



**May 2015**

## **IT Passport Examination**

**Questions must be answered in accordance with the following:**

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

**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 in 2015?

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

Since the correct answer is “c” (May), mark your answer sheet as follows:

[Sample Answer]

<b>Q1</b>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**Do not open the exam booklet until instructed to do so.**

**Inquiries about the exam questions will not be answered.**

Company names and product names appearing in the examination questions are trademarks or registered trademarks of their respective companies. Note that the symbols ® and ™ are not used within.

Answer questions Q1 through Q36 concerning technology.

- Q1.** As shown in Figure 1, there is a box that generates a single output in response to two inputs. The input to this box is either “Agree” or “Disagree.” The output “Agree” is generated only when both inputs are “Agree,” and in other cases the output “Disagree” is generated. When three inputs are entered into two boxes as shown in Figure 2, which of the following is the correct description concerning the output? Here, each box of Figure 2 has the same function as the box of Figure 1.

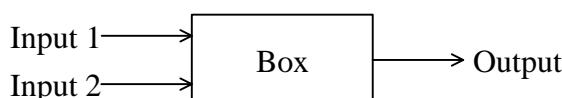


Figure 1

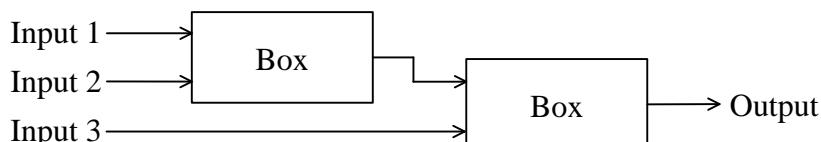
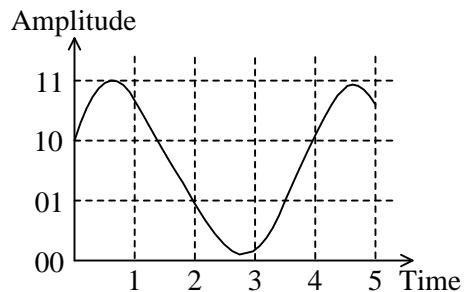


Figure 2

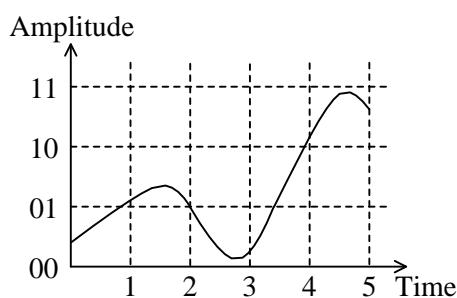
- a) The output “Agree” is generated at all times when one or more inputs are “Agree.”
  - b) The output “Agree” is generated at all times when two or more inputs are “Agree.”
  - c) The output “Disagree” is generated only when two or more inputs are “Disagree.”
  - d) The output “Agree” is generated only when all three inputs are “Agree.”
- Q2.** A single-sided single-layer DVD-R has a storage capacity of about 4.7 Gbytes. When a book has 700 double-byte characters that are printed per page, how many tens of thousands of pages, at maximum, can be recorded on this DVD-R? Here, two bytes are required to record one character, and only character information is stored. In addition, 1 Gbyte is 1 billion ( $10^9$ ) bytes.

- a) 42
- b) 71
- c) 335
- d) 671

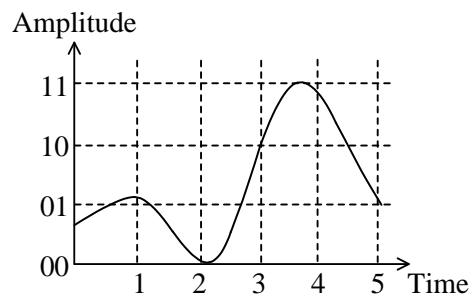
- Q3.** An analog sound signal is digitized. Sampling is performed at Time 1 through Time 5 in the figure below, and four-level quantization is performed; in other words, the levels closest to the sampling point are selected. After that, two-bit encoding is performed. The result is “11 01 00 10 11”. When digitization is performed in the same way, which of the following figures represents the sound signal that results in “01 00 10 11 01”?



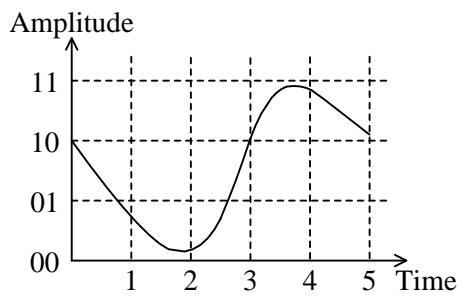
a)



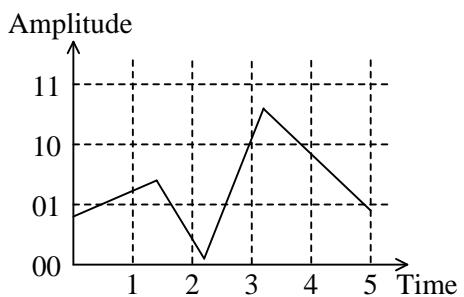
b)



c)



d)



- Q4.** The procedure described below is executed for two variables  $x$  and  $y$ , in order from step (1) through step (4). When the procedure is completed, what is the resulting value of  $x$ ?

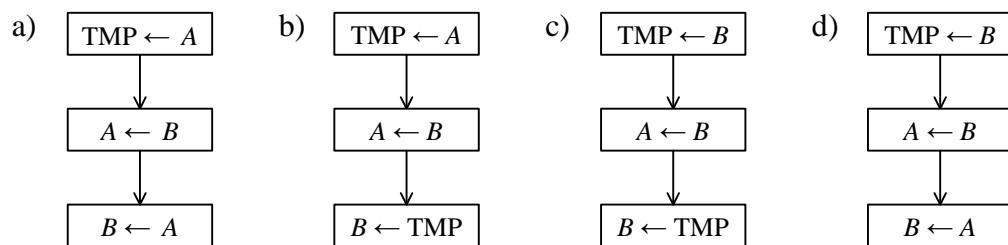
[Procedure]

- (1) Assign 2 to  $x$ , and 3 to  $y$ .
  - (2) Subtract 1 from the value of  $y$ , and assign the resulting value to  $y$ .
  - (3) Add the values of  $x$  and  $y$ , and assign the resulting value to  $x$ .
  - (4) If the value of  $y$  is 1, terminate the procedure. Otherwise, return to step (2).
- a) 4      b) 5      c) 7      d) 8

- Q5.** Which of the following is an appropriate description concerning the Java language?

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

- Q6.** The data is exchanged between variable  $A$  and variable  $B$ . When variable TMP is used to temporarily store data, which of the following is the procedure for exchanging data correctly? Here, “ $x \leftarrow y$ ” indicates that the content of “ $x$ ” is replaced with the data of “ $y$ ”.



- Q7.** There is a program that displays text in accordance with the specifications below. When the original text described below is displayed, in what point size does the program display the underlined character string? Here, the first character of the original text is displayed in 10 points.

[Specifications]

The characters between <B> and </B> are displayed one point larger than the preceding character.

The characters between <S> and </S> are displayed one point smaller than the preceding character.

Each of <B> </B> and <S> </S> must be used as a pair, and both of them can be nested with each other.

[Original text]

The system administrator promotes and implements <B>department-level<B> or <S>group-level</S> computerization</B> from a user <S>standpoint</S>. </B>

- a) 10                    b) 11                    c) 12                    d) 13

- Q8.** Which of the following is an appropriate explanation of HDMI?

- a) It is an interface for an audio-visual device that handles the input and output of video, audio, and control signals through a single cable.
- b) It is an interface that makes use of the infrared rays used for the exchange of information between cell phones.
- c) It is a serial interface that connects a peripheral device, such as an external hard disk, through a cable.
- d) It is a wireless interface that makes use of radio waves and can communicate even when there is a slight shielding.

**Q9.** Which of the following is implemented in a computer system in order to perform the role of transferring data between the CPU and memory, or between the CPU and I/O devices?

- a) Bus
- b) Hub
- c) Port
- d) Router

**Q10.** Which of the following is an appropriate description concerning flash memory?

- a) It is a type of rewritable memory that can erase all its content with ultraviolet light.
- b) It can read out data at a high speed, and therefore, it is often used as cache memory.
- c) It is a type of non-volatile memory that can erase and rewrite all or part of its content electrically.
- d) It is a type of memory that requires refresh operations and is widely used as main memory.

**Q11.** Which of the following is an appropriate explanation of some functional units that constitute a computer system?

- a) The arithmetic and logical unit performs calculation processing at the direction of the control unit.
- b) The arithmetic and logical unit exchanges data with the control unit, the input unit, and the output unit.
- c) The memory unit requests the arithmetic and logical unit to perform calculation processing and stores the results.
- d) The memory unit requests the output unit to read out data from the memory unit.

**Q12.** Which of the following is an appropriate explanation of the hot standby system?

- a) It is a system where a collection of various types of hardware, software, and data on the Internet is provided to the user.
- b) It is a system where a high level of reliability can be obtained by simultaneously operating the two sets of equipment and performing the same processing while cross-checking the results.
- c) It is a system where a backup machine is always kept on standby in an operable state and is immediately switched into operation at the occurrence of a failure.
- d) It is a system where a backup machine is arranged, and at the occurrence of a failure, the operator in charge starts up the backup machine to switch the production machine to the backup machine.

**Q13.** When MTBF is 600 hours and MTTR is 12 hours, what is the approximate availability?

- a) 0.02
- b) 0.20
- c) 0.88
- d) 0.98

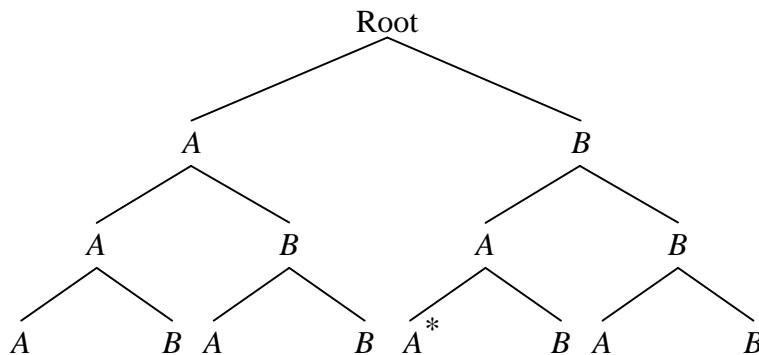
**Q14.** Which of the following is a method or technique that is used to connect multiple computers over a network such as a LAN or the Internet, and makes these computers available as if they were a single high performance computer?

- a) End user computing
- b) Social computing
- c) Grid computing
- d) Pervasive computing

**Q15.** Which of the following is an appropriate description concerning the OS for PCs?

- a) Only one type of OS can be installed and executed on one PC.
- b) There is no OS for PCs that are equipped with a 64-bit CPU.
- c) When an OS is upgraded to a new version, any software operating with the old version of the OS can no longer be used.
- d) There exist some OSs for PCs that can be started up by using an external storage device, such as a CD-ROM and USB memory, other than the hard disk.

**Q16.** In the hierarchical structure shown in the figure below, when the current directory is marked with an asterisk (\*), which of the following is the absolute path of the same directory as the directory specified by the relative path “..\\..\\B\\B”?



[Directory and file specification method]

- (1) A file is referenced as “directory name\\ … \\directory name\\file name”, where the directory names on the path are listed and separated with a backslash “\\” in sequence, and after that, followed by a backslash “\\” and the file name.
- (2) The current directory is represented by one period “.”.
- (3) The directory one level above is represented by two periods “..”.
- (4) When a path begins with a backslash “\\”, it is assumed that the root directory has been omitted from the beginning of the path.
- (5) When a path does not start with “\\”, “.”, or “..”, it is assumed that “\\.” for the current directory is omitted from the beginning of the path.

- a) \\A\\B\\B
- b) \\B
- c) \\B\\B
- d) \\B\\B\\B

**Q17.** Which of the following is the image data that is pasted onto the documents or Web pages created by the word-processing software or presentation software in order to improve the representational power?

- a) CSS
- b) CAPTCHA
- c) Clip art
- d) Template

**Q18.** In comparison with the program execution method where programs are started and executed sequentially, which of the following is an appropriate description concerning characteristics of the method where multiple programs are started and executed concurrently while switching between them in response to events such as input/output requests?

Number of programs executed within a certain amount of time	Amount of time between startup and completion of each program
a) Larger	Longer
b) Larger	Shorter
c) Smaller	Longer
d) Smaller	Shorter

**Q19.** In comparison with the compiler-based language processing, which of the following is an appropriate description concerning the interpreter-based language processing?

- a) Programs are executed at a slower speed.
- b) Recursive function calls are not allowed.
- c) Source programs are translated into machine language prior to execution.
- d) It is not suited to an interactive operation environment.

**Q20.** Which of the following is software that can be used free of charge on a trial basis but requires a usage fee if it continues to be used after the trial period?

- a) Groupware
- b) Shareware
- c) Adware
- d) Freeware

**Q21.** Which of the following is an appropriate explanation of a general purpose computer that is also known as a mainframe?

- a) It is an ultra-small computer in which the CPU, main memory, and interface circuits are embedded in a single chip.
- b) It is a large computer that is used for a wide range of applications from office processing to technical calculations, including mission-critical business as the main target.
- c) It is a client-dedicated computer that is equipped only with the minimum functions, such as data entry and display, in the configuration of a system where resources, such as the application programs and files, are managed at the server side.
- d) It is a portable information terminal where functions, such as schedule management, address book, and e-mail, are made available in a device that is small enough to fit into the palm of one's hand.

**Q22.** Which of the following is the unit that represents the resolution when a photograph or a picture is read by a scanner?

- a) dpi
- b) fps
- c) pixel
- d) ppm

**Q23.** When a relational database is constructed according to the processes (*A* through *C*) below, which of the following is the appropriate execution sequence?

*A:* Identifying the data items to be managed

*B:* Analyzing the target business operations

*C:* Creating the relational database tables

- a)  $A \rightarrow B \rightarrow C$       b)  $B \rightarrow A \rightarrow C$   
c)  $B \rightarrow C \rightarrow A$       d)  $C \rightarrow A \rightarrow B$

**Q24.** When the “Department,” “Location,” and “Employee” tables are joined to create Table *A*, which of the following is the “Employee” table that is to be joined? Here, an underline indicates a primary key, and a dotted underline indicates a foreign key.

Department

<u>Department_code</u>	Department_name
------------------------	-----------------

Location

<u>Location_code</u>	Location_name
----------------------	---------------

*A*

<u>Employee_number</u>	Employee_name	Department_name	Location_name	Age
------------------------	---------------	-----------------	---------------	-----

- a) 

<u>Employee_number</u>	Employee_name	Age
------------------------	---------------	-----
- b) 

<u>Employee_number</u>	Employee_name	Age	<u>Location_code</u>
------------------------	---------------	-----	----------------------
- c) 

<u>Employee_number</u>	Employee_name	Age	<u>Department_code</u>
------------------------	---------------	-----	------------------------
- d) 

<u>Employee_number</u>	Employee_name	Age	<u>Department_code</u>	<u>Location_code</u>
------------------------	---------------	-----	------------------------	----------------------

**Q25.** Which of the following is a service that provides disk space on a server connected to the Internet for storing files and allows a user to read and write data from anywhere inside or outside the home?

- a) Archive
- b) Authoring
- c) Online storage
- d) Flash memory

**Q26.** Which of the following is an appropriate description concerning a wireless LAN?

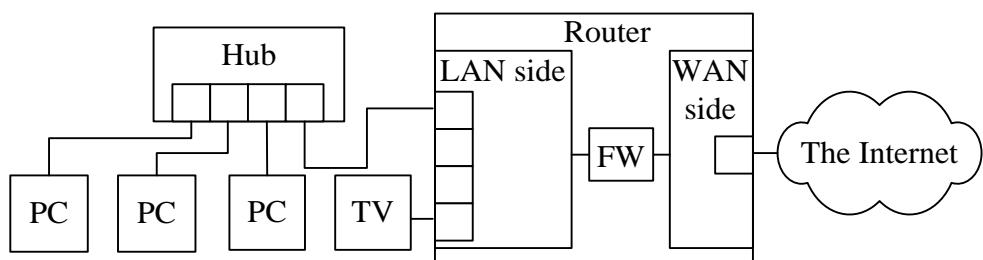
- a) A wireless LAN cannot be used with hardware other than a PC.
- b) A wireless LAN has an operation mode that allows a one-to-one connection without any access point.
- c) The encryption standards are unified into one type.
- d) When there are no barriers, communication can be performed regardless of the distance.

**Q27.** When a PC is connected to a network, which of the following is the protocol that is used for automatically obtaining the IP address?

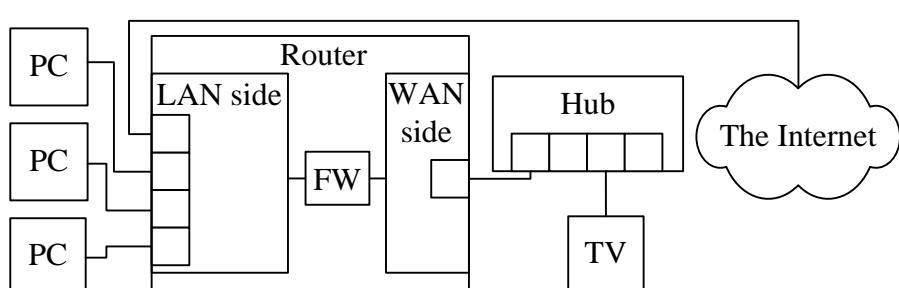
- a) DHCP
- b) HTTP
- c) NTP
- d) SMTP

**Q28.** Three PCs and an Internet-capable TV (television) set are to be connected to the Internet by using a hub and a router that has a firewall function. Which of the following is the appropriate connection that enables the firewall function of the router to be used for all devices? Here, “FW” in the figure indicates the firewall function.

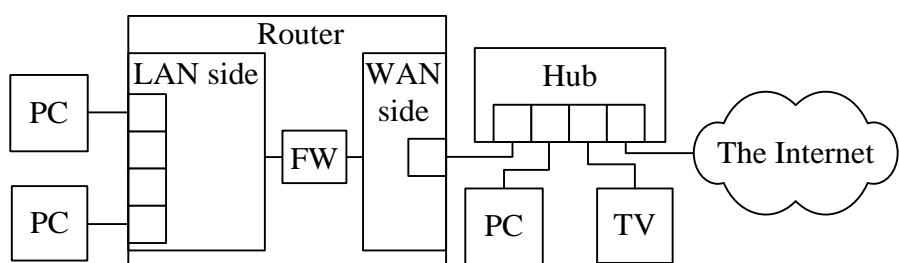
a)



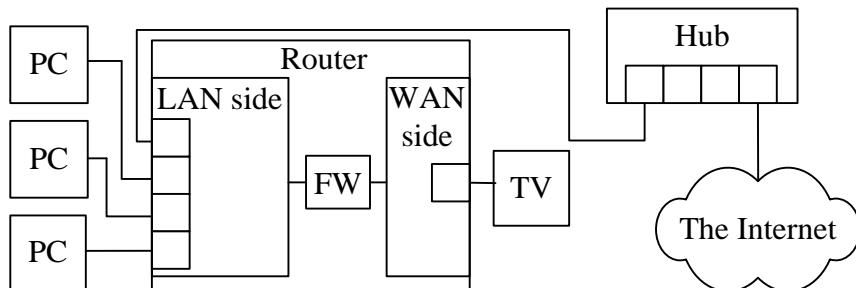
b)



c)



d)



**Q29.** In IPv4 (IP version 4), about 4.3 billion IP addresses can be defined. In IPv6 (IP version 6) that is intended to replace IPv4, how many bits are used as the length of an IP address?

- a) 32                    b) 64                    c) 128                    d) 256

**Q30.** In order to implement communication between applications via a network, a certain number of protocols are used in a hierarchical structure. Which of the following is the appropriate combination of the protocol names to be inserted into blanks A and B in the description below?

When a web page is viewed on the Internet, the browser and the web server use a protocol called **A**. Communication based on this **A** uses a protocol of a lower layer called **B** and a protocol of a further lower layer called IP (Internet Protocol).

	<i>A</i>	<i>B</i>
a)	FTP	Ethernet
b)	HTTP	TCP
c)	SMTP	POP3
d)	WWW	HTML

**Q31.** Which of the following is a form of direct damage to a server which is caused by a DoS attack?

- a) The encrypted data is decrypted.  
b) The administrator password is changed.  
c) The server is infected by a virus.  
d) The services of a server are interrupted.

**Q32.** Which of the following is one of critical factors of information security that can be improved by setting the mirroring disks in a RAID system?

- a) Availability
- b) Confidentiality
- c) Authenticity
- d) Accountability

**Q33.** Which of the following is a network area that is logically isolated from both a company's internal network and an external network, and is set up to ensure that no harm is caused to the internal network even if a server that is installed within the network area is accessed from the outside in an unauthorized manner?

- a) DMZ
- b) DNS
- c) NAT
- d) SSL

**Q34.** Which of the following is an appropriate explanation of a zero-day attack?

- a) In order to search for a vulnerable TCP/IP port that can be used as an entry point for unauthorized intrusion, an attacker accesses a server while changing port numbers in sequence.
- b) An attacker obtains important security information, such as a password, from the system administrator or user through skilled conversation or peeping, and then accesses the system illegitimately by posing as the user.
- c) When a vulnerability in software is identified, the identified vulnerability is exploited to perform an attack before a patch for the software is provided by the vendor.
- d) In order to identify the password or crack the encrypted code, an attacker successively attempts all character strings that are generated by mixing upper-case characters and lower-case characters of a term from the dictionary, or adding numeric characters to such a term.

**Q35.** With regard to malware, which of the following is an appropriate combination of descriptions (A through C) and keywords?

- A: An infected computer performs a fusillade to a specific site or transmits spam e-mails at the direction of an outside source.
- B: The information about users recorded by the key logger or such other method is collected.
- C: A penetration path is set up to perform an unauthorized login to a computer system from outside.

	A	B	C
a)	Spyware	Trojan horse	Back door
b)	Spyware	Back door	Trojan horse
c)	Bot	Spyware	Back door
d)	Bot	Trojan horse	Spyware

**Q36.** Among the descriptions (A through C) shown below, which of the following is the list that contains only all the appropriate descriptions that are directly effective as a measure against phishing?

- A: When personal information is entered in a web site, it must be confirmed that the web site uses an SSL connection, and also that the server certificate is valid.
- B: When an e-mail urging the transmission of an ATM card number and a personal identification number is received, its authenticity must be checked using several methods just to be safe, even if it is from a trusted partner such as a bank of account.
- C: The login password of an e-commerce site must have a sufficient length and complexity.

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

Answer questions Q37 through Q59 concerning management.

**Q37.** Which of the following is an appropriate description concerning software maintenance?

- a) Monitoring application program errors
- b) Updating the program to resolve defects or problems in the production environment
- c) Replacing the server to improve system performance
- d) Making data backups on a periodic basis

**Q38.** Mr. A, a developer, is analyzing and verifying the internal structure of a program in order to determine whether input data is processed as intended. Which of the following is the test that Mr. A is currently conducting?

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

**Q39.** In system development, which of the following is an appropriate phase or process that clarifies the quality (e.g., response time) that should be achieved by the system?

- a) Acceptance test
- b) System requirements definition
- c) Software detailed design
- d) Programming

**Q40.** Which of the following refers to a developer's activity that provides the correction of software errors and faults without any charge, and accepts responsibility for product liability claims, when the deficiencies are discovered within a certain period of time after the completion of the acceptance inspection?

- a) Warranty against defects
- b) SLA (Service Level Agreement)
- c) System audit
- d) Preventive maintenance

**Q41.** In software development, which of the following is an appropriate description concerning a system test?

- a) It is a test that is performed by the developer in the final stage of development in order to confirm whether the system requirements are met.
- b) It is a test that is performed to confirm whether the system requirements are appropriately and sufficiently defined.
- c) It is a test that performs the unit test and integration test of a program in parallel and simultaneously.
- d) It is a test that is performed by the user independently of the developer in order to confirm that the completed system is compatible with business operations.

**Q42.** Which of the following is an appropriate description concerning the activities that are performed in each process of system development?

- a) In external design, items on screens and forms are considered.
- b) In testing, design documents are reviewed, and system functions are checked in the documents.
- c) In programming, system operation procedures are confirmed by end users.
- d) In project execution planning, the internal processing of the system is considered.

**Q43.** Which of the following is an appropriate explanation of reverse engineering?

- a) A method for conducting efficient experiments with the fewest possible number of trials, in consideration for a better combination of multiple factors that should be confirmed
- b) A method for disassembling and analyzing an existing product in order to uncover its structure and acquire technology
- c) A method that transforms work into an ideal form by fundamentally reviewing workflow and work methods without changing the content of work
- d) A method that shortens the time from product development to production, through the parallel execution of multiple activities that can be performed simultaneously

**Q44.** In a system development project, a flowchart of the development process is created to perform quality management. Which of the following is an appropriate purpose of using such a flowchart?

- a) To consider where and what kind of problem is likely to occur in the work processes
- b) To determine whether the usage rate of the system is within the expected range
- c) To identify the relationships between major problems in project execution and latent causes of the problems
- d) To assess the frequency of problem occurrence on a per-cause basis in order to resolve the causes of the most problems

**Q45.** Which of the following is an appropriate explanation of decomposition that is performed to create the WBS of a system development project?

- a) The cost and time required to create project deliverables can be estimated, and it is desirable that decomposition be performed up to the manageable level.
- b) When system development is outsourced, all decomposition of deliverables should be left to the discretion of the outsourcee that creates the deliverables.
- c) Since a meeting that is held to report the progress of a project is a means of communication, the meeting is not subject to decomposition.
- d) If there are some experiences in developing similar systems, it is not necessary to perform decomposition again.

**Q46.** In project management, it is necessary to manage cost, time, quality, and other factors. Which of the following is an appropriate description concerning project management?

- a) Since cost, time, and quality differ in order of priority according to constraints, a balance among these must be achieved.
- b) Since cost, time, and quality are all independent of each other, there is no need to achieve a balance among these.
- c) Since cost and quality are in direct proportion to each other, management can be performed with the focus on either one of these.
- d) Since cost and time are in inverse proportion to each other, management can be performed with the focus on either one of these.

**Q47.** Which of the following is an appropriate activity that is performed in “project scope management” defined in the PMBOK (Project Management Body of Knowledge) Guide?

- a) Organizing a project team and developing staff members
- b) Defining all activities required for a project without any omissions
- c) Identifying the stakeholders of a project and deciding the communication method
- d) Identifying the project risks and considering appropriate action plans

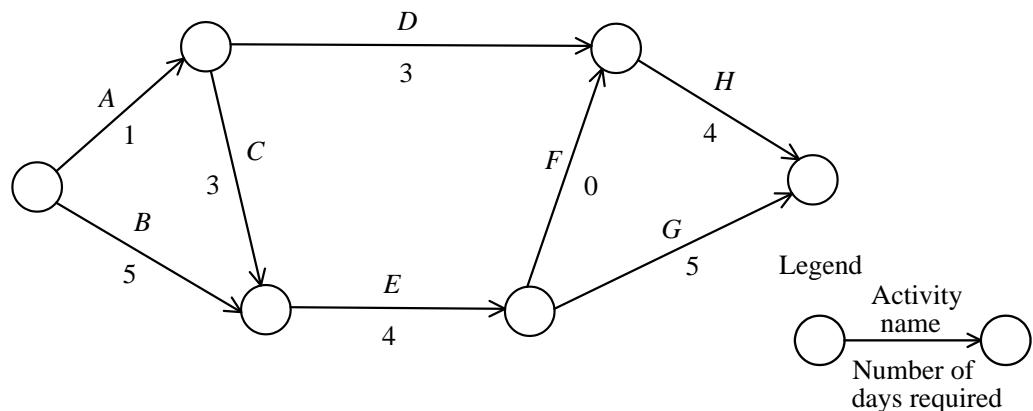
**Q48.** In a project, each member must perform one-to-one communication for sharing information. At this time, which of the following is an appropriate description concerning the relationship between the number of project members and the number of necessary communication paths?

- a) In the case where the number of members increases by one, the higher the original number of members, the higher the increase in the number of paths
- b) If the number of members increases by one, the number of paths also increases by one.
- c) The relationship between the number “ $x$ ” of members and the number “ $y$ ” of paths is represented by  $y = x!$ .
- d) The relationship between the number “ $x$ ” of members and the number “ $y$ ” of paths is represented by  $y = x^2$ .

**Q49.** It takes 10 days for Mr *A* to complete an activity of program development, and it takes 15 days for Mr. *B* to complete the same activity. When Mr. *A* and Mr. *B* work together, how many days are required to complete this activity? Here, their individual work efficiencies remain unchanged even when they work together.

- a) 5
- b) 6
- c) 7.5
- d) 12.5

**Q50.** When the arrow diagram below is created to manage a project that consists of eight activities *A* through *H*, which of the following is the critical path of this arrow diagram?



- a)  $A \rightarrow C \rightarrow E \rightarrow G$
- b)  $A \rightarrow D \rightarrow H$
- c)  $B \rightarrow E \rightarrow F \rightarrow H$
- d)  $B \rightarrow E \rightarrow G$

**Q51.** Which of the following is an explanation of IT service management?

- a) Providing operationally-managed services by an IT-related service company in order to satisfy customer requirements effectively
- b) Verifying the feasibility of whether new IT-related products, new services, or new schemes can be implemented as business activities
- c) Providing efficient services through utilizing IT by organizing and managing knowledge derived from the past accumulated experiences in an organization and by sharing it among employees
- d) Depicting graphically the market share and industry growth rate of IT-related services offered by the company, and on the basis of the positioning, developing a strategy with regard to a clear vision of services

**Q52.** In order to reduce the risk of unauthorized entry into the server room where a computer system is operating, the decision is made not to indicate the installation location of the computers. Which of the following is the appropriate management that corresponds to this measure?

- a) Supply chain management
- b) Knowledge management
- c) Business continuity management
- d) Facility management

**Q53.** An SLA contains a written description of arrangements, such as the content of the service agreed upon between the service provider and the user. Which of the following is an appropriate merit that is obtained by both the service provider and the user through concluding an SLA?

- a) It is possible to confirm the validity of the charge rate, on the basis of the content of the service performed.
- b) It is possible to share common recognition of the content, scope of provision, and minimum required level of the service.
- c) It is possible to request to change fees when the content of the service is insufficient or incomplete.
- d) It is possible to perform business operations without excessive demands placed on the content of the service.

**Q54.** In an IT facility such as a data center, which of the following is used to improve the maintainability and installation efficiency of several types of equipment?

- a) Server rack
- b) Hub
- c) Firewall
- d) Router

**Q55.** There exists a bug in a program on PCs that are used for business operations, and a symptom that a PC becomes unusable is reported to a service desk. From a perspective of “incident and service request management” in IT service management, which of the following is the most appropriate action to be taken at the service desk, prior to handover to problem management?

- a) Informing users of how to restart a PC and make it usable
- b) Making a plan to distribute a fixed program to the PCs
- c) Testing the fixed program
- d) Fixing the bug in the program

**Q56.** Which of the following is an appropriate explanation concerning the resolution processes of IT service management?

- a) The root causes of software faults are identified through problem management.
- b) The necessity of changes in software is decided through release management.
- c) Software versions are managed through incident management.
- d) Software is embedded and its operation is verified through change management.

**Q57.** Among the processes necessary for a system audit, which of the following is performed by the system auditor?

- a) Preparation of the audit targets such as operational rules
- b) Preliminary assessment of the audit targets
- c) Improvement of vulnerabilities in the audit targets
- d) Acceptance of the system audit report

**Q58.** A risk control matrix is used to evaluate the status of achievement of the established internal controls. In the description below concerning the use of the risk control matrix, which of the following is an appropriate combination of words or phrases to be inserted into blanks A and B?

The risks and the A control items are described, and the B is evaluated.

	<i>A</i>	<i>B</i>
a)	candidate	cost efficiency of control items
b)	candidate	degree of risk reduction
c)	implemented	cost efficiency of control items
d)	implemented	degree of risk reduction

**Q59.** In the course of a system audit, which of the following is performed by the auditee (i.e. the organization or person to be audited)?

- a) Verification of improvement results
- b) Preparation of an audit plan
- c) Creation of an audit report
- d) Improvement of business operations

Answer questions Q60 through Q88 concerning strategy.

**Q60.** The same type of product is manufactured by allocating sets of assembly parts to three different factories *A*, *B*, and *C*. The profit of each factory that is based on the allocated sets of parts is as shown in the table below. How much (in thousand dollars) is the maximum profit that is obtained by allocating a total of four sets of parts to these three factories?

Unit of profit: thousand dollars					
Number of allocated sets of parts	0	1	2	3	4
Profit of factory <i>A</i>	0	2	5	7	8
Profit of factory <i>B</i>	0	1	3	5	7
Profit of factory <i>C</i>	0	3	4	6	8

- a) 8                    b) 9                    c) 10                    d) 11

**Q61.** Among the senior management positions in a company or such other organization, which of the following is the highest-ranking person who exercises control over the information system?

- a) CEO                b) CFO                c) CIO                d) COO

**Q62.** As shown in the table below, a total of 1,000 products with a sales unit price of 1,000 dollars are to be manufactured and sold. Which of the following is an appropriate description concerning plan A and plan B?

Plan	Fixed cost	Variable cost per product	Unit: dollar
Plan A	100,000	300	
Plan B	200,000	200	

- a) Neither plan A nor plan B makes any profit.
- b) Profit of plan A is the same as that of plan B.
- c) Plan A makes more profit than plan B.
- d) Plan A makes less profit than plan B.

**Q63.** Which of the following is an appropriate diagram or chart that is used for ABC analysis?

- a) Control chart
- b) Scatter diagram
- c) Cause and effect diagram
- d) Pareto chart

**Q64.** The production line of a product is composed of two processes *A* and *B* in that order, and the number of machines in each process, the work time required for the production of one component, and the defective rate are as shown in the table below. When the work time per day is 10 hours, what is the daily production capacity (i.e., number of non-defective components produced in a day) of the production line? Here, the defective components of process *A* are not sent to process *B*. Furthermore, the downtime and setup time of machinery, and the inter-process inventory between processes are ignored, and the components that are being processed are always completed even when the end time is already reached.

Process	Number of machines	Work time per component	Defective rate
<i>A</i>	1	3 minutes	5 %
<i>B</i>	1	2 minutes	10 %

- a) 171                  b) 180                  c) 200                  d) 257

**Q65.** Which of the following is an appropriate characteristic of the QR code?

- a) The code can contain only single-byte alphanumeric characters and symbols.
- b) The amount of information that can be stored is equivalent to that of a barcode.
- c) The code can be read from any direction including the top, bottom, left, and right.
- d) The code has a two-dimensional structure in which three barcode layers are stacked.

**Q66.** Which of the following is an activity of quality management that is based on the ISO 9000 family?

- a) Preventive actions for potential problems are implemented at the field staff level, and are not reported to the management level.
- b) Since an audit is performed by a third party on a regular schedule, no internal audit is performed.
- c) Records related to quality are stored in a server in order to share the information among the interested parties.
- d) Although a project consists of the company's employees and the partner company's employees, only the company's employees are informed of the quality policy.

**Q67.** Which of the following is an appropriate description concerning a “volume license agreement”?

- a) It is an agreement where a master copy is provided to customers, such as companies, who purchase the software in high volume, and the number of permitted installations is determined in advance.
- b) It is an agreement where the location of use is restricted to a specified facility, and the software can be used without limiting the number of computers or users in the facility.
- c) It is an agreement where standard licensing conditions are defined and a license agreement is automatically considered to be concluded between the right holder and the purchaser when a certain limited number of packages are unwrapped.
- d) It is an agreement where the use of software is permitted by accepting the terms and conditions displayed on the screen when the software is downloaded from the Internet.

**Q68.** According to the ISO 9000 family, quality is defined as the “degree to which a set of inherent characteristics fulfills requirements.” When products are evaluated on the basis of this definition, which of the following is most appropriate as a product with good quality?

- a) A product having no customer complaints and a high level of customer satisfaction
- b) A product that a company produces in-house without outsourcing
- c) A product designed and manufactured using CAD and CAM
- d) A product utilizing materials and components of high quality

**Q69.** According to the WTO’s Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which of the following is a case example of copyright violation among activities concerning the development or creation of a computer program?

- a) Creating another web page by using the source of HTML that was downloaded from the Internet
- b) Creating a program based on an idea that was discussed on a bulletin board on the Internet
- c) Creating a program to increase a company’s operational efficiency by using a program that was created during one’s school days
- d) Creating a program based on a flowchart that was shown in a purchased book

**Q70.** An e-mail with a subject of “Caution: New computer virus” was received from the external network. The sender is not a well-known person, and the content may or may not be true. However, the e-mail describes the characteristics of the virus, and instructs that the e-mail must be forwarded to as many people as possible. Which of the following is an appropriate course of action to be taken in response to this e-mail?

- a) Forwarding the e-mail to acquaintances
- b) Forwarding the e-mail to all employees
- c) Not forwarding the e-mail to anyone
- d) Writing the sender an e-mail asking for a measure against the virus

**Q71.** Which of the following is a case example that contains a potential “threat” that is one of the four perspectives used in a SWOT analysis?

- a) Company *A* (consumer electronics manufacturer): There is a decrease in the number of cases of new product development because of a decline in technical capabilities.
- b) Company *B* (automobile distributor): The motivation of the sales staff seems to be lower than before.
- c) Company *C* (brand shop): The brand reputation has declined.
- d) Company *D* (export enterprise): The exchange rate is changing because of the appreciation of the local currency.

**Q72.** Which of the following is an appropriate purpose of CRM?

- a) To increase profits by building an excellent relationship with the customer from a long-term perspective
- b) To optimize the delivery time and cost by improving the series of processes from procurement to manufacturing, distribution, and sales across several companies
- c) To use management resources effectively by integrating and managing the information that is independently controlled in each department
- d) To determine when and how much of materials required for manufacturing products is to be purchased on the basis of a bill of materials and inventory information

**Q73.** Which of the following is the type of retailing where the headquarters provides the business right, the right to use the trademark, and know-how about opening and running stores, on the basis of contracts with member stores, and collects royalties in return?

- a) Outlet store
- b) Antenna shop
- c) Franchise chain
- d) Voluntary chain

**Q74.** In the planning of the business strategy of a retail business, “retention of loyal customers” is set as the CSF (Critical Success Factor). Which of the following is the most appropriate analysis that is used for evaluating the achievement level of this CSF?

- a) RFM analysis by customer
- b) Demographic analysis of new customers
- c) POS analysis of new products
- d) ABC analysis of the total sales amount by store and by product

**Q75.** In advertisements using the Internet, which of the following is an advertisement that uses a method where the prior consent of a recipient is acquired and advertisements relating to the field of interest of the recipient are sent by e-mail?

- a) Affiliate advertisement
- b) Overlay advertisement
- c) Opt-out e-mail advertisement
- d) Opt-in e-mail advertisement

**Q76.** Which of the following is an approach of mutually granting the right to execute the patents owned by each company as a way of introducing external technologies?

- a) Alliance
- b) Cross license
- c) Joint venture
- d) Royalty

**Q77.** Among advertisements on the Internet, which of the following is an appropriate explanation of a banner advertisement?

- a) When a web site is being browsed, an advertisement from an advertiser is automatically displayed in another new window.
- b) When a link from a web page to another page is clicked, a page with an advertisement is briefly shown before the target page is displayed.
- c) When an advertisement image that is placed on part of a web page is clicked, a page prepared by an advertiser is displayed.
- d) When keywords are entered into a search service site, an advertisement related to the keywords is displayed on the page showing the search results.

**Q78.** Which of the following is an appropriate case example that corresponds to traceability?

- a) Computers are applied to education through the use of the Internet and web technology.
- b) All development activities are outsourced to an external specialized company without placing the development department within one's own company.
- c) Business performance is improved by sharing and using personal knowledge and information effectively across the entire organization.
- d) The record from production up to sales can be confirmed on the basis of the food labels pasted on meat and fish products.

**Q79.** Which of the following is the most appropriate explanation of ERP (Enterprise Resource Planning)?

- a) It is the technique and concept to improve management efficiency by planning the company-wide management resources in an effective and integrated way.
- b) It is the technique and concept to perform commercial transactions for consumers and between companies by using electronic networks, such as the Internet.
- c) It is the technique and concept to introduce IT into business activities with the aim of improving not only efficiency and quality but also customer satisfaction.
- d) It is the technique and concept where wholesalers and manufacturers support the business activities of retail stores for increased turnover.

**Q80.** Which of the following is the most appropriate purpose of using the OS for PCs as the OS for intelligent home appliances?

- a) Reducing the memory necessary for operation
- b) Lowering the risk of being attacked from an outside source
- c) Improving the processing speed
- d) Shortening the development period of software

**Q81.** Which of the following is a socio-economic disparity or inequality that is caused by the differences in skills or opportunities to use ICT (Information and Communication Technologies), such as a PC and the Internet?

- a) Accessibility
- b) Diversity
- c) Digital divide
- d) Digital democracy

**Q82.** In online electronic commerce, retail stores and customers are vulnerable to threats, such as falsification, spoofing, and repudiation, during order processing. Which of the following is a security technique that is applicable to prevent these three threats?

- a) Virus check
- b) Junk mail filtering
- c) Digital signature
- d) Packet filtering

**Q83.** Training on how to use a sales forecast system is planned for the persons in charge of business operations across the country. Which of the following is the merit that is obtained by using “e-learning” in training?

- a) The persons in charge of business operations can be directly lectured about the content of the system from the system designer, and can also ask questions on site.
- b) The persons in charge of business operations can use their own free time and undergo training at any suitable time.
- c) Several persons in charge of business operations can participate together and exchange their opinions on how to use the system.
- d) The persons in charge of business operations can take a class all together by assembling in a classroom.

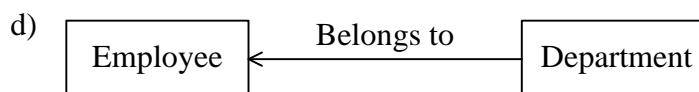
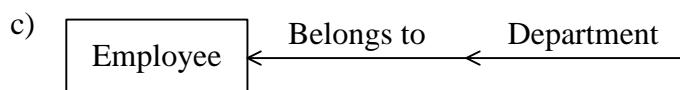
**Q84.** SOA (Service Oriented Architecture) is a concept of constructing a system by combining some services. Which of the following is an appropriate merit of using SOA?

- a) The processing speed of the system is improved.
- b) The security of the system is strengthened.
- c) The system users do not need education and training.
- d) The flexible system can be achieved.

**Q85.** In the software life cycle, which of the following is the process that prepares and creates the scheme of a computerization project?

- a) Operation
- b) Development
- c) Planning
- d) Requirements definition

**Q86.** Which of the following is an appropriate E-R diagram that shows which department an employee belongs to?



**Q87.** For the procurement of a system, which of the following is an appropriate combination of the words or terms to be inserted into blanks A and B?

In a certain company, prior to the procurement of a new system, an RFI is presented to the vendors with the aim of obtaining A. Thereafter, an RFP is presented to the vendors with the aim of obtaining B, and then a subcontractor is selected.

	<i>A</i>	<i>B</i>
a)	technology trend investigation reports	proposals
b)	technology trend investigation reports	non-disclosure agreements
c)	financial statements	proposals
d)	proposals	technology trend reports

**Q88.** Which of the following is an appropriate purpose of defining business requirements in system development?

- a) To use and control the management resources of the company in an effective and integrated way
- b) To fundamentally review and reconstruct the workflow, organization, and system of the company
- c) To create a policy and implementation plan for computerization in order to achieve business objectives
- d) To get the mutual consent of interested parties by clarifying and specifying the scope and functions of computerization

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

### Question A

Read the following description concerning a management approval system, and then answer the four questions.

The general affairs department of Company *F* decides to develop a system for employees (including executive officers) to request of approval for things such as purchase transactions and contract documents, and to approve such requests (hereinafter referred to as a management approval system). Mr. *G* of the general affairs department studies the application screen of the management approval system and the flow of application.

Table 1 shows the input items on the application screen.

**Table 1 Input items on the application screen**

Input item	Description
Subject	Title of management approval request
Type	Plan, purchase, contract, other (Select one from these four types.)
Application date	Date on which the application is made
Description of management approval request	Details
Approval amount	Amount requested for approval when the type is purchase or contract
Person(s) giving consent	Name of employee(s) whose consent is required before the approval (There are one or more persons whose consent is required.)
Approver	Name of the employee who gives final approval
Viewer(s)	Name of employee(s) viewing the management approval request after the request is approved
Attachments	Attachments deemed necessary by the applicant

The flow of application by the management approval system is as follows:

- (1) The applicant enters the required items on the application screen. It is possible to temporarily save the management approval request before the application.
- (2) The application for a management approval request is made after the required items are all entered.
- (3) Persons who give their consent can reference the management approval request for which there has been submitted.
- (4) Persons who give their consent agree to the request if there are no issues with the management approval request. If there are any issues, the request is returned.
- (5) After all persons who give their consent agree to the request, an approver can perform the approval process for the management approval request that has been submitted.
- (6) The approver approves the management approval request if there are no issues. If there are any issues, the request is returned.

In the management approval system, the process is performed by pressing the “Run” button, which is displayed on each screen for submitting, agreeing, returning, and approving. At the same time input items, date, and time are saved as history. However, input information before the application is not saved as history. If a management approval request has been returned, the applicant can edit and submit it for approval again.

[Technology]

**Q89.** Which of the following is an appropriate GUI (Graphical User Interface) component that is used for entering the input item “Type”?

- |               |                 |
|---------------|-----------------|
| a) Scroll bar | b) Check box    |
| c) Text box   | d) Radio button |

[Technology]

**Q90.** Which of the following is a basic error check that can be performed by the system in order to prevent input errors between multiple input items on the application screen?

- a) Check if the Approval amount is entered for Type that requires the input of Approval amount.
- b) Check if the Approval amount is appropriate for the Subject.
- c) Check if the Description of management approval request is filled in appropriately to the Subject.
- d) Check if there exists the required attachment for the Description of management approval request.

[Technology]

**Q91.** The flow of application by the management approval system is normally in the sequence (1) through (6). However, there are some cases where the flow branches. Which of the following is the process where the flow branches?

- a) Process where the applicant temporarily saves the management approval request before the application is submitted
- b) Process where the person(s) giving consent can reference the management approval request after the applicant has submitted the approval request
- c) Process where the approver can approve the management approval request after all persons who give consent have agreed
- d) Process where the approval request is returned if there are any issues

[Management]

**Q92.** Which of the following is an item that cannot be confirmed from the content that is saved as history by the management approval system?

- a) Date and time when each of application, agreement, return, and approval is executed
- b) Time that is taken from the submission of an application until its approval
- c) Number of times of correction before an application is submitted
- d) Number of times that an application is returned

## Question B

Read the following description concerning product sales data analysis, and then answer the four questions.

The sales department of Company N is developing a sales strategy for this fiscal year by analyzing product sales records of the previous fiscal year from the perspective of gross profit margin, inventory turnover, and sales composition. Here, inventory turnover is calculated by dividing the sales amount for a certain period of time by the average inventory quantity.

For this analysis, spreadsheet software is used to create the worksheet below, on the basis of sales records of the previous year. Here, the range of cells A2 through H11 are sorted on the basis of column B as a key in descending order, and then the expressions of columns I and J are entered.

	A	B	C	D	E	F	G	H	I	J
1	Product name	Amount of sales (dollars)	Cost of sales (dollars)	Gross profit (dollars)	Gross profit margin (%)	Average inventory amount (dollars)	Inventory turnover (times)	Sales composition (%)	Cumulative sales composition (%)	Rank
2	Product A	1,730			30.8	120	14.4	14.8		
3	Product B	410			23.4	50	8.2	3.5		
4	Product C	2,630			22.7	220	12.0	22.5		
5	Product D	3,360			30.7	364	9.2	28.8		
6	Product E	310			25.2	29	10.7	2.7		
7	Product F	210			21.0	30	7.0	1.8		
8	Product G	860			28.6	97	8.9	7.4		
9	Product H	610			28.2	40	15.3	5.2		
10	Product I	300			18.7	35	8.6	2.6		
11	Product J	1,260			22.1	90	14.0	10.8		
12	Total	11,680								

NOTE: The shaded cells are intentionally left blank.

**Fig. Worksheet of sales analysis by product**

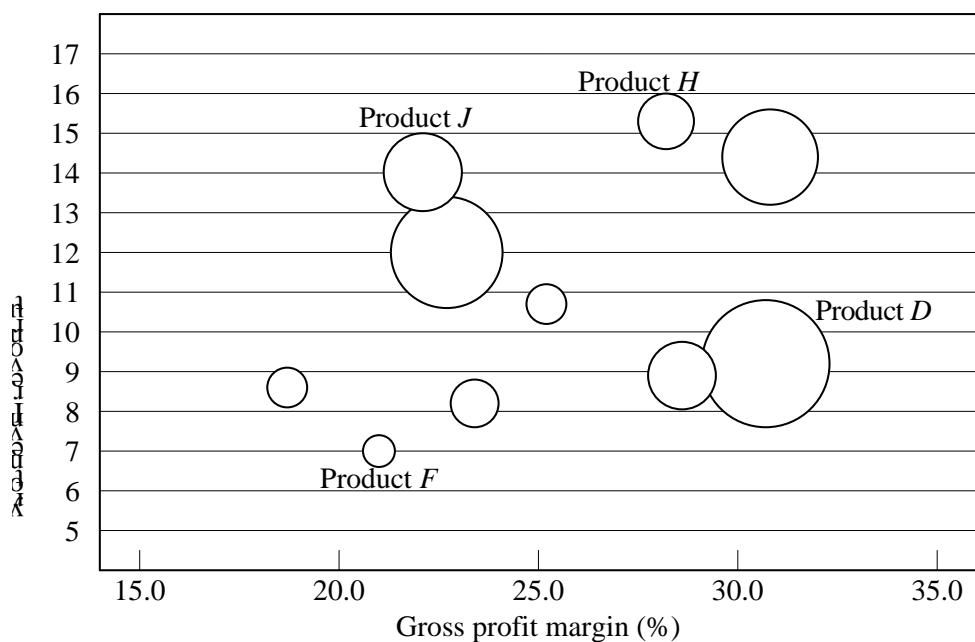
[Strategy]

**Q93.** Which of the following is the appropriate expression to be inserted into cell E2? Here, the expression does not perform the percentile operation and rounding, and the display of percentage is controlled by the display format of the cell.

- a) C2/B2
- b) D2/B2
- c) D12/B12\*B2
- d) D2/D12

[Strategy]

**Q94.** When sales are analyzed, a product with both high gross profit margin and high inventory turnover is regarded as an excellent product with high sales efficiency and high profitability. In order to visualize the sales efficiency indicator and sales amount, the bubble chart below can be created to show the relationship between sales amount, gross profit margin, and inventory turnover of each product. Which of the following is an appropriate description of the analysis results based on the chart?



- a) “Product D” is a low-margin high-turnover product. In order to maintain profit, careful product management is required so as not to run out of inventory.
- b) “Product F” exhibits a small sales amount and the highest sales efficiency. No special action is required for this product.
- c) “Product H” exhibits moderate sales amount, less excess inventory, and large profits. If proper action to increase sales is taken, growth in profit can be expected.
- d) “Product J” is a luxury product that exhibits small sales quantity and high price. It plays an important role to maintain a broad customer base.

[Strategy]

**Q95.** In Company  $N$ , the products are ranked on the basis of the sales composition. The company makes purchases and prioritizes sales management according to product rank. When a rank is assigned to each product by using the “worksheet of sales analysis by product” shown in the figure above, on the basis of the conditions shown below, which of the following is the expression to be inserted in cell J2?

[Conditions]

- (1) Sort the range of cells A2 through H11 on the basis of column B as a key in descending order.
- (2) Enter an expression into cell I2 that copies the value of cell H2 to cell I2.
- (3) Enter the expression “I2+H3” into cell I3, and then copy it to cells I4 through I11.
- (4) The ranking criteria are shown in the table below.

Rank	Classification based on cumulative sales composition
$A$	A product within the top 70%
$B$	A product not ranked as $A$ , but within the top 90%
$C$	A product ranked neither as $A$ nor $B$

- a)  $\text{IF}(\text{I2} \leq 0.7, 'A', \text{IF}(\text{I2} \leq 0.9, 'B', 'C'))$
- b)  $\text{IF}(\text{I2} \leq 0.9, 'C', \text{IF}(\text{I2} \leq 0.7, 'A', 'B'))$
- c)  $\text{IF}(\text{I2} \geq 0.7, 'A', \text{IF}(\text{I2} \geq 0.9, 'B', 'C'))$
- d)  $\text{IF}(\text{I2} \geq 0.9, 'C', \text{IF}(\text{I2} \geq 0.7, 'A', 'B'))$

[Strategy]

**Q96.** In developing a sales strategy for this fiscal year, the company is to extract products for which “cumulative sales composition” summed up from the top selling product downwards is less than or equal to 70%, and for which “inventory turnover” is less than or equal to 10 times. These products are designated as high-priority target products to improve inventory turnover. How many products are extracted as such target products?

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

### Question C

Read the following description concerning a library system, and then answer the four questions.

In Library A, lending and return operations for books are performed with a library system that makes use of bar codes.

[Lending and return operations for books]

- (1) The person in charge of book-lending operation reads the user number of the user card and the ID number that is assigned to each book with a bar code reader, and registers the lending information.
- (2) The person in charge of book-return operation reads the ID number of the book with the bar code reader, and registers the return information.

At present, with the aim of improving convenience for the user in addition to the efficiency of service, the installation of a system (hereinafter, new system) in which the bar code of the current library system is changed to RFID (Radio Frequency Identification) is being investigated. The comparison between the characteristics of the bar code used in the library system and RFID is shown in Table 1.

**Table 1 Comparison between the characteristics of the bar code used in the library system and RFID**

	Bar code	RFID
Reading distance	A few centimeters to a few tens of centimeters	A few centimeters to a few tens of centimeters
Read rate	One at a time	Two or more at a time
Amount of information read	Approximately ten and some characters at a time	Several hundred to several thousand characters at a time
Reading method	Optical reading	Reading by using electromagnetic waves

The librarian Mr. B studies the feasibility of implementing the requirements of users and librarians in the new system.

[Requirements]

- (1) The user number on a user card and the ID number of a book are read individually by the bar code reader. Therefore, during the time period when lending is at its peak, users may have no option but to queue at the lending counter. The person in charge of book-lending operations wants the service to be done quickly.
- (2) Books that are taken out from the bookshelf are sometimes not placed back on their original shelves by the user. Although this is corrected periodically while the shelves and books are checked, the time that is taken for this operation needs to be shortened.
- (3) The person in charge of book-return operations keeps aside the books that are reserved for lending, and informs the user who has reserved the book by telephone. Sometimes, contact cannot be established even after several calls are made, and therefore, the effort that is required to establish contact needs to be reduced.
- (4) The return of books is also accepted through the return box that is set up at the entrance of the library. When book-return operations are delayed, the time period for which books have been lent out on the library system increases. In order to improve convenience for the user, the books in the return box need to be ascertained.

[Strategy]

**Q97.** Mr. B makes a study of providing each user with a user card that contains a built-in RFID, pasting sheet-shaped RFIDs on the books, installing an RFID reader at the counter, and using such equipment at the time of the lending and return operations. Which of the following is the appropriate item of [Requirements] that can be improved with this change?

- a) (1)                  b) (2)                  c) (3)                  d) (4)

[Management]

**Q98.** Library A has a book collection of hundreds of thousands of books, and in order to migrate to the new system, sheet-shaped RFIDs must be stuck onto all books. In order to migrate smoothly to the new system without stopping the lending and returning operations by using the bar code currently stuck on the books and the RFID to be implemented in parallel during the migration period, a method of using the existing file (table) that is currently used to manage lending history is considered. Which of the following is an appropriate combination of the terms or phrases to be inserted into blanks C and D in the description below?

In order to implement the method to smoothly migrate to the new system, Mr. B makes the decision below on the ID number of a book and the user number of a user card.

ID number of a book: C .  
User number of a user card: D .

	C	D
a)	Use the current number	Use the current number
b)	Use the current number	Replace with the new number
c)	Replace with the new number	Use the current number
d)	Replace with the new number	Replace with the new number

[Strategy]

**Q99.** In order to implement the [Requirements], Mr. *B* investigates systems that use commercial RFIDs, and considers the solution plan described below.

- (i) Prepare a user card that contains a built-in RFID, stick a sheet-shaped RFID onto a book, and then install the new RFID reader to be used at the counter for the lending and return operations
- (ii) Install RFID readers in the shelf panel of all book shelves, and implement a system for checking the books and book shelves
- (iii) Install an RFID reader in the return box

Mr. *B* considers the effects of options (i) through (iii), and as a result, he notices that there is a requirement that cannot be fulfilled with them. Which of the following is the item of [Requirements] that **cannot be fulfilled**?

- a) (1)
- b) (2)
- c) (3)
- d) (4)

[Strategy]

**Q100.** In Library A, besides books, magazines are also provided for in-library use. However, magazines are not lent out. Since the budget for the purchase of magazines is limited, Mr. B considers purchasing magazines that are read more frequently by users, on a priority basis. Thus, Mr. B also investigates the possibility of collecting data by the use of newly installed RFIDs and then using such data as reference when magazines are replaced.

Magazines are kept in racks that hold the shelves where magazines are arranged (hereinafter, magazine racks). Upon investigation of the commercial system that uses the RFIDs, it is found that by sticking a sheet-shaped RFID onto each magazine, and installing an RFID reader in each shelf, the time taken for removing a magazine from the shelf and putting it back on the shelf can be recorded.

Which of the following is the appropriate information that can be obtained from the data that is acquired by using this mechanism?

- a) The number of times a magazine is removed from the shelf of the magazine rack and the length of time for which the magazine is removed can be acquired for each magazine.
- b) The number of times a magazine is removed from the shelf of the magazine rack and the average length of time for which the magazine is removed can be acquired for each user age group for each magazine.
- c) The number of times a magazine is removed from the shelf of the magazine rack can be acquired for each day of the week and each gender of the user for each magazine.
- d) The duplication in cases where the same person removes a magazine several times is eliminated, and the number of persons who remove a magazine from the shelf of the magazine rack can be acquired for each magazine.

## 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	> , < , ≥ , ≤ , = , ≠	

#### 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 \$A\$1+\$A2+A\$5 in cell B1 is copied into cell C4, the expression \$A\$1+\$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 <sup>1)</sup> )	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 <sup>1)</sup> )	Returns the average of the values in a specified cell range.
SAMPLE_STD_DEV (cell range <sup>1)</sup> )	Sample standard deviation: Returns the standard deviation of the sample values in a specified cell range.
POPULATION_STD_DEV (cell range <sup>1)</sup> )	Population standard deviation: Returns the standard deviation of the population values in a specified cell range.
MAX(cell range <sup>1)</sup> )	Returns the maximum value in a specified cell range.
MIN(cell range <sup>1)</sup> )	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, ...) <sup>2)</sup>	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, ...) <sup>2)</sup>	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.
ROUNDOFF(arithmetic expression, position)	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, ...) <sup>2)</sup>	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 <sup>1)</sup> , 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)	<p>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.</p> <ul style="list-style-type: none"> <li>• When the search option is 0: searches for values that matches the expression value.</li> <li>• 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.</li> </ul> <p>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.</p>
HLOOKUP (expression, cell range, row position, search option)	<p>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.</p> <ul style="list-style-type: none"> <li>• When the search option is 0: searches for values that matches the expression value.</li> <li>• 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.</li> </ul> <p>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.</p>

- Notes:
- <sup>1)</sup> Values other than numeric values contained in the cell range that is passed as an argument are not processed.
  - <sup>2)</sup> One or more expressions can be passed as a list of arguments.