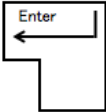# Allumer! / LED - IchigoJam

Allumez l'interrupteur de votre IchigoJam. Tapez "LED1" à partir de votre clavier. Et appuyez sur la touche ENTRÉE. (La touche ENTRÉE est située sur le côté droit et la grosse touche)

```
LED1↵
```

C'est un succès si votre LED d'IchigoJam s'est allumée et que vous avez le message "OK".

Tapez "LED0" pour éteindre.

```
LED0↵
```

La touche ESPACE est grande touche et est située au centre et en bas du clavier.
Tapez "LED 1" et appuyez sur la touche ENTRÉE.

```
LED 1↵
```

C'est BON de toute façon, que l'espace soit là ou non.

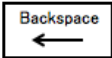Tapons "RED0" et appuyez sur la touche ENTRÉE.

```
RED0↵
```

La LED ne s'éteindra pas. Vous obtiendrez un message "Erreur de syntaxe".
Ne vous inquiétez pas de faire des erreurs à plusieurs reprises ! L'ordinateur ne se fâche jamais.

Tapons "ABD" sans appuyer sur la touche ENTRÉE.

```
ABD█
```

Appuyez une fois sur la touche "RETOUR".
La touche "RETOUR" située à droite et en haut.

```
AB█
```

Vous pouvez supprimer le caractère ! Donc, ne vous inquiétez pas des erreurs de frappe.

Essayez-le !
1. Tapez "ABCDEFG"
2. Essayez d'éteindre la LED
3. Essayez d'allumer et d'éteindre rapidement
4. Tapez « BEEP » et appuyez sur la touche ENTRÉE
5. Tapez "CLS" et appuyez sur la touche ENTRÉE

Contrôler le temps / WAIT

Apprenons "wait" sur IchigoJam.
Un curseur carré clignotant à l'écran signifie que le clavier est prêt être utilisé.

```
WAIT60↵
```

Avez-vous vu que ce curseur a disparu depuis peu de temps ? Essayons encore.

Si vous modifiez le nombre après "WAIT", la durée de "wait" pourra changer.
※1 second = 60

```
WAIT120↵
```

Le curseur a disparu plus longtemps qu'avant.

Allumez la LED et éteignez automatiquement.

```
LED1:WAIT120:LED0↵
```

Utilisez les deux points ' : ' (facile à confondre avec le point-virgule ' ; ') pour
concaténer(joindre) les commandes.
Allumez avec "LED1", attendez avec "WAIT120", éteignez avec "LED0".

Pour allumer pour peu de temps LED.

```
LED1:WAIT3:LED0↵
```

Si vous modifiez le nombre pour "WAIT", cela modifie le temps d'allumage de la
LED.

Allumez la LED deux fois..

```
LED1:WAIT3:LED0:WAIT3:LED1:WAIT3
:LED0↵
```

Vous pouvez vous joindre plus de commandes avec les deux points " : ".

Essayez-le!
1. Faisons "WAIT" pour 10 secondes
2. Allumez la LED pendant 5 secondes et éteignez-la
3. Faisons "WAIT 10000", au milieu, appuyez sur la touche ESCAPE pour arrêter
4. Allumez pour longtemps et allumez pour peu de temps
5. Essayons de créer un motif lumineux LED attrayant

Répondre avec des Chiffres / INPUT

Un programme qui résout divers problèmes d'addition en utilisant "RND" (aléatoire).
Utilisez "LET" pour stocker des nombres de A à Z.

```
10 LET A,RND(10)↵
20 LET B,RND(10)↵
30 ?A;"+";B↵
RUN↵
```

Exécutons « RUN » plusieurs fois !

Pour entrer les chiffres à l'aide du clavier, utilisez la commande "INPUT".

```
40 INPUT C↵
50 ?C↵
RUN↵
```

Devant le "?", tapez un nombre avec le clavier et appuyez sur la touche ENTREE.
Le nombre entré pour C est mémorisé !

Pour vérifier les réponses, "IF" est utilisé pour juger.

```
60 IF C=A+B ?"GOT IT!"↵
```

Utilisons "ELSE" lorsque vous voulez montrer un échec.

```
60 IF C=A+B ?"GOT IT!" ELSE ?"WR
ONG"↵
```

Il peut également apparaître avec un texte de question.

```
40 INPUT "ANSWER IS?",C↵
```

Essayez-le!
1. Modifions-le pour faire l'addition de 2 chiffres.
2. Modifions-le pour résoudre un problème extrêmement facile
3. Modifions-le pour résoudre un problème de multiplication
4. Mesurons le temps de réponse en utilisant "TICK"
5. Faisons un jeu de frappe de nombre

CFaire des Calculs / PRINT - IchigoJam

Posons une question à un ordinateur qui sait bien calculer
Utilisez "PRINT" pour afficher la réponse.

```
PRINT 1+1↵
```

Appuyez sur la touche ENTREE, vous pouvez immédiatement obtenir la réponse.
「2」 .

```
PRINT 15-7↵
```

Également c'est possible de soustraire.!

Dans l'ordinateur, un symbole de multiplication est représenté par un astérisque
'*'.

```
PRINT 3*5↵
```

Une division est une barre oblique '/'. (numérateur : gauche,
dénominateur : droite)

```
PRINT 10/2↵
```

En fait, au lieu de "PRINT", vous pouvez utiliser '?'.

```
?10/3↵
```

Oh? Le résultat est-il faux ?
C'est la bonne réponse avec "IchigoJam" qui n'utilise pas de décimales.
Le reste est calculé par le symbole'%'.

```
?10%3↵
```

Parce que 10 divisé par 3 est 3 et le reste est 1, '1' est affiché.

Enfin, calculons un grand nombre.

```
?1000*100↵
```

Oh, la réponse est étrange !.
En fait, la plage que IchigoJam peut calculer est déterminée de -32768 à 32767.

Essayez-le!
1. Faisons le calcul de "100 + 200" dans IchigoJam
2. Faisons le calcul de "8 * 7" dans IchigoJam
3. Faisons le calcul de "100 / 25" dans IchigoJam
4. Calculons le reste de "30/8" avec IchigoJam
5. Calculons 100 000 000 (10 000 * 10 000) avec IchigoJam

Exploiter le lieu / LOCATE

Affichons à un endroit spécifique!
Utilisez "LOCATE" pour préciser un endroit.

```
LOCATE 16,12:PRINT "*"↵
```

Appuyez sur la touche ENTREE, '*' s'affichera autour du centre.
Cela signifie que '*' s'affichera sur 16 espaces à partir de l'extrémité gauche et 12 espaces à partir de l'extrémité supérieure.

Affichons à un endroit différent.

```
LOCATE 25,5:PRINT "*"↵
```

Changez les numéros dans la commande "LOCATE", l'endroit à afficher changera.

En fait, vous pouvez également utiliser "LC" comme abréviation de "LOCATE".

```
LC 16,14:PRINT "*"↵
```

Les caractères peuvent également être affichés à deux endroits différents.

```
LC 16,12:PRINT "@":LC 10,10:PRIN
T "*"↵
```

La réponse calculée peut également être affichée.

```
LC 16,14:PRINT 2+3↵
```

Lorsque vous souhaitez effacer le moniteur (l'écran), appuyez sur la touche F1 ou "CLS".

```
CLS↵
```

Essayez-le!
1. Afficher à "IchigoJam" sur 20 espaces à partir de l'extrémité gauche et sur 10 espaces à partir de l'extrémité supérieure
2. Afficher un '@' à deux endroits différents, c'est-à-dire sur 10 à partir de l'extrémité gauche, sur 17 à partir de l'extrémité supérieure et sur 25 à partir de l'extrémité gauche, sur 18 à partir de l'extrémité supérieure
3. Afficher un résultat de "10-5" sur 15 à partir de l'extrémité gauche et 24 à partir de l'extrémité supérieure
4. Afficher un charatère préféré à un endroit préféré
5. Afficher le résultat d'un calcul préféré à un endroit préféré

Décider / IF

A éviter si les balles volent vers vous. Sautez s'il y a un trou.
"IF" est une commande pour laisser l'ordinateur juger et prendre des décision.

```
10 IF BTN()=0 GOTO 10
RUN
```

Si le bouton n'est pas enfoncé, la ligne 10 se répète.
En appuyant sur le bouton, le programme passe au suivant et termine.

Chaque fois que vous appuyez sur le bouton, la LED s'allume et s'éteint.

```
10 IF BTN()=0 GOTO 10
20 LED1
30 IF BTN()=0 GOTO 30
40 LED0
50 GOTO 10
```

Oh, en appuyant sur le bouton, la LED s'allume?
Étant donné que l'ordinateur est rapide, une pression sur le bouton allumera la LED et passera immédiatement au jugement suivant.

Pour ne pas passer immédiatement au jugement suivant, ajoutez la commande "WAIT".

```
10 IF BTN()=0 GOTO 10
20 LED1:WAIT30
30 IF BTN()=0 GOTO 30
40 LED0:WAIT30
50 GOTO 10
```

Essayez-le!

1. Continuez à appuyer sur le bouton
2. Changez "WAIT30" à "WAIT60"
3. Changez "WAIT30" à "WAIT5"
4. Essayez de changer "IF BTN()=1"
5. Faire un programme qui en appuyant sur le bouton commence à faire clignoter la LED
6. Faire un programme qui exploite la LED de façon agréable

Make a night signal / GOTO

A blinking signal for the night,it turns on and off every 0.5 seconds.

```
10 LED1:WAIT30:LED0:WAIT30↵
20 LED1:WAIT30:LED0:WAIT30↵
RUN↵
```

Type line 10 and press ENTER key, then take back the cursor to line 10 and change the head "10" to "20", and press ENTER key.
Confirm if the line 10 copied to line 20 with "LIST"!

Blink all the time with "GOTO". About 30,000 times until morning.

```
10 LED1:WAIT30:LED0:WAIT30↵
20 GOTO 10↵
```

The number after "GOTO" is a jumping destination.
> line 10, blink one time
> line 20, jump to line 10
To stop, press [ESC] key.

Fast blink

```
LIST↵
10 LED1:WAIT3:LED0:WAIT3↵
```

Display a program with "LIST" (=F4 key). Change two "30" to "3" in line 10 , press ENTER key, and execute by "RUN" (=F5 key).

Repeat alternately between short blink and long blink.

```
15 LED1:WAIT30:LED0:WAIT30↵
```

Make a line 15 between line 10 and line 20 by changing the line 10's head to 15 and wait 3 to 30, and press ENTER key.

Try it!
1. Let's return to a night signal program
2. Lengthen only lighting time
3. Try to fix it to a game that blink at high speed and stop when it is lighting
4. Make the line numbers from 100 per 100 steps, e.g. 100,200,300
5. Let's make a cool blink pattern, and boast to somebody.

Save a Program / SAVE/LOAD/NEW

A program that lights LED. Save the program with "SAVE".

```
SAVE0
Saved 30byte
OK
```

When the capacity and "OK" are displayed, saving of the program is completed.
IchigoJam can save 4 programs.(0〜3)

Let's turn off the power and load the program with "LOAD".

```
LOAD0
Loaded 30byte
OK
```

Confirm with "LIST"! Execute with "RUN"!

To confirm the saved program, use "FILES".

```
FILES
```

Be careful not to erase your favorite program by mistake.

To create a new program, use "NEW".

```
NEW
OK
LIST
OK
```

If you type "LIST", nothing will be displayed.

The program saved at No. 0 starts automatically when you turn on the power switch while holding down the button on the IchigoJam.
(Even if IchigoJam is disconnected from keyboard or screen, it can be used for electronic operations etc.)

Try it!
1. Let's save the program that lights 3 times
2. Let's do automatically start
3. Check what happens when use "SAVE" after "NEW"

Memory of program / RUN/LIST

Let's memorize a blinking pattern of LED.

```
10 LED1:WAIT10↵
```

Starting with a number is a command meaning "to memorize".
But the LED does not light.
A command to execute the program is "RUN" and ENTER key, the LED will light up.

```
RUN↵
```

Next starts with 20, and add a memory with ENTER key.

```
20 LED0:WAIT10↵
```

Use "RUN" to run a memorized program.
Light again with "RUN"!

Call a memory with "LIST".

```
LIST↵
10 LED1:WAIT10↵
20 LED0:WAIT10↵
```

Inserting "WAIT" between line 10 and line 20.

```
15 WAIT50↵
```

Confirm with "LIST", execute with "RUN"!

Programs with the same number will be overwritten.
(Confirm with "LIST"!)

```
15 WAIT110↵
```

Type only number and press the ENTER key, it deletes the respective line.

```
15↵
LIST↵
```

Try it!
1. Use a function key F5 instead of "RUN" command
2. Use F4 key instead of "LIST"
3. Let's make a program that the LED lights 2 times
4. Let's make a program that lights the LED with cool pattern

Make Sounds / BEEP - IchigoJam

Ensure the legs of a sounder are inserted in SOUND(SND) and GND of your IchigoJam.

```
BEEP
```

Did you hear a beep sound?

A high tone.

```
BEEP 5
```

A low tone.

```
BEEP 20
```

A long tone.

```
BEEP 10,30
```

Let's make a rhythm!

```
10 BEEP 5:WAIT 30
20 BEEP 20:WAIT 30
30 GOTO 10
RUN
```

WAIT is the command to wait. A slow rhythm results if you put a larger number. GOTO is the command to go back to the line 10 to repeat. Press [ESC] key to stop.

The rhythm will stop while pressing the button of the IchigoJam.

```
15 IF BTN() GOTO 15
```

Let's try!
1. Make various sounds!
2. Make a rhythm with fast tempo
3. Add this program "12 BEEP 20:WAIT 30" to change the tripple time (musical time pattern)
4. Make a quadruple rhythm
5. Check the rhythm if change "GOTO 15" to "GOTO 10" on line 15
6. Make your original rhythm!

Compose Music / PLAY - IchigoJam

Ensure the legs of a sounder are inserted in SOUND(SND) and GND of your IchigoJam.

```
PLAY"CDE"↵
```

Did you hear the sounds Do-re-mi?

Do-re-mi-fa-so-la-ti tones are represented by CDEFGAB

```
PLAY"CDEFGAB"↵
```

The octave (=pitch of sound) can be changed by the alphabet "O" followed by a number.

```
PLAY"O4 CDEFGAB O5 C"↵
```

You can change the length of tone by putting a number.

```
PLAY"CDE2"↵
```

"2" of "CDE2" means a half note. Default setting (without a number) is quarter note. Putting "8" means eighth note that its tone length is half of quarter note. "1" means whole note.

"#" (sharp) is to raise the tone by a semitone, "-" (minus) is to lower the tone by a semitone.

```
PLAY"C C# F-"↵
```

"R" means silence. You can change the length of tones' silence by putting number after R example "R2".

```
PLAY"CRC"↵
```

"T" means to set up the tempo. Default setting is "T120" means 120 quarter note per minute.

```
PLAY"T240 CDE2 CDE2 GEDCDED2"↵
```

Let's try!
1. Make a music "Tulip" "Twinkle-Twinkle" "Old-MacDonald"
2. Type just "PLAY" during playing music
3. Make a music "Froggie Song"
4. Let's play together as orchestra with your friends!
5. Let's compose music from your text book of music!

Multiplication by loop FOR/NEXT - IchigoJam

```
10 A=5
20 FOR I=1 TO A:?"*";:NEXT:?
```

You can count up the variable I from 1 to A with FOR/NEXT command. You can get the 5 '*' marks.

Let's modify to use the number you like with INPUT command.

```
10 INPUT A
```

Type any numbers!

Add a number and loop!

```
15 INPUT B
17 FOR J=1 TO B
30 NEXT
```

You can do the multiplication!

Count variable C that counts number of '*' marks.

```
16 C=0
25 C=C+A
40 ?C
```

C=C+A cause you can get A x '*' marks every loops. Using LET C,C+1 is OK also. If you don't input C=0 or LET C,0, then C will increase in every executions continuously.

Let's try
1. Calculate 7 multiply by 8
2. Calculate 8 multiply by 7
3. Change to the mark that you like
4. Check to change the mark to 2 letters
5. Check if input zero

Make a binary number / BIN$

There are numbers, syllables, alphabet, various characters, but the character used by the computer is only two "0" and "1".

Usually, if you add 1 in 9, it will be 10 and 2 characters, but because there is only 0 and 1, only 1 will be added to 1, so it will be 10 (one zero) and 2 characters. This is a binary number.

"BIN$" command that change the number to binary number.

```
?BIN$(2)↵
10
?BIN$(10)↵
1010
```

The symbol "` "(shift + "@" or left of "1") converts a binary number to a number.

```
?`1111↵
15
?`10000000↵
256
```

0, 1, 2, 3, 4 ... count it with binary number.

```
FOR I=0 TO 256:?BIN$(I),I:WAIT 3
0:NEXT↵
0    0
1    1
10    2
11    3
```

Binary numbers count with "bit".
3 is 2 bits with "11", 8 is 4 bits with "1000".

Try it!
1. Let's make "16" a binary number
2. Let' make the binary numbers "101", "1010", "10100" a number
3. Let's make "40" to binary number
4. What is the maximum number that can be represented by 5 bits?
5. Let's make "-1" a binary number

Memorize the numbers / LET - IchigoJam

The computer that has preeminent memory, can memorize numbers in variables A to Z!

```
LET A,1190:LET B,2014:LET C,794
```

If it displays "OK", memorizing is completed!

Clear the screen, and check if memorized A? B? C?

```
CLS
?A
?B
?C
```

It uses "LET" once again, overwrite the memory.

```
LET B,2017
?B
```

It can use also variables instead of numbers.

```
LET C,A+B
?C
LET C,C+1
?C
```

"="(Equal) symbol can be used to write in short form.

```
C=C+1
```

A sound that gradually lower!

```
10 LET A,1
20 ?A:BEEP A:WAIT 10:LET A,A+1
30 IF A=10 END
40 GOTO 20
```

Try it!

1. Let's make a sound that is getting more lower
2. Let's make a sound that get gradually higher
3. Let it memorize the birth year, month, day, and store a number that added all
4. Let's memorize and display the number multiplying the birth month and day
5. Let's try how many digits can be memorized as many as possible.

Connect the programs / LRUN - IchigoJam

IchigoJam can store up to four programs.
Connect one program to another, to be a masterpiece!
First, make a quiz game, the main part of the game.

```
10 CLS
20 LC10,10:INPUT "1+1=?",N
30 LC12,10:IF N=2 ?"CLEAR!!" ELS
E ?"GAME OVER!"
```

It displays "clear" with correct answer input! If not, it will display game over!.
Save this in file 1.

```
SAVE1
```

To create a program title, first of all from beginning.

```
NEW
```

A program title that ends when any key is pressed.

```
10 CLS
20 LC6,7:?"=MAGICAL MATH QUIZ="
30 WAIT 60
40 LC6,18:?"HIT ANY KEY TO START
"
50 IF INKEY()=0 CONT
```

Add concatenated command "LRUN".

```
60 LRUN1
SAVE0
RUN
```

Connected to the game from the title program!

Try it!
1. Let's make it to be retry/game-over with "LRUN0"
2. Let's remodel the title
3. Let's remodel the quiz
4. Let's make it to go back to the title screen if the game is over
5. Let's put a title on "Kawakudari Game"

Convey thoughts / BTN

Let's tell your thoughts to the computer with the button on the left of IchigoJam.

```
?BTN()↵
```

If you press ENTER key without pressing the button, it will display zero (0). Press the UP key three times on the lower right of the keyboard, move a blinking square (cursor) , then hold down the button and press ENTER key.
It is succeed if it displayed a "1"!

Repeat using "GOTO" command.

```
10 ?BTN()↵
20 GOTO 10↵
RUN↵
```

"0" displays in a row, let's try to press or release a button.
To stop, use the ESC(Escape) key.

The program that LED lights when button is pressed.

```
10 LED BTN()↵
20 GOTO 10↵
```

Even F5 key is OK instead of "RUN" command!
The "LED" command lights when it is 1 and disappears when it is 0, so it lights in line with the button press.
Stop with the ESC key.

You press the button, it blinks fast!

```
10 LED 1:WAIT 10-BTN()*5↵
20 LED 0:WAIT 10-BTN()*5↵
30 GOTO 10↵
```

"WAIT" is a command for waiting.
When the button is not pressed, it is "WAIT 10".
If pressed, BTN() will be 1, subtract a number which is multiplied by 5 with "* 5", so it becomes "WAIT 5".
Go back to line 10 with "GOTO", repeat.

Try it!
1. Let's make it blink more quickly, if the button is pressed.
2. Let's make it blink slowly, if the button is pressed.
3. Let's remodel to always light, if the button is pressed.
4. Let's remodel so as not to light at all when not pressing the button.

Make a dice / RND (RANDOM)

Let's make various dice!

```
?RND(3)↵
```

What kind of number appeared?
RND (random) is a dice that there are surfaces as much as the number in parenthese.

Type again and press the ENTER key!

```
?RND(3)↵
```

Did the displayed number change compared to the beginning?
Oh? But 3 does not come out?
This means that three numbers with 0 included will appear.
If a number in the parenthesis is 3, it is 3 numbers that are 0, 1, 2.

```
?RND(5)↵
```

You can also change the number in parentheses.

Do not want to put out 0?
Want to make the smallest number to 1 in the number that comes out?
In a case like that ...

```
?RND(3)+1↵
```

This is OK!
By adding 1 to 0 that was the smallest number, the smallest number in the number that comes out becomes 1.

```
?RND(3)+3↵
```

It can also change the smallest number out of the numbers that come out.

Try it!
1. Let's display randomly any of the numbers from 0 to 6
2. Let's display randomly any of the numbers from 1 to 6
3. Let's display randomly any of the numbers from 10 to 20
4. Let's make a dice that brings out your favorite number

Make an Original Character / PCG - IchigoJam

A "cat" appears if you hold down a left Alt on the keyboard and press "C".

```
?CHR$(236)↵
```

The character code of "cat" is 236.

To change this "cat" to a "stick".

```
POKE 236*8,8,8,8,8,8,8,8,8↵
```

Changed!?
Now time, to change to a small ball.

```
POKE 236*8,0,0,0,24,24,0,0,0↵
```

To a slanted line!

```
POKE 236*8,1,2,4,8,16,32,64,128↵
```

Program to write a favorite painting using binary number, 0 and 1.

```
10 POKE236*8+0,`01111110↵
11 POKE236*8+1,`11011011↵
12 POKE236*8+2,`11111111↵
13 POKE236*8+3,`11000011↵
14 POKE236*8+4,`11111111↵
15 POKE236*8+5,`11111111↵
16 POKE236*8+6,`00011000↵
17 POKE236*8+7,`00011000↵
RUN↵
```

Mr. Ice appears!

To return to a "cat", use "CLP" (clear pattern).

```
CLP↵
```

Try it!
1. Let's make a heart mark
2. Let's make a favorite character
3. Let's rewrite a alien of ALT + D by changing 236 to 237 (Characted code range is 224-255!)
4. Let's display the number for the binary number "10000000"
5. Let's make original character with 1 line program .

Make a stopwatch / TICK

1,2,3,4,5,6...
60 times while 1 second, keeps counting time, IchigoJam.

```
?TICK()↵
```

"TICK" is that number. Let's make displaying several times.

```
?TICK()↵
```

The number displayed for the second time is larger than the first time.

```
?TICK()/60↵
```

By dividing by 60, change the time since turning on the power, to be in seconds.

Use a command "CLT" (clear timer) , to reset a number that is counting.

```
CLT↵
OK↵
?TICK()/60↵
```

You can know the time since reset.

Stopwatch that measures the time in seconds since initializing "RUN" comand to pressing the ichigojam button.

```
10  CLT↵
20  IF BTN()=0 GOTO 20↵
30  ?TICK()/60↵
```

It has been waiting repeatedly until the button is pressed at line 20.

To make a stopwatch that displays the time each time with pressing the button.

```
40  IF BTN()=1 GOTO 40↵
50  GOTO 10↵
```

Try it!
1. Let's breath-in deeply, and measure the time how many seconds you can keep gasping for breath.
2. Let's close eyes, and press the button for becoming 5 seconds apart.
3. Let's erase "/ 60" on line 30 and measure own button's repeated push speed.
4. Save with "SAVE0", turn off the power, turn on the power while holding down the button, if it started automatically, let's press repeatedly!
5. Let's remodel it to start by pressing the button, and display by pressing the button second time.

1 + 1 = 1, LOGIC PUZZLE - IchigoJam

We have 0 and 1 only (in logic world), now let's do calculations. First we start with addition. "|" (vertical bar).

```
?1|0↵
1↵
?0|0↵
0↵
?1|1↵
1↵
```

There is no increase in digit with 1 adding by 1, still remains to be 1, that's the "logical sum".

Next is the multiplication, use "&". (Use comma to separate and calculate collectively)

```
?1&1,0&1,1&0,0&0↵
  1     0     0     0↵
```

If number multiplied by 1, answer is that same number, and it becomes zero when it is multiplied by 0, that's the "logical multiplication".

To perform unusual addition use "^". Even when both numbers are 1, the answer is zero

```
?1^1,0^1,1^0,0^0↵
  0     1     1     0↵
?1|1,0|1,1|0,0|0↵
  1     1     1     0↵
```

It is only for 1^1, but the rest remain same as "logic sum". That's "XOR" (exclusive OR)

Logic calculations can be put collectively up to maximum of 16！

```
?BIN$(`1010|`0011,4)↵
1011↵
```

Addition of binary numbers with 4 digits. You can calculate 1|0, 0|0, 1|1, 0|1 all at once！

Try it！

1. What is the answer for 3|1？
2. Use hint: ?BIN$(1),BIN$(2),BIN$(3), solve the puzzle 3|1
3. Lets do calculations of ?8323^35 and ?8323^35^35
4. Change to different numbers, let's play with secret numbers using logic
5. Let's do various calculations, let's make logic puzzles

Add from 1 to 100 - IchigoJam

Using "?", ask a "1+1" to computer.

```
?1+1↵
```

It answered "2" with ENTER key. Then, how is "1+2"?

```
?1+2↵
```

How many bowling pins are there in total?

```
?1+2+3+4↵
```

10 pins.
What will happen if it increases by 1 column?
Using the up/left/right cursor keys, recycles a program!
Type "+5" by addition, and press ENTER key.

```
?1+2+3+4+5↵
```

How is the result when adding 1 to 10 like this? Adding from 1 to 10 at this pace, how much is the answer?

```
?1+2+3+4+5+6+7+8+9+10↵
```

What if is adding from 1 to 100, it seems like tough!?
So, the repeating command "FOR".

```
FOR I=1 TO 100:?I:NEXT↵
```

Prepare the variable "A", and let's get added more and more.

```
A=0↵
OK↵
FOR I=1 TO 100:A=A+I:NEXT↵
OK↵
?A↵
5050↵
```

Try it!
1. What is the result by adding from 1 to 12?
2. What is the result by adding from 1 to 20?
3. What is the result by adding from 1 to 200?
4. What is the result by adding from 1 to 300?
5. What is the limit of number that can calculate properly?

Looking for a common multiple(Mathematics) - IchigoJam

Let's display the numbers from 1 to 100.

```
10 FOR X=1 TO 100
20 ?X
30 WAIT 3
40 NEXT
```

With "FOR"/"NEXT" command, while incrementing a variable X by 1, repeat until it reaches 100.

Let's display only the multiples of 3 using the symbol "%" which calculates the remainder.

```
20 IF X%3=0 ?X
```

When it displays also multiples of 5, use "OR" meaning "either".

```
20 IF X%3=0 OR X%5=0 ?X
```

When it displays what it is a multiple of 3 and 5, use "AND" meaning "both".

```
20 IF X%3=0 AND X%5=0 ?X
```

This is "common multiple" of 3 and 5.
The first number 15 is "least common multiple".

Let's display "common multiples" of 2 and 3 and 5

```
20 IF X%2=0 AND X%3=0 AND X%5=0
?X
```

There are 3 "common multiples", and 30 is the "least common multiple" between 1 and 100.

Try it!
1. Let's display the multiples of 7
2. Let's display the multiples of 13
3. Let's display both the multiples of 7 and multiples of 13
4. Let's display the multiples of 7 and 13
5. Let's rapidly count how many are common multiples of 3 and 7 from 1 to 1000

Looking for common divisor(Mathematics) - IchigoJam

What number is divisible by 182?

```
10  N=182↵
20  FOR  X=2  TO  N-1↵
30  IF  N%X=0  ?X↵
40  NEXT↵
```

With "FOR" / "NEXT" command, while incrementing a variable X by 1 from 2, and repeat.
It is OK that "N=182" be also written as "LET N, 182"!

Let's check the "divisor", a number that came out.

```
?182%91↵
0↵
?182%26↵
0↵
```

It can divide properly!

What is the number that can divide 455?

```
10  N=455↵
```

It displays the number that can divide both 182 and 455.

```
10  N=182:M=455↵
20  FOR  X=2  TO  N-1↵
30  IF  N%X=0  AND  M%X=0  ?X↵
40  NEXT↵
```

The displayed numbers 7, 13, and 91 are the "common divisor" of 182 and 455.
The largest number 91 is the "greatest common divisor" of 182 and 455.

Try it!
1. Let's display the "common divisor" of 3432 and 2002.
2. Let's divide 3432 by "greatest common divisor" from (1).
3. Let's multiply the number calculated above (2) with "greatest common divisor".
4. Let's count how many "divisors" of 2002.
5. Let's look for the "prime numbers" that do not have "divisor" in a 4 digit number.
6. Let's confirm that there is no "common divisor" between "prime numbers" from (5).

Rounding off(Mathematics) - IchigoJam

Let's round down!
41 is 40, 44 is 40, 45 is also 40, 49 is 40.
It is called round down the ones place.

```
?44/10
4
```

Since it is an integer calculation, if you divide by 10, it will be 4 instead of 4.4.

```
?44/10*10
40
```

Divide by 10, and multiply by 10, completed to round down!

Let's round it up!
49 is 50, 45 is 50, 44 & 41 is also 50, 40 is 40.
It is called round up the ones place.

```
?44/10*10+10
50
```

After rounding down, can it round up by adding 10!?

```
?40/10*10+10
50
```

Oh well, 40 has also turned to 50. Let's judge by the ones place.

```
10  INPUT N
20  LET M,N%10
30  ?M
```

"%" is a symbol for calculating the remainder in the world of IchigoJam BASIC.
If the ones place is 0, it rounds down, and if it is 1 or more it rounds up.

```
40  IF M=0  ?N/10*10
50  IF M>=1  ?N/10*10+10
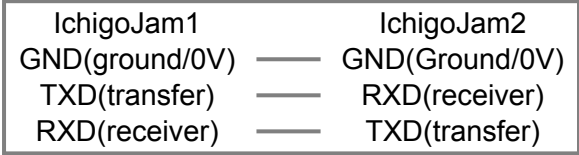```

**Try it!**
1. Let's round up the ones place of 72 by the program.
2. Let's make a "rounding off" program that rounds down the ones place if it is 4 or less and rounds up if it is 5 or more.
3. Let's confirm that it can round up the ones place even with "?(N+9)/10*10".
4. Let's make the program for rounding off to the ones place.

# Let's chat on a network!

Prepare 2 IchigoJam, 3 jumper wires. Connect that.

| IchigoJam1 | | IchigoJam2 |
|---|---|---|
| GND(ground/0V) | —— | GND(Ground/0V) |
| TXD(transfer) | —— | RXD(receiver) |
| RXD(receiver) | —— | TXD(transfer) |

※ Be careful! IchigoJam will break if you connect wrong pins.

On IchigoJam1: Type the followings.

```
?"LED1↵
```

What's up on IchigoJam2?
Check the wires if it doesn't work.

```
?"LED0↵
```

Let's send a message.

```
?"HELLO↵
```

You got many errors "Syntax error" continuly because "HELLO" is not a IchigoJam command. IchigoJam1 will send a error to IchigoJam2, IchigoJam2 will send a error.
Pick up a wire from TXD to RXD once to stop.

REM and "'" is command to ignore.

```
?"'HELLO↵
```

Let's try!
1. Talk on IchigoJam
2. Pick up all wires and connect again
3. Try to use 2 wires
4. Manipulate your friend's computer via the network
5. Make a idea to make game with the network

Number Quiz - IchigoJam

These are numbers in Kinyarwanda, the language of Rwanda.

```
10 LET[0],"ZERU","RIMWE","KABIRI
","GATATU","KANE","GATANU","GATA
NDATU","KARINDWI","UMUNANI","ICY
ENDA","ICUMI"↵
RUN↵
```

How to show a number word.

```
?STR$([1])↵
```

Let your computer count down!

```
20 FOR I=10 TO 0 STEP -1↵
30 ?I,STR$([I]):WAIT60↵
40 NEXT↵
```

Game 1: Answer the number game!

```
20 N=RND(11):?STR$([N]);↵
30 INPUT ". What's this?",M↵
40 IF N=M ?"Correct!" ELSE ?"Wro
ng. The answer is ";N↵
50 GOTO 20↵
```

Game 2: Type to answer the number game!

```
20 N=RND(11):?"Type ";N↵
30 FOR I=0 TO LEN([N])-1↵
40 IF INKEY()!=ASC([N]+I) CONT↵
50 ?STR$([N]+I,1);:NEXT:?↵
60 GOTO 20↵
```

Let's try!
1. Add "GAMEOVER" to Game 1 if wrong
2. Add the score to Game 1
3. Show the time after 10 answers on Game 1
4. Add "GAMEOVER" to Game 2 if mistyping
5. Change the language to another

Hand Game (Janken)

Janken famously known as Rock Paper Scissor often used as a fair choosing method is a hand game using three hand signs.
- Gu: (rock) simply ball your hand up into a fist. (Gu wins Choki)
- Choki: (scissors) use two fingers to mimic the shape. (Choki wins Pa)
- Pa: (paper) extend your hand palm down.. (Pa wins Gu)

Use random command with number 3 if you want to decide Gu, Choki or Pa by your computer.

```
?RND(3)↵
```

For instance 0 means Gu, 1 means Choki, 2 means Pa.

```
10 LET A,RND(3)↵
20 IF A=0 ?"GU"↵
30 IF A=1 ?"CHOKI"↵
40 IF A=2 ?"PA"↵
RUN↵
```

Try to type RUN or press F5 key repeatedly!
Press F5 key and say your hand sign to fight after your call "Jan ken"!

Try to judge by computer.

```
15 INPUT "YOUR HAND?",B↵
16 IF B=0 ?"GU - ";↵
17 IF B=1 ?"CHOKI - ";↵
18 IF B=2 ?"PA - ";↵
50 IF A=B ?"DRAW"↵
60 IF A-B=1 OR B-A=2 ?"WON!"↵
70 IF B-A=1 OR A-B=2 ?"LOST!"↵
```

Let's try!
1. Try to fight your friend's computer program!
2. Try to create the weakest computer!
3. Try to create Janken game with 3 players, you and 2 computers!

Kawakudari Game - IchigoJam

"Kawakudari Game" is a game that avoid obstacles and go down the river.
First, decide your own character.

```
10 CLS:X=15
20 LC X,5:?"O"
RUN
```

※For 「"」 hold down Shift key and press 「'」 . For 「?」 hold down Shift key

and press 「/」 . Sometimes positions can change depending on keyboard type.

Enemy character, appearance.

```
30 LC RND(32),23:?"*"
```

※ For 「(」 「)」 , hold down Shift key and press 「8」 「9」 respectively.
Let's press F5 key(same as "RUN") many times.

Repeat in program.

```
40 GOTO 20
```

Too fast? Stop with ESCAPE key, and insert "WAIT".

```
35 WAIT 3
```

To be able to move with the left and/or right key.

```
36 X=X-BTN(28)+BTN(29)
```

Attach the hit judgment for the completion of the game!

```
37 IF SCR(X,5) END
```

If no hitting, the game continues.

Try it!
1. Let's ajdust the speed
2. Let's change own character(hold down ALT key and press one of A to V)
3. Let's increase the obstacles(ex. "***")
4. Let's think about game story
5. Let's look for tricks(bugs)
6. Let's think how to delete bugs

Touch Typing

Touch typing to hit without looking at the keyboard is fast! fun! cool!

```
10 S="JKL"
20 CLT:FOR I=1 TO 10
30 N=RND(LEN(S)):C=ASC(S+N)
40 ?CHR$(C)
50 K=INKEY():IF K=0 CONT
60 IF C<>K ?"MISS!":END
70 NEXT:?TICK()/60
```

Position the index finger of the right hand at "J" position, middle finger at "K", ring finger at "L".
Type quickly J, K or L that displays randomly.
Can you hit 10 times without mistakes? The target time is 8 seconds!

After you cleared it, let's add the alphabet characters gradually.
Position the index finger of the left hand at "F".
Can you give out 8-second record with "FJKL"?

```
10 S="FJKL"
```

The middle finger of the left hand at "D", the ring finger at "S" and the little finger at "A".
This is the home position of the touch typing!

```
10 S="ASDFJKL"
```

Try it!
1. Let's give out 8-second record with "ASDFJKL"
2. Let's add "H" that press with the index finger of the right hand
3. Let's add "G" that press with the index finger of the left hand
4. Let's add "ZXCVBNM" located at bottom of keyboard
5. Let's add "QWERTYUIOP" located at top of keyboard
6. Let's give out 8-second record with all alphabet

```
Q  W  E  RT  YU  I  O  P
A  S  D  FG  HJ  K  L  ;
Z  X  C  VB  NM  ,  .  /
```

Key assignment table of each finger

Number Typing Game

Name typing game(type your name at line 20!)

```
10 CLS↵
20 ?"TAISUKE FUKUNO"↵
30 CLT:P=0↵
40 C=SCR(P,0)↵
50 IF C=0 ?:?TICK()/60:END↵
60 IF INKEY()<>C CONT↵
70 ?CHR$(C);:P=P+1↵
80 GOTO 40↵
```

Got used to?

Remodel to a ABC alphabet typing game!

```
10 FOR I=1 TO 10:?CHR$(65+RND(3)
);:NEXT↵
```

Can you cut off at 20 seconds?

Remodel to a number typing game!

```
20 FOR I=2 TO 5:?RND(256);",";:N
EXT:?RND(256)↵
```

Can you cut off 10 seconds?

How can a score be displayed up to first decimal place?

```
T=TICK():?T/60;".";T%60/6↵
```

Per 0.1 second, compete!

Try it!
1. Let's remodel to a favorite word typing game
2. Let's learn hard English words with a typing game
3. Let's remodel to binary number typing game
4. Let's remodel to a random alphabet typing game
5. Let's remodel to a emoji typing game

Jump game

Jump game that avoids enemies by jumping.
First, the main character appearance!

```
10  CLS:Y=15:V=0↵
20  LC 0,Y:?"M"↵
```

If you press any key, main character jumps!

```
30  IF Y=15 V=3*(INKEY()!=0)↵
40  Y=Y-V:V=V-1↵
50  SCROLL LEFT↵
60  GOTO 20↵
```

Put out enemy characters.

```
25  IF RND(10)=0 LC 31,15:?"K"↵
```

Adjust speed.

```
35  WAIT 4↵
```

And add game-over judgment, Completed!

```
37  IF SCR(1,Y) END↵
```

Try it!
1. Let's change the main character to "R"
2. Change main character, let's hold ALT and press "R"
3. Let's change "RND(10)" to "RND(4)"
4. Let's reduce enemy characters
5. Let's make the speed very fast
6. Let's change "V=3*" to "V=4*"
7. Let's reduce the jumping power
8. Let's add a score using "CLT" and "TICK()"
9. Let's count and put a score of the number of jumps
10. Let's make original game by remodeling

Nekonikoban Game - IchigoJam

"Neko ni koban" meaning relates with "casting pearls before swine"(big waste of resources). "Neko"- "Cat", "Koban"-"Coin" A cat appears at the horizontal 10 and the vertical 5.(character code 236, ALT + C)

```
10  CLS:X=10:Y=5
50  LC  X,Y:?CHR$(236)
```

Make it to be able to move with cursor.

```
20  K=INKEY()
30  X=X-(K=28)+(K=29)
40  Y=Y-(K=30)+(K=31)
60  WAIT10
70  LCX,Y:?"  "
80  GOTO20
```

Scatter the koban freely, and add score(S).

```
15  S=0:FOR I=1 TO 10:LOCATE RND(
30),RND(20):?CHR$(245):NEXT
45  IF SCR(X,Y)=245 S=S+1:LC0,0:?
S
```

Game over in 10 seconds.

```
7 CLT
47 IF TICK()>600 END
```

Try it!
1. Let's display "LIST"
2. Let's give out a large number of koban
3. Let's set to be gameover in 5 seconds
4. Let's be able to move fast
5. Let's make the score increase by 10 points
6. Let's modify and save it as you like

Population simulation

The Japanese population is 125.13 million. It decreased by 270,000 in one year. (Nov, 2016 Ministry of Internal Affairs and Communications, Statistics Bureau, Population Estimate)

```
10 P=12536
20 D=27
```

Set the population as "P", the reducing number as "D" and let the unit for both be ten thousand.

When keep decreasing in the same way every year since 2016, the population at 2100?

```
30 FOR Y=2016 TO 2100
40   ?Y,P;
50   ?
60   P=P-D
70 NEXT
```

Let's make it into a graph ('/' is the symbol of division).

```
42   FOR I=0 TO P/1000
45   ?"*";:NEXT
```

What if the reducing number is increased by 20,000 every year?

```
55   D=D+2
```

Try it!
1. Stop with the ESC key and check the population of 2060
2. Let's set the reducing number to 30,000 per every year
3. Let's change the character "*" in the graph to another character
4. Let's change a number at line 42, 1000 to 100
5. Let's increase the population
6. The world population is 7.3 billion people. How if will increase by 100 million every year?

What day of the week were you born?

Input Year, month, date, and know what day of the week?
Actually, it can be calculated by program.
First, a program to display days of the week.

```
10 LET[0],"SUN","MON","TUE","WED
","THU","FRI","SAT"↵
RUN↵
?STR$([0])↵
```

Use "STR$" to display the beginning [0] of the string in the array.

Repeat from Sunday to Saturday with 7 days of the week.

```
FOR I=0 TO 22:?STR$([I%7]):NEXT↵
```

Using "INPUT", put the year in the "Y", the month in the "M" and the date in the "D".

```
20 INPUT"Y?",Y↵
30 INPUT"M?",M↵
40 INPUT"D?",D↵
RUN↵
```

Let's display the fed data of year, month and date.

```
?Y,M,D↵
```

A "formula of Zeller" that calculates the day of the week from the year, month and date.

```
50 IF M<3 M=M+12:Y=Y-1↵
60 H=(Y+Y/4-Y/100+Y/400+(13*M+8)
/5+D)%7↵
70 ?STR$([H])↵
```

It is amazing to be able to know the day of the week with this!

Try it!
1. Put today's date and check what is the day today
2. What day of the week is my birthday?
3. What day of the week is the next birthday?
4. Let's display the days of the week with a different language
5. Let's make a birth month calendar

Gacha simulation - IchigoJam

Let's complete the alphabet with gacha!

```
10  A=RND(26)
20  ?"DRAW:";CHR$(ASC("A")+A)
```

The 26 alphabets from A to Z are used to play gacha!. Use "RND" to play.

Let's display the collection.

```
30  [A]=[A]+1
40  FOR I=0 TO 25
50    LC I%6*5,5+I/6*3
60    ?CHR$(ASC("A")+I);":";[I]
70  NEXT
```

Until complete, automatic gacha!

```
5  CLS:CLV
35 N=N+1:C=0
65   IF [I] C=C+1
80 ?:?:?"COLLECT:";C;"/26  ";
90 ?N;"00YEN"
100 IF C=26 ?"COMPLETE!":END
110 GOTO 10
```

How much will it cost?

Let's make "A" to be rare.

```
15  IF A=0 IF RND(10)>0 A=1
```

Make a probability of it becoming "B" be 9/10 even if "A" comes out.

Try it!
1. Let' try three times, and compare
2. Let's make it to be rare from "A" to "F"
3. Let's make sure that "Z" does not come out
4. Let's come out "Z" by a probability of 1/2
5. Let's make it to not go onto each other (not become same)