

Competitor Name _____

Work Station No _____



WORLD SKILLS SINGAPORE 2020

INFORMATION TECHNOLOGY SOFTWARE SOLUTIONS FOR BUSINESS

DAY 1 SESSION 2

THU 1 OCTOBER 2020

INSTRUCTIONS

NIL

Opening Narrative

The Worldskills ASEAN Singapore 2020 brings together competitors from all ASEAN member countries to showcase their skills in 22 skill areas, ranging from automobile Technology, to Beauty Therapy, to cooking and various IT skill areas. Worldskills ASEAN Singapore 2020 will be held from 25 July 2020 to 30 July 2020 in Singapore, and will see close to 300 top youth talents from 10 ASEAN member countries.

Each country typically organizes its own national-level skills competition to select the best of the best to represent the country in Worldskills ASEAN. With so many competitors and skill areas, each with vastly different evaluation criteria, managing the training of a national-level competition is indeed a major challenge.

To help countries to systematically nurture their talents and objectively select the best competitors to advance to Worldskills ASEAN, which in-turn ensures that only the top ones will represent their respective countries in the WorldSkills Competitions, a new **Training Management System (TMS)** that is to be adopted by all national-level skills competitions will be developed. Your consulting agency CWK Consultants has been engaged to design and implement the new TMS.

In the following questions, you will design and implement the **Scores Management and Competitors Selection Subsystem (SMACS)** of the TMS, which consists of two functional modules altogether.

Question 1

In this question, you will be working on **TWO** tasks for the database to support SMACS.

Task 1.1 – Conceptualize and design a relational database for SMACS that fulfills the following business requirements:

- Each national-level competition is divided into multiple skills.
- Each skill consists of one or more subjects.
- Each skill can consist of different number of subjects, and you may **NOT** assume that there is a predefined upper limit.
- A subject represents a domain, area or sub-skill that will be examined during the competition, and for which a competitor will be awarded a numeric score known as the subject score.
- The subject scores of a competitor will be combined into a total score using some formulas, and the total score will be used as the objective criterion for selecting competitors for advancement to the next higher-level competition, e.g., from national-level to ASEAN-level.
- The maximum possible score for each subject can be different, and you may **NOT** assume that there is a common predefined upper limit.
- A competitor refers to an individual participating in exactly one skill in the competition.
- The following attributes for a competitor must be stored in the database:
 - Country
 - City
 - Surname
 - GivenName
 - Gender
- The actual data for countries and cities are to be stored separately from the competitor data in a single table.

Task 1.2 – Create the required database and database tables and prepopulate the complete actual database that is provided, removing all duplicate records.

Question 2

In this question, you will be working on **THREE** tasks for the **Scores Management Module**.

Task 2.1 – Design and create a data entry form for an administrator to perform Create, Retrieve, Update and Delete (CRUD) operations on skills and the associated subject(s) of each skill.

Task 2.2 – Design and create a data entry form for an administrator to enroll and de-enroll one or more competitors in a skill.

Task 2.3 – Design and create a data entry form for an administrator to perform Create, Retrieve, Update and Delete (CRUD) operations on subject scores for one or more competitors for a particular skill. Input data validation check is to be performed to ensure that the administrator does not input a subject score that exceeds the maximum possible score of that particular subject.

Question 3

In this question, you will be working on **TWO** tasks for the **Competitors Selection Module**.

Task 3.1 – Design and create a data dashboard that allows an administrator to calculate and view the total score for all competitors of a particular skill, and thereafter to select competitor(s) for advancement to the next higher-level competition.

Before calculating total score, the subject scores for each subject should be rebased to a maximum possible score of 100 using the formula $x'_i = \frac{x_i \times 100}{h_i}$ where x'_i is the competitor's rebased score for subject i , x_i is the competitor's original score for subject i , and h_i is the highest possible score for subject i .

The dashboard should provide three different options of calculating total score for a skill that consists of n subjects. Note that competitor's raw score for a subject always refers to the score after rebasing, i.e., x'_i .

- **Simple average model:**
 - All subjects are even weighted.
 - Total score is calculated as $T = \frac{\sum_{i=1}^n x_i}{n}$ where x_i is the competitor's raw score for subject i .
- **Weighted average model:**
 - All subjects are weighted by their respective weight w_i such that $\sum_{i=1}^n w_i = 1.0$.
 - The administrator should be able to specify the required weights.
 - Total score is calculated as $T = \frac{\sum_{i=1}^n w_i x_i}{n}$ where w_i is the weight of subject i and x_i is the competitor's raw score for subject i .
- **T-score model:**
 - Individual subject T-score is computed using the formulae $T_i = 50 + 10 \left(\frac{x_i - m_i}{s_i} \right)$, where T_i is the competitor's T-score for subject i , x_i is the competitor's raw score for subject i , m_i is the average or mean score of subject i for all competitors, and s_i is the spread of the scores for subject i (i.e., the standard deviation, see Appendix A for more information).
 - The total score of each competitor is the aggregated T-score, which is calculated by summing all the subject T-scores, i.e., $T_A = \sum_{i=1}^n T_i$

An administrator should be able to sort the competitors for a particular skill in ascending or descending order of the total score. Thereafter, an administrator should be able to mark one or more competitors for advancement to the next higher-level competition. A sample screen design is as below.

Training Management System Dashboard

Skill: Trade 9 - ITSSB

Subject: Subject1

Max. Score: 100

Total Score Calculation: Simple Average Model (SA
Weighted Average Model
T-Score Model (TSM)

	Student ID	Given Name	Surname	Subject1	
	S12345	James	James	60	68.125
				
				
				

Task 3.2 – Design and create a data dashboard that allows an administrator to view a list of competitors for a particular skill that have been selected for advancement to the next higher-level competition. Sample screen design is as follows

Training Management System Dashboard

Student ID	Given Name	Surname	Subject1	Quartile	Subject2	Quartile
S12345	James	James	60	1	70	2	
.....							
.....							
.....							
.....							

In this data dashboard, the administrator should be able to see the subject scores (after rebasing to a maximum possible score of 100) for each competitor together with the corresponding quartile in which the competitor is placed among all competitors for each of the subject score.

For a skill that consists of n subjects, each row of competitor record should therefore show n pairs of subject score and the corresponding quarter. For example, if $n = 4$:

- (x'_1, q_1)
- (x'_2, q_2)
- (x'_3, q_3)
- (x'_4, q_4)

where q_i is the quartile for the competitor's rebased score for subject i .

For avoidance of doubts, quartiles are defined as:

- Quartile 1 – 25th percentile
- Quartile 2 – 50th percentile, which is also known as the median
- Quartile 3 – 75th percentile

For example, suppose there are 100 competitors for a skill and if a competitor's rebased score for a particular subject is in Quartile 1, this means that out of 100 competitors, 75 competitors will have a score higher than this competitor. But, if the competitor is in Quartile 3, then only 25 competitors will have a score higher than this competitor.

The dashboard should highlight selected competitors who have obtained scores in Quartile 1 for one or more subjects so that additional training can be provided to them to help them better prepare for the next higher-level competition.

Appendix 1

The sample standard deviation can be calculated using the formula $s = \sqrt{\frac{\sum_{i=1}^N (x_i - \bar{x})^2}{N}}$ where:

- s is the sample standard deviation of the competitors' scores for a particular subject of a particular skill.
- x_i is the score of a particular competitor i for that subject.
- \bar{x} is the average or mean of the competitors' scores for that subject.
- N is the total number of competitors in that skill.

The following is a worked example on calculating sample standard deviation:

- Given that there are 10 bushes and the number of flowers in each bush is 9, 2, 5, 4, 12, 7, 8, 11, 9, 3
- The average or mean number of flowers is 7
- The sample standard deviation of the number of flowers is 3.22490