

Institute of Systems Science
National University of Singapore

**MASTER OF TECHNOLOGY IN
SOFTWARE ENGINEERING, KNOWLEDGE ENGINEERING &
ENTERPRISE BUSINESS ANALYTICS**

Sample Entrance Test

Introduction

The Institute of Systems Science (ISS) of the National University of Singapore (NUS) annually recruits candidates of the Master of Technology (MTech) degrees in Software Engineering (SE), Knowledge Engineering (KE) and Enterprise Business Analytics (EBAC). A significant method used to assess applicants is their performance in an entrance test. It takes one hour to compete, and consists of **fifty multiple-choice questions**. It aims to validate the academic capability of applicants in the context of the degree they have applied for.

The test consists of three sections as follows:

- A. **General Capabilities.** The **twenty questions** in this section focus on the following:
- Assessing the mathematical capability of the candidate. In particular, their ability to understand and solve problems in a simple form using mathematical symbols.
 - Assessing the candidate's reasoning/logical capability and English language understanding skills:
 - Detecting patterns and sequences in data and making extrapolations.
 - Understanding complex processes and creating simple models or logical expressions that represent these processes.
 - Understanding and using technical English.
- B. **Information Technology (IT) Capabilities.** The **thirty questions** in this section focus on the basic IT knowledge of the candidate in the following areas:
- Software project management.
 - Programming.
 - Software development.
 - IT infrastructure.
- C. **Business Analytics Capabilities.** The **thirty questions** in this section focus on the basic statistical knowledge:
- Interpreting basic data visualization diagrams, such as bar-charts, scatter-plots and box-and-whisker plots.

- Calculating and understanding basic representative statistics.
- Identifying trends in data and estimating values based on trends.
- Calculating simple probabilities.
- Calculation permutations and combinations.

The SE and KE candidates will be required to complete sections A and B of the test, where as EBAC candidates will be required to complete sections A and C.

After candidates have submitted their application forms, ISS will assess which candidates need to take the test and will make arrangements for it to be conducted at a location convenient to each candidate. The test results will be assessed by ISS to determine the suitability of each candidate for the MTech course. Candidates that pass the test will be considered for interview. **Please note that ISS will not communicate the results of the entrance test to any candidate.**

To aid preparation for the test, the following sections provide some sample questions:

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SECTION A : General Capabilities

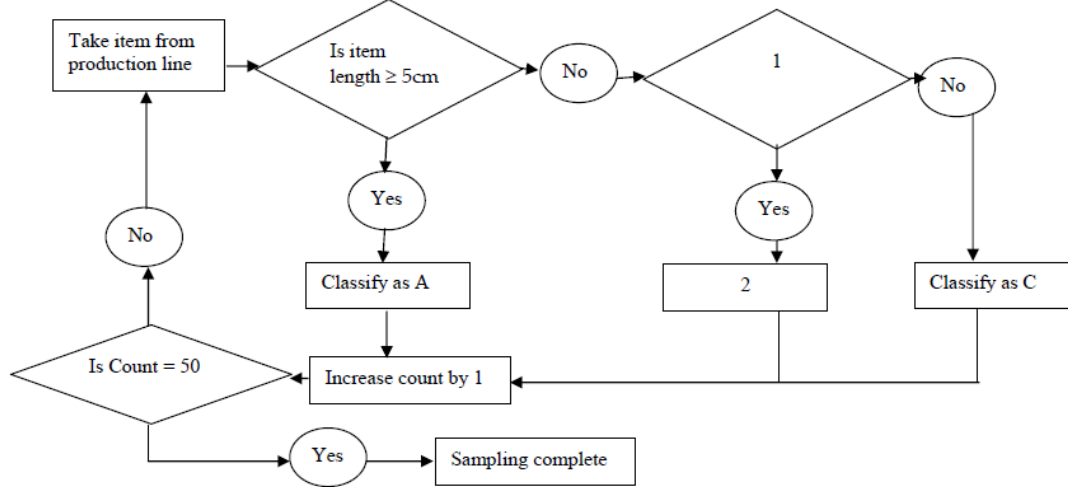
1. The relation between distance (**d**), time (**t**) and average speed (**s**) is expressed as $d = s \cdot t$. If both **s** and **t** are positive, **s** is constant and **t** decreases, then which **one** of the following is **true**?:
 - A. **d** decreases only if **s** is greater than **t**.
 - B. **d** increases only if **s** is greater than **t**.
 - C. There is no change in **d**.
 - D. **d** increases regardless of the size of **s** and **t**.
 - E. **d** decreases regardless of the size of **s** and **t**.
2. Suppose a company places F dollars each month in an employee's CPF account. This amount F is determined by multiplying the employee's salary S by a fixed rate X%. Suppose in month 1 the employee earns S, in month 2 he also earns S, but in month 3 his salary is increased by Z%. How much will be paid into his CPF account over these three months?:
 - A. $3 \cdot S \cdot X / 100$
 - B. $3 \cdot Z \cdot X \cdot S / 100$
 - C. $3 \cdot Z \cdot X \cdot S / 10000$
 - D. $(3 + Z / 100) \cdot S \cdot X / 100$
 - E. $(2 + Z / 100) \cdot S \cdot X / 100$
3. Which of the following words is closest in meaning to the word **Bias**?:
 - A. Direction.
 - B. Compulsion.
 - C. Pre-disposition.
 - D. Impartiality.
 - E. Mandatory.
4. What is the next letter in the following sequence?:

C, A, K, R, M V, M, V, K, R, _

 - A. A.
 - B. B.
 - C. C.
 - D. M.
 - E. R.

The diagram below represents the processing of a set of items from a production line. Fifty items must be taken from the production line and then classed as:

- **Class A:** Item length $\geq 5\text{cm}$
- **Class B:** $5\text{cm} > \text{Item length} \geq 4\text{cm}$
- **Class C:** Item length $< 4\text{cm}$



Answer Questions 5 and 6 below regarding this process:

- What would be the condition in **box 1**?
 - Is item length $\geq 5\text{cm}$.
 - Is item length $\leq 5\text{cm}$.
 - Is item length $< 4\text{cm}$.
 - Is item length $\geq 4\text{cm}$.
 - Is item length $> 5\text{cm}$.
- What would be the statement in **box 2**?
 - Classify as B.
 - Classify as C.
 - Classify as A.
 - Take item from production line.
 - Classify as B or C.

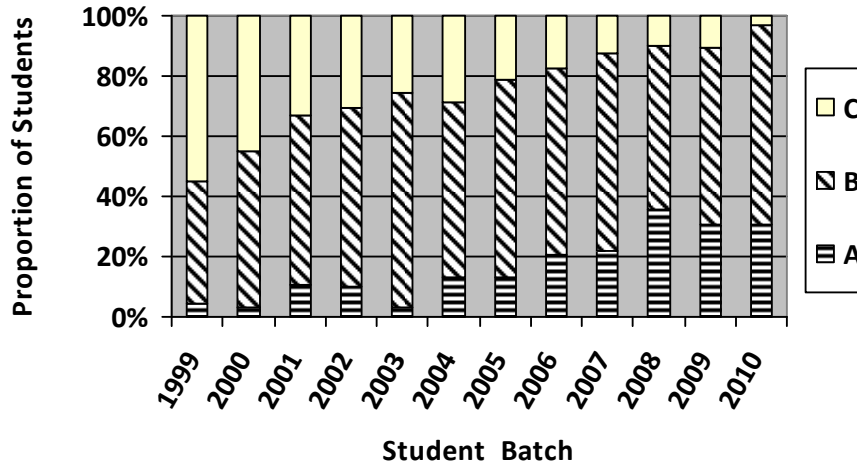
SECTION B : Information Technology Capabilities

7. Risk transfer is practiced when a development of a complex and difficult software component is subcontracted to an external software development organization. Which of the below factors do you believe is most important in determining if the risk transfer will be successful?:
- A. The external software development organization is contractually committed to deliver the difficult software component.
 - B. The external software development organization has ISO9001-2000 certification.
 - C. The external software development organization has sufficient funds to compensate you if they cannot deliver the software component.
 - D. The external software development organization has completed similar projects in the past.
 - E. The external software development organization has assured you that it can successively complete this work.
8. Which of the following may be a valid reason for re-estimating the project cost and schedule during the execution of a project?:
- A. The on-going collection of metrics within the project that will help determine the actual productivity of the project.
 - B. Implementing agreed software changes.
 - C. Identifying defects within the software that will need to be fixed pre-release.
 - D. Staff taking unanticipated vacations or sick leave.
 - E. All of the above are valid reasons for re-estimating.
9. Which **one** of the following is a loop construct that will always be executed once?:
- A. for.
 - B. switch.
 - C. while.
 - D. do...while.
10. How many times will the following loop execute?:
- ```
for(j=1; j<=10; j=j-1)
{ }
```
- A. 1.
  - B. 10.
  - C. Never.
  - D. Forever.

11. A syntax error is signaled by which **one** of the following?:
- A. Compiler.
  - B. Linker.
  - C. Editor.
  - D. Run time system.
12. Which of the following best describes a network operating system?:
- A. Hardware needed for the operation of a network.
  - B. A configuration of devices to support network operation.
  - C. Software used to protect microcomputers on a network from virus infection.
  - D. Software that controls network communications and the sharing of resources.
13. Which one of the following statements is true?:
- A. Serial and parallel transmissions differ in that in one case the bits are on separate wires where as in the other all are on one wire.
  - B. Serial and parallel transmissions differ in how many bits are transferred per character.
  - C. Serial and parallel transmissions are widely used in synchronous and asynchronous systems respectively.
14. Which of the following are **true** about **Firewalls**?:
- A. Filters network traffic.
  - B. Can be either a hardware or software device.
  - C. Follows a set of rules.
  - D. Can be configured to drop packets.
15. A team has been engaged to design and develop software to control the manufacturing processes of a factory making spare parts for off-road vehicles. The team needs to understand and document the processes undertaken in the manufacture of the spare parts. Which documentation technique would be most appropriate?:
- A. A storyboard.
  - B. A data dictionary.
  - C. A system flowchart.
  - D. A data flow diagram.

## SECTION C : Business Analytics Capabilities

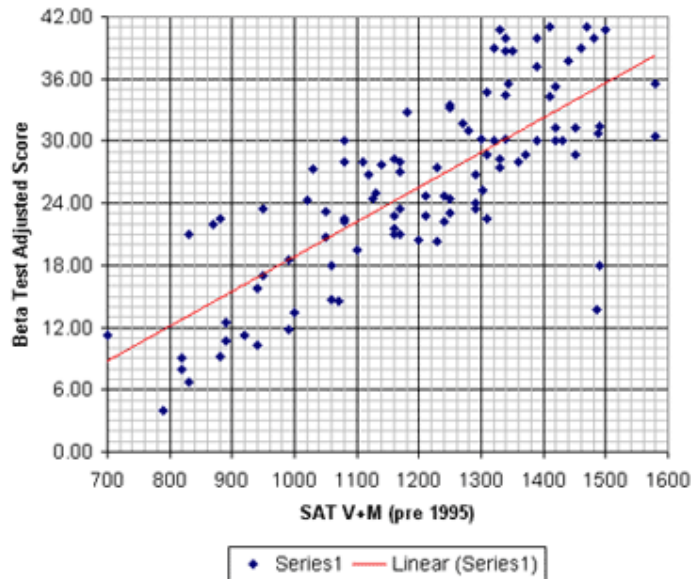
16. Consider the following **Bar-Chart** showing the proportion of students achieving A, B and C grades in their examinations for student batches in the period 1999 to 2010:



Which of the following statements are correct based on the information provided?:

- A. The total number of students is the same in each batch.
- B. Most students in 1999 achieved grade C.
- C. In 2010, most students achieved grade B.
- D. The number of students achieving grade A in 2008 is greater than the number of students achieving grade A in 2010.
- E. B and C.
- F. All of the above are correct.

17. The following **Scatter Plot** compares the Best Test adjusted score of US Army recruits with their SAT score:

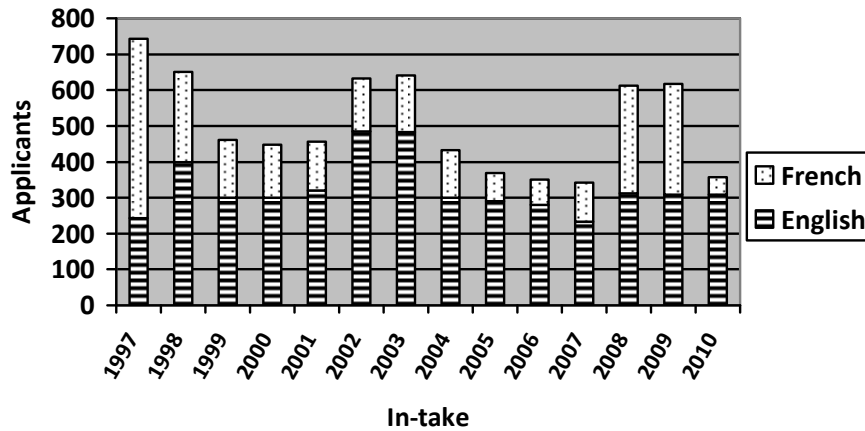


Based on these data points, what is the **most likely** Beta Test adjusted score of a recruit who scores 1200 on the SAT:

- A. Less than 6.
  - B. Between 6 and 18.
  - C. Between 18 and 24.
  - D. Between 24 and 30.
  - E. Greater than 30.
  - F. The data points do not indicate any relationship between Best Test adjusted scores and SAT scores making it impossible to be used for prediction.
18. The **mode** of a set of numbers is defined as to which **one** of the following?:
- A. The square root of the sum of the squares of the set of numbers.
  - B. The sum of the set of numbers divided by the number of numbers in the set.
  - C. The centre number in the set of numbers.
  - D. The most frequently repeated number in the set of numbers.
  - E. The smallest number in the set of numbers.
  - F. The largest number in the set of numbers.



19. Consider the following histogram of the number of students taking French and English courses in the years from 1997 to 2010:



Which **one** of the following **best** describes this distribution?

- A. Normally distributed.
  - B. Positively Skewed.
  - C. Negatively Skewed.
  - D. Bimodal.
  - E. Uniform.
  - F. Multimodal.
20. A fair dice has six sides – labeled with the numbers 1, 2, 3, 4, 5 and 6. If it is tossed in the air, what is the probability that it will land on the ground with the side showing 1 facing upwards?:
- A. 0.167.
  - B. 0.333.
  - C. 0.5.
  - D. 0.666.
  - E. 0.833.
  - F. 1.0.

21. A bag contains 5 blue balls, 5 red balls, 5 green balls and 5 yellow balls. What is the probability of drawing a yellow ball from the bag?:
- A. 0.3.
  - B. 0.75.
  - C. 0.25.
  - D. 0.4.
  - E. 0.5.
  - F. 0.1.
22. There are five employees available to work on project, but only three employees are required to carry out the required activities. In how many ways can the three employees be selected from the five that are available?:
- A. 10.
  - B. 30.
  - C. 60.
  - D. 80.
  - E. 100.
  - F. 120.

**Consider the following data set contain 27 numbers:**

**4, 24, 6, 18, 4, 9, 30, 41, 35, 66, 2, 10, 18, 16, 2, 99, 83, 8, 17, 65, 77, 11, 15, 60, 81, 4, 8**

**Answer questions 23-24 concerning this data set:**

23. What is the **mean value** of the set?:

- A. 26.15.
- B. 27.16.
- C. 30.11.
- D. 29.88.
- E. 3075.
- F. 31.0

24. What is the **median value** of the set?:

- A. 6.
- B. 8.
- C. 17.
- D. 21.
- E. 22.
- F. 25.