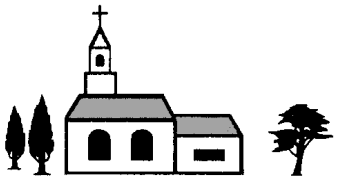
UNIT 20 *Statistics* Revision Test 20.6
(for Grades up to and including Grade A*)

$2\frac{1}{2}$ hours are allowed
Calculators may be used

1. (a) Give one *disadvantage* of each of the following statistical measures for spread:

(i) the range,

(ii) the mean deviation. *(2 marks)*



The 120 people who attended a Church Service on a particular Sunday were grouped according to age.

Age in years	*Number of people*
0 –	12
10 –	8
20 –	16
30 –	10
40 –	16
50 –	22
60 –	30
70 –	6
80 –	0

(b) *Calculate* the median age. *(4 marks)*

(c) One of the people attending the Service wrongly gave her age as 75, when in fact she was 90.

Without any further calculations, state briefly how this error would affect any previous calculations of

(i) the mode,

(ii) the median,

(iii) the range,

(iv) the semi-interquartile range. *(4 marks)*

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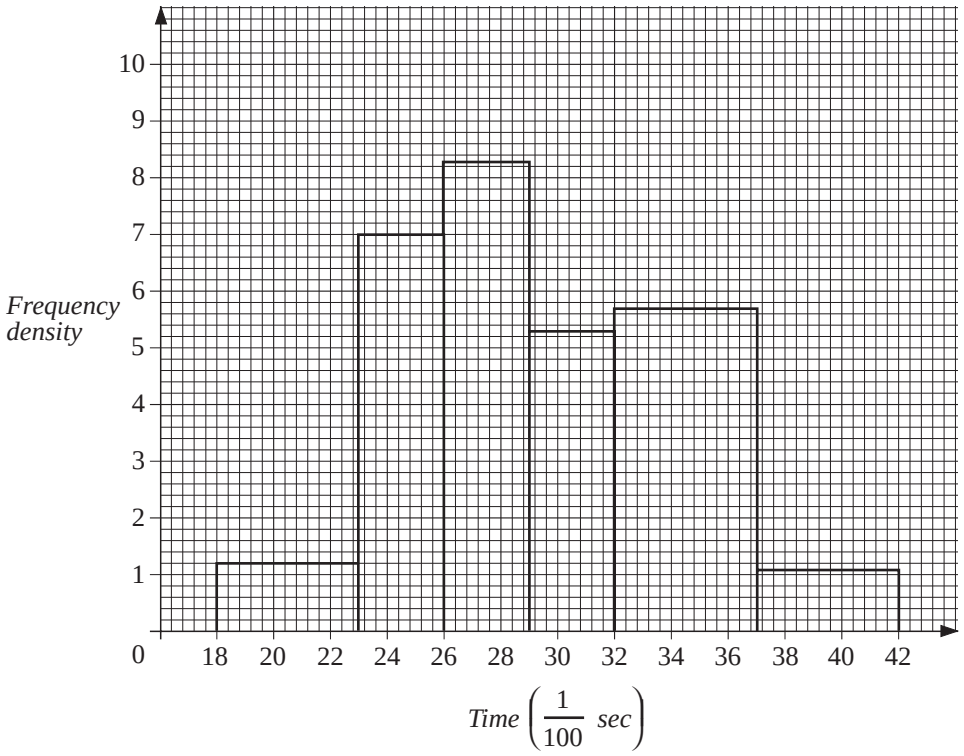
2. Emily used a computer program which records the times taken to respond to a letter flashing on the screen. Her results for 100 letters are given in the following table.

Time $\frac{1}{100}$ sec	18–	23–	26–	29–	32–	37–	42–
No. of letters	18	25	27	19	8	3	0

(a) On graph paper, draw a histogram to illustrate her results. *(6 marks)*

(b) From your diagram obtain an estimate of her modal time. *(2 marks)*

Emily then drank a large mug of black coffee and tested her reactions again. These results are shown in this histogram.



Emily wants to compare the two sets of results.

(c) Would the mode be a good average to use? Give a reason for your answer. *(1 mark)*

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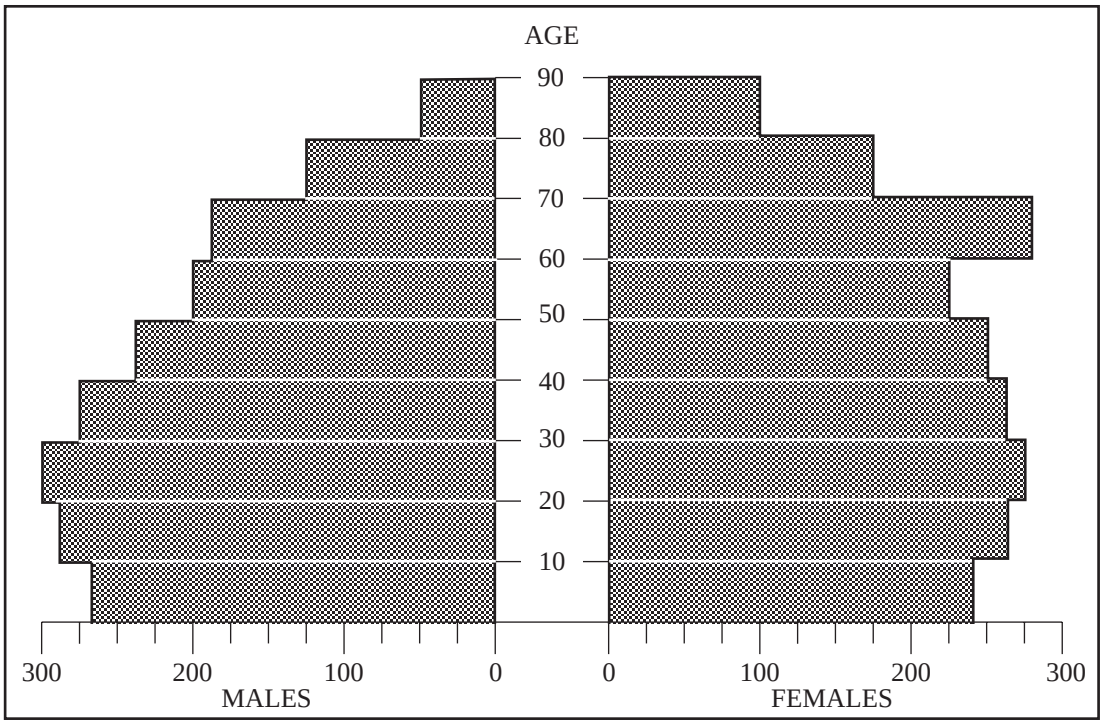
3. The diagram below shows the population pyramid of a town of 4000 inhabitants.



(a) The town has a large home for the elderly.
How is this shown in the diagram? *(1 mark)*

(b) How many of the inhabitants are at least 20 but under 30? *(2 marks)*

(c) A stratified random sample of 400 inhabitants is to be drawn, with the strata based on age and sex. How many women over 60 should there be in the sample?

(3 marks)

4. This table represents the Mathematics test results of 120 students.

The test was marked out of 60.

Marks	*Frequency*
1 – 10	11
11 – 20	16
21 – 30	29
31 – 40	31
41 – 50	21
51 – 60	12

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(a) Copy and complete the cumulative frequency table for these data.

Marks	*Cumulative Frequency*
≤ 10	11
≤ 20	
≤ 30	
≤ 40	
≤ 50	
≤ 60	

(2 marks)

(b) Draw the cumulative frequency curve for these data. *(2 marks)*

(c) Use the cumulative frequency curve to find estimates of

(i) the median, *(1 mark)*

(ii) the interquartile range. *(3 marks)*

In an English test, also marked out of 60, the interquartile range was 10 marks

(d) Using the interquartile ranges compare the marks for Mathematics and English. *(1 mark)*

5. (a) A machine is used to pack paper clips. In order to test the efficiency of the machine, twenty packets were taken at random and the contents counted.

Number of paper clips in a packet	*Number of packets*
48	2
49	2
50	6
51	5
52	0
53	1
54	2
55	2

Calculate

(i) the mean number of paper clips in each packet. *(2 marks)*

(ii) the standard deviation. *(3 marks)*

(b) Another machine packs paper clips with a mean of 51 and a standard deviation 4.2. By comparing the machines give reasons why you would prefer one to the other for efficiency. *(2 marks)*

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6. The table shows the number of deaths occurring in a particular year in towns A and B.

	Town A		*Town B*		
Age group	*Deaths*	*Population*	*Death rate per1000*	*Population*	*Standard Population*
0 – 19	10	3000	1	20%	15%
20 – 34	16	5500	2	25%	25%
35 – 49	*x*	5000	4	30%	25%
50 – 64	35	5500	4	15%	20%
65 & Over	70	6000	17	10%	15%

(a) The crude death rate for Town A is 6.12 per 1000.
Find *x*, the number of deaths in the 35–49 age group of Town A. *(3 marks)*

(b) Find the crude death rate per 1000 for Town B. *(3 marks)*

(c) For each town find the standardised death rate per 1000 population. *(6 marks)*

(d) State, giving a reason, which town has the better survival rate. *(2 marks)*

7. The quarterly turnover for the 'Pigs Parlour' seaside cafe is shown. The owner wishes to display these data in order to forecast the turnover for the coming year.

		QUARTER			
		1st	*2nd*	*3rd*	*4th*
YEAR	1990	£3000	£4000	£8000	£3500
	1991	£2500	£3600	£7000	£3500
	1992	£2000	£3100	£5500	£2100

(a) On graph paper plot the above figures for the cafe, joining the points with straight lines. *(4 marks)*

(b) (i) Calculate suitable moving averages for these data. *(3 marks)*

(ii) Plot these values on your graph. *(2 marks)*

(c) Draw on your graph, by eye, the trend line and use this to estimate the turnover for the cafe during the 1st quarter of 1993. *(3 marks)*

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8. During two consecutive months, a random sample of the school children in Town B had their spending habits monitored. The results are recorded in the table below. The figures are average amounts spent on each item by members of the sample.

Item	*Amount spent (pence)*	
	Month 1	*Month 2*
Entertainment	646	703
Sweets, Food, etc.	221	351
Books, Papers, etc.	306	295
Travel	441	474
Other	389	447

Using Month 1 as base, calculate for Month 2

(a) the price relative for entertainment, *(3 marks)*

(b) the price relative for Books, Papers, etc. *(2 marks)*

(c) an index of total expenditure. *(5 marks)*

9. (a) A survey was carried out to compare the cost of heating houses of different sizes.

When the rank correlation coefficient was calculated between the cost of heating and the floor area of the house, it gave a value of 0.9.

(i) What type of correlation does this indicate? *(1 mark)*

(ii) What does this tell you about the cost of heating and the floor area of the house? *(1 mark)*

(b) Write down the lowest value possible for a correlation coefficient. *(1 mark)*

(c) The sales in two shops for six types of clothing were recorded.

Sales	*Jeans*	*Skirts*	*Shorts*	*Tops*	*T-Shirts*	*Jumpers*
Deptford Branch	14	8	4	15	23	7
Birmingham Branch	23	20	11	14	21	8
Rank for Deptford Branch						
Rank for Birmingham Branch						
d						
d^2						

(i) Copy the table and complete the rank columns for the sales figures at both branches. *(2 marks)*

(ii) Calculate Spearman's rank correlation coefficient for these data. *(3 marks)*

(iii) What does this tell you about the sales pattern of these two branches? *(1 mark)*

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10. Twenty pupils from a certain school were entered for public examinations in both Mathematics and Music. The school's headteacher analysed the results obtained by the pupils. Explain clearly what each of the following statements means.

    (a) "If I convert the marks to a scale with mean zero and unit standard deviation, Andrew got +1.5 in both subjects, whereas Barbara got –0.5 in Mathematics and + 2.5 in Music." *(3 marks)*

    (b) "For the results of our 20 pupils, the value of Spearman's rank correlation coefficient is + 0.87." *(2 marks)*

11. At the village fete, Susan helps on a stall where radios can be won. She makes the following poster explaining the rules.

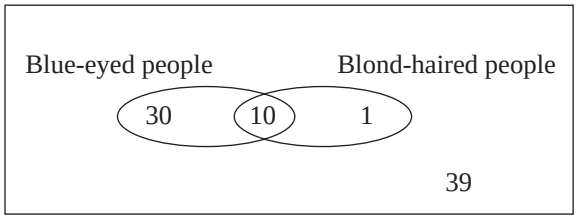
    (a) The first person to try their luck was told that they must throw a six with each dice to win. Calculate the probability of this person winning the radio. *(2 marks)*

    (b) During the day 648 people tried to win a radio. How many radios would you expect to be won during the day of the fete? *(2 marks)*

12. 40 blue-eyed people and 40 brown-eyed people were chosen at random

    They were classified by hair colour and eye colour.

    The results are shown in the Venn diagram.



    (a) How many of the blue-eyed people had blond hair? *(1 mark)*

    (b) One of the blue-eyed people is chosen at random.
    What is the probability that the person does not have blond hair? *(1 mark)*

    (c) How many people in the survey had blond hair? *(1 mark)*

    (d) One of the blond haired people is chosen at random.
    What is the probability that the person has blue eyes? *(1 mark)*

    (e) What does the number 39 on the diagram tell you? *(1 mark)*