

Knowledge Test

1. What does crude birth rate indicate?

How many births would be expected per 1000 of the population

2. What does a standardised population represent?

The expected numbers of each group in a sample of 1000 of the population.

3. What is the difference between the consumer price index (CPI) and the retail price index (RPI)?

RPI takes into account household expenditure such as council tax and mortgage rates

4. What is the difference between the spearman's rank correlation coefficient (SRCC) and the product moment correlation coefficient (PMCC)?

- SRCC: Whether an increase in one variable creates an increase/decrease in the other. PMCC: How well a straight line can be fit to the data.

5. What does a PMCC of 1 indicate?

Perfect correlation & all points lie on a straight line  
positive

6. When would a correlation generally be considered to be 'strong' correlation?

Strength of correlation  $> 0.7$

7. When would a correlation generally be considered to be a 'weak' correlation?

Strength of correlation  $< 0.4$

Crude Rates of Change (Formulae Provided)

1. In 2016 there were 38312 people in a town.

a) If 432 people died what was the crude death rate?

$$\frac{432}{38312} \times 1000 \approx 11.3$$

b) Interpret the meaning of this number.

Approximately 11.3 people in every thousand died in 2016.

2. In 2016 there were 1305 members of a village with 13 births.

a) What is the crude birth rate?

$$\frac{13}{1305} \times 1000 \approx 10.0$$

b) Interpret the meaning of this number.

For every 1000 members of the population there were approximately 10.0 births

3. The demographic of a small town is given in the table below:

Age Group	Frequency	Birth Rate
0-19	2812	22.9
20-35	15611	25.0
36-65	19062	13.1
65+	10001	0

a) Calculate the number of people in each age group in the standard population to 1 decimal place

e.g. 0-19:  $\frac{2812}{47486} \times 1000 = 59.21 \dots \cong 59.2$

20-35:  $\cong 328.8$

36-65:  $\cong 401.4$

65+ :  $\cong 210.6$

b) Calculate the standardised birth rate for the town

e.g.  $\frac{22.9}{1000} \times 59.2 = 1.35568 \cong 1.4$

20-35:  $\cong 8.2$

36-65:  $\cong 5.3$

65+ : = 0

Combined: 14.9 births per thousand

4. A village had 68 births and a crude birth rate of 10.1, show that the population is roughly 6733.

$$\frac{68}{n} = \frac{10.1}{1000}$$

$$n = 68 \times \frac{1000}{10.1} \cong 6733$$

$$\frac{n}{68} = \frac{1000}{10.1}$$

5. A village had 32 deaths and a crude birth rate of 9.8, calculate the size of the population.

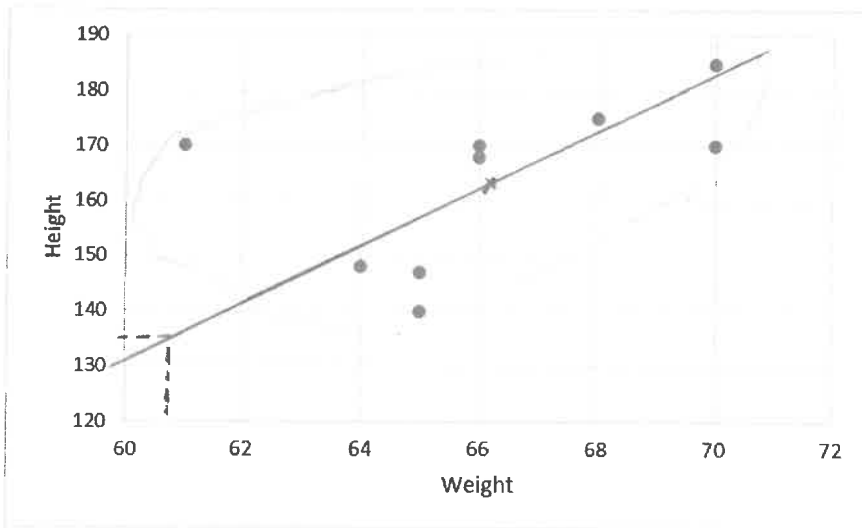
$$\frac{32}{n} = \frac{9.8}{1000}$$

$$n = 32 \times \frac{1000}{9.8} \cong 3265$$

6. TMSN your understanding of crude rates of change

(T)

WS Test 4 Revision



b) Draw a line of best fit on the diagram.

c) Estimate the weight of a person who is ~~120~~<sup>135</sup>cm tall. How valid is this estimate? *60.6, extrapolation so we are not sure if the pattern continues*

The equation of the trend line is found to be  $h = 2.6w - 7.7$

d) Interpret the meaning of the number 2.6

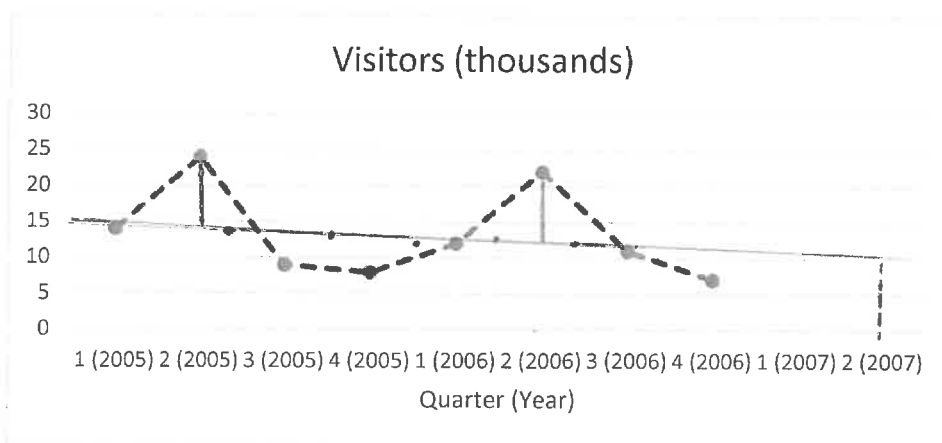
*For every extra kg the person tends to be 2.6cm taller.*

e) TMSN your understanding of scatter diagrams T

Time Series

1. Jenny draws a time series to represent the number of visitors to her town:

Year	2005				2006			
Quarter	1	2	3	4	1	2	3	4
Visitors (th)	14	24	9	8	12	22	11	7



WS Test 4 Revision

a) Calculate the 4 point moving averages

e.g.  $\frac{14+24+9+8}{4} = 13.75$

13.25  
12.75  
13.25  
13

b) Plot these on the time series and hence draw a trend line for the data

c) State and interpret the trend

*There is a slight decreasing trend.  
As time passes there are fewer visitors.*

d) Calculate the mean seasonal variation for quarter 2

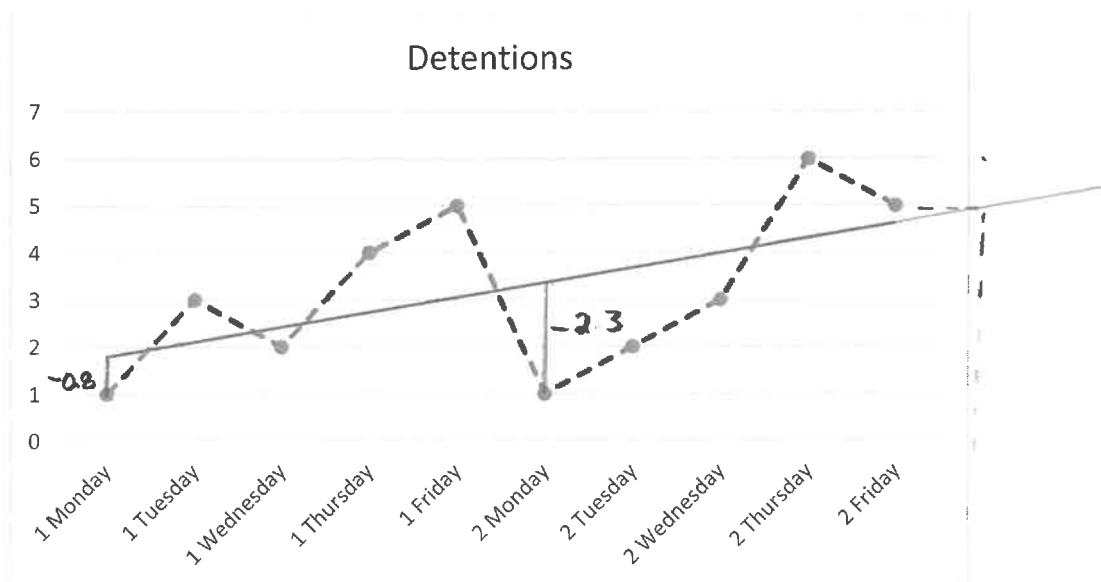
$$\frac{(24-14) + (22-13)}{2} = \frac{19}{2} = 9.5$$

e) Hence use the time series to estimate the number of visitors in quarter 2 of 2007

$$10.1 + 9.5 = 19.6 \text{ thousand visitors.}$$

2a) For the data below calculate the 'mean seasonal variation' for a Monday.

$$\frac{-0.8 + -2.3}{2} = -1.55$$



b) Use this to estimate the number of detentions given in the Monday of week 3

$$4.9 - 1.55 = 3.35$$

Index Numbers

1. The table below shows the average price of a 4 pint carton of milk between the years 2010 and 2012.

Year	2010	2011	2012
Price	112	120	121
Index Number (2010 is the base year)	100	107	108
Chain Base Index	100	107	101

a) Calculate the missing index numbers and base index numbers.

b) Which measure, the CPI or RPI, would be the most appropriate measure to compare this to and why? *CPI as milk would not be affected by fluctuation in mortgage / council tax rates.*

c) The CPI for the years 2011 and 2012 was 103.1, how does this compare to the change in the price of milk?

*Compare to chain base*

*Price of milk rose above CPI in 2011 and below in 2012.*

2. The table below shows the chain base numbers for the change in the average price of an ice cream between the years 2011 and ~~2014~~ 2013.

	2011	2012	2013
Chain Base Index	100	102.5	105

a) Geraldine says 'For both of the years the price increase was 2.5%.' Explain why she is wrong.

*As it is a chain base the price rose by 5% in 2013*

b) Harry's ice cream parlour sold vanilla ice cream for £2.10 in 2011 estimate the price of the ice cream in 2012.

$$2.10 \times 1.025 \approx \pounds 2.15$$

c) Estimate the price of the ice cream in 2013.

$$\times 1.05 \approx \pounds 2.26$$

d) Explain why your answers to b and c are only estimates.

*Ice cream costs will not rise perfectly in line with the national average.*

e) TMSN your understanding of index numbers

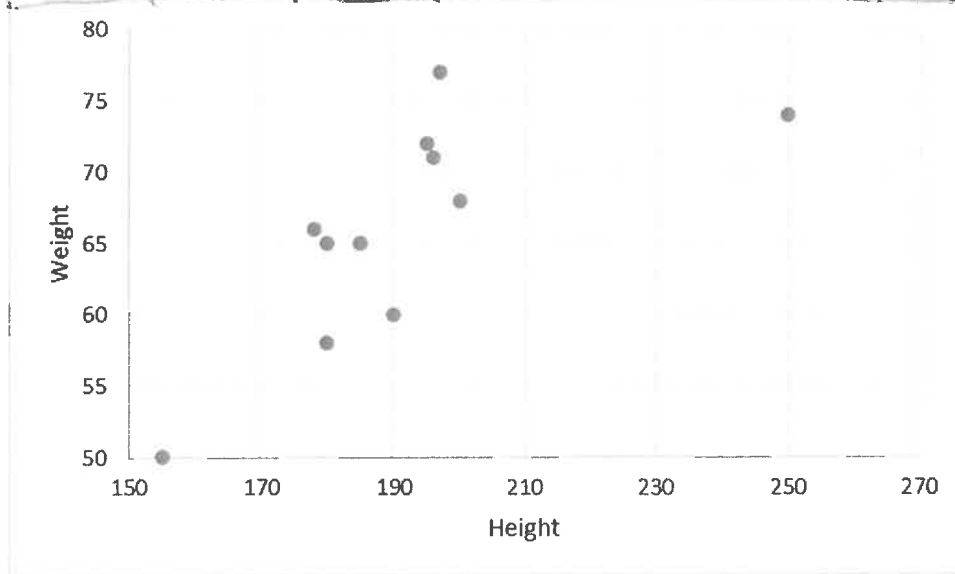
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Scatter Diagrams

1. The data below is represented on the scatter diagram.

Height	155	190	250	196	149	180	185	197	195	180	178	200
Weight	50	60	74	71	55	58	65	77	72	65	66	68
Hrank	11	6	1	4	12	8.5	7	3	5	8.5	10	2
Wrank	12	9	2	4	11	10	7.5	1	3	7.5	6	5
$d^2$	1	9	1	0	1	2.25	0.25	4	4	1	16	9

$\sum d^2 = 48.5$



a) Would you expect the PMMC or SRCC to be stronger for this data? Why?

SRCC because outlier would decrease ability to fit a straight line to the data.

b) Calculate the spearman's rank correlation coefficient. Use the blank parts of the table to help you.

$$r = 1 - \frac{6 \sum d^2}{n(n^2-1)} = 1 - \frac{6 \times 48.5}{12 \times 143} \approx 0.83 \text{ (2 d.p.)}$$

c) Interpret your answer from b)

There is a strong positive correlation between height and weight. As height increases so does their weight.

2a) For the data below, calculate the double mean point  $(\bar{x}, \bar{y})$  and plot this on the scatter diagram.

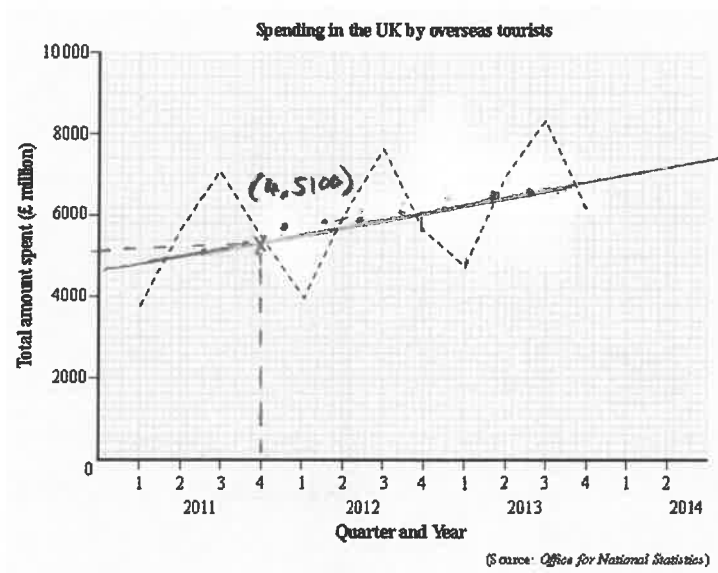
x	weight (kg)	70	61	68	66	70	65	64	65	66
y	Height (cm)	185	170	175	168	170	147	148	140	170

$$\bar{x} = \frac{70+61+\dots}{9} = 66.1 \text{ (1 d.p.)}$$

$$\bar{y} = 163.6 \text{ (1 d.p.)}$$

3a) For the time series below calculate four point moving averages and use them to plot a trend line

Y	2011				2012				2013			
Q	1	2	3	4	1	2	3	4	1	2	3	4
Value	2800	5200	7000	5300	4000	5900	7600	5900	4800	7000	8300	6000
4 ->		5075	5375	5550	5700	5850	6050	6325	6500	6525		



$$m = \frac{5100 - 4600}{4} = 125$$

b) Calculate the equation of your trend line and leave your answer in the form  $y = ax + b$

$$y = 125x + 4600$$

c) Interpret the value of both a and b

Every year the amount spent increases by £600,000,000, or each quarter by £125 mil.

