October 2013

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. As shown in the figure below, there exists a process of converting each character of a character string in accordance with the conversion table. When the result of performing such a conversion is "0110001010", which of the following is the character string before conversion?

Character conversion table

Character	Binary representation after conversion
A	0
B	10
C	11

Conversion example

Character	A	B	A	B	C	A	B	A
Result of using the conversion table	0	10	0	10	11	0	10	0

Final result of conversion 010010110100

 a) ABBAAABB   b) ACAAABB

 c) ACABB   d) CAAABB

Q2. As shown in Figure 1, there is a processing unit which reads two positive input values A1 and A2, and then writes two output values B1 and B2. B1 is equal to A2, and B2 is the remainder of A1 divided by A2. In Figure 2, two processing units with the same function as the above are connected in series. When A1=15 and A2=6 are given to the left-hand unit in Figure 2, what is the output value of B2 for the right-hand unit?
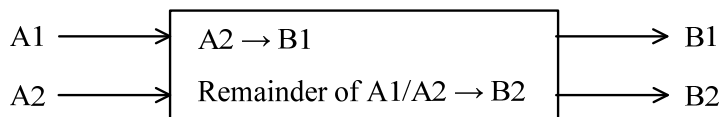
A1 ⟶ ┌─────────────────────────┐ ⟶ B1
        │ A2 → B1   │
A2 ⟶ │ Remainder of A1/A2 → B2 │ ⟶ B2
        └─────────────────────────┘

Figure 1

15 ⟶ ┌──────┐   ⟶ ┌──────┐ ⟶ B1
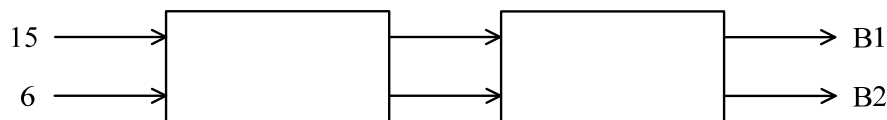6 ⟶ └──────┘   ⟶ └──────┘ ⟶ B2

Figure 2

 a) 0   b) 3   c) 6   d) 15

Q3. Among the items *A* through *C* described below about programming languages, which of the following is the list that contains all of the appropriate items?

A: A program that is created using a machine language or an assembly language can be executed without relying on a particular CPU.

B: A program that is converted using a compiler is finally translated into a machine language and then executed.

C: A high-level programming language with rules similar to human languages makes it possible to develop programs with complex calculations that cannot be executed using a machine language.

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

Q4. Which of the following can be created using HTML?

a) Web browser b) Web page
c) Cookie d) SQL program

Q5. Which of the following is the method for describing the logical structure of a sentence in XML?

a) Enclosing the sentence, clauses, and other elements by using double quotes ("")
b) Separating the sentence, clauses, and other elements by using commas
c) Enclosing the sentence, clauses, and other elements by using tags
d) Separating the sentence, clauses, and other elements by using tabs

Q6. Which of the following is an appropriate description of a characteristic of hypertext written in HTML?

a) Text information is handled, so image files cannot be linked.
b) The user must return to the highest hierarchical level before jumping to another text.
c) Links have bidirectional information, so the user can be free to jump between texts.
d) The user can jump to another text, file, or website by clicking a link.

Q7. Which of the following is a method of writing the same data to multiple hard disks simultaneously and improving reliability rather than performance?

a) Striping
b) Paging
c) Interleaving
d) Mirroring

Q8. Which of the following is a storage device or medium that is based on semiconductor memory technology?

a) CD-ROM
b) DVD-RAM
c) BD
d) SSD

Q9. Which of the following is a type of software that is provided for each PC peripheral and works as an intermediary between an OS and a specific peripheral so that application programs can use such a peripheral?

a) Installer
b) Device driver
c) Device manager
d) Converter

Q10. Which of the following is an appropriate description concerning PnP used on a PC?

a) A feature to launch application programs from a remote site
b) A feature to set up peripherals automatically when connected
c) A feature to start up an OS automatically when powered on
d) A feature to run software developed for another OS

Q11. Which of the following is the most appropriate description concerning a characteristic of RAID?

a) It increases the data transfer rate of each hard disk.
b) It provides a larger capacity than the total capacity of individual hard disks.
c) It provides better performance or reliability or both by using multiple hard disks.
d) It increases data access time because it needs to access multiple hard disks.

Q12. Which of the following is the most appropriate explanation of TCO (Total Cost of Ownership) that is a major factor when any purchasing decision is made for a system?

a) It is the sum of the operation and management costs incurred after the installation of the system.

b) It is the sum of the costs required to troubleshoot software and hardware faults that occur after the installation of the system.

c) It is the sum of the costs incurred during the installation of the system and the operation and management costs incurred after the installation.

d) It is the sum of the costs incurred during the installation of the system in addition to the planning phase of the system.

Q13. When a computer system operates for 1,200 hours, the status of the normal operation time and the repair time is shown in the table below.   What is the value of MTTR (Mean Time To Repair, in hours) of the system?

Elapsed time (Hours)	Status
0 through 250	Normal operation
250 through 265	Repair time
265 through 580	Normal operation
580 through 600	Repair time
600 through 990	Normal operation
990 through 1,000	Repair time
1,000 through 1,200	Normal operation

a) 10   b) 15   c) 20   d) 45

Q14. Which of the following is the most appropriate term that means the process of grouping multiple files into one, for the purpose of making effective use of storage media or promoting the efficiency of backup or distribution?

a) Archive   b) Aggregate   c) Bundle   d) Compile

Q15. Which of the following is the purpose of the virtual memory system that is known as one of the functions provided by an OS?

a) To prevent an application program from accessing the protected area on main memory used by the OS

b) To reduce electricity consumption during the idle state, by stopping the power supply after data is written from main memory to external storage

c) To make it possible to execute a program even if the program requires more storage capacity than main memory

d) To accelerate CPU processing with the assistance of a higher speed storage device than main memory

Q16. Which of the following is the most appropriate explanation of a "multimedia authoring tool"?

a) It is a tool that is used to create multimedia content by combining materials, such as image, sound, and text, on the screen.

b) It is a tool that is used to play back multimedia content, such as image, sound, and text, in the PC environment.

c) It is a tool that is used to search for multimedia information, such as image, sound, and text.

d) It is a tool that is used to interactively define schema for multimedia database containing information, such as image, sound, and text.

Q17. Which of the following is a unit that is used to represent "resolution", one of the performance indicators of a display or a printer?

a) bps   b) dpi   c) fps   d) psi

Q18. Which of the following is the concept representing a database that is built by extracting and restructuring data from a mission-critical business system for the purpose of supporting information analysis and decision making?

a) Data center   b) Data warehouse

c) Data mining   d) Data roaming

Q19. Which of the following is an appropriate purpose of normalizing data in a relational database?

a) To guarantee data compatibility so that data can be shared between different types of computers
b) To prevent the occurrence of redundancy or inconsistency of data when data is updated
c) To identify characters that are not permitted to be sent when a database is used via a network
d) To handle data storage areas distributed over multiple media as a single contiguous storage area

Q20. When the order records shown below are entered in the system where each order number must be uniquely defined, which of the following is the appropriate method for searching the order master file containing all of the past order records, and for checking the uniqueness of the order number?

Order record

Order number (Character)	Order date (year/month/day)	Item code (Character)	Quantity (Numeric value)	Customer code (Character)

a) Duplication check
c) Limit check
b) Format check
d) Logical check

Q21. In a system environment where several users have access to a database simultaneously, a new user tries to view a data record while another user is updating the same record. In order to assure data integrity in such circumstances, which of the following is an appropriate control method that should be used in the DBMS?

a) Interrupting the updating process to permit the new user to view the record
b) Permitting the new user to view the latest data during the updating process
c) Permitting the new user to view the record after completion of the updating process
d) Canceling the updating process to permit the new user to view the last record

Q22. Which of the following is an appropriate explanation of DNS?

a) It is a system that is used to search for a wide variety of information through the Internet.
b) It is a system that is used to map between host names and IP addresses of devices connected to the Internet.
c) It is a personal authentication system that is used to provide a safe and secure online shopping environment.
d) It is a system that is used to manage personal e-mail addresses for the delivery of e-mail messages.

Q23. When the Internet is accessed from an intranet, which of the following is the most appropriate mechanism that can be used to relay access to the Internet, to speed up access to it by caching Web content, and also to ensure security?

a) DMZ
b) Firewall
c) Proxy
d) Router

Q24. Which of the following is the most appropriate term that is used to indicate the location of information on the Internet, and has the standardized format, such as "http://www.ipa.go.jp/" ?

a) Address tag
b) Domain name
c) Home page
d) URL

Q25. Which of the following is an appropriate explanation of MIME used on the Internet?

a) It is a language that is used to describe hypertext on the Internet.
b) It is a hypertext transmission protocol between client and server on the Internet.
c) It is a method of address notation for uniquely identifying a resource on the Internet.
d) It is a standard of exchanging multimedia data, such as audio or video, by e-mail.

Q26. When ten e-mail messages are sent successively from Company *A* to Company *B*, they may arrive at Company *B* in a different order from the order they are sent.   Which of the following is the most possible reason for this phenomenon?

   a) There is a problem with the setup of Company *A*'s mail server.
   b) There is a problem with the setup of Company *B*'s firewall for e-mail.
   c) There is a possibility that e-mail delivered late is falsified on the way.
   d) There is a possibility that each e-mail is sent via different transfer routes.

Q27. Which of the following is an appropriate description concerning cryptography?

   a) The process of transforming the encrypted text back into its original plain text is called reset.
   b) In common key cryptography, the encrypted text is transmitted together with the common key.
   c) Public key cryptography uses two types of keys: a key for encryption and a key for recovering the plain text
   d) Common key cryptography that is also known as secret key cryptography is used for digital signature.

Q28. Which of the following is a characteristic of a Trojan horse that is a type of malicious program?

   a) It is designed to infect a specific type of data file by using the macro function of application software.
   b) It sends out fake virus information, such as a warning message about a new type of virus, through chain e-mails.
   c) It performs self-propagation by sending copies of itself to other computers connected through a network.
   d) It masquerades as a legitimate file or helpful program with the purpose of performing harmful operations.

Q29. Which of the following can be made possible by using a digital signature in e-commerce?

a) Preventing an unintended third party from accessing any confidential file
b) Checking that a file is not infected with a virus or other malicious software
c) Protecting the content of a transaction from being leaked through wiretapping
d) Confirming the identity of a partner and the correctness of the details of a transaction

Q30. Which of the following is an appropriate method of managing user IDs for a company's in-house system?

a) Shared common user IDs rather than individually assigned IDs are helpful for the reduction of system resources.
b) User IDs for retired employees are kept intact until removal is directly requested by each person in question.
c) Registered user IDs and authority levels are regularly inspected from the viewpoint of whether or not they are still needed.
d) When users are transferred, new access privileges are granted in addition to the previously assigned access authority levels.

Q31. When a PC is connected to an online shopping site on the Internet, the Web browser displays the SSL padlock icon on the screen. Also, it is confirmed that the server certificate is that of the operator of the intended online shopping site. Among the items *A* through *C* described below on such an occasion, which of the following is the appropriate combination of decisions to be made? Here, "√" means what can be decided, and " −" means what cannot be decided?

A: The operator of the shopping site being accessed is in stable financial condition.
B: The online shopping site being accessed is not a fake or fraudulent site.
C: The data and information entered by the user is never stolen along the way.

	A	*B*	*C*
a)	√	√	√
b)	−	√	√
c)	−	√	−
d)	−	−	√

Q32. When a Web server is invaded from an outside source and its content is tampered with, which of the following is the appropriate course of actions to be taken?

1	Analyze the server, IDS (Intrusion Detection System), and firewall logs to identify the access method, the extent of the impact, and the route of entry.
2	Rebuild the system, and then apply the latest patches and security setup data.
3	Disconnect the server from the network.
4	Connect the server to the network, and monitor its operation for a while.

a) $1 \to 2 \to 3 \to 4$ b) $1 \to 3 \to 2 \to 4$

c) $3 \to 2 \to 1 \to 4$ d) $3 \to 1 \to 2 \to 4$

Q33. A document was received via e-mail as an attachment while at work. When the document was opened by using a word processing program, it was abnormally terminated. When the received e-mail or attached document is possibly contaminated with a computer virus, which of the following is the most appropriate action to be taken?

a) Disconnecting the PC from the network, and then removing the virus safely by reinstalling the OS

b) Disconnecting the PC from the network, and immediately reporting to the person in charge of the system management department

c) Checking whether the problem is reproducible, if necessary, by reinstalling the word processing program

d) Sending an e-mail to all employees as soon as possible in order to alert them to the virus infection

Q34. Which of the following is the most appropriate description concerning operational management for user IDs and passwords?

a) In order to simplify management work, currently unused user IDs and passwords are allowed to be reused.

b) In order to respond to problems promptly, a table of user IDs and passwords are created and stored by administrators.

c) In order to prevent someone from maliciously using another person's ID and password, users are free to change their own passwords at any time.

d) In order to improve convenience, personnel relocation information is used to register temporary user IDs and passwords in advance.

Q35. Which of the following is the most appropriate design policy for an output form?

    a) The numeric items and the character items are classified into different groups, and each group is separately placed on the top and bottom or left and right of the form.

    b) In order to ensure consistency between forms, rules regarding the form design, such as the title position and the layout of data items, are predetermined.

    c) All data items, including both numeric and character items, are printed with either right or left justification.

    d) The data items are arranged so that the program can be understood and maintained as easily and simply as possible.

Q36. A test in system development often adopts a build-up approach where tests are performed incrementally from a smaller to a larger unit. On such an occasion, which of the following is the appropriate test sequence?

    a) System test → integration test → unit test

    b) System test → unit test → integration test

    c) Unit test → integration test → system test

    d) Unit test → system test → integration test

Q37. Which of the following is an appropriate description concerning program test?

    a) It is better to assure software quality during the test phase than to improve it during the design phase.

    b) When a program is modified after completion of the test, it is better to test the program by using both the original and additional test data.

    c) It is better to exclude test data that triggers an error in the program, because the purpose of the test is to confirm that the program works without any errors.

    d) It is better for programmers to design and execute the test cases without any assistance from other persons.

Q38. A client application for a mission-critical business system, which was built by the information systems department, displayed an error message on the screen and stopped. Which of the following is the most appropriate action to be taken by the user in this situation?

    a) Restarting the PC, and then notifying the information systems department that a failure occurred

    b) Trying to resolve the problem on one's own, on the basis of the error message or other information

    c) Checking the error message with the user manual, and deciding if the failure can be resolved by self, or if the information systems department should be consulted

    d) Notifying other PC-based clients about the occurrence of the failure, and asking them to stop operations in progress

Q39. Which of the following is an appropriate approach to performing maintenance work for hardware?

    a) Maintenance work should be planned and performed only after diagnostic and predictive information, such as warning indicator or error log, is provided.

    b) Maintenance work should be performed on a scheduled basis even when there is no fault or failure detected.

    c) Maintenance work should be suspended until the next periodical inspection even when a sensuous change such as "operation noise louder than usual" is detected.

    d) Maintenance work is required only for printers and storage devices that involve mechanical operations.

Q40. Which of the following is the term that means the process of modifying some of the functions of a software package on the basis of user environments and requirements?

    a) Reengineering   b) Customization

    c) Refactoring   d) Localization

Q41. Which of the following is the development model where a trial model or a pilot unit is developed at an early stage of system development so that users can verify their requirements in a tangible manner?

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

Q42. Among the charts and diagrams created for project management, which of the following is the most appropriate chart or diagram that can be used to visually check the overall status of progress as well as the planned start and finish dates?

a) Arrow diagram
b) Gantt chart
c) Cause and effect diagram
d) Pareto chart

Q43. Which of the following is the most appropriate example of a project?

a) Performing the periodic or schedule-based inspection of the ATM in a bank
b) Creating a monthly report concerning actual production results in a factory
c) Increasing the purchase volume of popular or best-selling products in a shop
d) Developing a new large-scale online system in a software house

Q44. Which of the following is the activity that is performed to confirm that project deliverables achieve the required quality?

a) Selecting suppliers for tools necessary for the creation of project deliverables
b) Performing the review of project deliverables in advance of delivery
c) Performing the progress management based on the plan of project deliverables
d) Defining the roles and responsibilities of each member involved in deliverables

Q45. The programming project of image processing using a newly devised algorithm is outsourced to an external vendor. In order to ensure the strict control of handling information, which of the following is an item that must be included in the contract?

a) Maintenance plan after development
b) Organizational structure of development
c) Performance assurance of the program
d) Protection of confidentiality

Q46. Which of the following is an appropriate diagram or chart used for the identification of the critical path that takes the longest period of time from the start to the end of a project?

a) Arrow diagram
b) Control chart
c) Tree diagram
d) Milestone chart

Q47. When direct one-to-one communication is performed between three project members A, B, and C, there exist three communication paths between A and B, B and C, and C and A. When communication is performed among seven persons, what is the maximum number of communication paths? Here, there exists a single communication path between any two of the seven members.

a) 7
b) 14
c) 21
d) 42

Q48. Which of the following is an appropriate risk management practice for system development projects?

a) Risk management begins at the point in time when the requirements definition is completed.
b) The scope of risk management does not include factors dependent on individuals, such as a lack of skills.
c) Measures are taken to prevent the occurrence of a risk and to minimize damages caused by the occurrence.
d) Risks can be prevented by thoroughly taking proactive measures, in which case corrective actions become unnecessary.

Q49. Which of the following is the framework that describes a collection of best practices of IT service management?

a) ISO 14001   b) ISO 27001   c) ITIL   d) PMBOK

Q50. In IT service management, which of the following is an appropriate explanation concerning SLA and SLM?

a) SLA is a proposal for improving services that are presented by the service provider, and SLM is an activity for providing technical means to perform the maintenance management of service levels.

b) SLA is an agreement on service levels between the service provider and the users, and SLM is an activity for the maintenance and improvement of the quality of IT services.

c) SLA defines the activities for measuring the degree of achievement of service levels and identifying problems, and SLM defines the technical means for resolving problems.

d) SLA aims at delivering a higher level of services, and SLM aims at providing a common understanding of service contents, required service levels, and other service factors.

Q51. In a company's accounting department, a new financial accounting package is to be used, and a new server with the package installed is delivered from a vendor. Operations management of the new server is performed by the information systems department. Among the items *A* through *D* described below about what should be agreed between the accounting department as the user department and the information systems department as the operations department from the point of view of service levels, which of the following is the list that contains all of the appropriate items?

    A: The operating hours available for the financial accounting package
    B: The cost sharing between both departments for purchasing the new server
    C: The items to be tested when the new server is received from the vendor
    D: The scope and frequency of data backup

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

Q52. Which of the following is a process of IT service management that proactively identifies and analyzes the root cause of an incident and also manages problems to closure?

a) Incident management
b) Change management
c) Problem management
d) Release management

Q53. Which of the following is an appropriate description concerning the organizational structure of risk management?

a) Authority and functions should be concentrated at the executive officer who is in charge of all risk management tasks covering from detection or identification to evaluation of risks.
b) Since risk management includes the handling of classified information and material, departments other than those specific to risk management should not be involved in risk management.
c) Since risk handling has a direct relationship with insurance and business resource management, the financial department should play the role of the risk management team.
d) Measures against risks should be performed by each department possessing authority and functions, and overall management should be performed by the risk management department directly connected with the top management team.

Q54. In an IT service agreement between a service provider and users, which of the following is the term that means the ratio of the amount of service time provided to users actually during the period of pre-defined service time?

a) Responsiveness
b) Availability
c) Usability
d) Serviceability

Q55. Which of the following is an appropriate description concerning a system audit?

a) The actual user of a developed system evaluates the system in order to determine whether or not the system can be brought into full operation.

b) Personal identification is performed as authentication for system use, on the basis of fingerprint, voice print, iris image, or any other unique physical representation.

c) From an independent standpoint, it is verified whether or not the measures against risks concerning the information system are developed and operated appropriately.

d) A system is evaluated by entering the system from outside the network, and trying to steal, modify, or destroy data and programs without permission.

Q56. In the ISO 9001 standard for quality management systems, which of the following is defined as a requirement for internal audits?

a) Internal audits must be conducted periodically by the organization's system audit department or certified system audit specialists.

b) Internal audits must be conducted without notice at irregular intervals to verify that the quality management system is correctly working as specified.

c) Internal audits must be conducted to check if the quality management system is effectively implemented and maintained, and conforms to the requirements.

d) As a prerequisite for conducting internal audits, the quality management system of an organization must be certified by an independent external assessor.

Q57. Which of the following is an appropriate explanation of IT governance?

a) A framework which is a comprehensive collection of best practices concerning the management and operation rules of IT services

b) The organizational ability to guide the development and implementation of an IT strategy in the appropriate direction to establish a competitive advantage

c) A specifications package requesting a detailed proposal from a subcontracting IT vendor from which information systems or IT services are to be procured

d) An agreement in which the service level is clearly defined by a service provider in order to assure the quality of the service

Q58. Which of the following is the organizational form of a company that is shown in the chart below?
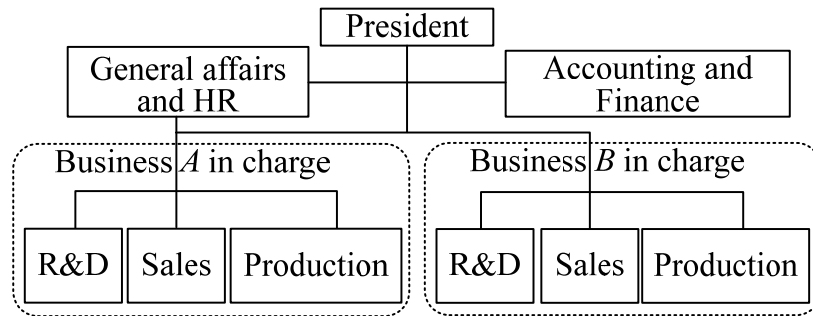
a) Divisional organization   b) Functional organization
c) Project organization   d) Matrix organization

Q59. There are four companies, each with a share price of 100 dollars.   One of them is to be selected for investment.   The table below shows the expected price increase for each stock under high, moderate, and low economic growth.   Which of the following is the stock that is expected to show the highest price increase?   Here, the probability is 0.4 for high economic growth, 0.4 for moderate economic growth, and 0.2 for low economic growth.   It is not necessary that zero economic growth be considered.

Unit: dollar

Stock	High growth	Moderate growth	Low growth
A	20	10	15
B	30	20	5
C	25	5	20
D	40	10	−10

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

Q60. The points representing the relations between production factors (*w*, *x*, and *y*) and quality (*z*) are plotted in the graphs shown below. Which of the following is an appropriate description concerning these graphs?
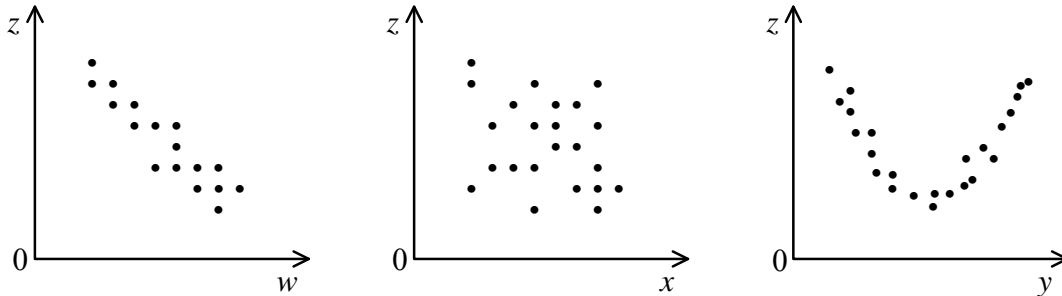
a) There is no correlation between *w*, *x*, *y*, and *z*, so none of *w*, *x*, and *y* can be considered as an item for quality control.

b) There is a negative correlation between *w* and *z*, so *w* can be considered as an item for quality control.

c) Changes in *x* make a great impact on *z*, so *x* can be considered as an item for quality control.

d) *z* is approximately defined as a quadratic function of *y*, so *y* cannot be considered as an item for quality control.

Q61. In order to prepare for any potential bad debt on accounts receivable from a business partner, which of the following is an action that enables the appropriation of a part of the business partner's property for accounts receivable more preferentially than the other?

a) Adding debt
b) Issuing an invoice
c) Setting collateral
d) Increasing interest

Q62. When a server with a purchase price of 30,000 dollars is leased for a period of five years at a lease rate of 2%, what is the total leasing expense in dollars? Here, the lease rate is shown as a proportion of the monthly lease fee to the purchase price.

a) 32,400   b) 33,000   c) 34,200   d) 36,000

Q63. Without any particular arrangements with Company *A* concerning the rights to the work, Company *B* makes a request to Company *A* for the development of a program for a sales management system based on the requirements of Company *B*. In this case, what happens to the original ownership of the copyright of the program?

a) Company *A* and Company *B* decide the copyright through discussions.
b) Company *A* shares the copyright with Company *B*.
c) The copyright belongs to Company *A*.
d) The copyright belongs to Company *B*.

Q64. From the viewpoint of careful and prudent consideration for recipients of e-mail, which of the following is the most appropriate example of e-mail transmission?

a) A questionnaire on member satisfaction is sent by e-mail to all the addresses of 100 selected members entered in the "To" (destination) field.
b) A large-size document presenting a company's products is sent to a customer as an e-mail attachment without being compressed.
c) A reply to an e-mail query about a product is sent to those customers who should know about the details, by entering their addresses in the "Cc" (carbon copy) field.
d) An e-mail is sent to the limited customers by using the "Bcc" (blind carbon copy) field in order to inform them of the URL of a specially planned Web page.

Q65. Which of the following is an appropriate explanation of corporate governance?

a) It quantitatively measures and analyzes the cost effectiveness of environmental conservation measures, and publicizes the cost and effects.
b) In addition to essential profit-making activities, a company contributes appropriately for the betterment of society by acting as a member of society.
c) It is a mechanism for monitoring whether or not business management is being performed appropriately, and maintaining the soundness of corporate activities.
d) It publicizes the business status of a company accurately, promptly, and continuously as a part of public relations with investors and analysts.

Q66. Which of the following is an explanation of compliance enhancement in corporate management?

a) Preventing management staff and employees from being involved in illicit or illegal acts that have a possibility of threatening the survival of the company

b) Establishing a framework that enables sound management by keeping the use of power by management staff in check

c) Improving the level of satisfaction of the interested parties, such as customers, shareholders, and employees, to ensure continued growth of the company

d) Increasing competitiveness by securing management resources that can be a source of differentiation against competitors

Q67. Which of the following corresponds to a third-party audit that is defined in "ISO 9000:2005 Quality management system—Fundamentals and vocabulary"?

a) A parent company audits the quality management system of a subsidiary company.

b) A customer audits the quality management system of a trading partner company.

c) A company audits its own quality management system for internal purposes.

d) A certification body audits the quality management system of a client company.

Q68. Which of the following is the primary purpose of the ISO 9000 series?

a) To provide standards for a quality management system that aims to improve customer satisfaction

b) To provide the latest methodologies and tools for effective and efficient quality management

c) To provide the successful best practices of software development processes and activities

d) To provide quality management activities that should be performed in a development project

Q69. Which of the following is the most advantageous effect that is produced by SCM (Supply Chain Management) that is known as a management method?

a) Sales or inventory information about commercial products in retail stores can be obtained efficiently and accurately.

b) Knowledge and findings can be organized into a database and used effectively and efficiently in business.

c) The sequence of processes from procurement to manufacturing, distribution, and sales can be improved, and the delivery time and cost can be optimized.

d) Inquiries from customers or users via telephone, FAX, e-mail, and other methods can be responded in a timely and coordinated manner.

Q70. Which of the following is an appropriate effect of alliance in corporate strategy?

a) Although confusion and friction may arise because of participation of a partner company with a different culture as a result of a merger or acquisition, tangible and intangible management resources can be acquired.

b) By outsourcing the non-core activities of a company to some specialized vendors or service providers, the company can shift the staff members to its mission-critical activities.

c) Through technological tie-ups, outsourcing of production and sales, and establishment of joint ventures, several companies can strengthen their cooperation while maintaining their independence.

d) By holding the stocks of group companies, a company can be managed and operated in the form of a company that is specialized to function as a headquarters of such companies.

Q71. Which of the following is an explanation of core competence management?

a) Acquiring management resources from other companies that have an established business operation, in order to gain an advantage over competitors
b) Optimizing the combination of business operations in order to have a greater effect than merely operating each business independently
c) Concentrating management resources on a company's own proprietary expertise and technology in order to establish a competitive advantage
d) Reviewing best practices of other companies in order to fundamentally improve and restructure the current business processes

Q72. Which of the following is an appropriate description concerning the JIT (Just In Time) production method?

a) The entire production process is performed rapidly and thoroughly by one or a few professional workers.
b) The production process is started at the manufacturing line as soon as a customer order is accepted.
c) Products are manufactured on the basis of the demand forecast that is made at the time of starting the production.
d) The necessary items are produced and delivered at the necessary time in the necessary quantity.

Q73. Which of the following is the terminology used when product improvement, addition of new varieties, and product disposal are planned according to each stage of introduction, growth, maturity, and decline?

a) Experience curve effect
b) Business continuity plan
c) Product portfolio management
d) Product life cycle strategy

Q74. Which of the following is the most appropriate description concerning the advantageous effects of implementing CRM?

a) It becomes easy to maintain accurate records about the customer payment status of account receivables.
b) It becomes easy to shorten the lead time required from the point of receipt of order to delivery.
c) It becomes easy to share sales approach to customers among all of the sales staff members.
d) It becomes easy to deeply understand customer needs and establish long-term positive relationships.

Q75. Which of the following is an appropriate explanation of MOT?

a) It is the business activity of a company gaining control of all or part of another company through merger or acquisition for the purpose of expanding the scale of operation.
b) It is the concept of management under which a company doing industrial business invests in scientific methods and materials to promote innovation and to grow business continuously.
c) It is the business activity of the management of a company raising funds from financial institutions and buying the stock to acquire the controlling interest of the company.
d) It is the material management technique for calculating the quantities of the components and materials necessary to produce a product and reflecting the results on the production plan.

Q76. An ERP package is a suite of fully integrated software applications that are used to perform administrative business processes, such as financial management, procurement, personnel, and payroll administration. Which of the following is the most appropriate description concerning such an ERP package?

a) An ERP package can be installed with relative ease because the business processes of a company do not need to be analyzed.

b) An ERP package should be maintained by individual user departments after its installation.

c) An ERP package should be installed after the business processes of a company are verified and standardized.

d) An ERP package is an integrated type of system software that is designed especially for the domestic business processes.

Q77. Which of the following is the system that is used to record sales information when a product is sold at the store, and also to collect, accumulate, and analyze product sales information for each product?

a) ECR b) QR c) EOS d) POS

Q78. Which of the following is a technology that is defined by some international standards and used for contactless IC cards, such as tickets for public transport?

a) IrDA b) RFID c) Bluetooth d) Wi-Fi

Q79. The component table below shows the quantity of each component that is required to build one unit of Product *A*, and the stock table below shows the quantity in stock for *A*, *a*, *b*, and *c*. How many units of Component *b* are additionally required to build and ship a total of 300 units of Product A? Here, there are no other items in process, on back order, or already allocated.
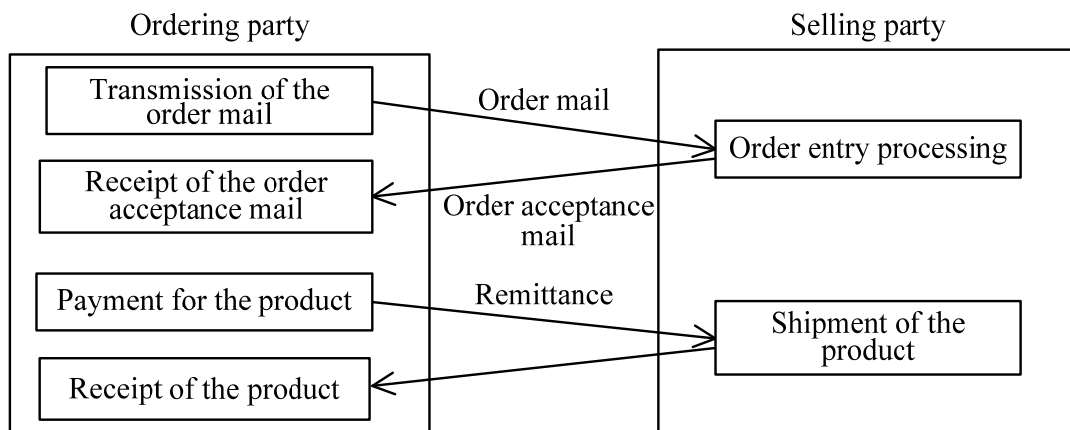
Component table

Item	Quantity of components		
	a	*b*	*c*
A	3	2	
a		1	2

Stock table

Item	Quantity in stock
A	100
a	100
b	300
c	400

a) 200   b) 600   c) 900   d) 1,500

Q80. When online shopping via the Internet is done according to the procedure shown in the figure below, which of the following is the point at which this order comes into effect between the two parties unless otherwise specified?

a) Transmission of the order mail
b) Order entry processing
c) Receipt of the order acceptance mail
d) Payment for the product

Q81. Which of the following is a form of e-commerce corresponding to an online bookstore or an online shopping mall that is constructed for individuals on the Internet?

    a) B to B   b) B to C   c) C to B   d) C to C

Q82. Among the characteristics required for an embedded system, which of the following is the most appropriate terminology used when a fixed process must be completed within a given period of time?

    a) Availability   b) Reliability
    c) Real-time ability   d) Serviceability

Q83. Which of the following is the appropriate explanation of the DFD that is created when a business process is analyzed?

    a) It shows various types of data items handled in the business operations and the interrelations among them.
    b) It shows various types of data items handled in the business operations, from sets to elements in a hierarchically detailed fashion.
    c) It shows the flow of data exchanged among the processes that make up the business operations.
    d) It shows the contents of the processes that make up the business operations, from overview to detailed view in a hierarchical fashion.

Q84. Company *A*, which manufactures and sells house building materials, identifies a problem with its logistics operation and develops an improvement plan to resolve the problem. Which of the following is the most appropriate mechanism that should be computerized to implement the improvement plan?

[Problem]
Since it takes several days to deliver the product ordered by a sales office, each sales office has in stock all of the products dealt with by the company in fear of being out of stock. As a result, an enormous inventory cost is incurred by Company *A* as a whole.

[Improvement plan]
A logistics warehouse is built in the major territory of the sales area, and delivery trucks are allocated so that any product can be delivered on the day the order from the sales office is received.

a) A mechanism that enables each sales office to inquire the number of new housing starts in its sales territory
b) A mechanism that enables each sales office to immediately inform the logistics warehouse about the order details
c) A mechanism that enables the manager of each sales office to understand the current inventory cost
d) A mechanism that enables management to compare and analyze the sales performance of individual sales offices

Q85. Which of the following is an appropriate purpose of installing groupware?

a) To integrate groupware into equipment, such as PCs and peripheral devices, and provide basic hardware control functions
b) To enhance the overall work efficiency of an organization by providing an environment for collaborative work
c) To enhance the organization's Internet security by implementing a solution that combines both hardware and software into a single security product
d) To shorten the period of system development and improve the efficiency of maintenance by installing a suite of packaged software

Q86. Among the various types of outsourcing services, which of the following is a service that is provided by an MSP?

a) Connectivity of "co-location" servers with the Internet environment
b) Business processes such as human resource management, accounting, sales, and logistics
c) The operations control of an IT infrastructure, such as a network, server, and storage, over the network
d) Standard application services over a network through a billing method such as a flat fee

Q87. Which of the following is an activity that is performed in the requirements definition process of system development?

a) Creating and approving computerization plan
b) Performing qualitative and quantitative risk analysis
c) Estimating investment effect and computerization costs
d) Identifying the needs and demands of system users

Q88. Which of the following is an appropriate explanation of an ASP?

a) A business operator or a form of service that provides communication lines for connecting to the Internet
b) A service on the Internet for creating a closed community that is accessible to users who are members of the community
c) A business operator or a form of service that provides users with application software on a server via the Internet
d) An approach of constructing an information system from the viewpoint of a service, rather than from the viewpoint of a product such as hardware and software

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

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

Mr. *A*, who is working in store *B*, performed sales analysis for the current one month by using spreadsheet software and then reported to the president.   The worksheet used for sales analysis is shown in Figure 1.   Here, each amount of money is given in dollars.

	A	B	C	D	E	F
1	Item	Unit price	Cost price	Sales quantity	Total sales	Gross profit
2	Item U	400	200	4,800	1,920,000	960,000
3	Item V	450	250	2,310	1,039,500	462,000
4	Item W	500	350	5,350	2,675,000	802,500
5	Item X	400	150	3,520	1,408,000	880,000
6	Total			15,980	7,042,500	3,104,500

Figure 1   Worksheet for performing sales analysis

[Strategy]

Q89. On the basis of Figure 1, which of the following is an appropriate result analyzed by Mr. *A*?

a) Item V has the lowest total sales and gross profit.
b) Item W has the highest total sales and gross profit.
c) Item X has the second highest gross profit rate.
d) Item U has the highest gross profit and the maximum gross profit ratio.

[Technology]

Q90. In order to calculate the ratio of the gross profit for each item to the total gross profit (hereinafter, the gross profit ratio), the expression is entered in cell G2 of the worksheet shown below, and then copied to cells G3 through G5. Which of the following is the expression that is entered in cell G2? Here, the cells used to calculate the gross profit ratio are displayed in percentage.

	A	B	C	D	E	F	G
1	Item	Unit price	Cost price	Sales quantity	Total sales	Gross profit	Gross profit ratio
2	Item U	400	200	4,800	1,920,000	960,000	30.9%
3	Item V	450	250	2,310	1,039,500	462,000	14.9%
4	Item W	500	350	5,350	2,675,000	802,500	25.8%
5	Item X	400	150	3,520	1,408,000	880,000	28.3%
6	Total			15,980	7,042,500	3,104,500	100.0%

a) F2/E2

b) F2/F6

c) F2/F$6

d) F2/SUM(E$2:E$5)

[Strategy]

Q91. Mr. *A* decides to offer a discount of 50 dollars on the unit price of Item U to increase the sales quantity. In order to offer the unit price of Item U at a discount of 50 dollars next month and yet to earn more than the gross profit of the current month, at least how many additional units of Item U must be sold in the next month?

a) 770   b) 880   c) 1,600   d) 3,450

Q92. Mr. *A* is instructed by the president to consider removing Item V and adding Item Y and Item Z to the item list. In order to investigate the combination of the sales quantity of Item Y and Item Z that can exceed the gross profit of Item V, Mr. *A* creates the worksheet shown below.

The unit price of Item Y is entered in cell B8, and the cost price is entered in cell C8. The unit price of Item Z is entered in cell B9, and the cost price is entered in cell C9. The sales quantity of Item Y is entered in cells C12 through H12, and the sales quantity of Item Z is entered in cells B13 through B18. Each of rows and columns of Item Y and Item Z is separated in 1,000-unit increments. The total gross profit of Item Y and Item Z is displayed as "○" when it is equal to or more than the gross profit of Item V, and as "×" when it is less than the gross profit of Item V, in cells C13 through H18. Which of the following is the arithmetic expression that is entered in cell C13? Here, the expression of cell C13 is copied to cells C13 through H18. The cells used to calculate the gross profit ratio are displayed in percentage.

	A	B	C	D	E	F	G	H
1	Item	Unit price	Cost price	Sales quantity	Total sales	Gross profit	Gross profit ratio	
2	Item U	400	200	4,800	1,920,000	960,000	30.9%	
3	Item V	450	250	2,310	1,039,500	462,000	14.9%	
4	Item W	500	350	5,350	2,675,000	802,500	25.8%	
5	Item X	400	150	3,520	1,408,000	880,000	28.3%	
6	Total			15,980	7,042,500	3,104,500	100.0%	
7								
8	Item Y	180	25					
9	Item Z	50	18					
10								
11			Item Y					
12			0	1,000	2,000	3,000	4,000	5,000
13		0	×	×	×	○	○	○
14		1,000	×	×	×	○	○	○
15	Item Z	2,000	×	×	×	○	○	○
16		3,000	×	×	×	○	○	○
17		4,000	×	×	×	○	○	○
18		5,000	×	×	○	○	○	○

a) IF(((B$8 − C$8) ∗ $C12 + (B$9 − C$9) ∗ B$13) ≥ F3, '○', '×')

b) IF((($B8 − $C8) ∗ B$13 + (B$9 − C$9) ∗ $C12) ≥ F3, '×', '○')

c) IF(((B8 − C8) ∗ C$12 + ($B$9 − C9) ∗ $B13) ≥ F3, '○', '×')

d) IF(((B8 − C8) ∗ $C12 + ($B$9 − C9) ∗ $B13) ≥ F3, '×', '○')

Read the following description concerning the consideration of installation of a transportation expense application system, and then answer the four questions.

The planning department of Company *S* is considering the installation of a transportation expense application system.   Mr. *A* of the planning department receives an instruction from Mr. *B*, a senior section head, to compile the contents of the system installation review meeting that was held some time ago.   Mr. *B* suggests starting this process by first sorting the current problems concerning the transportation expense application and the requirements of the system, and then identifying the functions that the system must have.   Mr. *B* also indicates that it is necessary to clarify the purpose of installation of the system.   The memorandum of the system installation review meeting is as described below.

[Memorandum of the system installation review meeting]
 (1) The most time is consumed in checking whether the departure and destination locations and the applied fares are correct.
 (2) If a commercially available software package is used, the system installation expense must come down.
 (3) It would be helpful to have a method of a batch application for a certain number of days.
 (4) There are many flaws in the application form such as a lack of items that must be entered.
 (5) There are many calculation errors in the application form, and as a result, a lot of time is taken before its approval.
 (6) Even after the installation of the system, flaws and mistakes in an application form are corrected by the applicant who then resubmits the application.
 (7) It is desirable that the applicant be able to reuse the past applied data.
 (8) It is desirable that the applicant be able to know when the transportation expense is paid after the submission of an application.
 (9) An explanatory meeting must be held at the time of system installation.

Q93. In the [Memorandum of the system installation review meeting], which of the following is the list of items that describe the current problems concerning the transportation expense application?

a) (1), (3), and (5)

b) (1), (4), and (5)

c) (3), (4), and (5)

d) (4), (5), and (6)

Q94. In the [Memorandum of the system installation review meeting], which of the following is the list of items that describe the requirements for the system, which are currently not seen as a problem but as a function that is believed to be convenient in the transportation expense application?

a) (2), (3), and (7)

b) (3), (6), and (9)

c) (3), (7), and (8)

d) (7), (8), and (9)

[Management]

Q95. The reason for "There are many calculation errors in the application form, and as a result, a lot of time is taken before its approval" described in item (5) of the [Memorandum of the system installation review meeting] was investigated. In conclusion, it was understood that a simple mistake in the calculation of a total amount caused the application form to be returned to the applicant and then to be corrected and re-submitted by the applicant, and therefore, a lot of time was taken before its approval. In order to improve the situation, which of the following is the most appropriate function that the system should have?

a) A function to enable the search of applications for calculation mistakes after the submission of the applications

b) A function to automatically perform the necessary calculation at the time of application

c) A function to enable the applicant to use the software having the electronic calculator function

d) A function to enable the supervisor approving the application to correct the calculation mistake

[Management]

Q96. Mr. *A* wants to set the purpose of system installation as "Improving the efficiency of the application procedure." When system installation is continued on the basis of this purpose, which of the following is an appropriate activity to be performed on a priority basis?

a) Enabling all employees to use the system by holding the system explanatory meeting repeatedly

b) Installing the system as cheaply as possible by using a commercially available software package

c) Informing applicants about the date of payment of the transportation expenses by using e-mail

d) Installing the function that can automatically set the applicable fare based on the departure and destination locations

Read the following description concerning the encryption of image data, and then answer the four questions.

Figure 1 is an example of a black and white image of 8 × 8 pixels.   In this figure, if white is represented as 0 and black is represented as 1, the image data can be represented as digital data having eight rows with eight bits per row, as shown in Figure 2 below.
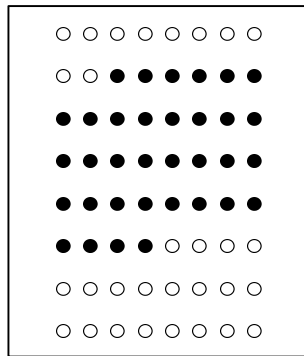

Figure 1   Example of a black and white image of 8 × 8 pixels

```
0 0 0 0 0 0 0 0
0 0 1 1 1 1 1 1
1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1
1 1 1 1 0 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
```

Figure 2   Representation of the image data of Figure 1 in bit strings

When an attempt is made to send image data via communication by which only character data can be sent, the image data needs to be first converted to character data and then transmitted.

Furthermore, in order to efficiently transmit image data of a larger size than the character data, a method of sending data after compression is implemented.   If the bit string of Figure 2 is viewed in a sequence from top left, it is understood that there are 10 consecutive 0s followed by 34 consecutive 1s, and then 20 consecutive 0s.   This consecutive number of the same value is called a run length.   Here, a method for using this run length to compress image data is considered.

Q97. The method of representing the image data shown below involves converting the image data to character data. Which of the following is the character that is used to represent a bit string of 9th bit through 12th bit (i.e., the first 4 bits of the second row) in the image data of Figure 2?

[Method of representing the image data]

(1) Extract strings sequentially in units of 4 bits from the bit string of the image data, and then append the 4-bit value "0100" to the beginning of each 4 bits to represent it in 8 bits.

(2) Represent each 8-bit value determined in (1) as a character corresponding to the 8-bit ASCII character code set. The 8-bit values 01000000, 01000001, 01000010, ..., and 01001111 correspond to the characters @, A, B, ..., and O respectively in an 8-bit ASCII character format.

a) @ 　　　　　 b) B 　　　　　 c) C 　　　　　 d) O

[Technology]

Q98. The method shown below is used to convert image data for the purpose of compressing the amount of information. How many bits are required to represent the image data shown in Figure 2?

[Method of representing the image data]

(1) The image data is represented using a run length encoding scheme, and the run length is represented in 4-bit binary. The image data is always expressed by using a combination (8-bit data) including the 4-bit run length for white and the 4-bit run length for black. For example, "01000011" means 4 white pixels followed by 3 black pixels.

(2) When the run length exceed 15 (i.e., the maximum value of 4 bits), it is split into multiple run lengths in units of 15. For example, when the run length for white is 20, it is split into 15 and 5, and then "black having a run length of 0" (i.e., "0000" in binary) is additionally inserted between the two run lengths. As a result, "111100000101..." is generated for the run length 20 of white.

(3) In the same way as the above (2), when more than 15 black pixels appear consecutively, "white with a run length of 0" is inserted.

(4) When black is located at the start, "white with a run length of 0" is inserted at the beginning. On the other hand, when white is located at the end, "black with a run length of 0" is inserted at the end.
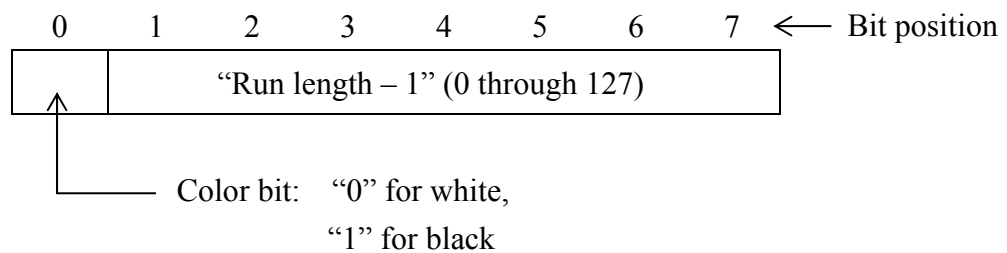
a) 12   b) 24   c) 40   d) 48

[Technology]

Q99. The method shown below is used to convert image data for the purpose of compressing the amount of information. How many bits are required to represent the image data shown in Figure 2?

[Method of representing the image data]

(1) The image data is represented using a run length encoding scheme. When the run length exceeds 128 (i.e., "10000000" in binary), it is split into multiple run lengths in units of 128. For example, when the run length is 200, it is split into 128 and 72.

(2) "1" is subtracted from each value represented in the above (1) so that each value can be represented as a 7-bit binary number. After that, "0 for white" or "1 for black" as a color indicator is appended to the first bit position of each of the 7-bit strings. As a result, each run length is represented as shown below.

```
  0     1     2     3     4     5     6     7   ←── Bit position
┌─────┬──────────────────────────────────────┐
│     │        "Run length – 1" (0 through 127)│
└─────┴──────────────────────────────────────┘
   ↑
   └────── Color bit:   "0" for white,
                        "1" for black
```

a) 7   b) 8   c) 21   d) 24

[Technology]

Q100. The method shown below is used to convert image data for the purpose of compressing the amount of information. How many bits are required to represent the image data shown in Figure 2?

[Method of representing the image data]

(1) The image data is represented using a run length encoding scheme, and each run length is represented in binary.

(2) When the value n obtained by representing the run length value in binary has m digits, each single run length is represented in the format described below.

(i) Information about the number of digits	(ii) Information about delimiter	(iii) Information about run length

(i) Information about the number of digits: This information is represented as consecutive 1s composed of $(m-2)$ bits. When m is equal to 0, 1, or 2, it is represented as "0"

(ii) Information about delimiter: The delimiter is represented as "0"

(iii) Information about run length: n

For example, when the value of the run length is 20, the value n represented in binary becomes "10100", and the number of digits "m" becomes 5. Therefore, when m is 5, (i) becomes "111" that is composed of $(5-2)$ bits. In addition, when the delimiter "0" and n are appended to "111", the result becomes "111010100" as shown below.

$$1 \quad 1 \quad 1 \quad 0 \quad 1 \quad 0 \quad 1 \quad 0 \quad 0$$

n = 20 ("10100" in binary)

delimiter

consecutive 1s composed of "m−2 = 5−2 = 3" bits
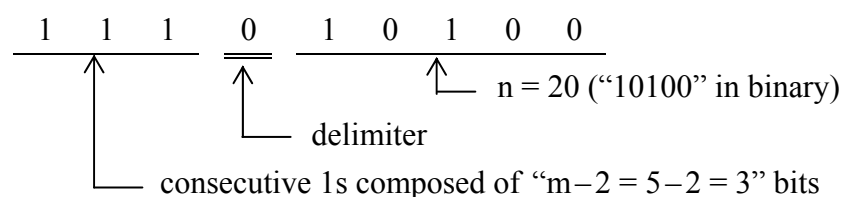
(3) The values in the format determined in the above (2) are consecutively concatenated. At this time, the image data always starts with white, and if the image data starts with black, "000" is inserted at the beginning in order to indicate the existence of white with a run length of 0. In the case of Figure 2, the image data starts with white, so the insertion "000" is not necessary.

a) 27   b) 30   c) 33   d) 36

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.