UNIT 20 *Statistics* Revision Test 20.4
(for Grades up to and including Grade A*)

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

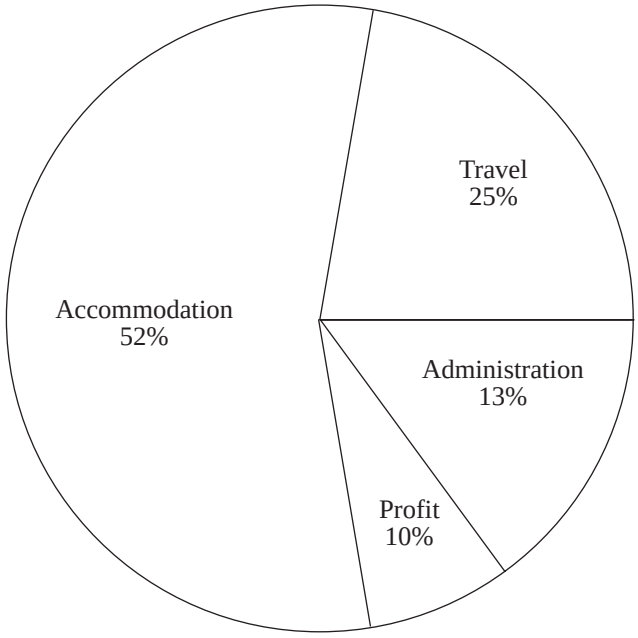
1. One hundred children were each asked to complete the jigsaw puzzle 'Swan Lake'.
The time, taken to the nearest minute, by each child to complete the puzzle was recorded.

Time (minutes)	0 – 4	5 – 6	7 – 8	9 – 10	11 – 14	15 – 18	19 – 30
Frequency	9	7	16	30	20	12	6

(a) Draw a histogram to represent these data. *(5 marks)*

(b) From your histogram, estimate the modal time taken to complete the puzzle. *(2 marks)*

2. In 1987 a holiday company advertises a new package holiday to Switzerland. In June this cost £436 and included travel, accommodation, administration and profit as shown by the following pie chart with radius 3 cm.



Total cost £436

In 1988, the profit relatives were 115 for travel, 112 for accommodation, 98 for administration and 111 for profit.

(a) Calculate the percentage increase in the price of the same holiday to Switzerland in 1988 compared with the 1987 price. *(5 marks)*

(b) Calculate the radius of a comparable pie chart for 1988. *(3 marks)*

(c) Give an explanation for the reduction in administrative costs in 1988 compared to 1987. *(1 mark)*

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3. Ben counts the number of cars passing the front of his house, between 3.00 pm and 3.30 pm each day for 145 days. He records his results.

Number of cars	*Frequency*
0 – 4	20
5 – 9	24
10 – 14	25
15 – 19	21
20 – 24	17
25 – 29	14
30 – 34	10
35 – 39	7
40 – 44	4
45 – 49	2
50 – 54	1

(a) Calculate the median number of cars for these data. *(3 marks)*

The mean for these data is 17.81.

Ben wants to state the 'average' number of cars.

(b) (i) Should he choose the median or the mean?

(ii) Give a reason for your choice. *(2 marks)*

(c) What is the probability that on a particular day, at least 30 cars pass Ben's house between 3.00 pm and 3.30 pm? *(2 marks)*

4. In six league cricket matches a cricketer scored a total of 108 runs and the standard deviation of his scores was 5.0.

(a) Write down the mean and variance of his scores. *(2 marks)*

In his seventh match he scored 25 runs.

(b) Calculate the mean and standard deviation of all seven scores. *(5 marks)*

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5. In order to improve the efficiency of branches of the Midwest bank, a survey was carried out. The number of customers using 80 branches on Monday 12 June 1995 was as follows.

Number of customers	100 or less	200 or less	300 or less	400 or less	500 or less	600 or less	700 or less
Number of branches	4	14	30	50	69	76	80

(a) Use the table to draw a cumulative frequency curve to represent these data. *(3 marks)*

(b) Use your curve, showing all construction lines, to

(i) find the median number of customers; *(2 marks)*

(ii) calculate the interquartile range for these data; *(2 marks)*

(iii) estimate the number of branches with 240 customers or less; *(1 mark)*

(iv) estimate the number of branches with 530 customers or more. *(2 marks)*

6. A newspaper article gave the following data concerning the cost of living.

Item of expenditure	*Percentage relatives*		*Average expenditure per £1*
	1990	*1993*	
Housing	100	80	40p
Food	100	121	25p
Heating	100	125	15p
Clothing	100	110	15p
Sundries	100	130	5p

(a) How does the change in the cost of housing differ from the other items? *(1 mark)*

(b) I paid £525 for heating during 1990.
How much would I expect to pay during 1993? *(2 marks)*

(c) Calculate a retail price index for 1993. *(4 marks)*

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7. Whilst on holiday in Seatown George is told that the resort is far healthier than his home town of Brightbury. George decides to check on this and collects the following data on the two towns.

Age Group	*SEATOWN*		*BRIGHTBURY*		*Standard Population (England & Wales)*
	Number of deaths	*Population (thousands)*	*Number of deaths*	*Population (thousands*	
0 – 9	50	25	60	10	10
10 – 19	30	30	16	8	6
20 – 29	80	40	32	16	14
30 – 39	90	30	75	15	25
40 – 49	120	10	240	24	15
50 – 59	180	6	190	19	20
60 – 69	140	5	600	20	8
70 +	80	4	360	8	2

(a) Why did George collect the STANDARD population data? *(1 mark)*

(b) Find the crude death rates of the two towns. *(3 marks)*

(c) Calculate the standardised death rates for the two towns. *(4 marks)*

(d) Using your results comment on the statement that Seatown is a far healthier place to live than Brightbury. *(2 marks)*

8. A Regional Health Authority is considering the future of two neighbouring maternity units, the Murray and the Firs, with a view to closing one of them.

The table shows the number of babies delivered each quarter over the last three years for the Murray maternity unit.

		QUARTER			
		1st	*2nd*	*3rd*	*4th*
YEAR	*1985*	356	369	411	344
	1986	332	346	302	324
	1987	285	319	306	298

(a) When did the number of babies delivered each quarter at the Murray maternity unit reach its peak? *(1 mark)*

(b) Plot the quarterly figures for the Murray maternity unit and join successive points with straight lines. *(2 marks)*

(c) (i) Copy and use the following table to calculate the four-quarterly moving averages for the Murray maternity unit.

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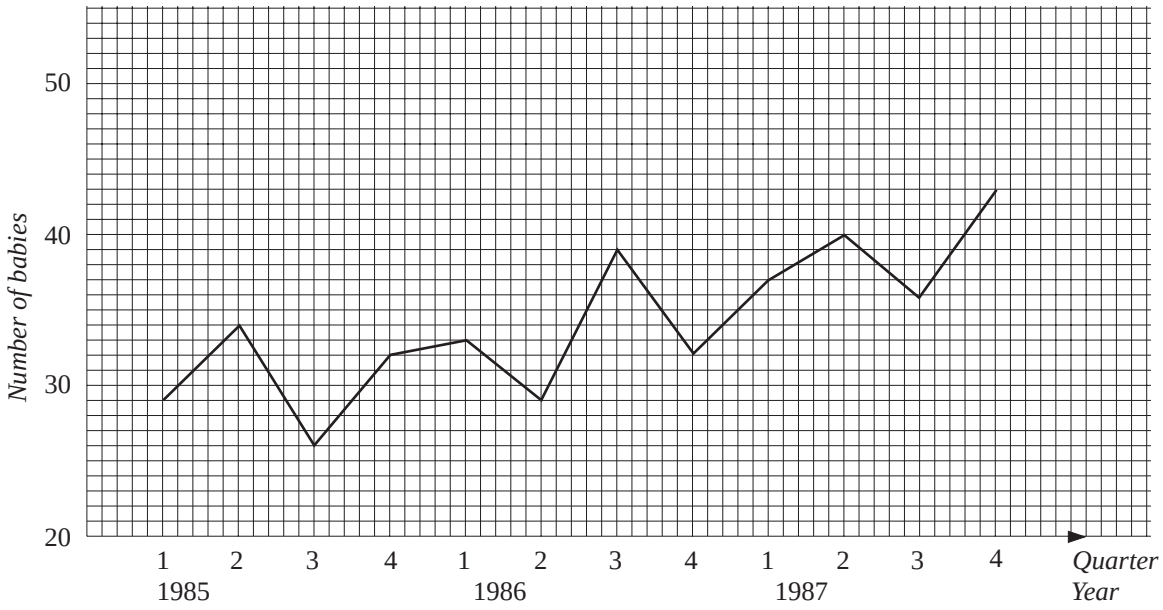
Quarter		*Babies Delivered*	*Four Quarterly Total*	*Four Quarterly Moving Average*
1985	1st	356		
	2nd	369		
	3rd	411		
	4th	344		
1986	1st	332		
	2nd	346		
	3rd	302		
	4th	324		
1987	1st	285		
	2nd	319		
	3rd	306		
	4th	298		

(3 marks)

(ii) Plot these moving averages on the same axes and join them. *(2 marks)*

(d) Comment briefly on the general trend implied by the moving average graph. *(1 mark)*

The graph below shows the number of babies delivered each quarter by the Firs maternity unit.



(e) On the evidence of the number of babies delivered at each of these units and the trend in births, which would you recommend for closure?

You must give a reason to justify your answer. *(2 marks)*

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9. A television company broadcasting a snooker tournament organised a 'shot of the week' competition. Viewers were invited to rank ten shots in order from best to worst. Peter entered the competition, submitting the entry

D G C F I B J H A E

whilst Richard submitted the order

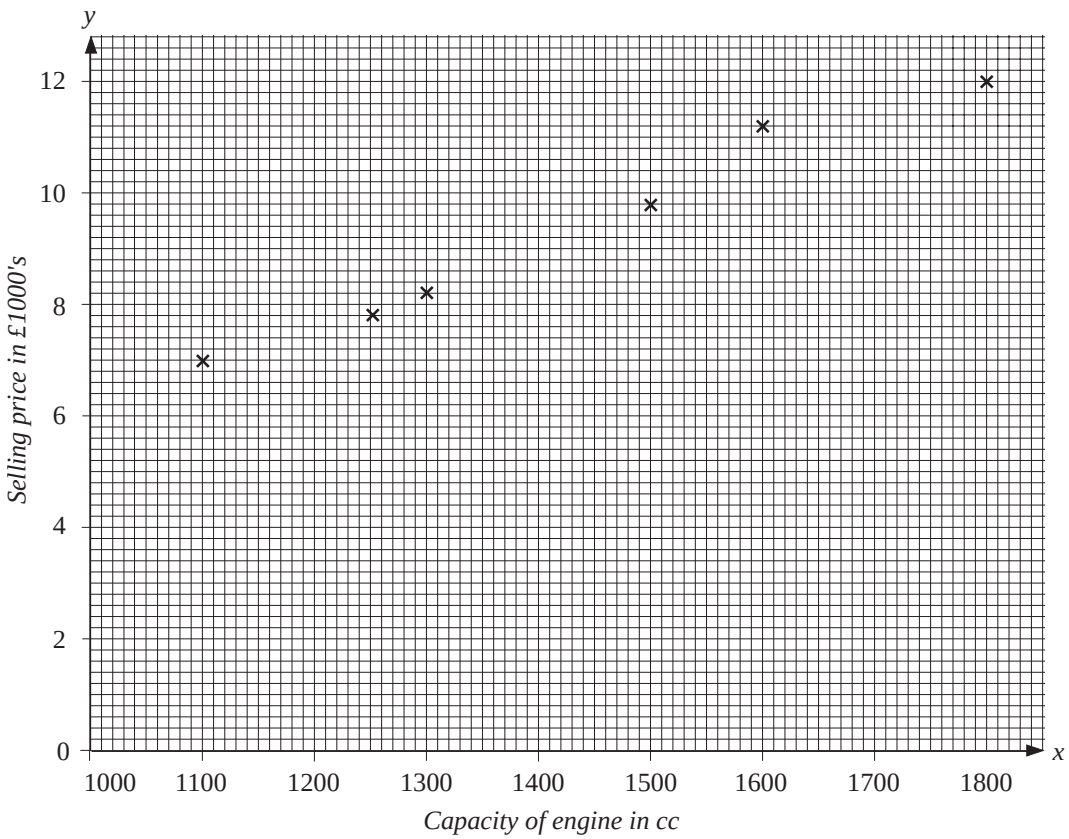
G D B C I F A J E H

(a) Calculate Spearman's rank correlation coefficient between these two rankings. *(4 marks)*

(b) What information does your value convey about the two entries? *(1 mark)*

(c) Neither Peter nor Richard was successful in the competition. The Spearman rank correlation coefficient between the winner and Peter and between the winner and Richard was -0.64 in each case. What do you conclude from this? *(2 marks)*

10. The scatter diagram shows the engine capacity (x) and the selling price (y) of 6 different models of car.



The mean selling price of these cars is £9370.

(a) On a copy of the diagram, construct a line of best fit through the points. *(2 marks)*

(b) Obtain the equation of this line in the form $y = mx + c$. *(4 marks)*

(c) (i) Use this information to predict the selling price of a car with an engine capacity of 1700 cc. *(1 mark)*

(ii) Give *one* reason why this answer may not be reliable. *(1 mark)*

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11. (a) Explain briefly the purpose of linear transformations to a given mean and standard deviation. *(1 mark)*

(b) In a Statistics examination candidates sat two papers. Mr Pokes marked the first paper and his mean mark was 65.2 with a standard deviation of 8.9; Mrs Young marked the second paper and her mean mark was 44.1 with a standard deviation of 13.8. The marks were to be scaled to a distribution with a mean of 50 and a standard deviation of 16. The following table shows the original marks for the two best candidates, Michelle and Rajinder.

Candidate	*Paper 1*	*Paper 2*
	Mr Pokes	Mrs Young
Michelle	82	85
Rajinder	87	80

(i) The scaled mark for Michelle on Paper 1 was 80.2 and that for Rajinder on Paper 2 was 91.6

Calculate the scaled marks for Michelle on Paper 2 and for Rajinder on Paper 1. *(4 marks)*

(ii) A prize was to be given to the candidate scoring the best overall result from the scaled examination mark.

On the basis of these calculations, which candidate should receive the prize? *(1 mark)*

12. In a game at a Spring Fayre, a competitor pays for a 'go' which involves choosing a disc from a bag.

There are 50 discs, numbered from 11 to 60, in the bag.

Each number appears exactly once.

If the number on the disc ends in a 0, the competitor wins £1.

If the two digits of the number on the disc differ by exactly one, the competitor wins 50p.

Otherwise, nothing is won.

(a) Alan has one 'go' at this competition.

What is the probability that

(i) he wins £1, (ii) he wins 50p? *(3 marks)*

Alan returns his disc to the bag.

When a competitor pays for a double 'go', a second disc is taken without replacing the first disc.

(b) Betty pays for a double 'go' at the competition.

Find the probability that

(i) Betty does not win a prize, (ii) Betty wins £2, (iii) Betty wins £1. *(8 marks)*