JAN 2013

A country requires all students in Year 7 to take a Cognitive Assessment Test (CAT). An educational psychologist is interested in the difference in performance in this test between students who have autumn birthdays and those who have summer birthdays.

Nine pairs of siblings, where one sibling has an autumn birthday and the other a summer birthday, are selected. The score achieved by each of these eighteen students in their Year 7 CAT test is given in the table.

Assume that the pairs of siblings form a random sample.

	Sibling pair								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Autumn	82	76	62	58	74	65	60	53	81
Summer	81	61	49	49	68	51	65	60	72

(a) Explain the purpose of using sibling pairs in this comparison of CAT scores. *(2 marks)*

(b) Carry out a sign test, at the 10% significance level, to investigate whether, on average, students with autumn birthdays gain higher CAT scores than those with summer birthdays. *(6 marks)*

JUNE 2012

After an intensive advertising campaign for a particular brand of breakfast cereal, a market research company asked 12 households who regularly purchase breakfast cereal to record the number of packets of this brand that they had purchased.

(a) The numbers of packets purchased per household during the three months following the campaign are

4 8 7 12 11 10 6 7 0 6 0 15

The median number of packets of this particular brand of breakfast cereal purchased per household over a similar time period before the campaign was 5.

Carry out a sign test, using the 10% level of significance, to investigate whether the median number of packets purchased per household increased following the campaign. *(6 marks)*

(b) Name another distribution-free test that could be used to investigate whether the median number of packets purchased per household increased following the campaign. *(1 mark)*

JUNE 2013

Each day, Jamal completes a crossword puzzle from a particular newspaper and records his completion time, to the nearest minute.

For 2011, his median completion time for a crossword puzzle from this newspaper was 32 minutes.

Jamal's completion times, to the nearest minute, for a random sample of 12 crossword puzzles, selected from those that he completed from the same newspaper during 2012, were as follows.

40 20 18 11 27 36 38 35 22 14 12 21

Use a sign test, with the 10% significance level, to examine whether Jamal's median completion time for crossword puzzles from this newspaper during 2012 had decreased from that for 2011. *(6 marks)*

JAN 2008

During 2005, the weekly amounts of pocket money given to a random sample of 14-year-old children living in Brighton were:

£ 5.50	£6.30	£7.50	£15.00	£10.00	£12.50
£12.00	£6.00	£7.75	£10.50	£ 5.00	£ 7.15

During 2003, the median weekly amount of pocket money given to 14-year-old children living in Brighton was £5.60.

Carry out a sign test to determine whether there is support for the claim that the median weekly amount of pocket money given to 14-year-old children living in Brighton has changed since 2003. Use the 10% level of significance. *(7 marks)*

ONE SAMPLE SIGN TEST

Variables: _____

H_0: _____
H_1: _____

_____ Tailed Test _____ % Sig Level n: _____

Test Statistic: _____

_____

Hence B(____ , ____)

Critical Region: _____
Compare:

Conclude:
Hence we: _____
Therefore there is: _____
_____
_____

DEFINITIONS

Tests which do not require the knowledge or assumption that the data involved is normally distributed are known as

D __ __ __ __ __ __ __ __ __ __ __ - F __ __ __
or N __ __ - P __ __ __ __ __ __ __ __ __ tests.

The **sign test** involves allocating a ___ or ___sign to each reading and uses a B __ __ __ __ __ __ __ M __ __ __ __ with *p*=____ to determine the critical region

If a value is equal to the null hypothesis in question we are testing we D __ __ __ __ __ __ __ this from the test

ASSIGNING A SIGN FOR A ONE SAMPLE TEST

When assigning a sign to the variable we must compare it to the hypotheses. If the value agrees with the alternative hypothesis then we assign a '+' and if not we assign a '-'.

For each of the following data sets, assign each value a '+' or '-' sign for its corresponding hypotheses

H_0: population median = 23 miles
H_1: population median > 23 miles

21	24	23	26	25	21	20	23	26	25	22
__	__	__	__	__	__	__	__	__	__	__

H_0: η = 2.2 hours
H_1: η ≠ 2.2 hours

2.1	2.3	2.2	2.5	2.4	2.1	2.3	2.5	2.0	1.9	2.1
__	__	__	__	__	__	__	__	__	__	__

H_0: adults show no preference in the colour of the car
H_1: adults show a preference for the blue car

B	R	Y	R	B	B	Y	R	Y	B	B
__	__	__	__	__	__	__	__	__	__	__

The Sign Test
Revision Mat

PAIRED SAMPLE SIGN TEST

Variables: _____

H_0: _____
H_1: _____

_____ Tailed Test _____ % Sig Level n: _____

Test Statistic: _____

_____

Hence B(____ , ____)

Critical Region: _____
Compare:

Conclude:
Hence we: _____
Therefore there is: _____
_____
_____

PAIRED SAMPLES

The sign test can be manipulated to test for the

D __ __ __ __ __ __ __ __ __ between paired samples

A paired comparison is a single experimental design which can be used to R __ __ __ __ __

E __ __ __ __ __ __ __ __ __ __ __ E __ __ __ __

when two treatments are being compared.

ASSIGNING A SIGN FOR A PAIRED SAMPLE TEST

When assigning a sign to the pair of variables we must compare the difference of the two values to the hypotheses. If the difference agrees with the alternative hypothesis then we assign a '+' and if not we assign a '-'.

For each of the following data sets, assign each value a '+' or '-' sign for its corresponding hypotheses
(subtraction order is important!)

H_0: population median difference = 0
H_1: population median difference ≠ 0

X	32	39	34	56	61	42	52	21	35	62
Y	31	35	36	54	59	46	54	21	34	60
dif	__	__	__	__	__	__	__	__	__	__
	__	__	__	__	__	__	__	__	__	__

H_0: η difference = 0
H_1: η difference > 0 (B - A)

A	7	9	5	3	6	2	4	5	6	8
B	7	8	4	1	2	3	6	5	8	2
dif	__	__	__	__	__	__	__	__	__	__
	__	__	__	__	__	__	__	__	__	__