



- 一、 衡量變數的特性有四種量尺，分別是(1)名義量尺 (nominal scale) (2) 次序量尺 (ordinal scale) (3)等距量尺 (interval scale) (4)比率量尺 (ratio scale)。以下有 10 個變數，請問其各屬於何種量尺？請回答(1) (2) (3) (4)即可。 10%

- a. 家庭人口數目 _____ b. 職棒排名 _____
c. 考績(甲乙丙丁) _____ d. 汽車銷售量 _____
e. 工作時數 _____ f. 政黨屬性 _____
g. 耗油量 _____ h. 主修科系 _____
i. 溫度 (°C) _____ j. 職災工安意外事故 _____

- 二、 以下有五個研究問題，請就下列 7 種統計方法中選擇最適當的一種。

〔註：也許適用的統計方法不只一種，但請選出最適當且一般最常用的一個答案〕 10%

(1)卡方檢定 (χ^2) (2)相關分析 (Pearson's r) (3)複迴歸 (multiple regression) (4) t 檢定(獨立樣本) (5) t 檢定(相依樣本) (6)單因子變異數分析 (One-way ANOVA) (7) 雙因子變異數分析 (Two-way ANOVA or factorial design)

- _____ a. 某行銷人員想瞭解三種不同的廣告〔A、B、C 三案〕對於消費者購買意願〔Likert 五點量表〕的影響，於是將消費者隨機分為 3 組，每組給予一種廣告，再測量其購買意願，請問以上宜採用何種統計方式？
- _____ b. 某研究人員想瞭解國內不同政黨屬性民眾對訂閱不同報紙〔中國時報、聯合報、自由時報、大成報〕的人口分配傾向，於是隨機抽樣了 1000 名民眾作調查。
- _____ c. 某研究人員想用身高〔cm〕和食量〔克/每天〕來預測體重〔kg〕。
- _____ d. 某研究人員想瞭解一種新型藥物對血壓的影響，於是選取 20 名高血壓病人，測量其服藥前和服藥後的血壓，以比較其前後差異性。



____ e. 某企管研究生想瞭解高階經理人之奇魅領導風格〔五點量表〕對員工忠誠度〔五點量表〕的影響。

三、 某教授教導一個大班級〔可視為常態分布〕，全班的原始期末考成績平均為 65 分， $s=15$ 分，某教授覺得全班考的太差，且高低分同學分布相差太遠，決定重新調整分數，提高平均數、縮小分數差距，於是將全班平均數調整為 75 分， $s=12$ 分，請問若有一同學的原始分數為 60 分，經過調整之後的新分數為_____分。 10%

四、 隨機抽取某大型企業內男性及女性主管各 5 人，調查其月薪如下：〔單位：萬元〕

女性主管 9, 12, 8, 10, 16

男性主管 16, 19, 12, 11, 22

a. 請問男女主管平均月薪差異的 95% 信賴區間為_____ 5%

b. 請問我們是否可作結論認為此大型企業在主管薪資給付上有性別歧視的現象？_____〔是/否〕。 1%

c. 原因？(1)_____ (2)_____ 4%

五、 以下是 10 位業務人員的成就動機分數和銷售量：

成就動機 55, 52, 51, 48, 44, 40, 37, 34, 32, 30

銷售量 94, 91, 88, 84, 86, 81, 85, 76, 79, 74

$n=10$ $\sum X^2=18,619$ $\sum Y^2=70,592$

a. 請計算相關係數 $r_{XY} =$ _____〔取到小數點後兩位〕以及 $r^2 =$ _____ 6%

b. 請解釋 r^2 的意義？_____ 4%



6. The classification of school academics (e.g. college of management, engineering, design, etc.) is an example of _____ measurement. (4%)
- (A) Nominal
 - (B) Ordinal
 - (C) Interval
 - (D) Ratio
 - (E) None of the above
7. Which of the following statement is/are false? (4%)
- (A) When the population follows a normal distribution, \bar{X} follows a normal distribution, too.
 - (B) \bar{X} is approximately normally distributed, when the sample size is large enough.
 - (C) When σ is unknown, \bar{X} follow a t -distribution.
8. Which of the following methods will enlarge the width of a confidence interval? (4%)
- (A) Increase the confidence coefficient.
 - (B) Increase the sample size.
 - (C) Have a larger sample variance.
9. When doing a hypothesis test, $H_0: \mu \leq 30$ vs. $H_1: \mu > 30$. Which of the following statements is/are incorrect? (4%)
- (A) The maximal value of the probability of making a type I error occurs when $\mu > 30$.
 - (B) When the p -value of the sample result is smaller than the significance level, the H_0 is rejected.
 - (C) If the significant level is smaller, then the power of the test is large.
10. When multicollinearity exists, which of the following statements is/are incorrect? (4%)
- (A) The overall F value is not likely to be significant.
 - (B) No predictions of the dependent variables should be made.
 - (C) The estimated regression coefficients tend to have large standard errors and small t values.
 - (D) R -squared will tend to be smaller than if no multicollinearity exist.



11. In brief, explain the following two situations when model selection. (10%)
- (A) How Mallows C_p can be utilized in the selection of the best subset model.
- (B) What are the disadvantages of using R^2 as a measure to compare competing models.
12. Given the following complete factorial sources and sum of square for an experiment with 3 level of Nitrogen (N) fertilizer and 5 herbicides (H) and 4 replication, complete the analysis of variance table below. The experiment is set up as split-plot in a completely randomized design with herbicides as whole plots and Nitrogen levels as subplots. Assume a fixed model. ($\alpha = 0.05$). (20%)

<u>Source</u>	<u>SS</u>
Rep	10
N	100
H	80
Rep x N	20
Rep x H	30
N x H	40
Rep x N x H	10

ANOVA (split-plot)				
<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>



1. List and describe three Internet business models for electronic commerce. Distinguish between a pure-play Internet business model and a clicks-and-mortar business model.(20%)
2. What is Kelly's personal construct theory? How to build a repertory grid matrix by an example to explain. (15%)
3. What is hybrid AI system? Please list three application products and describe what methods are used. (15%)
4. 請說明使用 artificial agent (AA) 來管理 electronic supply chain management (E-SCM) 之優點? (15%) 並請舉一例說明之? (5%)
5. 請繪圖並說明如何以資訊系統架構將公司願景、策略性目標和衡量指標統整運作，其中應包含哪些基本構成原則? (20%)
6. 若以財務資訊作為輸入變數，而以統計迴歸法和類神經網路法分別構建預測模式，請問使用此兩種方法在預測準確度與變數貢獻度的考慮為何? (10%)



一、配合題，共 14 題，每題 1 分，答錯不倒扣。(14%)

- | | | | |
|------------------|----------------|----------------|---------------------|
| A. POP | B. EDI | C. MUD | D. ISDN |
| E. HTTP | F. Analog | G. Portal | H. Packets |
| I. Star topology | J. Multiplexor | K. Handshaking | L. Microwave signal |
| M. Flaming | N. Firewall | | |

1. establishing a link between source and destination
2. digital communications link
3. line of sight
4. network that involves a centralized host
5. intercompany networking
6. concentrates signals from low-speed devices
7. telephone line signal
8. an access point to the Internet
9. the primary access method for interacting with the WWW
10. adventure games
11. strings of bits
12. Infoseek, Yahoo, Exite
13. restricts access to a network
14. barrage of messages on Net

二、單選題，共 43 題，每題 2 分，答錯不倒扣。(86%)

1. "Sort," "average," and "report" would be terms that would best be associated with
 - (a) database software.
 - (b) word processing software.
 - (c) presentation software.
 - (d) idea processor software.

2. What type of memory is included in I/O devices that lets the user load vendor software upgrades directly to the system?
 - (a) ROM
 - (b) cache
 - (c) flash memory
 - (d) promenade memory

3. The concept of using multiple processors in the same computer is known as
 - (a) dual processing.
 - (b) perpendicular processing.
 - (c) multi-processing.
 - (d) parallel processing.

4. Disk processing implies
 - (a) non-concentric circles.
 - (b) random or direct processing.
 - (c) sequential processing.
 - (d) serial processing.



5. A 32X CD-ROM drive
- (a) holds ten times the data of the original CD standard.
 - (b) holds up to ten CD-ROM disks.
 - (c) spin thirty two times faster than the original CD standard.
 - (d) is the tenth generation of CD-ROM drives.
6. When a person refers to a monitor's resolution, they are referring to
- (a) the screen size.
 - (b) its quality of output.
 - (c) the number of rows and columns of characters that can be displayed on the screen at one time.
 - (d) the number of colors that can be displayed.
7. The electronic link between the motherboard and the monitor is the
- (a) graphics block. (b) graphics adapter. (c) graphics array. (d) graphic link.
8. Which of the following is not one of the three basic hardware components in a PC-based LAN?
- (a) NIC (b) token-net (c) network cables (d) server
9. The kernel in an operating system
- (a) is "swapped" in and out of primary storage as needed.
 - (b) compiles source programs.
 - (c) loads other system programs to primary storage as they are needed.
 - (d) eliminates the need for computer operators.
10. Multitasking is made possible by the great difference in processing speed and
- (a) the speed of the instruction register. (b) the speed of cache memory.
 - (c) the speeds of the peripheral devices. (d) the speed of the program register.
11. Which of the following is not true?
- (a) Mainframe and micro operating systems differ in complexity and orientation.
 - (b) Most micro operating systems are designed to support a single user.
 - (c) Mainframe operating systems may perform the concurrent execution of dozens of programs.
 - (d) Micro operating systems may monitor interaction with hundreds of nodes in a network.



12. During the PC power up sequence, the operating system is loaded from disk storage to
 (a) ROM. (b) the external memory. (c) RAM. (d) the internal matrix.
13. The bit-mapped file format introduced for Windows PC Paintbrush files is
 (a) PCX. (b) XCP. (c) PNG. (d) JPG.
14. When discussing multimedia computer applications, the term MIDI stands for
 (a) Master Interface Digital Image.
 (b) Multimedia Instrument Digital Interface.
 (c) Multimedia Interface Digital Instructions.
 (d) Musical Instrument Digital Interface.
15. Flexibility is often built into the knowledge worker's work environment to avoid which one of the following?
 (a) consolidated terraform disability (b) cumulative trauma disorder
 (c) collapsed tunnel distortion (d) conformative task discharge
16. Most computer crimes are classified
 (a) as computer fraud. (b) under computer monitoring.
 (c) as a form of computer caching. (d) as physical distortion.
17. The transmission protocol for transmitting data securely over the WWW is called
 (a) Secondary Source Level. (b) Secure Sockets Layer.
 (c) Secure Sender Link. (d) Security Station Layer.
18. Which of the following would not be associated with a decision support system?
 (a) query languages (b) forecasting models
 (c) routine transaction processing (d) color graphics
19. What is the result of converting the infix expression
 $a + b * c + (d * e + f) * g$
 into postfix?
 (a) $a b + c * d e f * + g * +$ (b) $a b c * + d e f + * g * +$
 (c) $a b c * + d e * f + g * +$ (d) $a b c + * d e * f + g * +$
20. What is the maximum number of nodes in a binary tree of height H?
 (a) $2^H + 1$ (b) $2^H - 1$ (c) $2^{H+1} + 1$ (d) $2^{H+1} - 1$



21. Which one of the following is *not* a method to resolving hashing collisions?
 (a) primary clustering (b) separate chaining
 (c) hash bucket (d) open addressing
22. Consider a leftist tree with r nodes on the right path. What is the minimum number of nodes in the leftist tree?
 (a) $2^{r-1} - 1$ (b) $2^r - 1$ (c) $2^{r+1} - 1$ (d) $2^{r+1} + 1$
23. Which one of the following sorting methods has the best average running time?
 (a) proxmap sort (b) heap sort
 (c) quick sort (d) bubble sort
24. Physical data independence is the capacity to
 (a) change the conceptual schema without having to change the external schema.
 (b) change the internal schema without having to change the conceptual schema.
 (c) change the external schema without having to change the conceptual schema.
 (d) change the conceptual schema without having to change the internal schema.
25. Which one of the following statements about entity-relationship model is true?
 (a) A weak entity type always has a partial participation constraint with respect to its identifying relationship.
 (b) The owner entity type of a weak entity type must be a strong entity type.
 (c) An attribute A of entity type E whose value set is V can be defined as a function from E to the power set $P(V)$ of V :
 $A : E \rightarrow P(V)$
 (d) The degree for a binary relationship specifies the number of relationship instances that an entity can participate in.
26. Suppose we want to create a linear hash file with a file load factor of 0.7 and a blocking factor of 20 records per bucket, which is to contain 112,000 records initially. How many buckets should we allocate in the primary area?
 (a) 4200 (b) 5600 (c) 6400 (d) 8000
27. A file has $r = 20,000$ STUDENT records of fixed length. Each record has the following fields: NAME (30 bytes), SSN (9 bytes), ADDRESS (40 bytes), PHONE (9 bytes), BIRTHDATE (8 bytes), SEX (1 byte), MAJORDEPTCODE (4 bytes), MINORDEPTCODE (4 bytes), CLASSCODE (4 bytes, integer), and DEGREEPROGRAM (3 bytes). An additional byte is used as a deletion marker.



- The file is stored on a disk whose block size is 512 bytes. Assuming an unspanned organization, what is the blocking factor?
- (a) 6 (b) 5 (c) 4 (d) 3
28. Consider a disk with block size $B = 512$ bytes. A block pointer is $P = 6$ bytes long, and a record pointer is $P_R = 7$ bytes long. A file has $r = 30,000$ EMPLOYEE records of fixed length. Each record has the following fields: NAME (30 bytes), SSN (9 bytes), DEPARTMENTCODE (9 bytes), ADDRESS (40 bytes), PHONE (9 bytes), BIRTHDATE (8 bytes), SEX (1 byte), JOBCODE (4 bytes), SALARY (4 bytes, real number). An additional byte is used as a deletion marker. Suppose that the file is ordered by the key field SSN and we want to construct a primary index on SSN. What is the index blocking factor?
- (a) 26 (b) 34 (c) 42 (d) 54
29. Which one of the following statements about relational model is true?
- (a) Tuples in a relation are ordered.
- (b) A key K of a relation R is a subset of K 's attributes such that, for any two distinct tuple t_1 and t_2 in a relation state r of R , we have the constraint that
- $$t_1[K] \neq t_2[K]$$
- (c) A relation $r(R)$ is a proper subset of the Cartesian product of the domains the define R .
- (d) A set of attributes FK in relation.schema R_1 is a foreign key of R_1 that references relation R_2 if it satisfies the following two rules:
- (1) The attributes in FK have the same domain(s) as the primary key attributes PK of R_2 .
- (2) A value of FK in a tuple t_1 of the current state $r_1(R_1)$ either occurs as a value of PK for some tuple t_2 in the current state $r_2(R_2)$ or is null.
30. Which one of the following sets of relational algebra operations is a complete set?
- (a) $\{\sigma, \pi, \cup, -, \times\}$ (b) $\{\sigma, \pi, \cup, \cap, -\}$
- (c) $\{\sigma, \cup, \cap, -, \times\}$ (d) $\{\cup, \cap, -, \times, \div\}$
31. Which one of the following statements about relational database is true?
- (a) A decomposition $D = \{R_1, R_2, \dots, R_m\}$ of R is dependency-preservation with respect to F if the intersection of the projections of F on each R_i in D is equivalent to F ; that is
- $$((\pi_{R_1}(F)) \cap \dots \cap (\pi_{R_m}(F)))^+ = F^+$$
- (b) A decomposition $D = \{R_1, R_2, \dots, R_m\}$ of R has the lossless join property with



respect to the set of dependencies F on R if, for some relation state r of R that satisfies F , the following holds, where $*$ is the natural join of all the relations in D :

$$*(\pi_{R_1}(r), \dots, \pi_{R_m}(r)) = r$$

- (c) A relation schema R is in fourth normal form (4NF) with respect to a set of dependencies F if, for every nontrivial functional dependency $X \rightarrow Y$ in F^+ , X is a superkey for R .
- (d) A relation schema R is in fifth normal form (5NF) with respect to a set F of functional, multivalued, and join dependencies if, for every nontrivial join dependency $JD(R_1, R_2, \dots, R_n)$ in F^+ , every R_i is a superkey of R .
32. Which one of the following statements about database security is true?
- (a) Mandatory security mechanisms are used to grant privileges to users, including the capability to access specific data files, records, or fields in a specified mode (such as read, insert, delete, or update).
- (b) Discretionary security mechanisms are used to enforce multilevel security by classifying the data and users into various security classes (or levels) and then implementing the appropriate security policy of the organization.
- (c) Security for statistical databases must ensure that information on individuals cannot be accessed.
- (d) The security mechanism of a DBMS must include provisions for restricting access to the database system as a whole. This function is called data encryption.
33. Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies $G = \{\{A, B\} \rightarrow \{C\}, \{B, D\} \rightarrow \{E, F\}, \{A, D\} \rightarrow \{G, H\}, \{A\} \rightarrow \{I\}, \{H\} \rightarrow \{J\}\}$. What is the key for R ?
- (a) $\{A, B, D\}$ (b) $\{A, D, H\}$ (c) $\{B, D\}$ (d) $\{A, D\}$
34. Which one of the following statements about computer networks is true?
- (a) Before sending a packet into a datagram network, the source must determine all of the links that packet will traverse between source and destination.
- (b) The application and transport layers of the Internet protocol stack are implemented in the end systems but not in the routers in the network core.
- (c) The Internet provides its applications two types of services, a TDM service and a FDM service.
- (d) ADSL bandwidth is shared.



35. Which one of the following statements about computer networks is true?
- (a) Network News was present in the Internet before the emergence of the World Wide Web.
 - (b) The HTTP protocol was invented at Netscape in the early 1990s.
 - (c) Ethernet is a popular residential Internet access technology.
 - (d) Twisted-pair copper wire is no longer present in computer networks.
36. Which one of the following statements about computer networks is true?
- (a) If an HTTP request message uses the "Accept-language: fr" header, and the server only has an English version of the object, then the server will return the "404 Document Not Found" error message.
 - (b) With SMTP, it is possible to send multiple mail messages over the same TCP connection.
 - (c) A server can use cookies to determine a user's postal address without the user's consent.
 - (d) The Web typically sends multiple objects in a Web page within a multipart MIME message.
37. Which one of the following statements about computer networks is true?
- (a) With POP3 client, user folder information is kept on the mail server.
 - (b) With non-persistent connections between browser and origin server, it is possible for a single TCP segment to carry two distinct HTTP request messages.
 - (c) DNS lookups often involve a combination of recursive and iterative queries.
 - (d) The "Date:" header in the HTTP response message indicates when the object in the response was last modified.
38. Which one of the following statements about computer networks is true?
- (a) Consider an HTTP Web server using persistent connections. Suppose the server spawns a separate process for each client that connects to the server. Then each of these spawned processes will have different server port numbers.
 - (b) Host A is sending host B a large file over a TCP connection. Assume host B has no data to send A. Host B will not send acknowledgements to host A because host B cannot piggyback the acknowledgements on data.
 - (c) Suppose host A is sending a large file to host B over a TCP connection. If the sequence number for a segment of this connection is m , then the sequence number for the subsequent segment will necessarily be $m+1$.
 - (d) The TCP segment has a field in its header for receive window.



39. Which one of the following statements about computer networks is true?
- Suppose host A sends host B one segment with sequence number 38 and 4 bytes of data. Then in this same segment the acknowledgement number is necessarily 42.
 - In TCP, the acknowledgement number that a host puts in a segment is the sequence number of the next byte the host is expecting from the sender.
 - Suppose that host A wants to send data over TCP to host B, and host B wants to send data to host A over TCP. Two separate TCP connections - one for each direction - are needed.
 - The MSS is the maximum size of a TCP segment including headers.
40. Which one of the following statements about computer networks is *false*?
- With a virtual-circuit network layer, packet switches are involved in virtual circuit setup, and each packet switch is aware of the VCs passing through it.
 - With a datagram network layer, each packet carries the address of the destination host.
 - In the BGP (Border Gateway Protocol) routing algorithm, each AS (autonomous system) advertises to its neighbors its estimates of the shortest distances from the AS to all possible destination ASs.
 - In a distance-vector routing algorithm, each node has a map of the entire network and determines the shortest path from itself to all other nodes in the network.
41. Which one of the following statements about computer networks is *false*?
- Single-homed hosts have one interface and routers typically have two or more interfaces.
 - A gateway router must run both an intra-AS routing algorithm and an inter-AS routing algorithm.
 - The network portion of an IP address is the same for all the hosts on the same IP network.
 - Every autonomous system must use the same intra-autonomous system routing algorithm.
42. Which one of the following statements about computer networks is true?
- Each LAN adapter has a unique LAN address.
 - All link layer protocols that support IP have the same frame structure (i.e., length of frame, number and length of header fields).



- (c) CRC error detection, as used in Ethernet, is always able to detect whether there is an error in a frame.
- (d) The even parity bit scheme can correct single bit errors.
43. Which one of the following statements about computer networks is true?
- (a) Consider a twisted-pair Ethernet in which all nodes are 50 meters from the hub. The time it takes for a bit to propagate from hub to node for a 10BaseT Ethernet is ten times longer than for a 100BaseT Ethernet.
- (b) Consider a computer network consisting of several interconnected 10BaseT hubs, but which does not include any bridges or routers. Then this network has only one collision domain.
- (c) The entries in a bridge table need to be configured by the network administrator.
- (d) PPP excludes certain bit patterns in the network-layer packets that it carries.



一、單選題 (每題 2 分 共 30 分)

- (1) 以下有關 HTML 的敘述何者不正確？
- (A)
是用來製作換行的標記 (tag)
 - (B) <callback>是一個在表單 (form) 中指定處理程式位置的屬性名稱
 - (C) <table>是用來製作表格的標記
 - (D) <!-->是加入註解的標記
- (2) 以下哪一個語言不能撰寫 CGI 的程式？
- (A) C
 - (B) Scheme
 - (C) Visual Basic
 - (D) XML
- (3) 以下有關抽象式資料型態的敘述何者不正確？
- (A) C 語言不能製作具有抽象式資料型態功能的資料結構
 - (B) 一個抽象式資料型態提供使用者使用該資料型態的介面 (interface)
 - (C) 抽象式資料型態儲存資料的方式在改變後，不必修改使用者的程式碼
 - (D) 抽象式資料型態讓程式易於再利用
- (4) 以下哪個執行 Web 程式的功能不是在伺服器端執行？
- (A) 讀取 session 變數的值
 - (B) 讀取 HTML 檔案
 - (C) 儲存 Cookies
 - (D) 處理表單 (form) 資料
- (5) 以下有關物件導向程式語言的描述何者正確？
- (A) class variables 會因為物件的產生或消失而產生或消失
 - (B) A 種物件內有 B 種物件，也就是 A 種物件 has-a B 種物件時，適合將 A 物件放入 B 物件中成為 B 物件的物件變數 (instance variable)
 - (C) C++ 語言支援多重繼承 (multiple inheritance)
 - (D) 一個類別 (class) 中可以有名稱相同的物件變數
- (6) _____ examine the port number field of each arriving packet's encapsulated TCP segment.
- (A) Switched hubs
 - (B) Layer 3 switches
 - (C) Layer 4 switches
 - (D) Gateways



- (7) Which one of the following protocols is defined in the OSI architecture?
 (A) POP3 (B) TCP (C) IP (D) LLC
- (8) Using a _____ local variable to retain data from one call to a function to the next is a poor programming practice.
 (A) auto (B) static (C) register (D) extern
- (9) A _____ is a set of $n \geq 0$ disjoint trees.
 (A) B-Tree (B) heap (C) forest (D) selection tree
- (10) Which one of the following data structures is more suitable for solving a mazing problem?
 (A) Queues (B) Stacks (C) Lists (D) Arrays
- (11) _____ is the evaluation of alternative problem solutions, and the detailed specification of the final solution.
 (A) Planning (B) Analysis (C) Design (D) Implementation
- (12) _____ are a favorite tool for documenting process or activity requirements for a new system.
 (A) Location Connectivity Diagrams (LCDs)
 (B) Entity Relationship Diagrams (ERDs)
 (C) Data Model Diagrams (DMDs)
 (D) Data Flow Diagrams (DFDs)
- (13) Which one of the following languages is used by the DBA and by database designers to define conceptual schemas and internal schemas?
 (A) Data Definition Language (DDL)
 (B) Storage Definition Language (SDL)
 (C) View Definition Language (VDL)
 (D) Data Manipulation Language (DML)
- (14) Decision Support Systems belong to which level of the following information systems?
 (A) Operation-Level Systems
 (B) Management-Level Systems
 (C) Knowledge-Level Systems
 (D) Strategic-Level Systems



(15) What is the return value of fun(6)?

```
int fun(int n)
{
    int i, f0, f1, temp;
    if (n == 0 || n == 1)
        temp = 1;
    else {
        f0 = 1;
        f1 = 1;
        for (i = 2; i <= n; i++) {
            temp = f1;
            f1 = f1 + f0;
            f0 = temp;
        }
        temp = f1;
    }
    return temp;
}
```

- (A) 13 (B) 21 (C) 28 (D) 34

二、問答題 (70 分)

- (1) 何謂 XML, Valid XML, 及 XSL? 另外, XML 可以應用在哪些方面? (10%)
- (2) 試以圖說明 Microsoft .Net Framework 的架構為何? 並說明此架構的優缺點為何? (10%)
- (3) 何謂 Knowledge Management (KM)? 試問你(妳)將如何應用 KM 方法及技術來管理你(妳)自己的專業知識呢? (10%)
- (4) 請使用 C 語言撰寫一個程式。這個程式的主程式 (main) 由 stdin 輸入三個整數, 這個程式有一個命名為 calculate 的函式 (function), calculate 有五個參數, 其中兩個傳出這三個數字的總和與平均。主程式將由 calculate 傳出的總和與包括小數第二位的平均數, 輸出至 stdout。 (10%)



(5) 以下三題請合併作答：

1. 請使用 C 或 Scheme 語言，撰寫一個程式。這個程式使用遞迴或迴圈將由 1 到 49 的奇數放入一個命名為 `num_list` 的串列(List or Linked List)中。(10%)
2. 接續上題，請撰寫一個遞迴的函式，這個函式以 `num_list` 當作輸入資料，並輸出其中三的倍數的和（請勿假設 `num_list` 中的數字是由 1 到 49 的奇數）。請將輸出的結果存入在主程式中命名為 `num3` 的變數中。(10%)
3. 接續上題，請撰寫一個使用尾端遞迴 (tail recursion) 方式撰寫的函式，這個函式以 `num_list` 當作輸入資料，並計算其中所有數字的和（請勿假設 `num_list` 中的數字是由 1 到 49 的奇數）。請將輸出的結果存入在主程式中命名為 `sum` 的變數中。(10%)



1. Write a program to generate the sequence of positive integers (in increasing order) whose only prime divisors are 2 and 3, that is, your program should produce the sequence 2, 3, 4, 6, 9, 12, 16, 18, 24, 27, (20 分)
2. Design an algorithm, given a list of five or more numbers, finds the five smallest and five largest numbers in the list without sorting the entire list. (20 分)
3. 請分別說明在什麼情況下，您會建議使用下列兩種排序中的其中一種，為什麼？(10 分)
 - (1) Insertion Sort
 - (2) Selection Sort
4. 在雙向佇列(double ended queue, deque)中，循序輸入 1, 2, 3, 4, 5 之後，此佇列的可能的排列順序有哪些？(15 分)
5. 寫出一個遞迴演算法用來算出二元樹中的節點總數。二元樹的每個節點有三項資料：左鏈、右鏈、資料欄，其中的左鏈與右鏈是分別指到該節點的左子樹與右子樹的指標。(15 分)
6. 針對由 A, B, C, D 四個符號所組成的字串 **DBDCADCCBDCD** 進行霍夫曼(Huffman)編碼，請寫出 A, B, C, D 的最小冗餘碼(minimal redundancy code)？請畫出演算的過程。(20 分)



每題 10%，請詳列計算或證明過程。

1. Proof that for all sets $A, B,$ and $C,$ $(A \cup B) - (C - A) = A \cup (B - C).$
2. Define $f: \mathbf{R} \rightarrow \mathbf{R}$ and $g: \mathbf{Z} \rightarrow \mathbf{Z}$ by the rules
 $f(x) = 4x - 1$ for all x in \mathbf{R} and
 $g(n) = n^2$ for all n in $\mathbf{Z}.$
 - a. Is f one-to-one? Prove or give a counterexample.
 - b. Is g one-to-one? Prove or give a counterexample.
3. Show that the sequence $1, -1!, 2!, -3!, 4!, \dots, (-1)^n n!, \dots,$ for all $n \geq 0,$ satisfies the recurrence relation
 $S_k = -k \times S_{k-1}$ for all integers $k \geq 1.$
4. Let R_1 be the "divides" relation on the set of all positive integers and let R_2 be the "divides" relation on the set of all integers.
 For all a, b in $\mathbf{Z}^+, a R_1 b \Leftrightarrow a \mid b.$
 For all a, b in $\mathbf{Z}, a R_2 b \Leftrightarrow a \mid b.$
 - a. Is R_1 anti-symmetric? Prove or give a counterexample.
 - b. Is R_2 anti-symmetric? Prove or give a counterexample.
5. Prove that if a graph has an Euler circuit, then every vertex of the graph has even degree.
6. 試以 " $\varepsilon - \delta$ form" 解釋 $\lim_{x \rightarrow 3} x^2 \neq 8$.
7. 設有面額 3 元與 5 元的郵票兩種，證明可用這兩種郵票貼足所有 8 元與 8 元以上的郵資。
8. 以數字 $1, 2, \dots, 10$ 沿一圓周排列，試證明必有 3 個相鄰的數字，其和至少為 18.
9. 試解方程式 $A_n - 4A_{n-1} + 4A_{n-2} = 3 \times 2^n,$ 其中 $A_0 = 1, A_1 = 7.$
10. 試解下列委派問題：

$$\begin{pmatrix} 11 & 1 & 5 & 8 \\ 9 & 9 & 8 & 1 \\ 10 & 3 & 5 & 10 \\ 1 & 13 & 12 & 11 \end{pmatrix}.$$



申論題：(每大題 25 分)

1. 企業在引進資訊科技時，應作何效益分析？企業應如何避免或減輕引進資訊科技所帶來的負面影響？另外企業營運模式與外在環境均會影響網路規劃內容，例如派駐外地員工如何取得所需資訊；出差員工遺失筆記型電腦；SARS 的疫情昇溫，公司採購 USB 隨身碟供員工下載檔案居家辦公，但又怕資訊外洩，等等。因此在建置企業資訊網路時，應作何考量？
2.
 - (1) 何謂 SDLC？一般 SDLC 包含哪些發展模式 (models)？請個別說明這些模式及其優缺點與適用情形？(10 分)
 - (2) 貴公司是否導入 SDLC 於系統開發？運用何種發展模式？為什麼選用此種發展模式？成效為何？若貴公司未導入 SDLC，請說明未導入原因？並規劃如何導入？請考慮如何克服導入障礙。(15 分)
3. What is change management and why is it important? Give an example to explain.
4. **Situation:** The IT director opened the department staff meeting today announcing that management has approved the payroll system project this morning. It is hoped that the new system will reduce clerical time and errors, improve morale in the payroll department, and avoid possible fines and penalties for noncompliance. However, the system must be installed by the end of May in order to meet new government reporting rules, costs must be within the budgeted amount, the new system must interact with existing systems.

Please identify tangible and intangible benefits of the new payroll system.