HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2023

INFORMATION AND COMMUNICATION TECHNOLOGY
PAPER 1

8:30 am – 10:30 am (2 hours)
This paper must be answered in English

GENERAL INSTRUCTIONS

1. There are two sections, A and B, in this Paper.

2. Section A consists of multiple-choice questions in this question paper. Section B contains conventional questions printed separately in the Question-Answer Book.

3. Answers to Section A should be marked on the Multiple-choice Answer Sheet. Answers to Section B should be written in the spaces provided in the Question-Answer Book. **The Answer Sheet for Section A and the Question-Answer Book for Section B must be handed in separately at the end of the examination.**

INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.

2. When told to open this book, you should check that all the questions are there. Look for the words **'END OF SECTION A'** after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.

Not to be taken away before the end of the examination session

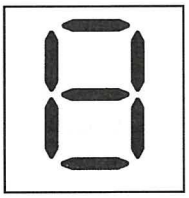
Section A
There are 40 questions in this section. Choose the most suitable answers.

1. Which of the following statements about direct access on a storage device are correct?

(1) Writing the data of a file starts from the beginning of the storage device.
(2) In general, the seek time to search for a file is faster than that of sequential access.
(3) It is more commonly used in hard disks than sequential access.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

2. The following seven-segment display is widely used. Each segment is an LED light that can be turned on or off independently. Other than when all segments are turned off, how many different patterns can be generated by the display?



A. 10
B. 63
C. 127
D. 255

3. Mary only has a computer without any network connections. Which of the following systems can she carry out?

(1) Distributed processing system
(2) Real-time system
(3) Batch processing system

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

4. In which of the following 8-bit representations will the addition of integers `01100000` and `01100000` result in an overflow error?

(1) Sign-and-magnitude
(2) One's complement
(3) Two's complement

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

5. Which of the following clauses should be used in a `SELECT` SQL command for displaying information where `salary` is greater than 5000 in ascending order of `salary`?

A. `WHERE salary > 5000 ORDER BY salary`
B. `HAVING salary > 5000 ORDER BY salary`
C. `WHERE salary > 5000 AND ORDER BY salary`
D. `HAVING salary > 5000 OR ORDER BY salary`

6. Consider the following pseudocode for checking a normal school exam result:

```
IF (MARKS >= 50) THEN
     OUTPUT 'PASS'
ELSE
     OUTPUT 'FAIL'
```

Which of the following sets of test values is appropriate?

A.	-10	30	40
B.	10	25	45
C.	100	99	98
D.	99	0	50

7. Which of the following should be considered when creating a presentation for a project using presentation software?

(1) Layout of the slides
(2) Colour scheme
(3) Sequence of the slides

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

8. When entering formulas in a spreadsheet, which of the following results is **incorrect**?

	Formula	Result
A.	`LEN("HKDSE")`	5
B.	`UPPER("technology")`	Technology
C.	`FIND("for","information")`	3
D.	`TRIM("    ICT ")`	ICT

9. Which of the following is **not** required for a mail merge using a word processor?

A. Data source
B. Main document
C. Merge fields
D. Field length

Go on to the next page

10. What is/are the benefit(s) of creating a report in PDF format instead of DOCX format?

(1) The text format can be preserved.
(2) Hyperlinks can be inserted.
(3) Colour fonts can be used.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

11. Which of the following image file formats support transparent background images?

(1) PNG
(2) GIF
(3) JPG

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

12. Which of the following may involve Object Linking and Embedding (OLE)?

(1) Using mail merge to create documents
(2) Creating a pivot table
(3) Inserting images in a presentation slide

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

13. Which of the following regarding Unicode and Big-5 code is correct?

A. In a computer, the use of Big-5 code and Unicode depends on the operating system.
B. Big-5 code is used for representing characters in Chinese only.
C. Unicode is used for representing characters in English and other languages.
D. For web browsing, the use of a character set depends on the browser.

14. For a CPU with the specifications of 16 cores, 5 GHz and a 30 MB cache, which of the following are correct?

(1) The clock rate of the CPU is 5 GHz.
(2) The maximum number of programs that the CPU can handle at the same time is 16.
(3) The CPU accesses data in the cache memory faster than that in RAM.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

15. Which of the following is the main function of a network interface card in a computer?

A. To connect to a wired router and project Wi-Fi signals to a designated area.
B. To direct data packets from one network to another network.
C. To filter and forward data packets from the computer to another device.
D. To send and receive network signals.

16. Which of the following are functions of an operating system?

(1) Allocate hardware resources.
(2) Schedule jobs.
(3) Store user programs permanently.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

17. Which of the following is **not** a specification of a projector?

A. WiFi 802.11ac supported
B. 3800 lm (lumen)
C. 4K UHD (Ultra High Definition)
D. 5400 rpm (revolutions per minute)

18. In a computer, the performance of each individual task is shown below:

Task	Performance
Execution of database queries	Poor
Online meetings	Smooth
Playing of 4K videos on a hard disk	Fair

Which of the following components should be upgraded?

(1) Network interface card
(2) Display card
(3) CPU

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

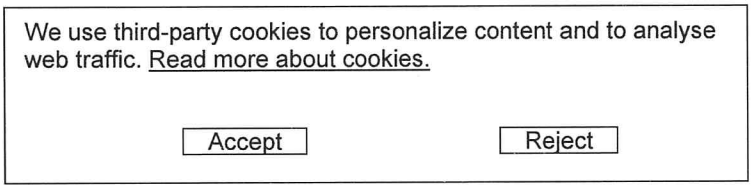
19. John has just connected a new USB printer to a computer. Why is he able to use the printer immediately?

A. The RAM size of the printer is large enough to store the data for printing.
B. The operating system of the computer already has a driver program for the printer.
C. USB printers do not need driver programs.
D. There is a built-in CPU in the printer to manage the printing.

20. Which of the following about the use of HTTP is correct?

A. It can convert a domain name into an IP address.
B. It can distinguish a wireless network from a wired network.
C. It can retrieve a web page from a web server.
D. It can encrypt and decrypt data through a secure channel.

21. Peter browses a new web site and sees the following message:



Which of the following is/are the consequence(s) of clicking the 'Accept' button?

(1) Personal information may be collected.
(2) The bandwidth of the network may be decreased.
(3) The address book of his email account may be disclosed.

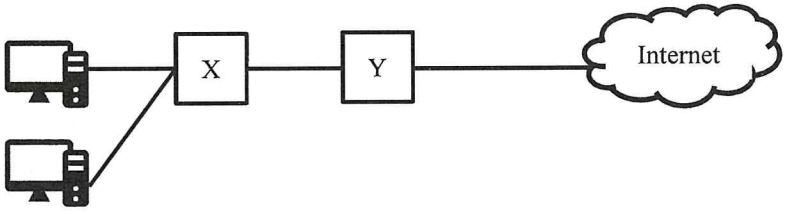
A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

22. Mary uploads a photo to her social media account through a browser. Which of the following protocols will probably be involved?

(1) IP
(2) DNS
(3) HTTP

A. (1) only
B. (2) only
C. (2) and (3) only
D. (1), (2) and (3)

23. In the following network diagram, computers can access the Internet. What are X and Y?



	X	Y
A.	Switch	Router
B.	Firewall	Switch
C.	Firewall	Router
D.	Router	Switch

24. Which of the following about IP addresses is/are correct?

(1) They contain location information and make network devices accessible for communication.
(2) They are used to reassemble the data received back into the original order.
(3) They can be used with both the Internet and Intranet.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

25. Which of the following is the common input and output of a domain name system (DNS) server?

	Input	Output
A.	HTML	IP address
B.	IP address	MAC address
C.	Domain name	MAC address
D.	Domain name	IP address

26. Which of following about wired networks and wireless networks is correct?

	Wired network	Wireless network
A.	A more stable connection	Flexible network access
B.	Higher network security	A more stable connection
C.	Flexible network access	Higher network security
D.	Flexible network access	A more stable connection

27. Dry run the following algorithm. How many '*' are output?

```
N ← 2
WHILE N < 8 DO
      OUTPUT '*'
      N ← N + 3
```

A. 0
B. 2
C. 3
D. 4

Go on to the next page

Answer Questions 28 and 29 with reference to the following algorithms.

Algorithm 1

```
S ← 0
i ← 0
FOR i FROM 1 TO 5 DO
      S ← S + N[i]
OUTPUT S
```

Algorithm 2

```
S ← 0
WHILE (i <= 5) DO
      S ← S + N[i]
OUTPUT S
```

28. Suppose that all values in the array `N` are 2. What is the output of Algorithm 1?

A. 0
B. 5
C. 10
D. 20

29. The purposes of Algorithm 1 and Algorithm 2 should be the same. What are the missing statements in Algorithm 2?

(1) `i ← 0`
(2) `i ← 1`
(3) `i ← i + 1`
(4) `IF i=1 THEN i ← i+1`

A. (1) and (3) only
B. (2) and (3) only
C. (1) and (4) only
D. (2) and (4) only

30. What is the output of the following algorithm?

```
A ← 5
B ← 11
C ← 7
FOR C FROM 2 TO 3 DO
     B ← A + B
OUTPUT (A + B)
```

A. 16
B. 21
C. 26
D. 32

31. What is the output of the following algorithm for the input 'Y', 'N', 'Y', 'N', 'Y'?

```
S ← 0
FOR i FROM 1 TO 5 DO
      INPUT CH
      IF CH = 'Y' THEN
         S ← S + 1
      ELSE
         OUTPUT '#'
OUTPUT S
```

A. 1#2#3
B. 1#1#1
C. ##3
D. ###

32. NUM is an integer array with N values. What is the purpose of the following algorithm?

```
i ← 1
A ← NUM[i]
WHILE i < N DO
       i ← i + 1
       IF NUM[i] > A THEN
              A ← NUM[i]
```

A. To count the number of values in NUM.
B. To calculate the sum of values in NUM.
C. To find the maximum value in NUM.
D. To find the minimum value in NUM.

33. Which of the following are advantages of using the modular approach when designing algorithms?

(1) A module can be reused in other scenarios.
(2) The execution time of an algorithm is shorter.
(3) The modules are easier to design and test.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

34. Which of the following is/are the advantage(s) of using open source software over freeware?

(1) It is easier to set up and use.
(2) Users can improve the source code and share it in the community.
(3) Open source software is cross-platform.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

35. Which of the following are proper measures when using social media platforms?

(1) Manage the privacy settings to control who can see your posts.
(2) Use a strong login password and change it regularly.
(3) Be aware of what personal information you have provided.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

36. Which of the following programs can enhance the security of using a computer?

(1) Adware
(2) A firewall
(3) An encryption program

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

37. Which of the following can help bridge the digital divide?

(1) Providing free access to computers in public libraries.
(2) Providing Internet access for students in need.
(3) Providing online English lessons for students in need.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (3) only
D. (1), (2) and (3)

38. What is/are the advantage(s) of using Secure Socket Layer (SSL) on web sites?

(1) The data transfer rate is higher.
(2) The transferred data is encrypted.
(3) The IP addresses of the web sites can be hidden.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

39. Why do many companies prefer commercial software to open source software?

(1) Open source software contains more software bugs.
(2) Commercial software developers can provide better support.
(3) Open source software cannot be modified by companies.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

40. How can updating an operating system frequently protect computers from virus attacks?

A. Security loopholes can be fixed.
B. More support from the developer of the operating system can be provided.
C. The computer performance can be enhanced.
D. A virus check can be conducted.

END OF SECTION A

2023-DSE
ICT

PAPER 1
(SECT B)

Please stick the barcode label here.

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2023

Candidate Number									

INFORMATION AND COMMUNICATION TECHNOLOGY

PAPER 1

SECTION B: Question-Answer Book

This paper must be answered in English

INSTRUCTIONS

(1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3 and 5.

(2) Refer to the general instructions on the cover of the Question Paper for Section A.

(3) **ANSWER ALL QUESTIONS.** Write your answers in the spaces provided in this Question-Answer book. Do not write in the margins. Answers written in the margins will not be marked.

(4) Supplementary answer sheets will be supplied on request. Write your Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with string **INSIDE** this book.

(5) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

(6) The last page of this Question-Answer book contains SQL commands and spreadsheet functions which you may find useful.

* A 2 0 0 E 0 1 B *

Answer all questions.

1. Mary plans to upgrade her laptop computer.

(a) Give **two** benefits of replacing the hard disk with an SSD as the secondary storage of the computer.

(2 marks)

(b) Mary plans to increase the size of RAM to enhance the computational power of the computer. What is the main function of RAM? How can it enhance the computational power of the computer?

(2 marks)

(c) Mary chooses one of the following methods for using a word processor:

Method 1: She uses a word processor that runs on a browser.
Method 2: She installs a word processor on her laptop computer.

(i) Other than cost, give a benefit of each method.

Method 1: _____

Method 2: _____

(2 marks)

(ii) She finally chooses Method 2. However, she finds that she cannot install the software successfully. Give **two** possible reasons for this.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

(d) Mary and her classmate Peter are working on a project for a competition and have the following conversation.

Peter: I've found some useful information and images on the Internet for our project.
Mary: I'm not sure that the information you've found is reliable.

(i) Suggest **two** ways of validating the information found by Peter.

(2 marks)

(ii) In terms of copyright, what should they do before using the images in their project? Give **two** suggestions for them.

(2 marks)

Answers written in the margins will not be marked.

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Answers written in the margins will not be marked.

Go on to the next page

2. Ms Ng uses the following spreadsheet to record the progress of her students in a reading scheme. The cut-off date and basic score are stored in `C102` and `E102` respectively.

	A	B	C	D	E	F
1	StudID	Book code	Completion date	Level	Valid	Score
2	S01	C001	31/12/2021	2	1	4
3	S29	C234	4/3/2022	3	0	2
4	S29	E456	1/1/2022	4	0	2
5	S03	C900	30/4/2021	5	1	7
6	S01	E233	1/12/2021	4	1	6
⋮	⋮	⋮	⋮	⋮	⋮	⋮
101						
102		Cut-off date	31/12/2021	Basic score	2	

(a) If a student can complete the reading on or before the cut-off date in `C102`, the value 1 will be shown in Column `E`, and 0 if otherwise. A formula is entered into `E2` and then copied to `E3:E100`. Write down the formula in `E2`.

_____

(2 marks)

The values in Column `F` are students' scores. They are calculated based on `E102`, Column `D` and Column `E`, as shown below:

`Score = Level × Valid + Basic score`

(b) A formula is entered into `F2` and then copied to `F3:F100`. Write down the formula in `F2`.

_____

(1 mark)

(c) Ms Ng uses a pivot table to find the sum of the scores for each student. Complete the following part for creating the pivot table.

COLUMNS	VALUES
_____	_____

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

(d) Ms Ng converts `A1:F100` in the spreadsheet to a database table `REC`.

(i) Suggest a primary key for `REC`.

_____

_____

(1 mark)

(ii) Based on the given 5 records on the spreadsheet, what is the output after executing the following SQL statement?

```
SELECT StudID, SUM(Score) FROM REC
WHERE Valid = 1
GROUP BY StudID
```

(2 marks)

(e) Ms Ng plans to display the top 5 students who have the highest scores using a chart in presentation software. Draft a chart to illustrate the presentation clearly and concisely.

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

3. Eva writes a subprogram with the following pseudocode to sort an array `A`.

Line number	Content
1	`i ← 1`
2	`j ← 2`
3	`while i < 5 do`
4	`    if A[i] >= A[i-1] then`
5	`        i ← j`
6	`        j ← j + 1`
7	`    else`
8	`        swap the contents of A[i] and A[i-1]`
9	`        i ← i - 1`
10	`        if i = 0 then`
11	`            i ← 1`

(a) Suppose that the initial content of `A` is:

A[0]	A[1]	A[2]	A[3]	A[4]
4	3	1	8	6

(i) `TEMP` is a variable. Complete the following pseudocode to represent Line 8.

`TEMP ← A[i]`

_____

_____

(1 mark)

(ii) What are the contents of `A`, `i` and `j` after completing the first, second and third iterations of the loop (Lines 3 to 11)?

First iteration:

A[0]	A[1]	A[2]	A[3]	A[4]

i: _____ j: _____

Second iteration:

A[0]	A[1]	A[2]	A[3]	A[4]

i: _____ j: _____

Third iteration:

A[0]	A[1]	A[2]	A[3]	A[4]

i: _____ j: _____

(5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(b) Set 1 and Set 2 below are two sets of values as the initial content of `A`. How many times will Line 8 be executed for each set?

Set 1

A[0]	A[1]	A[2]	A[3]	A[4]
2	3	5	7	9

Set 2

A[0]	A[1]	A[2]	A[3]	A[4]
9	7	5	3	2

Set 1: _____ Set 2: _____

(3 marks)

(c) On Line 10, there will be no changes in the result of the subprogram if '`i = 0`' is changed to '`i <= 0`'. Why?

_____

_____

(1 mark)

(d) Below are three sets of test data as the initial content of `A`. Choose **two** sets for testing the subprogram and explain briefly.

Test 1: `-3, -1, 4, 0, 7`
Test 2: `1, 2, 3, 4, 5`
Test 3: `1, 1, 3, 3, 5`

_____

_____

_____

_____

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. David operates a toy shop in a shopping centre.

(a) David sets up a computer network in the toy shop.

(i) Name **two** transmission media for a wired network.

_____

_____

(2 marks)

(ii) In the network, David uses a switch instead of a router. Give a reason for this.

_____

_____

(1 mark)

(b) David considers changing the toy shop from a physical shop to an online shop. State a benefit and a drawback of this change and explain briefly.

_____

_____

_____

_____

_____

_____

(2 marks)

(c) David has set up mytoyshop.com for customers to order toys. He considers providing an HTTPS connection with the URL https://mytoyshop.com .

(i) What should David apply for and obtain before he can implement an HTTPS connection?

_____

(1 mark)

(ii) A public and private key encryption system is used in the web site. Who should use the public key and private key respectively?

Public key: _____

Private key: _____

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(d) David uses robots to retrieve toys from a warehouse. The robots are controlled by 5-bit commands, where part of the commands are shown below:

Command	Description
00000	Stop
01111	Start
01001	Turn 90° clockwise
10000	Turn 90° anti-clockwise
11001	Move 1 step forward
10111	Move 1 step backward

(i) During data transmission, an error bit may occur. Briefly describe how this error can be checked.

_____

_____

(1 mark)

(ii) David considers using 2-bit commands to control the robots, as shown below:

Command	Description
00	Stop
11	Start
10	Turn 90° clockwise
01	Move 1 step forward

Write the five 2-bit commands below to take the action 'Move 1 step backward'.

11 _____ _____ _____ _____ _____ 00

(2 marks)

(iii) What is the benefit of using 2-bit commands instead of 5-bit commands to control the robots?

_____

_____

(1 mark)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page

5. John sets up a fitness centre and considers the following three methods of identifying members:

(1) A smart card
(2) A plastic card with a printed QR code
(3) A mobile application installed in members' mobile phones

(a) (i) Give an advantage of (1) over (2).

(1 mark)

(ii) Give an advantage of (2) over (1).

(1 mark)

(iii) Give an advantage of (3) over (1) and (2).

(1 mark)

(b) John plans to provide a device for each member to monitor their heartbeat rates. The device is connected to a server so that his staff can remotely collect members' heartbeat rates. Each device continuously records and stores the heartbeat rates in a data file. Every 5 minutes the data file will be uploaded to the server.

(i) Is this arrangement a batch processing system or a real time system? Explain briefly.

(1 mark)

(ii) The data files are 2KB each. The network bandwidth acquired by the fitness centre is 10 Mbps. When 200 members upload their data files at the same time, how long will it take in total? Show your calculation.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

(iii) Give **two** potential problems of using WiFi to upload the data files to the server.

(2 marks)

(c) The fitness centre provides livestreamed fitness lessons for members to join at home.

(i) A member complains that the streaming of videos is *sometimes* not smooth, though the bandwidth of his broadband connection is sufficiently large for streaming. Why?

(1 mark)

(ii) John decides to record videos of the lessons for members to download. Other than solving the problem in (c)(i), give a benefit of his decision.

(1 mark)

(d) John receives the email below:

> To:
> From: survey@HKSAR.com.hk
> Subject: From HKSAR Government
>
> Please complete the following survey:
>
> Link to survey

Explain briefly why it is probably a scam email. Describe what harmful consequence might happen after clicking the link.

(2 marks)

END OF PAPER

Answers written in the margins will not be marked.

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Database (SQL commands – based on SQL–92 Standard)

Constants	TRUE, FALSE
Operators	+, –, *, /, >, <, =, >=, <=, <>, %, _ , ' , AND, NOT, OR
SQL	ABSOLUTE (ABS), AVG, INT, MAX, MIN, SUM, COUNT, AT, CHAR_LENGTH (LEN), LOWER, TRIM, SPACE, SUBSTRING (SUBSTR/MID), UPPER, AS, BETWEEN, BY, ASC, DESC, DISTINCT, FROM, GROUP, HAVING, LIKE, NULL, ORDER, SELECT, WHERE

Electronic Spreadsheet

Constants	TRUE, FALSE
Operators	+, –, *, /, <, >, =, <>, <=, >=
Functions	ABS, INT, RAND, SQRT, ROUND, AND, NOT, OR, CHAR, CONCATENATE (&), ISBLANK, LEFT, LEN, LOWER, MID, PROPER, RIGHT, TEXT, TRIM, UPPER, VALUE, AVERAGE, COUNT, COUNTA, COUNTBLANK, COUNTIF, MAX, MIN, RANK, SUM, SUMIF, FIND, VLOOKUP, IF