April 2014

IT Passport Examination

Questions must be answered in accordance with the following:

Question Nos.	**Q1 – Q100**
Question Selection	**All questions are compulsory.**
Examination Time	**9:30 – 12:15 (165 minutes)**

Instructions:

1. Use a pencil. If you need to change an answer, erase your previous answer completely and neatly. Wipe away any eraser debris.

2. Mark your examinee information and your answers in accordance with the instructions below. Your answer will not be graded if you do not mark properly. Do not mark nor write on the answer sheet outside of the prescribed places.

   (1) **Examinee Number**
   Write your examinee number in the space provided, and mark the appropriate space below each digit.

   (2) **Date of Birth**
   Write your date of birth (in numbers) exactly as it is printed on your examination admission card, and mark the appropriate space below each digit.

   (3) **Answers**
   Select one answer (a through d) for each question.
   Mark your answers as shown in the following sample question.

   [Sample Question]
   Q1. In which month is the spring IT Passport Examination conducted?

   a) March b) April c) May d) June

   Since the correct answer is "b)" (April), mark your answer sheet as follows:

   [Sample Answer]

Q1	ⓐ	●	ⓒ	ⓓ

Do not open the exam booklet until instructed to do so.
Inquiries about the exam questions will not be answered.

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Answer questions Q1 through Q34 concerning technology.

Q1. Which of the following is the decimal number that is equivalent to the hexadecimal number “A3”?

a) 103 b) 153 c) 163 d) 179

Q2. Which of the following is the logical operation that is equivalent to the truth table below?

Input *A*	Input *B*	Output
0	0	0
0	1	0
1	0	0
1	1	1

a) AND b) NOT c) OR d) XOR

Q3. Which of the following is a standard encoding system that is widely used for handling multilingual text and symbols around the world as a single character set?

a) ASCII b) EBCDIC
c) EUC d) Unicode

Q4. Which of the following is an appropriate combination of compression techniques that are used for still images, moving images, and audio?

	Still image	Moving image	Audio
a)	GIF	MPEG	MP3
b)	JPEG	MP3	GIF
c)	MP3	JPEG	GIF
d)	MPEG	GIF	MP3

Q5. In a queue, three elements 33, 27, and 12 are stored (i.e., enqueued) in this order. After another element 45 is enqueued to the queue, two elements are retrieved (i.e., dequeued). Which of the following is the second element to be dequeued?

a) 12 b) 27 c) 33 d) 45

Q6. Which of the following is an appropriate explanation of an algorithm that is used on a computer?

a) A generic term for artificial languages used to enable a computer to perform a series of operations
b) A processing procedure for enabling a computer to accomplish a specific purpose
c) Designing of buildings or industrial products with the assistance of a computer
d) Software for translating a program into a machine language that can be directly executed by a computer

Q7. Among the program control structures, which of the following is classified as a "while-type" loop structure?

a)

b)

c)

d)

Q8. Which of the following is an appropriate description concerning the Java language?

a) It is a general-purpose language developed mainly for business applications.
b) It is a language developed for scientific and engineering calculations.
c) It is a markup language used for describing Web pages.
d) It is an object-oriented language that provides platform-independent portability.

Q9. In a markup language with the purpose of displaying and printing a screen, it is possible to directly embed not only the body of a document but also various types of specifications, such as the structure and layout of the document, and also the font and size of the character. Which of the following is classified as such a markup language?

a) CASL b) HTML c) SQL d) URL

Q10. Which of the following is an appropriate combination of words that are inserted into blanks *A* and *B* in the description below concerning the execution sequence of instructions in a computer?

In a computer, the instructions are executed in the sequence shown below.

(1) Refer to the program counter.
(2) [*A*] the instruction.
(3) Set the program counter to the main memory address of the next instruction.
(4) [*B*] the instruction.
(5) Execute the process corresponding to the instruction.
(6) Return to (1).

	A	*B*
a)	Decode	Read
b)	Read	Decode
c)	Read	Write
d)	Write	Decode

Q11. Which of the following is the most appropriate explanation of a DVD drive that is used as an auxiliary storage device for a PC?

a) A laser beam is used for reading data, and magnetism is used for writing data.
b) It cannot be installed in a notebook PC because of its heat release and physical size.
c) It cannot read a CD-ROM disc because of the nature of the recording method.
d) Several types of media, such as DVD-R, DVD-RW, and DVD-RAM, can be used.

Q12. Which of the following is an appropriate description concerning a touch panel?

a) Operations are performed by using a pen-type or mouse-type device for specifying a position on the screen, and a flat-plate input device for detecting the position.
b) Operations of a mouse pointer on the screen or other functions are performed by tracing a flat-panel input device with a finger.
c) The movement of a finger is detected by a sensor on the surface, and operations are performed by rotating a component called a wheel that is similar to a disc.
d) There are some methods such as electronic or electrostatic techniques, and operations are performed through direct contact with the screen by using a finger.

Q13. In a client/server system, which of the following is the most appropriate system that manages both application software and data on the server side in a centralized manner and has only the minimum required functions on the client side?

a) Distributed processing system
b) Interactive processing system
c) Rich client system
d) Thin client system

Q14. Which of the following is an explanation of a dual system?

a) It is a computer system in which exactly the same processing is performed in two computers, and its reliability is assured by cross-checking the results.
b) It is a computer system that is composed of a primary system used usually and a secondary system kept on standby in preparation for a failure.
c) It is a distributed processing system in which the computers in a group connected via a network have an equivalent relationship.
d) It is a distributed processing system that provides a clear hierarchical relation to the computers in a group connected via a network.

Q15. The types of programs that are executed at the startup time of a PC are generally classified into three categories: BIOS, OS, and resident applications. Which of the following is the list that is arranged in the sequence of the execution of the programs?

a) BIOS → OS → Resident applications
b) OS → BIOS → Resident applications
c) OS → Resident applications → BIOS
d) Resident applications → BIOS → OS

Q16. Which of the following is an appropriate explanation of plug-in software?

a) Plug-in software bridges differences between OSs, and provides more advanced and specific functions than the OSs.
b) Plug-in software does not work as a standalone program, but can be integrated into applications, such as a Web browser, to enhance their functions.
c) Plug-in software is often included in applications such as a spreadsheet, and allows the users to record and replay the series of operations performed.
d) Plug-in software is provided to replace part of a program for the purpose of modifying functions or fixing bugs.

Q17. Which of the following is an appropriate explanation of multitasking?

a) Several computers connected via a network build a system that works together to achieve a high-performance system.
b) Several processor cores composed of arithmetic circuits and other control circuits are implemented in a single CPU.
c) The CPU processing time is allocated to several processes in a sequence so that the processes can be executed concurrently.
d) The same processing is performed for multiple data items by executing a single instruction.

Q18. Which of the following is the appropriate combination of the terms and explanations *A* through *D* concerning the file system of a hierarchical directory structure?

A: It is the directory at the topmost level of the hierarchy.
B: It shows all paths starting from the topmost directory of the hierarchy down to the target file or directory according to the directory structure.
C: It is the directory that is currently being manipulated.
D: It shows all paths starting from the directory that is currently manipulated through the target file or directory according to the directory structure.

	Current directory	Absolute path	Root directory
a)	*A*	*B*	*C*
b)	*A*	*D*	*C*
c)	*C*	*B*	*A*
d)	*C*	*D*	*A*

Q19. Which of the following is an appropriate description concerning the characteristics of an interpreter-based program?

a) It can be used for batch processing, but cannot be used for interactive processing or real-time processing.
b) It generally runs faster than a compiled program, and is suitable for a large-scale program.
c) It takes a long runtime because the program is translated and executed on a line-by-line basis.
d) The generated object program has a tendency to be larger than a program generated by a compiler.

Q20. Which of the following is the reason why it is better to store a file in contiguous area on a hard disk?

a) Because of less movement of the magnetic head, it takes less time to read data continuously.
b) Since fewer areas are needed to store the management information of files, the user can use more areas.
c) Since no area where data is not stored is required in the hard disk, all the areas can be used.
d) The number of read errors can be decreased in comparison with a file that is stored in fragmented areas.

Q21. Which of the following is an appropriate description concerning a pull-down menu that is used as a user interface on a PC?

a) A list of the options is displayed when a title is clicked, and then an item from the list can be selected.
b) All the necessary items can be selected from among the several options displayed on the screen.
c) During keyboard input, subsequent input is anticipated and displayed on the basis of the past input history.
d) It can be used for displaying error messages or entering the small amount of data on the screen.

Q22. Which of the following is a technique that can provide accessible links between information items represented in text, still images, video, voice, music, or other forms so that related information can be easily reached by jumping from one place to another in documents or Web pages?

a) Cyberspace
b) Groupware
c) GUI
d) Hypermedia

Q23. Employee information is managed by creating two tables "Emp" for employees and "Dept" for Departments in a relational database. Which of the following is an appropriate combination of the primary key(s) and foreign key(s) that are set in the "Emp" table and the "Dept" table as needed? Here, any employee always belongs to a department that exists in the "Dept" table, and when the employee data is added or updated, the referential constraints are used to ensure consistency.

Emp

Emp_code	Emp_name	Year_joined	Date_of_birth	Dept_code

Dept

Dept_code	Dept_name

	Primary key	Foreign key
a)	Dept_code of the "Dept" table	Emp_code of the "Emp" table Dept_code of the "Emp" table
b)	Dept_code of the "Emp" table	Emp_code of the "Emp" table Dept_code of the "Dept" table
c)	Emp_code of the "Emp" table, Dept_code of the "Dept" table	Dept_code of the "Emp" table
d)	Emp_code of the "Emp" table, Dept_code of the "Dept" table	None

Q24. There are three tables “Supplier” table, “Purchase_details” table, and “Product” table that are managed by using a relational database. When a new product is purchased from a new supplier, which of the following is the appropriate sequence of inserting data into the tables? Here, an underline indicates a primary key, and a dotted underline indicates a foreign key. An arrow (→) in the answer group represents the sequence of the tables into which data is inserted.

Supplier

Supplier_code	Supplier_name

Purchase_details

Slip_number	Suffix_number	Date	Product_code	Quantity

Product

Product_code	Product_name	Supplier_code	Unit_price

a) “Product” table → “Supplier” table → “Purchase_details” table
b) “Purchase_details” table → “Product” table → “Supplier” table
c) “Supplier” table → “Product” table → “Purchase_details” table
d) “Supplier” table → “Purchase_details” table → “Product” table

Q25. Which of the following is the combination of conditions that can retrieve only three employees including “Tom Cruise” from the “Employee” table managed in a relational database?

Employee

Emp_number	Emp_name	Department	Location	Service_years
A0001	George Scott	Accounting	Boston	5
A0002	Susan Hayward	Accounting	Boston	3
A0003	Tom Cruise	Accounting	Chicago	20
A0004	Catherine Bell	Sales	Dallas	5
A0005	Jim Carrey	Sales	Boston	7
A0006	Bill Murray	Sales	Boston	35
A0007	Nancy Allen	HR	Boston	10
A0008	Diana Hayden	Sales	Chicago	5

[Conditions]

(1) Location = 'Boston'

(2) Department = 'Sales'

(3) Service_years > 10

a) (1) AND (2) AND (3)

b) ((1) AND (2)) OR (3)

c) (1) OR ((2) AND (3))

d) (1) OR (2) OR (3)

Q26. Which of the following is an appropriate explanation of a commercial database service?

a) Databases created by users are managed on behalf of the users in order to release information to the public.

b) Information collected only from the commercial field is published free of charge in the form of a database.

c) Information is provided for profit by creating a database of information collected in a specific field.

d) Professional advice is provided on various issues that occur when a database is designed and built.

Q27. Which of the following is a protocol that enables a client to download an e-mail that has arrived at the mailbox of a remote server?

a) DNS b) HTTP c) POP3 d) SMTP

Q28. Which of the following is an appropriate explanation concerning URL?

a) It is a communications protocol between a Web page and a browser.
b) It is a message about the update history of a Web page.
c) It is a notation for representing the location of a Web page.
d) It is grammar for describing the content (i.e., body) of a Web page.

Q29. Which of the following is an appropriate description concerning a virus check for an e-mail?

a) A virus check does not need to be performed if the e-mail is encrypted.
b) A virus check is not required for the received e-mail if it is inspected by the sender.
c) A virus check is performed even if the attached file has a file extension of "jpg".
d) A virus check is performed only for the e-mail sent by an unknown sender.

Q30. Which of the following is an appropriate description concerning the characteristics of cross site scripting?

a) It is an attack by which data being considered too long is sent to an application on a Web site where the length of input data is not checked.
b) It is an attack that illegally uses the function of recording, invoking, and executing the operating procedures of word processing software or spreadsheet software.
c) It is an attack that intrudes into a computer under the disguise of a useful program so that a user installs it unsuspectingly.
d) It is an attack that uses a vulnerability, whereby a malicious script included in the data entered on a Web site is sent to a Web browser as it is.

Q31. Items *A* through *C* below are explanations about information security incidents. Which of the following is an appropriate combination of the three major elements of information security that is directly related to items *A* through *C*?

A: The necessary information cannot be accessed because of a system failure.
B: The important customer information is leaked to competitors.
C: The design information of a new product is falsified.

	A	*B*	*C*
a)	Availability	Confidentiality	Integrity
b)	Availability	Integrity	Confidentiality
c)	Integrity	Availability	Confidentiality
d)	Integrity	Confidentiality	Availability

Q32. Which of the following is an appropriate explanation of a DoS attack?

a) It refers to interrupting a network service by sending a large number of requests.
b) It refers to spying on the data of other people on a communication path.
c) It refers to trying various combinations of letters or numbers to unlock an account.
d) It refers to using a service illegally on a network by pretending to be another person.

Q33. Which of the following is an appropriate purpose of using HTTPS for accessing a Web page?

a) To receive all data of one screen effectively through a single connection
b) To secure communications by authenticating the server and encrypting data
c) To shorten the communication time by compressing data
d) To use a dynamically generated Web page in communications

Q34. When a spam e-mail is received, which of the following is the most appropriate action that should be avoided?

a) E-mails from the same sender are routed to a spam folder by setting a spam filter.
b) In order to make a complaint against the sender, a reply to the spam e-mail is sent.
c) The e-mail service provider is notified of the transmission of the spam e-mail.
d) The spam e-mail is deleted without opening, viewing, or forwarding.

Answer questions Q35 through Q56 concerning management.

Q35. When the current system is replaced with a new system, the data to be migrated from the current system to the new system and the resources necessary for the migration are assembled and organized to create a migration plan. Which of the following is the most appropriate item to be included in the migration plan?

a) Functional requirements for the new system
b) Operational procedures for the screens and forms provided by the new system
c) Procedure for making a periodical backup copy of data files
d) Schedule and organizational framework for switching to the new system

Q36. Which of the following is an appropriate explanation and application example of an E-R diagram?

a) It is a diagram describing the state transition and conditions; for example, it can be used to describe the specifications of a communication protocol.
b) It is a diagram representing sequence, selection, and iteration structures by combining them; for example, it can be used to describe the flow of a program.
c) It is a diagram representing the relationships between entities; for example, it can be used to represent the relationships between the tables of a relational database.
d) It is a diagram showing the sequence of activities and the work period; for example, it can be used to perform schedule management of system development.

Q37. Which of the following is a problem that can be expected to be resolved by replacing printed manuals with online manuals?

a) Discrepancy between one part of descriptions and another part
b) Incomprehensible key points because of too long text
c) Inconsistency between versions of applications and manuals
d) Poorly-written text because of wrong or omitted letters

Q38. It takes about five minutes to search for customer information with the currently-used system, but this should be completed within one minute with the next version of the system. Which of the following is an appropriate development phase for setting such an objective?

a) Software acceptance
b) System design
c) System requirements definition
d) System test

Q39. In system development, which of the following is an activity that is performed after software detailed design?

a) Programming
b) Software architecture design
c) Software outline design
d) Software requirements definition

Q40. In system analysis and design, which of the following is described by using DFD?

a) Flow of data
b) Layout of items on a data entry screen
c) Procedure of a program
d) Physical structure of a database

Q41. Among the test techniques to verify the quality of a program, which of the following is a test technique that is used for analyzing the internal structure of the program and then creating the test cases?

a) Black box test
b) Bottom-up test
c) Top-down test
d) White box test

Q42. When system development progresses in the sequence of system requirements definition, external design, internal design, and programming, which of the following is the most appropriate phase for defining the layout of screens and the format of forms?

a) External design
b) Internal design
c) Programming
d) System requirements definition

Q43. Which of the following is defined by "ISO/IEC 12207:2008 Systems and software engineering – Software life cycle processes"?

a) A common framework for both contracting parties to visualize software-oriented system development and transactions
b) A control level for project management (e.g., schedule management or process management) that is effective for developing packages
c) A method for describing the content, format, and writing style of a contract concerning software development and transactions
d) A specific method for evaluating deliverables, quality of processes, delivery date, and productivity concerning system development

Q44. Which of the following is the most appropriate description concerning the role of the user department in large-scale system development?

a) The manager of the user department makes efforts to convince the development department to accept implementing the functions requested by the user department regardless of the investment effects on the installed system.
b) The user department checks the deliverables from the perspective of business operations, but the detailed program design is left to the discretion of the development department.
c) The user department is the party who uses the system built by the development department, so all decisions regarding system development are left to the discretion of the development department.
d) The user department needs to provide various suggestions, so its staff members with computer skills should be preferentially involved even if they do not have sufficient knowledge of the business operations.

Q45. Which of the following is a chart or a diagram that is illustrated in length proportional to the time period required for each activity, with time on the horizontal axis and activities on the vertical axis?

a) Arrow diagram
b) E-R diagram
c) Gantt chart
d) Pareto chart

Q46. When a project manager makes a plan for the schedule, cost, and quality of a project, which of the following is the activity that should be performed first?

a) Defining the specifications of deliverables to be created in the project and the activities to be performed for completing the deliverables
b) Identifying the activity path that requires the longest time period to complete the entire project
c) Measuring the effects of countermeasures against uncertain events affecting the objectives of the project positively or negatively
d) Reporting the actual results of the project to concerned parties who are affected positively or negatively by the implementation and results of the project

Q47. At the request of a user department, the development department launches a project of system development. Which of the following is the most appropriate role of the project manager?

a) Monitoring the progress to take preventive measures against problems
b) Preparing a proposal for the project on behalf of the user department
c) Presenting the requirements of the system to the user department
d) Raising funds to carry out the project on behalf of both departments

Q48. The risk response planning of a project starting in April of year *X*, which is the next fiscal year, is being considered. When the four risks described in the table below are assumed, which of the following is the risk that is expected to have the highest priority for taking action? Here, the priority is determined in consideration of the probability of occurrence and the extent of impact of the risk, and if the priority is the same, the risk with the closer deadline is handled as soon as possible.

Risk	Expected time of risk occurrence	Probability of risk occurrence	Loss expected at the occurrence of a risk
Risk 1	April 1 of year $X+1$	0.6	60,000 dollars
Risk 2	July 1 of year X	0.4	90,000 dollars
Risk 3	July 1 of year X	0.1	10,000 dollars
Risk 4	March 1 of year $X+1$	0.5	70,000 dollars

a) Risk 1 b) Risk 2 c) Risk 3 d) Risk 4

Q49. When the allocation of human resources in a project is compiled into a plan document, which of the following is the most appropriate description concerning the items that should be taken into consideration?

a) A shortage of members during the project period is not taken into consideration because the purpose is to allocate sufficient members at the beginning of the project.
b) All project members should be able to clearly understand their individual missions, roles, and responsibilities.
c) The limit of the working time of each project member is not taken into consideration because the success of the project is the most important factor.
d) The total working hours of each project member should be the same throughout the entire period of the project.

Q50. Among the change items *A* through *C* concerning a project, which of the following is the list containing all items that are subject to "change management" within the project scope?

A: A change in related laws concerning the requirements occurring within the project
B: A change in customer requirements
C: A change in the affiliated department name of a project member

a) *A* b) *A*, *B* c) *A*, *B*, *C* d) *B*, *C*

Q51. The figure below shows the "service profit chain" developed by James L. Heskett. Among the items to be inserted into blanks *A* through *D*, which of the following is the appropriate item to be inserted into blank *C*?

a) Improvement of customer loyalty
b) Improvement of customer satisfaction
c) Improvement of employee retention rate
d) Improvement of employee satisfaction

Q52. The service provider of a Web portal system to which functions are added as necessary creates a catalog so that users can have a look at available IT services. Which of the following is an appropriate description concerning the content of the catalog?

a) In order to reduce any extra cost of maintenance, the catalog should be updated collectively once a year.
b) Technical terms should be used to ensure the accuracy of description even if it is difficult for general users to understand them.
c) The catalog should be created in a format that is easy to explain from the standpoint of the service provider.
d) The content of each service should be easy to understand even if a user does not have sufficient knowledge of IT.

Q53. Among the policies of facility management concerning an information system in a BCP (Business Continuation Plan), which of the following is the policy that is based on the assumption that a data center stops for a long period of time because of a huge earthquake?

a) A backup center for periodic synchronization of the data is located at a remote site.
b) A UPS is connected to the servers as a backup power-supply in the data center.
c) The servers are installed on an upper floor in preparation for a tsunami.
d) The various types of redundant equipment or devices are installed in the data center.

Q54. Which of the following is an appropriate description concerning the content of system auditing?

a) An independent third party evaluates whether the risks of an information system are appropriately controlled or not.
b) The person who is responsible for quality management establishes and operates a quality management system based on 1SO 9001.
c) The persons in charge of development conduct a test for the content of a system that they have developed.
d) The system administrators verify the security holes of a system on their own by using a specially-designed software tool.

Q55. Which of the following is an appropriate segregation of duties in view of internal control?

a) A single activity is performed by several persons on the basis of division of labor.
b) The managers give authority to their subordinates because of long absence.
c) The remaining activity of a person on an early shift is transferred to another person.
d) The rules are set forth so as not to be approved by the applicants themselves.

Q56. A company monitors and manages business operations by establishing standards and operational procedures to prevent unlawful or unjustifiable acts, mistakes, errors, and other problems, and to ensure that the organization is run healthy, effectively, and efficiently. Which of the following is the most appropriate term that represents this policy or mechanism?

a) Information ethics
b) Internal control
c) IT governance
d) Privacy protection

Answer questions Q57 through Q88 concerning strategy.

Q57. Which of the following is a mechanism by which interested parties, such as the shareholders or investors, supervise and monitor the management of a company conducted by the management executives and board of directors?

a) Compliance
b) Corporate governance
c) Risk management
d) TOB

Q58. Which of the following is an appropriate graph or diagram that is suitable for comparing the value of shipped industrial products by industry in the three industrial zones *A*, *B*, and *C* shown in the table below?

Unit: %

	Metal	Machinery	Chemical	Food	Textile	Other
Zone *A*	7.7	51.3	11.2	7.1	0.9	21.8
Zone *B*	19.1	34.9	13.1	9.7	4.1	19.1
Zone *C*	10.5	58.3	5.8	6.6	3.0	15.8

a) Association diagram
b) Band graph
c) Pyramid graph
d) Scatter diagram

Q59. Which of the following is an appropriate description of how to calculate the sales unit price for each material by using the moving-average method?

a) For each purchase, the purchased amount is added to the last balance, and then the result is divided by the total of the remaining quantity and purchased quantity.
b) The purchase amount of each material is recorded for each purchase, and the sales unit price is equal to the unit price of the first purchased material during the period.
c) The sales unit price is calculated as the average of the unit prices for each of the purchased materials.
d) The sales unit price is equal to the unit price of the last purchased material during the period.

Q60. Company *A* manufactures and sells product *B*. Which of the following is the appropriate expression for calculating the total cost of product *B*? Here, the total cost refers to all the costs incurred until product *B* is sold.

a) Manufacturing cost of product *B* + Operating cost of product *B*
b) Manufacturing cost of product *B* + Operating profit of product *B*
c) Sales of product *B* – Manufacturing cost of product *B*
d) Sales of product *B* – Operating cost of product *B*

Q61. What is the sales amount in thousand dollars at the break-even point that is calculated on the basis of the income statement shown below?

Unit: thousand dollars

Sales	4,000
Variable manufacturing cost	1,400
Variable selling cost	600
Fixed cost	800

a) 1,200 b) 1,231 c) 1,600 d) 2,154

Q62. Which of the following is the right that belongs to a purchaser of a PC software package provided by means of CD-ROM?

a) Copyright of the CD-ROM storing the program
b) Copyright of the program stored in the CD-ROM
c) Design right of the CD-ROM storing the program
d) Right to use the program stored in the CD-ROM

Q63. When a business operator handling personal information conducts a questionnaire survey regarding its service and asks respondents to fill in their addresses and names, which of the following is an action that violates the OECD guidelines (i.e., Recommendation of the Council concerning Guidelines governing the Protection of Privacy and Transborder Flows of Personal Data)?

a) Applying the same rules that are adopted for a paper-based questionnaire even when the questionnaire survey is conducted via a browser screen
b) Indicating the usage purposes of both the questionnaire and its response in the questionnaire form
c) Sending invitations to a launch event for a new product to respondents by mail without mentioning any advance notice at the time of the survey
d) Taking measures to increase the response rate, such as offering special gifts to respondents of the questionnaire

Q64. Two control charts below show the quality characteristics of products manufactured by Line *A* and Line *B* in the factory for each day of manufacture. Which of the following is an appropriate response or reaction to Line *A* or Line *B* or both?

a) Since the daily fluctuation of values in Line *A* is larger than in Line *B*, the cause should be investigated.
b) Since the value for Line *B* has a tendency to increase, the cause should be investigated.
c) Since values for both Line *A* and Line *B* deviate from the center line, the cause should be investigated.
d) Since values for both Line *A* and Line *B* fall within the control limit range, it should be desirable to wait and see.

Q65. Which of the following is a formula that can be used to calculate operating profit?

a) Sales amount − sales cost
b) Sales amount − (sales cost + selling, general, and administrative expense)
c) Sales amount − (sales cost + selling, general, and administrative expense)
+ non-operating income − non-operating expense
d) Sales amount − (sales cost + selling, general, and administrative expense)
+ non-operating profit and loss + extraordinary profit and loss

Q66. Which of the following is the coding scheme that can encode a large amount of information into a small area and has an error correction function that enables the code to be read out correctly even when the code cannot be partially read out?

a) ISBN code
b) ITF code
c) QR code
d) Unicode

Q67. Which of the following is an appropriate combination of the standards and their applicable fields?

	IEEE 802.3	ISO 9001	ISO 14001
a)	Environmental management	LAN	Quality management
b)	Environmental management	Quality management	LAN
c)	LAN	Environmental management	Quality management
d)	LAN	Quality management	Environmental management

Q68. Which of the following is an appropriate combination of terms to be inserted into blanks *A* and *B* in the description below concerning PPM (Product Portfolio Management)?

[*A*] is a group of products that create a profit with a little investment. In contrast, [*B*] is a group of products that require an investment of more than the fixed amount for potential future growth.

	A	*B*
a)	Cash cow	Dog
b)	Cash cow	Question mark
c)	Star	Dog
d)	Star	Question mark

Q69. Which of the following is an appropriate explanation of SWOT analysis?

a) It is a technique for deriving the future direction of corporate activities by analyzing opportunities and threats underlying in the external environment surrounding the company, and the strengths and weaknesses of the company.

b) It is a technique for designing a company's own activities from the viewpoint of what kind of value the activities finally generate for customers and whether this satisfies the customers.

c) It is a technique for evaluating and analyzing the business performance of a company in a well-balanced manner, from the perspectives of financial, customer, internal business process, and learning and growth.

d) It is a technique for plotting a business on a matrix created by the two quantitative items of market growth rate and market share, and then optimizing the allocation of management resources.

Q70. Strategies for promotion, which is known as one of the 4Ps of the marketing mix, include the push strategy and the pull strategy. Among the sales promotion plans of the manufacturer, which of the following is considered as the pull strategy?

a) Dispatching salespersons to a shop in order to sell products over the counter
b) Enhancing the training of salespersons concerning product knowledge and sales talk
c) Increasing sales incentives that are paid according to the sales amount or volume
d) Introducing advertisements that aim to draw customers to sales outlets

Q71. Companies are classified into four different types: leader, challenger, follower, and nicher on the basis of competitive position in the market. Which of the following is the most appropriate characteristic of the strategy of a challenger?

a) A new product and its usage method are proposed to the consumer to expand the market size, and at the same time, the product lineup is expanded and market share is maintained or expanded.
b) A specific market that is not targeted by a high-ranking company is captured. Limited management resources are concentrated, and predominance in the market is secured and maintained.
c) Measures are taken for capturing regions and fields where leader companies do not take a strength. There may be confrontation with leader companies, whereas there may be a case where the market share of a low-ranking company is stolen.
d) The real ability of the challenger company in the market is determined, and priority is given to securing stable profits rather than market share by doing as the leader company does.

Q72. In value engineering, which of the following is the combination of two elements that define value?

a) Fixed cost and variable cost
b) Functions and cost
c) Gross profit and sales cost
d) Plans and results

Q73. "The establishment of a satisfactory relationship with customers and acquisition of excellent customers who bring about long-term profits" is set as a goal based on business strategy. Which of the following is an appropriate system to be constructed for supporting the achievement of this goal?

a) CRM system
b) MRP system
c) POS system
d) SCM system

Q74. When some activities for planning a technology development strategy are performed in the order of (1) through (5), which of the following is applicable to blank *A*?

Order of activities	Activity item
(1)	Identifying in-house and external technology related to the business strategy
(2)	*A*
(3)	Determining the technology area that is useful for the development of competitive superiority
(4)	Evaluating the in-house technical strength and selecting the area to be strengthened
(5)	Determining the priority order of development and creating a development road map

a) Carrying out test marketing
b) Predicting the changes in technology and environment
c) Setting the objectives of sales and profit for new products
d) Setting up an organizational structure for technology development promotion

Q75. Which of the following is the most appropriate explanation of BTO that is used for the production of PCs?

a) Each product is assembled by only one worker.
b) The products are manufactured with the minimum possible inventory between the production processes by procuring the required amount of raw materials and components at the required time.
c) The products are stocked as components rather than finished products, and assembled after receiving an order from the customer, according to the details of the order.
d) The products showing a company's own logo are assembled by another company.

Q76. Which of the following is a technique for achieving effective business operations by managing and optimizing a company's management resources in an integrated manner?

a) BPR b) ERP c) RFP d) SLA

Q77. Which of the following is a situation that is suitable for using CAM as an engineering system?

a) Creation of a design drawing for an industrial product or a building
b) Creation of a monthly production plan
c) Creation of a plan for the order quantity of each component required for production
d) Generation of the processed data used for controlling a machine tool

Q78. A factory is engaged in assembly production of product *P* that consists of components *A* and *B*. The processing of component *A* requires component *C*, and the processing period is one week. The delivery lead times of purchased components *B* and *C* are two weeks and three weeks, respectively. Product *P* can be assembled in one week only after components *A* and *B* are both delivered. What is the minimum number of weeks required to produce one unit of product *P*, including the delivery periods of the components? Here, there is no stock of any of the components.

a) 4 b) 5 c) 6 d) 7

Q79. Which of the following is classified as a "B to E" transaction?

a) A company provides services, such as welfare and education for the company's own employees, through the Internet.
b) A travel company uses the Internet to give campaign information and sell tickets to consumers by subscription.
c) An automobile manufacturer uses the Internet to procure components and materials from vendors across the world.
d) In an auction held on the Internet, a participant buys a product from another participant.

Q80. Which of the following is an appropriate explanation of EDI?

a) A communication service that provides added values such as storage of data transmitted over the network and conversion of data formats
b) An international standard for e-mail services, which is based on the OSI basic reference model, and provides general services for the generation, transmission, and processing of messages
c) An ordering system that enables orders to be placed by transmitting order information from a data entry terminal to the head office or a supplier
d) The exchange of business transaction data between computers (including terminals) over a network in accordance with standard protocols

Q81. Which of the following is an appropriate general term for computers that are embedded in home electric appliances, such as a microwave oven or a rice cooker?

a) Handheld computer
b) Micro computer
c) Mini computer
d) Mobile computer

Q82. In the course of the planning of an information systems strategy, which of the following should be performed when the policies and objectives for optimization of the overall information system are set?

a) Analyzing risks resulting from the installation of the information system
b) Clarifying the skills of the staff members that are necessary for development
c) Taking into consideration the consistency with the business strategy
d) Verifying the conformity of user needs to the software package

Q83. Which of the following is a term that means that the development and operation of a system is farmed out to an overseas company or an overseas subsidiary?

a) Hosting
b) Offshore outsourcing
c) Onshore outsourcing
d) System integration

Q84. A company is aiming to analyze the data that is accumulated in an information system and use such data in business operations. However, progress is not made because of the insufficient experience of employees. Which of the following is the most appropriate activity that should be performed with higher priority in order to achieve the objective?

a) Improving the performance of software used for analysis
b) Installing a high-performance PC for analysis in each department
c) Providing typical examples of analysis and templates for analysis
d) Speeding up the provision of data that can be used for analysis

Q85. Which of the following is an appropriate approver for the optimization plan of the overall information system of a company?

a) Chief Information Officer
b) Head of the business operations department handling the mission-critical system
c) Head of the department where RFP is created
d) System development project manager

Q86. When the software life cycle is classified into the processes of planning, requirements definition, development, and operations, which of the following is an item that should be clarified in the requirements definition process?

a) The function and capability of each software configuration item
b) The needs and wants of the stakeholders
c) The purpose of developing a system
d) The structure of the database

Q87. Which of the following is an explanation of "acceptance inspection" performed for a vendor?

a) Checking the estimate submitted by the vendor prior to placing an order based on that estimate
b) Checking whether the deliverables provided by the vendor conform to the requirements specifications
c) Requesting the vendor to provide information for the purpose of collecting information
d) Requesting the vendor to study and submit the proposal for the construction of a new system

Q88. When the initial investment in the development of a new system is 240,000 dollars, the monetary effect after full operation is 10,000 dollars per month, the system operation cost is 2,000 dollars per month, and the annual system maintenance cost is 15% of the initial investment, how many years does it take to recover the investment? Here, other factors such as the cost of interest can be ignored.

a) 2 b) 2.5 c) 2.9 d) 4

Answer questions A through C, each of which has four questions.

Question A Read the following description concerning the administration of a questionnaire by e-mail, and then answer the four questions.

Mr. *F* from the HR (Human Resources) department of Company *X* is asked by his manager to conduct an employee satisfaction survey by e-mail. The survey is conducted by attaching a questionnaire for the satisfaction survey that is created with word processing software and then returning the questionnaire by e-mail.

The instructions provided by the manager of Mr. *F* are as follows:

(1) The purpose, respondents, method of replying, and deadline of the satisfaction survey are clearly described in the e-mail text..

(2) Mr. *F* attaches a questionnaire to a request e-mail and sends it to all the employees. For collecting the filled-out questionnaires, employees return the filled-out questionnaires by sending them back to Mr. *F* as an e-mail attachment. The deadline is the end of the next month.

(3) As the company would like to have replies to the questionnaire from 90% or more of all the employees, a personal reminder e-mail is sent to all the employees who do not reply two working days before the deadline.

(4) Based on the reply e-mails, a check mark is placed in the employee list in order to record all the respondents.

(5) The returned questionnaire documents are stored in a shared folder for questionnaires (hereinafter called shared folder) on the server. Only the HR department can access the shared folder. The returned questionnaires are saved separately by department of respondents with a file name that enables the employee to be identified. The reply e-mails for questionnaires are stored separately from other received e-mails until the tabulation process is completed.

[Strategy]

Q89. Mr. *F* creates an e-mail for sending a request for participation in the questionnaire survey to employees so that the instructions given by his manager can be accomplished. Which of the following is the appropriate description to be inserted into blank *A*?

In order to improve the working environment, a satisfaction survey is to be conducted. All the employees are in the scope of the survey. [*A*].
The deadline is the end of next month. We look forward to your cooperation and support.
Please contact Mr. *F* of the HR department for any questions about this survey.

a) All the employees are in the scope of this survey, so please be sure to keep to the deadline.
b) Please ensure that there are no mistakes in the details that you write in the questionnaire.
c) Please fill out the attached questionnaire document, and return it as an attachment of the reply e-mail.
d) Two days before the deadline for response, a reminder e-mail is sent to all the employees who are yet to reply.

[Technology]

Q90. Which of the following is the appropriate method for setting addresses prior to sending the questionnaire to all the employees in order to prevent unforeseen or potential problems that may occur when the questionnaire is returned from each employee?

a) Setting the addresses of all the employees in the TO and BCC fields
b) Setting the addresses of all the employees only in the BCC field
c) Setting the addresses of all the employees only in the CC field
d) Setting the addresses of all the employees only in the TO field

[Technology]

Q91. Which of the following is the most appropriate procedure for returning the questionnaire attached to the e-mail on the basis of the instructions given by Mr. *F*?

a) Open the attachment file, fill out the questionnaire, and save it on a PC. Create a new e-mail, set the recipient to the HR department, attach the file saved on the PC, and send the e-mail.
b) Open the attachment file, fill out the questionnaire, and save it on a PC. Select "Reply", attach the file saved on the PC to the reply e-mail, and send the e-mail.
c) Save the attachment file on a PC. Select "Reply", write the results of questionnaire in the text of the created e-mail, and send the e-mail.
d) Save the attachment file on a PC. Select "Reply", write the results of the questionnaire in the text of the created e-mail, attach the file saved on PC, and send the e-mail.

[Technology]

Q92. Mr. *F* decides to arrange the questionnaires according to the instructions that are given by his manager. Which of the following is the appropriate method for arranging questionnaires?

a) Create a new folder in the Inbox, and store the reply e-mails for the questionnaire survey. In the shared folder, create folders by department and save the attachment files. Each file has an employee name and employee number as the file name so that the respondents can be identified. For each employee whose file is saved, place a check mark in the employee list.
b) Create a new folder in the Inbox and store the reply e-mails for the questionnaire survey. In the shared folder, create folders by department and save the attachment files. Each file has an employee name and employee number as the file name so that the respondents can be identified. For each employee whose file is saved, place a check mark in the employee list, and delete the e-mail from the Inbox.
c) Create a new folder in the Inbox and store the reply e-mails for the questionnaire survey. Save the attachment files in the shared folder. Each file has a department name as the file name so that the department can be identified. For each employee whose file is saved, place a check mark in the employee list.
d) Store the reply e-mails for the questionnaire survey in the Inbox. Save the attachment files in the shared folder as is. For each employee whose file is saved, place a check mark in the employee list.

Question B Read the following description concerning the implementation of an accounting system, and then answer the four questions.

In the accounting department of Company *F*, the implementation of the accounting system (hereinafter called the new system) of Company *G*, which is engaged in IT service, is in progress. The accounting department is to outsource the maintenance and operation of the new system to Company *G* after the operation of the new system starts, so the accounting department decides to confirm details of the support content after the delivery of the new system with Company *G*.
The basic service of Company *G* for maintenance and operation is as described below.

[Basic service of Company *G* for maintenance and operation]

(a) Questions about the new system are accepted via e-mail only on weekdays. The replies are sent back via e-mail.
(b) Failures that occur in the new system are isolated, and bugs that are discovered are corrected.
(c) The time for providing service for the new system operation is between 9:00 and 19:00 on weekdays.
(d) If a failure occurs in the new system, the system is recovered within nine hours. Data backup is taken daily, and the data of one month is stored. If a disk failure occurs, the recovery of data up to the previous day is guaranteed.

On the other hand, as for the usage and support of the new system, the accounting department has the requirements below for Company *G*.

[Requirements for the usage and support of the new system]

(1) Questions on the usage method of the new system should be answered via both telephone and e-mail between 9:00 and 18:00 on weekdays.
(2) Action should be taken if a failure occurs in the new system.
(3) After the operation of the new system starts, changes should be made in the new system to improve convenience.
(4) The standard usage of the new system should be between 9:00 and 18:00 on weekdays.
(5) During busy periods such as closing of accounts, the new system at nighttime and on holidays should be able to be used in the same way as usual, and questions should also be answered.

[Strategy]

Q93. Which of the following is the agreement that Company *F* signs with Company *G* in order to receive the support for the new system?

a) Agreement for outsourcing of accounting operation
b) Agreement for outsourcing of development activities
c) Agreement for outsourcing of maintenance and operation
d) Agreement for the software license

[Management]

Q94. In the basic service of Company *G*, which of the following is the appropriate combination of requirements that are fulfilled for the accounting department of Company *F* after the operation of the new system starts?

a) (1) and (2) b) (2) and (4) c) (3) and (4) d) (4) and (5)

[Management]

Q95. In the basic service of Company *G*, which of the following is the appropriate combination of items that describe the content of the service for maintenance and operation by quantitatively defining the time or the time period?

a) (a) and (c) b) (a) and (d) c) (b) and (c) d) (c) and (d)

[Management]

Q96. In the basic service of Company *G* for maintenance and operation, there are several items that do not satisfy the requirements of the accounting department for the usage and support of the new system. The accounting department desires to make an improvement request by quantitatively showing the details of the requirements. Which of the following is classified as such type of request?

a) A full backup of data files is taken every day without fail, and the backup files are stored for one week.
b) By making a request the previous day, the new system can be used up to 22:00, and from 9:00 through 17:00 on holidays, and questions are also handled.
c) If a serious failure or fault occurs in the new system, the system is recovered on the basis of the predetermined procedures within 24 hours.
d) The isolation of failures or faults and the correction of bugs are performed as promptly as possible in the new system.

Question C Read the following description concerning the check digit, and then answer the four questions.

Most of the books available in the market have an ISBN (International Standard Book Number) code for identifying the book. The ISBN code is a 13-digit symbol using numbers 0 through 9, and each digit is counted from left. The left-most digit is the first digit. The left 12 digits (the 1st digit through the 12th digit) include the country code, the publisher code, the book-specific code, etc.

The 13th digit (right-most digit) of the ISBN code is called the check digit. The check digit of an ISBN code is calculated by the following calculation method using the numbers in the 1st digit through the 12th digit. Here, as shown in Fig. 1, the numbers in the 1st digit through the12th digit are a_1 through a_{12}, and the check digit is X.

[Method of calculating the check digit]

(1) As for a_1 through a_{12}, a weight of 1 is given to the odd-numbered digits and a weight of 3 is given to the even-numbered digits.

(2) The sum S is calculated as a total of multiplying each digit from a_1 through a_{12} by the weight corresponding to each digit as follows:

$$S = a_1 \times 1 + a_2 \times 3 + a_3 \times 1 + \ldots + a_{12} \times 3$$

(3) The remainder R obtained by dividing S by 10 is determined.

(4) The check digit X is determined as follows:

$$X = \begin{cases} 0 & (R = 0) \\ 10 - R & (R > 0) \end{cases}$$

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13
ISBN code	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9	a_{10}	a_{11}	a_{12}	X
Weight	1	3	1	3	1	3	1	3	1	3	1	3	

Fig. 1 Structure of the ISBN code

[Technology]

Q97. When the left 12 digits (from the 1st digit through the 12th digit) of the ISBN code are the numbers shown below, which of the following is the check digit *X* to be appended to the 13th digit?

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13
	9	7	8	4	0	0	0	0	8	6	0	1	*X*

a) 1 b) 3 c) 7 d) 9

[Strategy]

Q98. Which of the following is an effect that is produced by appending the check digit to the ISBN code?

a) Since a classification function is added, the bibliographical classification for book management performed by a library or a school becomes clear.
b) Since a sorting function is added, it becomes easy to identify the bookshelf displaying the book when a customer looks for a book in a bookstore.
c) Since an identification function is added, the efficiency of computer processing in an inventory control system or a book search system is improved.
d) Since an inspection function is added, it becomes easy to detect an input error when the ISBN code is entered manually.

[Technology]

Q99. The check digit is determined by using spreadsheet software. When the worksheet for calculating the check digit is created by the procedure described below, which of the following is an appropriate expression to be inserted into blank *A*?

(1) In cells B1 through N1, enter a numeric value expressing the number of digits of the ISBN code.

(2) In cells B2 through M2, enter the 1st through 12th digit of the ISBN code with one digit in each cell.

(3) In cells B3 through M3, enter the weight corresponding to each digit of the ISBN code.

(4) In cell B4, enter the expression [*A*], and copy it to cells C4 through M4.

(5) In cell B5, enter an expression for calculating the total of cells B4 through M4.

(6) In cell B6, enter an expression for calculating the remainder when the value of cell B5 is divided by 10.

(7) In cell N2, enter an expression for calculating the check digit.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Digit	1	2	3	4	5	6	7	8	9	10	11	12	13
2	ISBN code	9	7	8	4	0	0	0	0	1	2	3	4	
3	Weight	1	3	1	3	1	3	1	3	1	3	1	3	
4														
5	Sum (S)	72												
6	Remainder (R)													

Note: The shaded cells are not displayed.

Fig. 2 Worksheet for calculating the check digit

a) B1∗B2 b) $B1∗B$3 c) B2∗B3 d) $B2∗B$3

[Technology]

Q100. The check digit is determined by using spreadsheet software. Which of the following is an appropriate expression to be inserted into cell N2 in the worksheet that is described below? This worksheet is used repeatedly by entering numbers in cells B2 through M2. Here, the details of the modulo arithmetic MOD(x, y) are described in the appendix "Spreadsheet Software Functions and Terminology". For example, the equation "MOD(x, y) = $x - y * \mathrm{INT}(x/y)$" holds for integers x and y, and the result of MOD(−10, 3) is 2.

(1) In cells B1 through N1, enter a numeric value representing the number of digits of the ISBN code.

(2) In cells B2 through M2, enter the 1st through the 12th digit of the ISBN code with one digit in each cell.

(3) In cells B3 through M3, enter the weight corresponding to each digit of the ISBN code.

(4) In cell B5, calculate the total of multiplying each digit of the ISBN code by the corresponding weight.

(5) In cell B6, enter the expression using the modulo arithmetic as follows:

MOD (B5, 10)

(6) In cell N2, enter an expression for calculating the check digit.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Digit	1	2	3	4	5	6	7	8	9	10	11	12	13
2	ISBN code	9	7	8	4	0	0	0	0	4	3	2	1	
3	Weight	1	3	1	3	1	3	1	3	1	3	1	3	
4														
5	Sum (S)	68												
6	Remainder (R)													

Note: The shaded cells are not shown.

Fig. 3 Worksheet for calculating the check digit

a) 10 − B6

b) B6 − 10

c) 10 − MOD (B6, 10)

d) MOD (10 − B6, 10)

Spreadsheet Software Functions and Terminology

The following defines the basic functions and technical terms of spreadsheet software.
In addition, when worksheet functions not described here, such as save, read, print, line creation, and graph creation, are used, they are described in the exam question text.

1. Worksheets

(1) The work area that is composed of a grid of rows and columns is called a worksheet. A worksheet has 256 columns and 10,000 rows.

(2) The position of each column and row in a worksheet is represented by a column letter and a row number. The leftmost column letter is A, and all column letters are represented as A, B, ..., Z, AA, AB, ..., AZ, BA, BB, ..., BZ, ..., IU, and IV. The uppermost row number is 1, and all row numbers are represented as 1, 2, …, 10000.

(3) Multiple worksheets can be used. In this case, a unique name is assigned to each worksheet in order to distinguish worksheets from one another.

2. Cells and cell ranges

(1) Each box-shaped area in the grid that constitutes a worksheet is called a cell. The position of a cell is represented by a pair of the column letter and row number of the cell, and this is called a cell address.

Example: The cell address at column A and row 1 is A1.

(2) When a group of all cells included in certain rectangular area of a worksheet is handled, the cell addresses of the top left and bottom right cells of the group are used with a semicolon " : ", and the group is represented as "top left cell address:bottom right cell address". This is called a cell range.

Example: The cell range with the top left cell at A1 and the bottom right cell at B3 is represented as A1:B3 .

(3) When a cell address or a cell range in another worksheet is specified, the worksheet name and an exclamation mark "!" are used, and they are represented as "worksheet name!cell address" or "worksheet name!cell range" respectively.

Example: When the cell range B5:G10 in the worksheet "sheet1,"is specified from another worksheet, it is represented as sheet1!B5:G10.

3. Values and expressions

(1) A cell holds a value, and this value can be referenced using the cell address. A value can be a numeric value, a character string, a logical value, or a null value.

(2) A character string is enclosed in a pair of single quotation marks ' '.

Example: The character strings "A" and "BC" are represented as 'A' and 'BC' respectively.

(3) A logical value is represented as true or false.

(4) A null value is represented as null, and a cell that has a null value is called a blank cell. The initial state of a cell is null.

(5) An expression can be entered into a cell. A cell holds the resulting value of an evaluated expression.

(6) An expression is composed of constants, cell addresses, operators, parentheses, and functions. A constant is a notation that represents a numeric value, a character string, a logical value, or a null value. A cell address in an expression refers to the value held in the cell at that cell address.

(7) An expression can be an arithmetic expression, a character expression, or a logical expression. An expression whose evaluation generates a numeric value is called an arithmetic expression, an expression whose evaluation generates a character string is called a character expression, and an expression whose evaluation generates a logical value is called a logical expression.

(8) When an expression is entered into a cell, it is evaluated immediately. When the value in a cell that is referenced by an expression is changed, the expression is immediately re-evaluated.

4. Operators

(1) Unary operators are the plus sign "+" and the minus sign "−".

(2) Arithmetic operators are addition "+", subtraction "−", multiplication "*", division "/", and exponentiation "^".

(3) Comparison operators are greater than ">", less than "<", greater than or equal to "≥", less than or equal to "≤", equal to "=", and not equal to "≠".

(4) For grouping symbols, a pair of parentheses "( )" is used.

(5) When there are multiple operations and parentheses in an expression, the order of calculation is prioritized as shown in the table below.

Type of operation	Operator	Priority
Parentheses	( )	High
Exponentiation	^	↑
Unary operation	+, −	
Multiplication and division	*, /	
Addition and subtraction	+, −	↓
Comparison operators	>, <, ≥, ≤, =, ≠	Low

5. Copying of cells

(1) A value or expression in a cell can be copied into other cells.

(2) In a cell copy operation, when the source cell holds an expression containing a cell address, the cell reference method that changes the cell address in the expression so that the difference in the cell addresses of the source cell and destination cell can be maintained is called a relative reference. In this case, the expression that is entered into the destination cell is the expression modified by

adding the difference in column letter and row number between the source cell and destination cell to each cell address in the expression that is entered into the source cell.

Example: When the expression A1+5 in cell A6 is copied into cell B8, the expression B3+5 is entered into cell B8.

(3) In a cell copy operation, when the source cell holds an expression containing a cell address, the cell reference method that does not change either of or both the column letter and row number of the cell address is called an absolute reference. A dollar symbol "$" is placed immediately before either of or both the column letter and row number to which an absolute reference is applied.

Example: When the expression A1+$A2+A$5 in cell B1 is copied into cell C4, the expression A1+$A5+B$5 is entered into cell C4.

(4) In a cell copy operation, when the source cell holds an expression that refers to another worksheet, the name of the referenced worksheet does not change at the copy destination.

Example: When the expression Sheet1!A1 in cell A6 of the worksheet "Sheet2" is copied into cell B8 of the worksheet "Sheet3", the expression Sheet1!B3 is entered into cell B8 of "Sheet3".

6. Functions

The functions defined in the table below are available for use in an expression.

Format	Description
SUM(cell range[1)])	Returns the sum of the values in a specified cell range. Example: SUM(A1:B5) returns the sum of the values in the cell range A1:B5.
AVG(cell range[1)])	Returns the average of the values in a specified cell range.
SAMPLE_STD_DEV (cell range[1)])	Sample standard deviation: Returns the standard deviation of the sample values in a specified cell range.
POPULATION_STD_DEV(cell range[1)])	Population standard deviation: Returns the standard deviation of the population values in a specified cell range.
MAX(cell range[1)])	Returns the maximum value in a specified cell range.
MIN(cell range[1)])	Returns the minimum value in a specified cell range.
IF(logical expression, expression 1, expression 2)	Returns the value of expression1 when the value of the logical expression is true, and returns the value of expression 2 when it is false. Example: IF(B3 > A4, 'Chicago', C4) returns the character string "Chicago", if the value in cell B3 is greater than the value in cell A4. Otherwise, the value in cell C4 is returned.
COUNT(cell range)	Returns the number of non-blank cells in a specified cell range.
COUNTIF(cell range, search condition)	Returns the number of cells within a specified cell range that meet the specified search condition. The search condition is described using a combination of a comparison operator and an expression, and the value of each cell contained in the cell range is evaluated using the specified comparison operator. Example 1: COUNTIF(H5:L9, > A1) returns the number of cells in cell range H5:L9 that hold a greater value than the value in cell A1 . Example 2: COUNTIF (H5:L9, = 'ABC') returns the number of cells in the cell range H5:L9 that hold the character string "ABC".

INT (arithmetic expression)	Integer: Rounds a value down to the maximum integer that is less than or equal to the value of a specified arithmetic expression. Example 1: INTEGER(3.9) returns 3. Example 2: INTEGER(−3.9) returns −4.
MOD(arithmetic expression 1, arithmetic expression 2)	Modulo arithmetic: Returns the remainder after the value of arithmetic expression 1 (dividend) is divided by the value of arithmetic expression 2 (divisor). The equation below holds for functions MOD and INT. MOD(x, y) = x − y ∗ INT(x / y) Example 1: MOD(10, 3) returns 1. Example 2: MOD(−10, 3) returns 2.
SQRT(arithmetic expression)	Square root: Returns the non-negative square root of the value of a specified arithmetic expression. The value of the arithmetic expression must be a non-negative numeric value.
AND(logical expression 1, logical expression 2, ...)[2)]	Returns true only when the values of logical expression 1, logical expression 2, and all other logical expressions specified are true. Otherwise, it returns false.
OR(logical expression 1, logical expression 2, ...)[2)]	Returns true when the value of at least one expression out of logical expression 1, logical expression 2, and all other logical expressions specified is true. Otherwise, it returns false.
NOT(logical expression)	Returns false when the value of a specified logical expression is true, and returns true when the value of the logical expression is false.
ROUNDUP(arithmetic expression, position)	Returns the value of a specified arithmetic expression that is rounded to the position specified. The function ROUNDUP rounds the value up, ROUNDOFF rounds the value off, and ROUNDDOWN rounds the value down. Here, the position is the number of places as counted from left to right with the first position being 0. Example 1: ROUNDUP(−314.159, 2) returns −314.16. Example 2: ROUNDUP(314.159, −2) returns 400. Example 3: ROUNDUP(314.159, 0) returns 315.
ROUNDOFF(arithmetic expression, position)	
ROUNDDOWN (arithmetic expression, position)	
CONCATENATE (expression 1, expression 2, ...) [2)]	Treats the value of expression 1, expression 2, and all other expressions as a character string, and returns these as a single character string joined in order of the arguments. Example: CONCATENATE(‘Chicago’, ‘Washington’, 123, 456) returns the character string “ChicagoWashington123456”.
RANK(arithmetic expression, cell range[1)], order option)	Returns the rank order of the value of a specified arithmetic expression in a cell range in ascending order when the order option is 0, and in descending order when the order option is 1. Here, if the same value occurs more than once in the cell range, these values are given the same rank order and the subsequent rank order is set as this rank order plus the number of cells in the same rank order.
RANDOM( )	Returns a uniform random number (real value) that is greater than or equal to 0 and less than 1.
TLOOKUP(cell range, row position, column position)	Table lookup: Counts each row and column from the top left position of a specified cell range as 1, 2, ..., and returns the value of a cell at the location specified using a row position and a column position. Example: TLOOKUP(A3:H11, 2, 5) returns the value of cell E4.

VLOOKUP (expression, cell range, column position, search option)	Vertical lookup: Scans the leftmost column of a specified cell range vertically from top to bottom, and searches for the first row with a cell that meets the search option. For the row found, counts each column from the leftmost column of the cell range as 1, 2, ..., and returns the value of the cell in the column specified by the column position. • When the search option is 0: searches for values that matches the expression value. • When the search option is 1: searches for the maximum value that is less than or equal to the expression value. Here, the leftmost column must be sorted in ascending order from top to bottom in advance. Example: VLOOKUP(15, A2:E10, 5, 0) searches the leftmost column in the cell range from cell A2 to A10. Under this condition, if the value 15 is first found in cell A6, the value in cell E6 is returned, which is located at the 5th column E in the same row as cell A6.
HLOOKUP (expression, cell range, row position, search option)	Horizontal lookup: Scans the top row of a cell range horizontally from left to right, and searches for the first column with a cell that meets the search option. For the column found, counts each row from the top row of the cell range as 1, 2, ..., and returns the value of the cell in the row specified by the row position. • When the search option is 0: searches for values that matches the expression value. • When the search option is 1: searches for the maximum value that is less than or equal to the expression value. Here, the top row must be sorted in ascending order from left to right in advance. Example: HLOOKUP(15, A2:G6, 5, 1) searches the top row in the cell range from cell A2 to G2. Under this condition, if the maximum value less than or equal to 15 is first found in cell D2, the value in cell D6 is returned, which is located at the 5th row 6 in the same column as cell D2.

Notes: [1] Values other than numeric values contained in the cell range that is passed as an argument are not processed.

[2] One or more expressions can be passed as a list of arguments.