Classroom to Campus: Math and Stats Challenge

Grade 12 – MCT4C

Topic A: Exponential Functions
Estimating Beverage Temperature Over Time

You're at a café with friends, enjoying a freshly brewed cup of coffee. You want to determine how long it will take for the coffee to cool to a drinkable temperature of 50°C.

The temperature of the coffee over time can be modelled by:

$$T = 71.25(0.96)^t + 19.50$$

Where T is temperature in degrees Celsius, and t is time in minutes.

a) Sketch the graph of the temperature function and describe its key features (e.g., intercepts, asymptotes, long-term behavior).

b) Determine the initial temperature of the coffee. *(Round your final answer to two decimal places.)*

c) Determine the time (in minutes) it will take for the coffee to cool to 50°C. *(Round your final answer to two decimal places.)*

d) If you prefer your coffee at 40°C, how much additional time (in minutes) will it take to cool from 50°C to 40°C? *(Round your final answer to two decimal places.)*

e) Determine the room temperature (in °C). *(Round your final answer to two decimal places.)*

f) If the coffee were placed in a refrigerator at 5°C how would the cooling rate change? Discuss the effect of a lower ambient temperature on the cooling process.

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