October 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 autumn IT Passport Examination conducted?

   a) September   b) October   c) November   d) December

   Since the correct answer is "b)" (October), 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.**

Q1. Which of the following is an appropriate description concerning the relationship that always holds for two sets A and B?   Here, "$X \cap Y$" represents the intersection (i.e., product set) of X and Y, and "$X \cup Y$" represents the union set of X and Y.

   a) "$A \cap B$" is a subset of the set other than A.
   b) "$A \cap B$" is a subset of A.
   c) "$A \cup B$" is a subset of "$A \cap B$".
   d) "$A \cup B$" is a subset of A.

Q2. As shown in the table below, columns A and B contain all possible combinations of numbers 0 through 9, and the table has 100 rows in total.   When all the rows where the value in column A is equal to or less than the value in column B are removed from the table, how many rows remain in the table?

A	B
0	0
0	1
0	2
⋮	⋮
9	8
9	9

   a) 40   b) 45   c) 50   d) 55

Q3. When the decimal to binary conversion is performed, which of the following is a decimal number that can be represented in the finite number of bits?

   a) 0.1   b) 0.2   c) 0.4   d) 0.5

Q4. When an analog audio signal is digitized and converted back to analog again, which of the following is the combination that can generate a signal waveform most closely approximating the original wave?

	Sampling cycle	Number of quantization levels
a)	Long	Many
b)	Long	Small
c)	Short	Many
d)	Short	Small

Q5. A stack is a first-in last-out data structure. By using the stack, a device changes the order of data received from the right side and sends it to the left side, as shown in the figure below. There are three types of operations available on the device, as described below.

(1) Data received from the right side is sent to the left side without any alteration.
(2) Data received from the right side is pushed into the top of the stack.
(3) Data popped out of the top of the stack is sent to the left side.

When the device receives X, Y, and Z in this order from the right side, which of the following is the order in which the device **cannot** send them to the left side even if the operations (1) to (3) are combined?
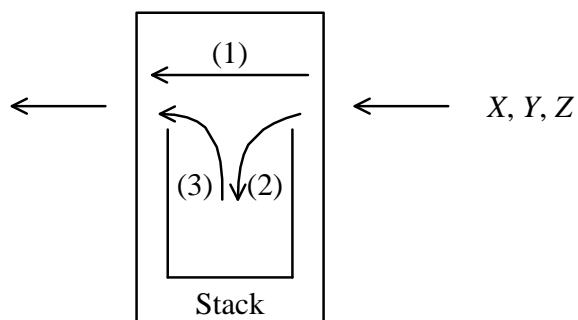
a) X, Z, Y b) Y, Z, X c) Z, X, Y d) Z, Y, X

Q6. CGI (Common Gateway Interface) is an interface to the Web server from a particular program that is executed in response to a request from a client.   Which of the following is a script language that can be used to write such a program executed via CGI?

a) Perl b) Postscript c) SGML d) SQL

Q7. Which of the following is the language that enables the user to define and use tags enclosed by angle brackets ("<" and ">") specifying the structure and other aspects of a document, in order to accomplish the intended purpose?

a) COBOL b) HTML c) Java d) XML

Q8. Which of the following is a file that is used to store information before and after database updates and also used to recover from a database failure?

a) Backup file b) Index file
c) Journal file d) Snapshot file

Q9. Which of the following is an appropriate characteristic of an HDD (Hard Disk Drive) that is used as an auxiliary storage device?

a) The read/write speed of an HDD is slower than that of a CD-ROM drive.
b) An HDD can be used as main memory as well as auxiliary storage.
c) Electric power must always be supplied to an HDD in order to retain data.
d) Data can be read and written to and from an HDD in a direct (or random) access manner.

Q10. Which of the following is a dedicated memory module that is used to retain data, such as characters and graphics, to be displayed on a computer screen?

a) Cache memory b) Flash memory
c) Video memory d) Virtual memory

Q11. Which of the following is the most appropriate description concerning a multi-core processor?

    a) Several microprocessors are installed in a single PC in order to improve the reliability of the PC by performing the same processing simultaneously in each processor.

    b) A quad core processor has four times as much processing power as a dual core processor, if each core is equipped with the same arithmetic and logic unit.

    c) The clock frequency of a processor is temporarily increased according to the load of processing, and as a result, high-speed processing can be achieved.

    d) A single processor has multiple processing circuits that can perform different arithmetic operations in parallel in order to enhance the performance of the processor.

Q12. Which of the following is the unique value that is sequentially assigned to a memory location in order to identify the location of instructions or data stored in the main memory of a computer?

    a) Address   b) Counter   c) Index   d) Pointer

Q13. Which of the following is a technical term that refers to a dedicated file server that can be connected directly to a LAN and shared among several client computers?

    a) NAS   b) RAID   c) SAN   d) SSD

Q14. Which of the following is an explanation concerning the reliability index that is calculated by the expression below?

$$\frac{MTBF}{MTBF+MTTR}$$

    a) Average amount of time between system failures

    b) Average amount of time necessary to recover from a system failure

    c) Proportion of the time available for system operations to the total time

    d) Proportion of the downtime of a system to the total time

Q15. Which of the following is the most appropriate description concerning the benchmark test that is used as a method for the evaluation of a system?

a) The availability of a system is evaluated as a proportion of the time that the system is normally operable.
b) The processing power of a system is evaluated by means of a set of standard programs and data.
c) The reliability of a system is evaluated with the average time between inherent failures of a system.
d) The maintainability of a system is evaluated with the average time to fix and restore the system.

Q16. Which of the following is an appropriate explanation concerning a deadlock?

a) It is a state in which the processes of a computer are prohibited from getting intentional or accidental access to information that usually must not be accessed.
b) It is a state in which, if the authentication of a user fails more than the limited number of times, the user is prohibited from accessing the computer.
c) It is a state in which, when shared resources are exclusively used, two processes are endlessly waiting for each other to release the lock of a shared resource.
d) It is a state in which processes in the ready state under a multi-programming environment have used up the CPU time allocated by the OS.

Q17. Which of the following is an appropriate description concerning the virtualization of a server?

a) A technique for virtually creating computer-generated worlds or immersive environments that users can interact with
b) A technique for virtually operating the GUI of a remote computer connected via a network by using a local computer
c) A technique for virtually implementing and operating two or more computers on a single computer
d) A technique for virtually allocating more memory space than the capacity of main memory by using a particular part of auxiliary storage

Q18. Which of the following is an appropriate description concerning file management under UNIX?

    a) No removable storage media, such as CD-ROM, can be allocated to a directory, so it is directly accessed by specifying the drive name.

    b) Files are managed in a directory tree for each drive, and at first, the drive where the target file is located is determined when the file is searched for.

    c) The entire file system is managed in a single directory tree, and remote files via a network are also allocated and accessed in the directory.

    d) A home directory can be referenced by its owner only, and cannot be used when a file is shared by multiple users.

Q19. Which of the following is the most appropriate description concerning Java applet?

    a) It is integrated into a client as add-in software and executed on the client.
    b) It is downloaded from a server to a client and executed on the client.
    c) It is executed in cooperation with an HTML document on a server.
    d) It is executed without compiling the source code.

Q20. When a digital color image with a color depth of 24 bits per pixel is stored in graphics memory, approximately how many megabytes of memory are required at a minimum to display the image on a screen of 1,024 horizontal pixels by 768 vertical pixels?   Here, one megabyte is 10^6 bytes.

    a) 0.8   b) 2.4   c) 6.3   d) 18.9

Q21. Which of the following is a technique that can be used to compress both video and audio data?

    a) BMP   b) GIF   c) JPEG   d) MPEG

Q22. Which of the following is represented by an E-R diagram that is used for the design of a relational database?

    a) The state transition of a system that changes according to some factors, such as time and events

    b) The relationship between the input data, output data, and functions (i.e., processes) of a system

    c) The relationship between entities, such as humans, objects, places, and events, which constitute the target world

    d) The movement of business processes illustrated with the attention focused on the flow of data

Q23. In the description below concerning a relational database, which of the following is an appropriate combination of technical terms to be inserted into blanks *A* and *B*?

In a relational database, information for uniquely identifying each individual record (i.e., row) is called ⬚ *A* ⬚, and tables are related to each other with a particular ⬚ *B* ⬚.

	A	*B*
a)	an entity	field
b)	an entity	record
c)	a primary key	field
d)	a primary key	record

Q24. Among the primary key, foreign key, and index that are set in the tables of a relational database, which of the following is the list that contains all the items where multiple units of each item can be set for a single table?

    a) Index   b) Foreign key, index

    c) Primary key   d) Primary key, foreign key, index

Q25. Which of the following is the relational operation that extracts only the rows of a product whose price is 10 dollars or more, from the "Product" table of the relational database shown below?

Product

Product number	Product name	Price (dollars)
S001	Scissors	20
S002	Pencil	5
S003	Notebook	12
S004	Eraser	8
S005	Ruler	15

a) Join b) Projection c) Selection d) Union

Q26. Which of the following is an appropriate description concerning IPv6?

a) A larger number of addresses than IPv4 can be assigned because of a 128-bit address.
b) IPv6 and IPv4 cannot co-exist in the same single LAN.
c) IPv6 is a dedicated protocol for a wired LAN, and cannot be used for a wireless LAN.
d) An optical fiber cable rather than a regular twisted pair cable is required to use IPv6.

Q27. Which of the following is an appropriate role of the NTP (Network Time Protocol) that is used in a TCP/IP network?

a) Delivering synchronized video and audio data via network in real time
b) Synchronizing the time between devices connected to a network
c) Providing proof that a file existed at or before a certain time
d) Changing the encryption key after a fixed period of time in a wireless LAN

Q28. Which of the following is the most appropriate description concerning WAN?

   a) High-speed communication is enabled with the help of a wide frequency bandwidth available for data communications using ADSL, optical fiber, etc.
   b) All information terminals and devices are connected via diverse wired or wireless networks, and various services can be used at any time and from any location.
   c) Electric waves are used in place of metal cables or optical fiber cables to construct a WAN infrastructure.
   d) The network service of a telecommunications carrier is used to connect geographically separated LANs, such as those for the headquarters and branch offices.

Q29. In the environment of a wireless LAN, which of the following is an appropriate description concerning ESSID that is set in the access point and terminal?

   a) It is a character string used as a key for encrypted communication.
   b) It is a type of algorithm used for encryption and decryption.
   c) It is a channel number for electromagnetic waves used in the wireless LAN.
   d) It is a character string used to identify the network of a wireless LAN.

Q30. Which of the following is an appropriate explanation concerning a router that is used as a network device?

   a) It is used to interconnect a LAN and a telephone line, and perform data modulation and demodulation.
   b) It is used to interconnect the terminals of LAN, and analyze the MAC address of the received data in order to transfer it to the destination terminal.
   c) It is used to interconnect the terminals of LAN, and transfer the received data to all terminals.
   b) It is used to interconnect LANs and/or WANs, and analyze the IP address of the received data in order to transfer it to the appropriate network.

Q31. In an organization under the operation of an ISMS, the fact that the retired persons' IDs are deleted in a batch at the end of the month is reported during an audit. Among the four steps of the PDCA cycle in the ISMS, which of the following is the step where the corrective action plan is implemented so that such a deletion is performed each time a person retires?

a) P b) D c) C d) A

Q32. In terms of information security, which of the following is an incident where availability is compromised?

a) A system stops because of the occurrence of a power failure.
b) A file is accessed by an unauthorized user because of some wrong privilege settings.
c) Data of a transaction with a customer is leaked because of unauthorized access.
d) Data is updated erroneously because of a bug in a program.

Q33. The right of access to the file *aaa* is set as shown in the table below. When it is necessary for user *B* to create another file *bbb* by copying the file *aaa*, which of the following is the most appropriate description concerning the right of access to the file *aaa*?

File owner	Right of access	
	File owner	Other than file owner
User *A*	R	–

Note: Type of access right
   R: Readable, W: Writable, – : Neither readable nor writable

a) No right of access needs to be changed.
b) R (readable) needs to be added to "Other than file owner" for user *B*.
c) W (writable) needs to be added to "Other than file owner" for user *B*.
d) W (writable) needs to be added to "File owner" for user *B*.

Q34. Which of the following is the name of a malicious program that infects multiple computers and simultaneously makes an attack, such as a DDoS attack, when a command is received from an attacker who is in a remote location?

a) Bot
b) Honey pot
c) Macro virus
d) Worm

Q35. Which of the following is the most appropriate description concerning risk management in information security?

a) The person with ultimate responsibility is appointed from among the staff members in charge of information security management at the workplace.
b) Risk management is performed as an independent activity that is separated from the activities of the organization.
c) All staff members of an organization divide up their roles, and perform the activities of risk management across the organization.
d) An individual information security policy is developed for each department under a single management system, and each department implements the policy independently.

Q36. Which of the following is an appropriate explanation concerning a numeric check?

    a) It examines whether the check characters calculated from the input data on the basis of a certain rule are the same as the appended check characters.

    b) It examines whether the input data to be handled as a numeric value does not include non-numeric characters, such as alphabetic characters.

    c) It examines whether there exist no inconsistencies between related items, such as sales quantity, stock quantity, and purchase quantity.

    d) It examines whether the input data does not include multiple records with the same key during the creation of a master file.

Q37. Hardware and software that are identical to the production environment are prepared, and it is verified that the response time of a query from a terminal is within the target value. What is this type of test called?

    a) Software integration test   b) System test

    c) Unit test   d) White box test

Q38. In order to achieve a non-stop system, which of the following is an appropriate item to be considered during the design of the system architecture?

    a) Partitioning of software into components

    b) Encryption of data

    c) Reduction in power consumption of hardware

    d) Dual redundancy of hardware

Q39. As described below, there are three types of worksheets created by using spreadsheet software. Each of the worksheets can be considered to be a program. Among the test activities for those worksheets, which of the following is an activity that is regarded as an integration test?

   (1) Worksheet "First Half Year" that calculates the total sales when the sales of all the months from January through June are entered

   (2) Worksheet "Second Half Year" that calculates the total sales when the sales of all the months from July through December are entered

   (3) Worksheet "Full Year" that automatically calculates the annual total sales by adding the total sales of "First Half Year" to that of "Second Half Year" and then displays the sales by month in a graph

a) A test activity which verifies that, if the sales of any month fail to be entered in "First Half Year" or "Second Half Year", an error occurs in relation to the total sales in the worksheet

b) A test activity which verifies that, when the sales of all the months from January through June are entered in "First Half Year" and the sales of all the months from July through December are entered in "Second Half Year", the total half-year sales are correctly calculated in each worksheet

c) A test activity which verifies that the total sales of "First Half Year" and those of "Second Half Year" are correctly reflected in worksheet "Full Year"

d) A test activity which sums up the manually calculated total sales of "First Half Year" and "Second Half Year" and then verifies that the result matches the total annual sales that are manually calculated

Q40. The development of new business software is completed and ready for installation in the production environment. Which of the following is an appropriate activity that is required during the installation of the software?

a) Estimating the total cost required for system operations
b) Obtaining all necessary hardware resources such as disk capacity
c) Determining the functions to be implemented by the software
d) Estimating the person-hours required for the development of the software

Q41. Which of the following is an appropriate explanation concerning software maintenance?

a) During system development, each program is created and verified on the basis of the detailed design, and also modified as appropriate if a significant error or inaccuracy is detected.
b) Programs are revised or modified for the purpose of maintaining the stable system operations and also keeping pace with the development of information technology and some changes in business strategy.
c) In response to a question from a system user, the question is recorded and if necessary, transferred to the appropriate department, and after that, the final result is also recorded.
d) From a wide range of perspectives, the system including software is investigated, and it is determined whether or not the system can contribute to the management of business operations.

Q42. Which of the following is an appropriate description concerning the creation of a test case for a white box test?

a) For items in which a numeric value should be entered, a test case is created by setting non-numeric data.
b) The relationship between input data and output data is illustrated by using a graph, and the effective combination is created as a test case.
c) In a test for entering the body weight of people, a test case is created by setting the upper limit as 300 kg and the lower limit as 500g.
d) A test case is created so that all branch paths of a program are executed at least once on the basis of the program logic.

Q43. In a software development project, the development process is performed in sequence from upstream to downstream.   The judgment of whether or not a phase is completed is made for each phase, such as requirements definition, system design, and detailed design, and after that, programming is performed.   Which of the following is the software development model that is applicable to such a project?

a) Incremental model
b) Prototyping model
c) Spiral model
d) Waterfall model

Q44. When the system development process is performed in the order of requirements definition, external design, and internal design, which of the following is an activity that is performed during internal design?

a) Determining the target value of the screen response time
b) Dividing the system into several subsystems
c) Determining the length and attributes of each record stored in a database
d) Designing the layout of the I/O screens and forms

Q45. Which of the following is the most appropriate purpose of creating a WBS in project management?

a) To improve the efficiency of progress management
b) To clarify the deliverables and associated activities
c) To clarify the standards for quality verification
d) To promote awareness of the purpose of a project

Q46. In project management, which of the following is an appropriate diagram or chart that can be used for representing the time sequence and dependencies of activities and creating the schedule of a project?

a) Arrow diagram
b) Cause and effect diagram
c) Composite bar chart
d) Control chart

Q47. In a project, a contingency reserve is the cost that is included in the initial project scope and is prepared for measures against events that are predictable but uncertain. Among the costs that are allocated by the project manager of a vendor company that receives an order for a system development project, which of the following is an appropriate cost that can be classified as a contingency reserve?

a) The cost that is necessary for the replacement of a device when the device happens to fail under the development environment
b) The cost that is necessary for the activities of the project leader who manages the development progress
c) The cost that is necessary for fulfilling the new requirements of users that are outside the scope of the project
d) The cost that is necessary for purchasing the quality management tools of a system that are planned to be adopted in the project

Q48. Among the descriptions *A* through *C* concerning the measures for risk reduction to be considered when a new product is developed, which of the following is the list that contains all appropriate measures for reducing quality-related risks?

A: Developing the product by using stable technology
B: Purchasing insurance against development delays
C: Creating a prototype of the product

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

Q49. In order to increase the productivity of programming activities in a system development project, the course of training to improve skills necessary for using development tools is planned for new project members. Which of the following is the most appropriate indicator that can be used to evaluate the effect of this plan?

a) The total number of participants in training
b) The number of times that training is implemented
c) The amount of programming created in one day by each member
d) The total hours of participation in training by each member

Q50. Among the management functions for service support, which of the following is the process of identifying all IT assets such as hardware and software, and creating and maintaining an up-to-date record of those IT assets including related documentation or such other information?

a) Configuration management

b) Incident management

c) Problem management

d) Release management

Q51. Which of the following is an appropriate description concerning incident management?

a) An incident that cannot be resolved within the time period specified in the SLA is transferred to problem management.

b) Measures for eliminating or minimizing the possibility of any potential recurrence of an incident are implemented.

c) The recovery of a normal service operation is given higher priority than the cause investigation of an incident.

d) The occurrence of an incident for which the method of resolution is known does not need to be recorded.

Q52. Which of the following is the technical term that shows the management cycle in IT service management?

a) ITIL   b) PDCA   c) SLA   d) SLCP

Q53. Which of the following is an appropriate description concerning a service desk?

a) The service desk must provide an automated answering mechanism rather than operator-assisted services.
b) The service desk is located within a company, and the relevant business operations are not outsourced.
c) Questions, such as how to operate the system, are received through e-mail and telephone.
d) The service desk activities can be classified into inbound for receiving phone calls such as those for receiving orders, and outbound for making phone calls such as those for sales.

Q54. When a contract is signed between a user organization and an IT service provider, which of the following is the document that describes the consensus between the two parties in order to define the quality and scope of services?

a) Service catalog
b) Service document
c) Service level agreement
d) Service level requirements

Q55. In a data center where IT equipment is installed for providing IT services, which of the following is an appropriate activity that exercises control over the physical environment, such as the cooling and power source of IT equipment, and control over the entrance and exit to and from the data center?

a) Access management
b) Facility management
c) Incident management
d) Service level management

Q56. IT control is classified into general control and application control concerning IT. General control refers to the control activities for guaranteeing the environment in which each application control works effectively. Application control refers to the control activities for ensuring that all business operations approved in the system for managing business operations are processed and recorded appropriately. Among the descriptions concerning IT control activities, which of the following can be regarded as general control?

a) A set of system development rules and regulations that are used commonly across an entire company
b) A method for restricting the usage range of a personnel system that is used commonly across an entire company
c) A method for managing the master data of an accounting system that is used commonly across an entire company
d) A procedure for correcting the input errors of a purchasing system that is used commonly across an entire company

Q57. Among the improvement activities that are performed on the basis of the results of a system audit conducted within a company as an internal audit, which of the following is conducted by the system auditor?

a) Individual improvements are performed on the basis of the improvement action plan.
b) The improvement action plan is approved.
c) The items to be improved are decided, and the improvement action plan is developed.
d) The improvement status is confirmed, and the improvement results are evaluated.

Q58. A system auditor is not allowed to have any vested interest in a subject for audit. Which of the following is the technical term that is associated with such a situation?

a) Competence of auditor
b) Independence of auditor
c) Practical experience of auditor
d) Presentation ability of auditor

Q59. Which of the following is the concept for promoting energy conservation in society and protecting the environment through not only the energy saving of information and telecommunications systems including PCs, servers, and networks, but also the effective use of such systems as well as resources?

a) Eco farm
b) Environmental assessment
c) Green IT
d) Zero emission

Q60. Which of the following is the most appropriate description concerning management principles?

a) It is reviewed and revised every one to two years.
b) It expresses a company's mission and its meaning of existence.
c) It defines the management plan and management policy.
d) It is not clearly written as a company's motto or philosophy.

Q61. Among the employee training methods, which of the following is classified as "off-the-job training" rather than "on-the-job training"?

a) Promoting the independence and autonomy of employees by granting authority to the site where the real work takes place
b) Enabling the acquisition of knowledge and techniques through education and training implemented separately from work
c) Enabling the acquisition of necessary knowledge and techniques by imparting guidance and training on a planned basis through actual tasks
d) Putting forward questions and simple advice to have employees work towards their goals for themselves

Q62. Which of the following is an appropriate explanation concerning a Pareto chart?

a) It represents the flow of activities from start to end by using an arrowed line for each activity and a circle for the start point or end point for individual activity, and by connecting circles and arrows sequentially from left to right.
b) It is created by plotting values of two-dimensional data as coordinate values of the vertical axis and horizontal axis.
c) It is a type of graph that combines both a bar graph with items arranged in descending order of frequency and a line graph with cumulative frequencies.
d) It has a polygon-like shape where the values on radially elongated numeric axes are connected with a line.

Q63. When the test scores of students in eight subjects are evaluated, which of the following is the most appropriate type of graph where each student can compare the average score per subject with his/her own score per subject, and evaluating the score balance between the subjects?

a) Histogram
b) Pie chart
c) Radar chart
d) Scatter diagram

Q64. Which of the following is a consolidated financial statement by which a parent company indicates the status of revenue and expenses of an accounting period of a corporate group including subsidiaries?

a) Consolidated balance sheet
b) Consolidated cash flow statement
c) Consolidated income statement
d) Consolidated statement of shareholders' equity

Q65. Company *A* researches the tier of loyal customers. "Loyal customers" are defined as customers who have recently purchased something and who have made many purchases. During some recent periods, such as the last one month, two months, and three months, Company *A* counts the number of customers for each period and each number of purchases, and then creates an analysis table for customer purchases, in order to narrow down the loyal customers. Which of the following is a "customer purchase analysis table" that is suitable for obtaining the stratified number of loyal customers?

a)

Customer purchase analysis table
(number of persons)

Month \ Purchases	10	9	…
Last one month	550	650	…
Last two months	700	850	…
:	:	:	:
:	:	:	:

b)

Customer purchase analysis table

Customers (persons)	Month	Purchases
850	Last two months	9
700	Last two months	10
650	Last one month	9
:	:	:
:	:	:

c)

Customer purchase analysis table

Purchases	Month	Customers (persons)
10	Last one month	550
	Last two months	700
	:	:
9	Last one month	650
:	:	:

d)

Customer purchase analysis table

Month	Purchases	Customers (persons)
Last one month	10	550
	9	650
	:	:
Last two months	10	700
:	:	:

Q66. Which of the following is an explanation concerning ROE (Return on Equity)?

a) It is an index that measures how many times a company's inventory is sold and replaced in a given period.

b) It is an index that measures the safety and soundness of financial activities in a company.

c) It is an index that measures the profitability calculated as a company's net income divided by its equity capital.

d) It is an index that measures the ratio of dividends paid to stockholders on the basis of the current net profit.

Q67. Among the various types of license agreements for a software package, which of the following is an appropriate explanation concerning a site license?

a) A software package can be used on multiple computers in a designated company or organization.
b) A software package can be used on a designated computer or a definite number of computers.
c) A software package can be installed on a designated server, and can also be used by any and all clients to access the server.
d) A software package can be used by a designated user or a definite number of users regardless of use or purpose.

Q68. Which of the following is the type of software that can be copied or modified freely without permission from the owner of copyright?

a) Open source software   b) Package software
c) Shareware   d) Utility software

Q69. Which of the following is a case example where Bluetooth is used as a standard protocol of wireless communications for cellular phones, household electric appliances, or such other devices?

a) Connecting two controllers to one home video game console without any cables
b) Receiving signals from some GPS satellites into a car navigation system
c) Reading a QR code by using a cellular phone
d) Reading the information or data on an IC card ticket at an automatic ticket gate

Q70. There exist two indicators for evaluating the status of achievement of strategic objectives: one is the leading indicator for evaluating the means of achievement of objectives, and the other is the lagging indicator for evaluating the level of achievement of objectives. When the strategic objective is the "acquisition of new customers," which of the following is considered as a leading indicator?

a) The number of new customers
b) The number of visits to prospective customers
c) The rate of acquisition of new contracts
d) The rate of increase in total customers

Q71. For the purpose of reviewing business strategy, Company *A* analyzes the internal and external environments by using a SWOT analysis. Which of the following is the most appropriate example that is handled as an analysis of the internal environment?

a) Identifying the characteristics of products that compete with Company *A*'s products
b) Understanding the marginal profit ratio of Company *A*'s products
c) Investigating the market value of Company *A*'s products
d) Performing market research into alternatives to Company *A*'s products

Q72. Which of the following is an appropriate explanation concerning TOB?

a) It refers to announcing the time of purchase, number of stocks, price, and such other conditions to buy the stocks of a specific company outside the market.
b) It refers to building cooperative relationships, such as financial contribution and cross-shareholdings, between companies.
c) It refers to the acquisition of stocks of a company by its own management so that they can become owners themselves.
d) It refers to the acquisition of a company through borrowing that uses the assets of the target company as collateral.

Q73. Which of the following is the strategy that enables a company to achieve growth by incorporating advanced technologies developed by other companies and human resources with high-level research and development capabilities into the management resources of the company?

a) Alliance
b) M&A
c) R&D
d) Technology alliance

Q74. In mutual decision-making between Company A and competitor Company B, the scenarios to be executed mutually up to the third scenario, with Company A executing the first scenario, are described as shown in the table below. The numeric values in the table are the expected values of Company A in the step of the third scenario. While Company A selects a scenario for improving its expected value, Company B selects a scenario for reducing the expected value of Company A by predicting the result of the third scenario. What is the expected value (in million dollars) of Company A in the step of the third scenario?

Unit: million dollars

First scenario: Company A	Second scenario: Company B	Third scenario: Company A	Expected value of Company A in the step of the third scenario
Discount	Discount	Advertisement	900
		No advertisement	200
	No discount	Advertisement	1,500
		No advertisement	800
No discount	Discount	Advertisement	0
		No advertisement	– 600
	No discount	Advertisement	1,000
		No advertisement	400

a) 800
b) 900
c) 1,000
d) 1,500

Q75. Which of the following is an appropriate explanation concerning target marketing?

a) Corporate activities are broken down into individual value activities, and the added value of each activity is analyzed.

b) Businesses and products are classified from the viewpoint of growth and market share, and optimum resource allocation according to positioning is performed.

c) The market is divided into several segments, and an approach focusing on a small number of segments is undertaken.

d) The period of time from the introduction of a product to the market until its decline is divided, and a strategy corresponding to each divided period is established.

Q76. In order to achieve the marketing objectives such as an increase in the total sales and the expansion of market share, a company aims for optimization by combining four elements called 4Ps.   Which of the following is an appropriate combination of the four elements?

a) Place, Price, Product, Profit

b) Place, Price, Product, Promotion

c) Place, Product, Profit, Promotion

d) Price, Product, Profit, Promotion

Q77. In a sales company, the number of actually stocked products is 100 at the end of April, and the order transactions are recorded until May 10 as shown in the table below.   When products come into stock in 5 days after an order is placed, how many stocked products are available for allocation on May 10?   Here, holidays of the sales company and its trading partners do not need to be considered, and transactions prior to the previous month can also be ignored.

Transaction date	Orders received	Orders placed
May 2	40 units	—
May 3	—	50 units
May 6	20 units	—
May 7	—	50 units
May 9	30 units	—

a) 60   b) 90   c) 110   d) 140

Q78. Which of the following is an appropriate explanation concerning six sigma activities?

a) Taking preventive measures against the failures, which might occur in the process of activities, by predicting such potential failures in advance

b) Solving the various problems continuously, which occur at the workplace, by getting together as a group of staff members and by discussing such problems in the group

c) Improving the quality of target business operations by expressing the quality of the operations in numerical values and by reducing avoidable variation in quality

d) Improving quality assurance and customer satisfaction by creating procedures, documents, and records for all activities of quality management

Q79. Among the devices *A* through *D*, which of the following is the list that contains all devices that are equipped with an embedded system?

    A: Automated teller machine   *B*: Car navigation device
    C: Portable game console   *D*: Cellular phone

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

Q80. Which of the following is the most appropriate service that makes use of the information sharing function provided by groupware?

a) Network management   b) Schedule management
c) Security management   d) User management

Q81. When the system life cycle is divided into planning process, requirements definition process, development process, operation process, and maintenance process, which of the following is the appropriate state at the time of completion of the planning process?

a) The scope of computerization, system configuration, and basic architecture that are necessary to achieve business objectives are determined.

b) The requirements and constraints for the system that are based on user needs and preferences are determined.

c) The software requirements that are optimized in light of the system requirements are determined.

d) The requirements for business operations including the target system and for the organization of system operations are determined.

Q82. In order to make good use of IT to implement the business strategy of a company, which of the following is the most appropriate point to be considered when an information strategy is created?

a) The creation of the business strategy is the responsibility of top management, and on the other hand, the creation of the information strategy is the responsibility of the information systems department, and these activities should proceed independently.

b) When the computerization of business operations is planned, IT-based automation of actual business processes should be implemented after the investigation into the business functions and workflow of the current business operations.

c) When the computerization of business operations is planned, a clear vision of the information system should be clarified, and it should be examined whether the purpose and functions of the information system conform to the business strategy.

d) In the stage of creation of the information strategy, the initial cost should be evaluated as the cost of the system, and the cost of system operations and maintenance should be evaluated again at the start of operations.

Q83. Which of the following is the technique for analyzing data, such as the purchase history of customers accumulated in a database, and extracting helpful and valuable information for use in business decisions and business operations?

a) Data cleansing
b) Data mining
c) Data modeling
d) Data warehouse

Q84. Which of the following is the most appropriate system that is installed with the aim of speeding up the application procedure for approval within a company and reducing the administrative workload of staff members and managers?

a) MRP system
b) POS system
c) SFA system
d) Workflow system

Q85. Company *A* runs a securities business and outsources a project to develop a stock ordering system to Company *B* that is a system vendor. During the operational test of the project, a defect is discovered. The defect is caused by the fact that Company *B* cannot understand the "Exceptional rule for approval of the responsible person during ordering of stocks," which is established by Company *A*. Which of the following is the phase where such a rule should be clearly explained?

a) Definition of business requirements   b) Definition of software requirements

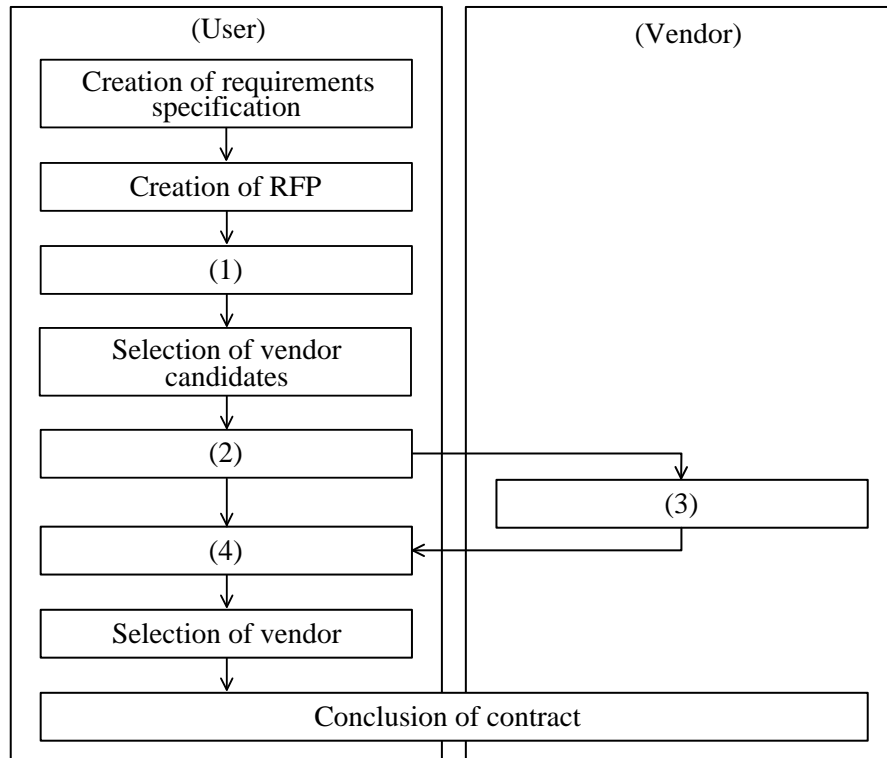c) Definition of system requirements   d) Definition of system test requirements

Q86. When a system development project is started, which of the following is the appropriate stage for setting the target values for quality, cost, and delivery date?

a) Creation of a computerization plan

b) Creation of a software installation plan

c) Definition of software requirements

d) Definition of system requirements

Q87. Which of the following is an appropriate explanation concerning an RFP (Request for Proposal)?

a) It is created by the vendor with whom an order is placed, with the purpose of requesting the ordering company to submit a request for computerization.

b) It is created jointly by the ordering company and the vendor with whom an order is placed, with the purpose of providing the details of the development.

c) It is created by the ordering company with the purpose of obtaining specific and concrete ideas for a system from the vendors with whom an order is to be placed.

d) It is created by the ordering company with the purpose of collecting information and accumulating knowhow and knowledge from a wide range of sources.

Q88. When software is procured in accordance with the procedure shown in the diagram below, which of the following is the most appropriate item to be inserted into blank (1)?　Here, each of items a) through d) corresponds to one or other of blanks (1) through (4).

(User)	(Vendor)
Creation of requirements specification	
Creation of RFP	
(1)	
Selection of vendor candidates	
(2)	
	(3)
(4)	
Selection of vendor	
Conclusion of contract	

- a) Creation of criteria for vendor selection
- b) Creation of proposal
- c) Evaluation of proposal
- d) Explanation of RFP

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

Question A Read the following description concerning analysis for sales data, and then answer the four questions.

In order to analyze the trend for sales of product *N*, Mr. *A* creates a worksheet with spreadsheet software as shown in Figure 1, on the basis of the transition of the total sales for the last year and current year.

Unit: thousands of dollars

	A	B	C	D	E
1	Month	Sales of last year	Sales of current year	Moving total	Cumulative sales
2	January	30	32	608	32
3	February	41	44	611	76
4	March	119	132	624	208
5	April	73	77	628	285
6	May	58	65	635	350
7	June	35	37	637	387
8	July	32	35	640	422
9	August	80	92	652	514
10	September	50	58	660	572
11	October	32	47	675	619
12	November	29	43	689	662
13	December	27	41	703	703
14	Annual total	606	703		

Figure 1　Transition table of sales

An expression for calculating the total of sales in the past 12 months including the current month is entered in "Moving total" in column D of Figure 1. An expression for calculating the accumulated total of the sales for the current year is entered in "Cumulative sales" in column E. Furthermore, in order to visually check the sales trend of product *N*, a transition graph of the sales is created as shown in Figure 2.
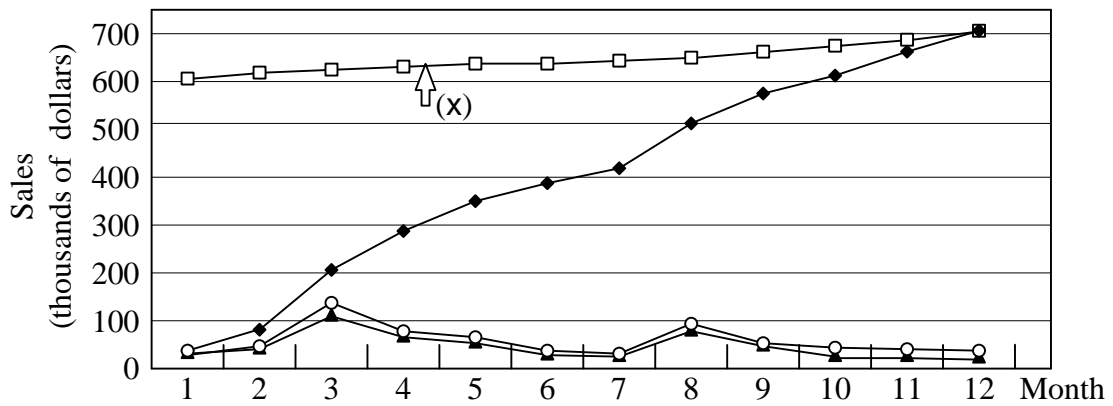
Figure 2   Transition graph of sales

[Technology]

Q89. Which the following is the appropriate expression that is entered in cell D3 of Figure 1? Here, the expression "B14 + C2 − B2" is entered in cell D2, and the expression of cell D3 is copied to cells D4 through D13.

a) B3 + C3

b) D2 + C3 − B3

c) B14 + C3 − B3

d) SUM(B4:B13) + SUM(C2:C3)

[Strategy]

Q90. Which of the following is an appropriate interpretation that can be retrieved from the polygonal line graph indicated by (x) in Figure 2?

a) The accumulated total of the sales for the current year is understandable.

b) The increase ratio of the current year's sales to the last year's sales is understandable.

c) The transition of sales over a long period of time is understandable.

d) The trend of fluctuation in sales depending on months and seasons is understandable.

[Strategy]

Q91. Which of the following is a result that is obtained from the sales analysis for product *N* on the basis of Figure 1 and Figure 2?

    a) August is the peak of growth, and thereafter, growth slows down.

    b) The gradient of the line graph indicated by (x) in Figure 2 is almost constant, and the sales fluctuations in each month are small.

    c) The sales of each month is continuously increased throughout the year.

    d) Despite fluctuations in some months, growth is continued over the long term.

Q92. From the analysis of the sales trend and the economic trend, Mr. *A* expects an increase of 10% in the annual sales of product *N* in the next year as compared with the current year. Furthermore, in order to determine the sales target of each month and manage the achievement of the target, Mr. *A* creates the worksheet shown below for calculating the target sales from the sales trend of each month.

	A	B	C	D	E	F
1	Month	Sales of last year (Unit: 1,000 dollars)	Sales of current year (Unit: 1,000 dollars)	Average (Unit: 1,000 dollars)	Monthly sales composition ratio	Target sales (Unit: 1,000 dollars)
2	January	30	32	31.0		
3	February	41	44	42.5		
4	March	119	132	125.5		
5	April	73	77	75.0		
⋮	⋮	⋮	⋮	⋮	⋮	⋮
13	December	27	41	34.0		
14	Annual total	606	703	654.5		

Note: The shaded cells are intentionally hidden.

When each cell of the worksheet is set as described below, which of the following is the appropriate expression to be entered in cell F14?

[Setting of each cell]

- The expression "(B2+C2)/2" is entered in cell D2, and then copied to cells D3 through D13.
- The expression "SUM(D2:D13)" is entered in cell D14.
- The expression "D2/D$14" is entered in cell E2, and then copied to cells E3 through E14.
- The expression "F$14∗E2" is entered in cell F2, and then copied to cells F3 through F13.

a) C14+(D14∗0.1)   b) C14∗1.1

c) C14∗E14   d) SUM(F2:F13)

Read the following description concerning the online sale of products, and then answer the four questions.

Company *N* is a retailer of sports goods, and in addition to selling at retail stores, it is also engaged in online sales through a shopping site on the Internet.   The operation of the server of the shopping site is outsourced to a vendor.   The vendor analyzes the access log every month and reports to Company *N*.   This report is used for the operation and improvement of the shopping site.

Figure 1 shows the path from the top page of the shopping site until the completion of the purchase procedure for a product.   Arrows in Figure 1 show the link paths.   Here, *A* through *F* indicate the access ratios from the previous page to the next page.   For example, *A*% of users who access the top page access the product introduction page, and *C*% of users who access the product introduction page access the purchase procedure page.   In addition, the ratio of the number of purchase procedure completions to the number of accesses to the top page from outside is called the conversion ratio.   The conversion ratio of the previous month is 5%.
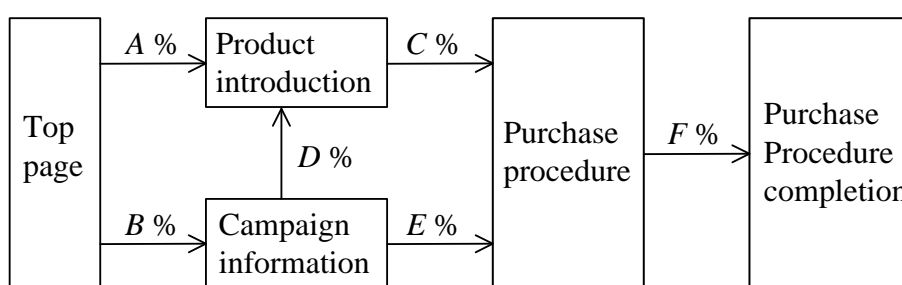

Figure 1   Link paths of the shopping site of Company *N*

[Technology]

Q93. Which of the following is the appropriate expression for calculating the conversion ratio of this shopping site in the link paths of Figure 1?   Here, each value of *a* through *f* in the expressions is obtained by converting the corresponding access ratio of *A*% through *F*% into a fractional value.   For example, if "*A*" is 10, "*a*" is 0.1.

a) $(a+b) \times (c+d+e) \times f$

b) $(a+c+f) \times (b+d+c+f) \times (b+e+f)$

c) $a \times c \times f + b \times d \times c \times f + b \times e \times f$

d) $f \div (a+b)$

Q94. As a measure for attracting more customers to the shopping site by advertisement, Company *N* decides to compare and evaluate one month of banner advertisement and one e-mail advertisement.   When these two proposals are as shown below, which of the following is an appropriate description as a result of the comparison?   Here, the link ratio of each proposal is the ratio of the number of links to the shopping site of Company *N* with respect to the number of displayed advertisements or the number of transmitted e-mails.   The conversion ratio is the ratio of purchase procedure completions with respect to the number of links from the corresponding advertisement, and each value of the conversion ratio shown here is a predicted value based on the past data.

[Two proposals]

Proposal *A*:   Put a banner advertisement on the portal site of Company *C*.

Expense:	1,200 dollars per month
Number of times advertisement is displayed:	250,000 times per month
Link ratio from banner advertisement:	0.8%
Conversion ratio:	5%

Proposal *B*:   Announce a one-time advertisement in the e-mail magazine of Company *D*.   Based on the database of Company *D*, e-mail is transmitted only to people who want to receive information related to sports goods.

|	
Expense:	0.04 dollars per e-mail
Number of e-mails transmitted:	50,000 e-mails per one-time advertisement
Link ratio from e-mail advertisement:	5%
Conversion ratio:	8%

a) As for Proposal *A*, the advertisement reaches users a greater number of times, so Proposal *A* is more effective than Proposal *B*, in order to increase the number of users who visit the shopping site of Company *N*.

b) As for Proposal *B*, the e-mail is only transmitted to the limited users, so the conversion ratio is higher, but the number of e-mails transmitted is less.   Therefore, Proposal *B* is inferior to Proposal *A* in terms of the number of purchase procedure completions.

c) Proposal *B* has the higher link ratio than Proposal *A*, so the cost of acquiring one link from a user is less than Proposal *A*.

d) As for the cost of acquiring one purchase procedure completion by advertisement, Proposal *B* is lower than Proposal *A*.

Q95. For an advertising sales campaign with special benefits for soccer goods, Company *N* placed a banner advertisement on the soccer news Web site of Company *C* last month. It is reported that there were 3,000 accesses of the top page of Company *N* from this banner advertisement. The moves of these 3,000 accesses within the Web site were traced, and are shown in Figure 2. From this result, which of the following is considered to be a problem? Here, the number of accesses is the number of links to the next page from the previous page. The difference between the number of accesses linked to each page and the number of links to a different page in the Web site of Company *N* from that page is regarded as a departure from the Web site of Company *N*.
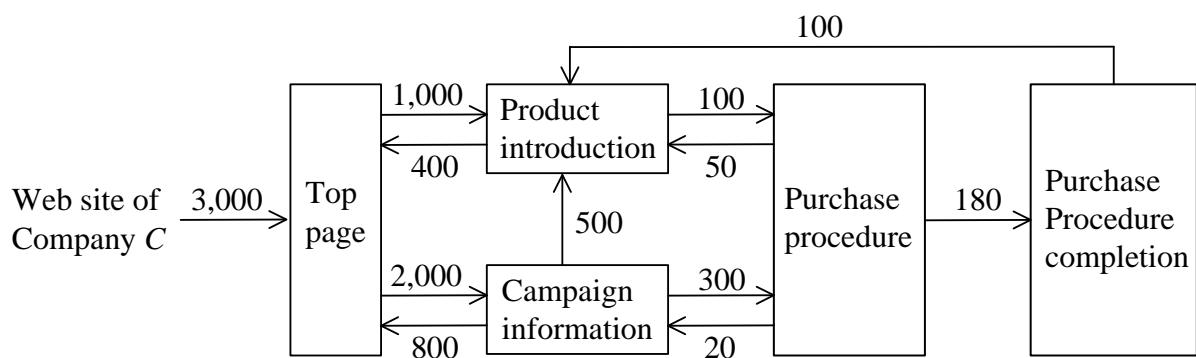
Note: A value shown above or below each arrowed line is the number of accesses.

Figure 2   Tracing of access from the Web site of Company *C*

a) There is a possibility that half of the users who accessed from the Web site of Company *C* left after they viewed the top page only.

b) The conversion ratio of access from the Web site of Company *C* was lower than the conversion ratio (5%) of the overall Web site in the previous month.

c) More than half of accesses that proceeded to "purchase procedure" moved to another page or left the Web site without completing purchase procedure.

d) The number of accesses to the campaign information page, which was the purpose of the advertisement, was smaller than the number of accesses to the product introduction page.

[Technology]

Q96. In order to increase the sales revenue of the shopping site, Company *N* thinks that it is important to consider that users can shop without any security concerns, and Company *N* is exploring various measures for gaining the trust of users.   Which of the following is an appropriate measure that Company *N* should take so that users can buy products on the Internet without any security concerns?

a) For transmitting personal information on a Web site, the communication is encrypted with an electronic certificate issued by a third party organization.

b) On the company information page, information, such as server, OS, application software, and IP address, is displayed to show the overall reliability of the system.

c) In order to ensure that there is no error in the payment procedure, a plaintext e-mail, containing the user's name, address, and credit card number, is sent to the user.

d) The purpose of use and inquiry methods for personal information are not published so that users do not become concerned about the handling of personal information.

Read the following description concerning a product development project, and then answer the four questions.

Company *N* started a product development project of application software (hereinafter, mobile application) for a personal digital assistant on April 1 on a confidential basis. In the product development project of the mobile application, marketing is performed by the company itself, and software development is outsourced.

[Project history up to July 1]
(1) Organization of Company *N*: The staff members at the time of start of the project in April included one project manager and three project members, but from June, Mr. *A* also participated, thus the total number of members is raised to five persons.
(2) Software development: After a non-disclosure agreement was signed with Company *B* and Company *C*, these two companies were asked to submit a quotation, and in mid-June, a service contract was signed with Company *B*.
(3) Reduction of project period: Although the project was started with an initially planned period of seven months, competitors appeared to be developing a similar product, and therefore, an overall reduction of the project period by one month was considered and implemented at the end of June. The two prerequisites were set as follows:
  • The product specifications and the scope of the contract work are not changed.
  • At first the announcement of the product was to take place at the time of completion of software development, but is shifted ahead of schedule to 0.5 months before the completion of software development.

[Contract change and process management]
When the reduction in the project period was discussed with Company *B*, the response below was received.
  "The completion of the activities can be hastened by adding staff members to the activities that are performed in the software development process. As a result of the addition of staff members, productivity will decline and the development person-hours will increase, and therefore, if the increase in cost is accepted, the response to the reduction in the project period will be implemented. The risk of increase in bugs is low."
Company *N* and Company *B* agreed to these details, and signed a change contract of the service contract at the end of June.
Figure 1 is a Gantt chart that shows a changed plan with the project period that is shortened by one month. Company *N* started process management according to the changed plan as shown in the Gantt chart from July 1.
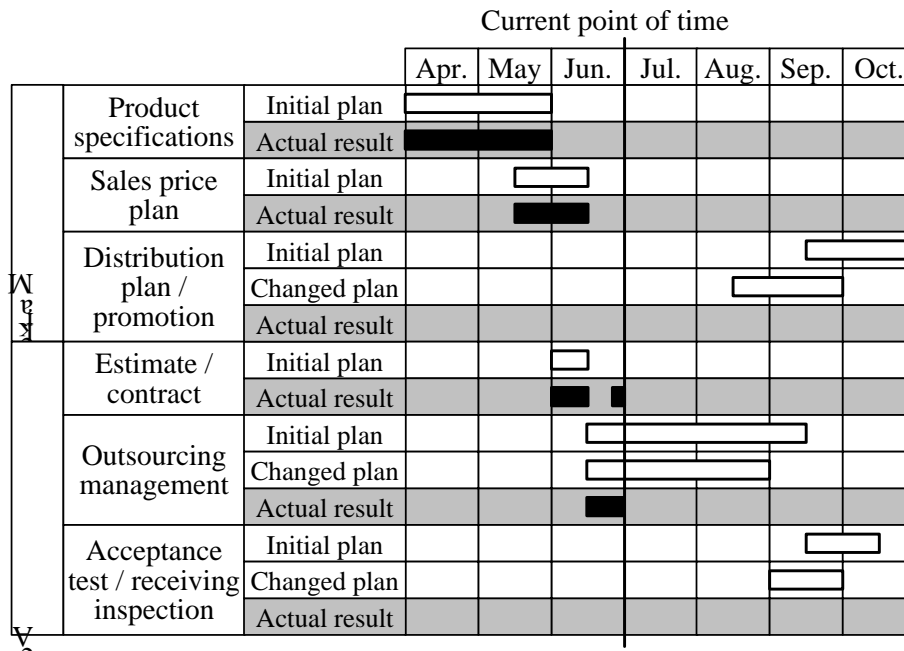
Current point of time

			Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.
Product specifications	Initial plan		▭						
	Actual result		▬						
Sales price plan	Initial plan			▭					
	Actual result			▬					
Distribution plan / promotion	Initial plan								▭
	Changed plan							▭	
	Actual result								
Estimate / contract	Initial plan				▭				
	Actual result				▬ ▪				
Outsourcing management	Initial plan					▭			
	Changed plan					▭			
	Actual result					▬			
Acceptance test / receiving inspection	Initial plan								▭
	Changed plan							▭	
	Actual result								

Figure 1   Gantt chart of Company *N*

[Management]

Q97. At Company *N*, all staff members communicate with each other to proceed with the project, and each staff member is required to convey information on a one-to-one basis. This path where information is conveyed on a one-to-one basis is called a communication channel.   The total number of communication channels before the participation of Mr. *A* was 6.   What is the number of total communication channels from June after the participation of Mr. *A*?

a) 7   b) 9   c) 10   d) 15

[Strategy]

Q98. Which of the following is an appropriate purpose for which Company *N* signed a non-disclosure agreement with Company *B* and Company *C*, who were requested to submit a quotation?

a) To prevent the subcontractor from further sub-contracting the work operations for which a contract is signed with Company *N*

b) To ensure that the employees of the subcontractor strictly follow the instructions from the project manager of Company *N*

c) To protect the copyright of Company *N* concerning the mobile application

d) To prevent the information that is provided to Company *B* and Company *C* for the creation of a quotation from leaking to an external party through either company

Q99. In order to shorten the software development period, Company *N* and Company *B* agreed to a change in the service contract that they had signed between them, and signed a change contract of the service contract at the end of June. At that time, which of the following is the combination of items that were changed as compared with the initial service contract?

    (i)   Amount of contract
    (ii)   Product specifications
    (iii) Delivery date
    (iv) Deliverables

  a) (i) and (ii)   b) (i) and (iii)   c) (ii) and (iv)   d) (iii) and (iv)

[Management]

Q100. Company *N* started process management according to the changed plan of the Gantt chart from July 1, as shown in Figure 1. Which of the following is an appropriate explanation concerning the measures that enable the overall project period to be shortened by one month in the changed plan?

  a) The software development activities of Company *B* are shortened by 0.5 months, and the acceptance test and the receiving inspection are performed 0.5 months early.

  b) The software development activities of Company *B* are shortened by 0.5 months, and the acceptance test and the receiving inspection are performed 0.5 months early. Furthermore, the start of distribution planning and promotion activities is shifted ahead of schedule, and these activities are performed in parallel with the software development activities of Company *B* for 0.5 months (i.e., the second half of August).

  c) The software development activities of Company *B* are shortened by one month.

  d) The start of distribution planning and promotion activities is shifted ahead of schedule, and these activities are performed in parallel with the software development activities of Company *B* for one month in September.

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) ROUNDOFF(arithmetic expression, position) ROUNDDOWN (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.
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.