About the exam

'Section B contains a single question. In Paper 1, this question requires a statistical analysis of a set of data; in Paper 2, the design of an experiment or series of experiments is required… Section B [is] assigned 25% of the total maximum marks for a paper.'

Past paper questions

Q1 (2000, Paper 1).

In a treatment trial for depression all patients received treatment with imipramine, an antidepressant drug. In addition, half received cognitive therapy (Cogth) while half received counselling (Couns). Patients were assessed on the Beck Depression Inventory prior to (Pre) and following (Post) the treatment programme. The results are shown overleaf.

(a) Which treatment is more effective?
(b) Are there any differences between the levels of depression in men and women prior to treatment?
(c) Is there a relationship between depression before and after treatment in the cognitive therapy group?

Treatment	Gender	Pre	Post
Cogth	F	20	10
Cogth	F	18	11
Cogth	F	17	6
Cogth	F	19	10
Cogth	F	21	8
Cogth	M	42	20
Cogth	M	35	17
Cogth	M	32	18
Cogth	F	15	3
Cogth	M	28	18
Cogth	F	22	11
Cogth	F	21	7
Cogth	M	26	17
Cogth	F	27	14
Cogth	F	19	8
Couns	F	19	14
Couns	F	17	13
Couns	F	18	19
Couns	F	20	14
Couns	F	23	19
Couns	M	38	30
Couns	M	33	29
Couns	M	34	27
Couns	F	13	10
Couns	M	29	20
Couns	M	23	16
Couns	F	24	16
Couns	F	28	25
Couns	F	24	16
Couns	F	17	13

Q2 (2003, Paper 1).

In an initial experiment to measure the reaction times for discriminating 'positive affect' faces (expressing 'happiness') from 'negative affect' faces (expressing 'sadness') the following ten reaction times from ten subjects were recorded in milliseconds (msec):

630 580 604 596 720 549 613 660 578 618

Within what interval is there a 95% probability that the true population mean lies (assuming that the 10 observations have been sampled randomly from a normally distributed population)?

In a subsequent experiment, 12 subjects were randomly assigned to two groups. One group was given a caffeine tablet (condition A) while the other group was given a placebo — a 'sugar pill' with no physiological effect (condition B). Reaction times were then taken for subjects in both groups on the 'positive affect' versus 'negative affect' face discrimination test. These are given below.

	Reaction time score (msec)					
Condition A:	643	497	567	521	596	507
Condition B:	586	601	547	630	654	593

Is there a significant difference between the two groups?

Q3 (2002, Paper 2).

Answer **one** of the following three questions on Experimental Design. Say what data you would collect and what statistical procedure(s) you would use.

(a) Young infants from about 12 months have been observed to look at their caregiver before they approach or reach out for an unfamiliar object. If their caregiver looks anxious, the infant will withdraw from the unfamiliar object, but they will approach if their caregiver looks happy. This phenomenon is called 'social referencing'. Some have argued it reflects the infant's new capacity to understand that their caregiver has mental states, which the infant infers from the adult's facial expression. Design an experiment to assess this claim against alternative explanations for 'social referencing'.

(b) Design an experiment to determine whether the left or the right ear is more accurate in recognising words presented, one to each ear, simultaneously. What particular problems does such an experiment encounter?

(c) Suppose you are interested in determining the mechanisms that are responsible for retroactive and proactive interference. Design an experiment that might help elucidate these mechanisms.

Q4 (2002, Paper 1).

The results below were obtained in a recent practical class on mental rotation. The subject was asked to indicate as quickly as possible whether a letter was presented in its normal form or as a mirror-image. The letter was presented in different orientations on different trials. The first row of the table shows the number of degrees by which the letter was rotated from the upright position. The second row shows the corresponding mean reaction time for those trials in which the target was presented in its normal form. The final row shows the average error rate for each orientation.

Rotation (deg)	0	45	90	135	180	225	270	315
RT (msecs)	518	563	638	781	896	738	625	552
Error rate (%)	0.87	0.84	1.47	2.44	4.20	2.29	1.33	0.53

A standard theory holds that the subject performs a 'mental rotation' of the target before judging whether it is in its normal form. The transformation is thought to be carried out over the most direct route. On the assumption that this theory is correct, estimate the rate of 'mental rotation' from the data. What is your best estimate of the time occupied by the remaining components of the reaction time?

Is there a significant relationship between reaction time and error rate?

Q5 (2001, Paper 2).

Answer **one** of the following three questions on Experimental Design.

(1) Subjects are able to adapt to the displacement of the visual field produced by a prism worn over one eye. Design a series of experiments to demonstrate this effect and to investigate what subjects learn during adaptation.

(2) Some words in English also happen to be words in another language. For example, the word "*gift*" means *poison* in German, whereas the word "*four*" means *oven* in French. Design an experiment to investigate:

(a) whether bilingual speakers automatically access meaning in both languages when they read a word like "*gift*", and

(b) whether it makes a difference if the words in the two languages have the same phonology as well as the same spelling.

(Note: You do *not* need to display any knowledge of a second language or use real words as examples.)

(3) Design an experiment to determine whether a therapy that is aimed at reducing expressed emotion in the families of individuals with schizophrenia has an effect on relapse rate.

Q6 (2001, Paper 1).

In an incidental memory experiment, 10 subjects were presented with a series of preference judgement trials. On each trial, the subjects were asked to rate a picture for attractiveness. In two subsequent tasks, the subjects were tested first for their recall, and then for their recognition, of the fifty pictures used in the preference task. The number of pictures correctly recalled and recognised by each subject is given below:

Subject	Recalled	Recognised
1	19	12
2	27	38
3	24	34
4	40	47
5	29	39
6	50	50
7	17	17
8	25	43
9	30	31
10	38	35

Determine whether recognition performance is better than recall performance using an appropriate statistical test.

Construct a scatter plot of the number of pictures recognised against the number recalled. Did those subjects who recalled more pictures also recognise more of them?

Plot on your graph the line that best predicts recognition performance from recall performance.

Q7 (2000, Paper 2).

Answer **one** of the following three questions on Experimental Design.

(1) Design a research project to investigate the relative importance of different depth cues in determining size constancy.

(2) It has been shown that babies of 8 to 9 months can show "conditioned joint attention". The experimenter and baby face one another and then the experimenter turns his/her head to look at a movable toy either to the left or the right of the baby. If the baby turns and looks in the same direction, the toy is activated, thus acting as a reinforcer. Design an experiment to assess the kind of learning that underpins this behaviour.

(3) A pharmaceutical company has developed a new drug for alleviating anxiety. However, they are concerned that this drug may also have effects on working memory, and therefore they wish to assess the effects of the drug on this form of memory using an animal model before conducting trials with human volunteers. Design an experiment to assess this question using rats as subjects.

Q8 (2003, Paper 2).

Answer **one** of the following three questions on Experimental Design. State what data you would collect and what statistical procedure(s) you would use, and give the reasons for your choices.

(1) Design an experiment to demonstrate blocking in humans. Indicate how you would investigate the processes responsible for the effect in further experiments.

(2) It has been claimed that aspirin adversely affects the operation of the active mechanism in the cochlea. Design an experiment to test this claim.

(3) Design an experiment to investigate whether people who are blind perform a mental imagery task. Be sure to choose a task that requires visual mental imagery and cannot be performed using semantic knowledge.