 25	25 – 30	30 – 50
Number sold	5	15	25	15	20

Each column in the table is represented by a rectangular box. The area of the box corresponds to the frequency (no. of students).

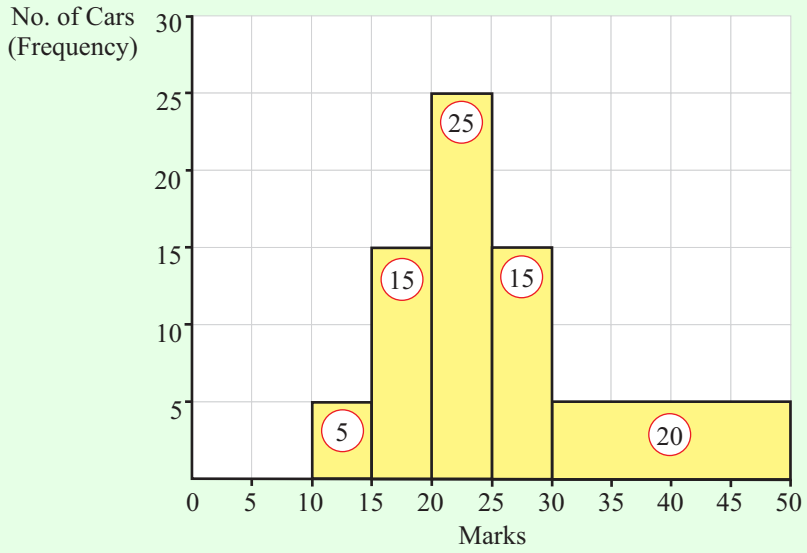
Area (No. of students) = Base × Height = Frequency

Look at the prices. Pick out the smallest interval (10 – 15) and make this base one unit. Therefore the interval 30 – 50 has a base of 4 units. Divide the base into the area (frequency) to get the height of a box.

Draw a new table:

Interval (Prices)	10 – 15	15 – 20	20 – 25	25 – 30	30 – 50
Frequency (No. sold)	5	15	25	15	20
Base	1	1	1	1	4
Height	5	15	25	15	5

Drawing the histogram:
Horizontal (*x*-axis) axis (Prices): Look at the intervals. The prices go from 0 to 50. The smallest interval (Base 1) is 5 so go up in 5's.
Vertical (*y*-axis) axis (No. sold): Always start at zero. The biggest number is the maximum height (i.e. 25).



7 (b) (ii)

Draw up a frequency table using the mid-interval values. To get a mid-interval value add the two numbers together and divide by 2.
Ex. Class interval: 30 – 50

Mid-interval value: $\frac{30+50}{2} = 40$

x	f	fx
12.5	5	62.5
17.5	15	262.5
22.5	25	562.5
27.5	15	412.5
40.0	20	800
	80	2100

$$\bar{x} = \frac{f_1x_1 + f_2x_2 + \ldots\ldots + f_Nx_N}{f_1 + f_2 + \ldots\ldots + f_N} = \frac{\sum fx}{\sum f} \quad \ldots\ldots \text{(2)}$$

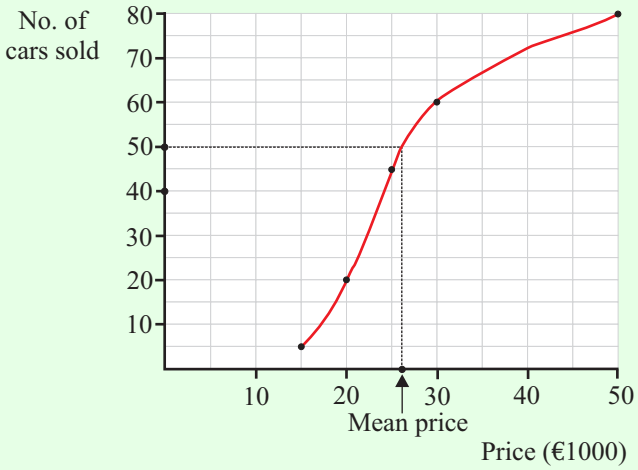
Mean price: $\bar{x} = \frac{\sum fx}{\sum f} = \frac{2100}{80} = 26.25$

As the prices are in thousands of euro, the mean price is €26.25 × 1000 = €26,250

7 (b) (iii)

Price (€1000's)	< 15	< 20	< 25	< 30	< 50
Number sold	5	20	45	60	80

7 (b) (iv)



7 (b) (v)

Go to the mean price (26.25) on the horizontal axis. Draw a broken line up to the curve and across to the vertical axis. The number of cars sold at the mean price is 50.
The median number of cars sold is 40 (half of 80).
No. of cars sold priced between the mean and median = 50 – 40 = 10