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Cambridge Assessment International Education

Cambridge O Level

COMPUTER SCIENCE **2210/21**

Paper 2 Problem-solving and Programming **May/June 2021**

PRE-RELEASE MATERIAL



No additional materials are needed.

This material should be given to the relevant teachers and candidates as soon as it has been received at the centre.

INSTRUCTIONS

- You should use this material in preparation for the examination.
- You should attempt the practical programming tasks using your chosen high-level, procedural programming language.

This document has **2** pages.

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Your preparation for the examination should include attempting the following practical tasks by **writing and testing a program or programs**.

A system is required to record and count votes for candidates in school council elections. The voting system will allow for one representative to be elected from a tutor group. The school has between 28 and 35 students in each tutor group, five year groups named Year 7 to Year 11, and there are six tutor groups in each year group. Tutor group names are their year group followed by a single letter e.g. 7A, 7B, etc.

All students are allowed to vote in the system. Each student may only vote once for a representative from their tutor group in the election.

Write and test a program or programs for the voting system.
- Your program or programs must include appropriate prompts for the entry of data; data must be validated on entry.
- Error messages and other output need to be set out clearly and understandably.
- All variables, constants and other identifiers must have meaningful names.

You will need to complete these **three** tasks. Each task must be fully tested.

Task 1 – Setting up the voting system to allow a tutor group to elect a representative.
Write a program to:
- allow the tutor to enter the name of the tutor group
- allow the tutor to enter the number of students in the tutor group
- allow the tutor to enter the number of candidates in the election; maximum of four candidates
- allow the tutor to enter the names of the candidates and store them in a suitable data structure
- allow each student to input their vote or to abstain
- count the votes for each candidate and student abstentions.

When all students have voted, display the name of the tutor group, the votes for each candidate and the name of the candidate who has won the election. If there is a tie for first place, display all candidates with the equal highest number of votes.

Task 2 – Checking that students only vote once.
Each student is given a unique voter number by their teacher.
Extend **Task 1** to achieve the following:
- Allow students to enter their unique voter number before casting their vote.
- Check whether the student has already voted:
  - if so, supply a suitable message and do **not** allow them to vote.
  - if not, store the unique voter number, but **not** their vote, in a suitable data structure, and add their vote to the relevant candidate count or abstention.

Task 3 – Showing statistics and dealing with a tie.
Extend **Task 2** to achieve the following:
- Calculate the percentage of the votes that each candidate received from the number of votes cast, excluding abstentions.
- Display the name of each candidate, the number of votes and the percentage of votes they received from the number of votes cast, excluding abstentions.
- Display the total number of votes cast in the election and the number of abstentions.
- In the event of a tie, allow the election to be immediately run again, with only the tied candidates as candidates, and all the students from the tutor group voting again.

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