

ACCA7022 – Statistical Testing Activity

Scenario 1 – Revision Class vs Test Scores

Variables:

Group → Categorical (Yes / No)

Score → Numerical

Appropriate Test: Independent Samples t-test

Justification:

The test compares the means of two independent groups (students who attended the revision class vs those who did not).

R Code:

```
scores <- data.frame(  
  group = rep(c("yes", "no"), each = 15),  
  score = c(85,80,78,83,81,79,84,82,87,83,85,88,80,86,84,  
            72,70,69,73,75,68,71,74,70,69,72,71,68,73,70)  
)
```

```
t.test(score ~ group, data = scores)
```

Interpretation:

Students who attended the revision class have higher average scores.

If $p < 0.05$, the revision class significantly improves performance.

Scenario 2 – Blood Pressure Before and After Diet

Variables:

Before BP → Numerical

After BP → Numerical

Appropriate Test: Paired t-test

Justification:

The same participants are measured before and after the diet, making the observations dependent.

R Code:

```
bp <- data.frame(  
  before = c(140,145,138,142,141,139,144,143,140,137,  
             141,142,139,143,138,140,144,146,139,141),  
  after = c(130,132,129,134,133,130,131,132,129,128,  
            131,132,130,133,129,130,134,135,130,132)  
)  
  
t.test(bp$before, bp$after, paired = TRUE)
```

Interpretation:

If $p < 0.05$, the diet significantly reduces blood pressure.

Scenario 3 – Heart Rate Between Two Supplements

Variables:

Group → Categorical (A / B)

BPM → Numerical

Appropriate Test: Independent Samples t-test

Justification:

We compare the mean heart rate between two independent groups.

R Code:

```
heart_data <- data.frame(  
  group = rep(c("A","B"), each = 20),  
  bpm = c(72,70,71,73,74,72,70,72,73,71,  
          70,72,74,72,71,73,72,72,73,71,  
          72,72,73,71,72,70,72,74,73,71,  
          70,71,72,73,72,70,72,71,73,72)  
)
```

```
t.test(bpm ~ group, data = heart_data)
```

Interpretation:

If $p > 0.05$, there is no significant difference between the supplements.

Scenario 4 – Sleep Duration Across Age Groups

Variables:

Age Group → Categorical (3 groups)

Sleep Hours → Numerical

Appropriate Test: One-Way ANOVA

Justification:

ANOVA compares the means of three or more groups.

R Code:

```
sleep_data <- data.frame(  
  age_group = rep(c("young", "middle", "senior"), each = 15),  
  hours = c(  
    8.5, 8.2, 8.1, 7.8, 8.0, 8.3, 7.9, 8.4, 8.2, 8.1, 8.0, 7.7, 7.9, 8.3, 8.0,  
    6.5, 6.3, 6.6, 6.4, 6.2, 6.5, 6.6, 6.4, 6.3, 6.1, 6.4, 6.2, 6.3, 6.5, 6.4,  
    5.8, 5.7, 5.9, 5.6, 5.5, 5.8, 5.7, 5.6, 5.9, 5.8, 5.6, 5.7, 5.8, 5.6, 5.7)  
  )
```

```
anova_model <- aov(hours ~ age_group, data = sleep_data)  
summary(anova_model)
```

Interpretation:

If $p < 0.05$, at least one age group differs in average sleep duration.