7.10 Skills Focus: Selecting, Implementing, and Communicating Inference Procedures

Name: _____ Class: _____ Date: _____ **Total: 18 marks**

KEY WORDS inference procedure • categorical • quantitative • paired • two-sample • significance test

Objective

Build the skills to answer exam questions on **selecting an inference procedure** for proportions and means.

You must be able to:

- decide whether a question is about a **proportion** or a **mean**
- tell one-sample, **two-sample** and **paired** situations apart
- choose between a confidence interval and a significance test

1 Key knowledge and worked examples

■ Which procedure?

question	procedure
categorical variable, one group	one-sample z interval or test for p
categorical variable, two groups	two-sample z interval or test for $p_1 - p_2$
quantitative variable, one group	one-sample t interval or test for μ
quantitative variable, two independent groups	two-sample t interval or test for $\mu_1 - \mu_2$
quantitative variable, paired data	paired t interval or test for μ_{diff}
estimate or decide	"how large / estimate": interval; "is there evidence that …": test

Answer shapes: name the procedure in full, for example "two-sample t test for $\mu_1 - \mu_2$", and give the reason.

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2 Practice

2.1 A researcher asks a random sample of 500 adults whether they own an electric car, to estimate the proportion who do. Name the procedure. [2]



2.2 A doctor measures the blood pressure of 20 patients before and after a new medicine, to see whether it lowers blood pressure. Name the procedure. [2]

patient	before	after
1	148	139
2	152	150
⋮	⋮	⋮

2.3 A study compares the mean weekly screen time of random samples of 60 boys and 60 girls. Name the procedure. [2]

60 boys 60 girls

3 Exam-style questions

3.1 Name the inference procedure for each study.

(a) Study P: compare the proportions of drivers who always wear a seatbelt in two cities. [2]

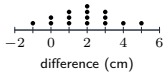
P: drivers in two cities seatbelt: yes or no? Q: 40 runners race time (minutes)

(b) Study Q: estimate the mean race time of all the runners. [2]

3.2 A coach wants to know whether a stretching routine improves jump height. Each of 15 athletes jumps once without stretching and once after stretching, in a random order.

(a) Name the procedure. [2]

athlete	without	with
1	42	45
2	38	39
⋮	⋮	⋮



(b) State the hypotheses. [2]

(c) State the conditions that must be checked. [2]

(d) Explain why a two-sample t test would be the wrong choice. [2]

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Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

a one-sample z interval for a proportion; one group, a yes/no (categorical) variable, and the aim is to estimate

2.2

a paired t test for the mean difference; two measurements on the same patients (quantitative), and the aim is to decide

2.3

a two-sample t procedure for $\mu_1 - \mu_2$; two independent groups and a quantitative variable

3.1

(a) a two-sample z test (or interval) for $p_1 - p_2$; two groups and a categorical variable

(b) a one-sample t interval for μ; one group, a quantitative variable, and the aim is to estimate

3.2

(a) a paired t test for the mean difference; each athlete gives two jumps

(b) $H_0 : \mu_{\text{diff}} = 0$, $H_a : \mu_{\text{diff}} > 0$; μ_{diff} = the true mean of (with stretching minus without) jump heights for athletes like these

(c) random order of the two jumps for each athlete; $n = 15 < 30$, so the dotplot of the 15 differences must show no strong skew and no outliers

(d) the two sets of jumps are not independent: they come from the same athletes; a paired test removes the differences between athletes, so it is the right test and more powerful

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