

CTF with a detailed solution: Pi Image

This CTF begins with a file named 3.14159265358979323846264.png:

Here is the downloaded file:

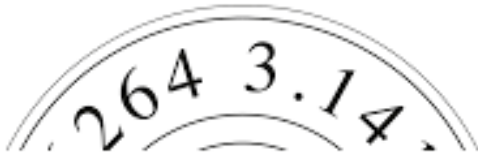


3.14159265358979323846264.png

If you would like to give this CTF a try with zero guidance, then stop reading, and return to this document when you're done to compare your solution to our guided solution.

Solution:

1. First, we notice that the file name is the first digits of pi (π). Then we examine the image by opening it:



The image is split to three horizontal parts. The upper part of the image is the logo of CyTaka, the middle part is some unrecognized black and white pattern (or in another version just plain gray), and the bottom part is plain white.

The visible part of CyTaka's logo only reveals digits of pi, just like the file's name. Notice that both the image in the logo and the file's name end with the first instance of 264 in pi's digits.

2. At this stage, we begin to think pi has something to do with the solution. But the information revealed to us this far doesn't get us closer to finding the flag. So, we decide to examine the file's contents. We open the file in a text editor such as Notepad++ (downloadable from [here](#)) to find the following contents:



```

19 *start*
20 eē2fáIh:ēī4ø¥†GēwUSQ7øsisÜGSEOT«[
21 ...1*Et9*iSO=Ñ<[OqmGu6æCeiŪá+DDEBBIKXN, @á»eFF"ž...DC2; Ék+[5KSI]Ō>^$DGSİSTXiszYŪYfŌüGS[C9-ETX8(1šĐ3dbDDEBSK
22 ');faE)q+ĀPuúV")çŌFFie-STX!C+eĀóeSO"V-:iQ«EtZŪžoGEBBŌ-úrÇiDCL( >Ō' HŝdŌ.jĀQTSŌ°-8æBSC9Y'ziWZü)m_øvBSK+feS;=ø
23 $gDC2<qéNUB+puNAKdäræø.puWA<WiBOT·|, BSCĒA^LLGEBOTñ«'FB+ĀDC3óEBBĀ'IACK:ī æšEYijžšŪRSRS×ÇuĐESÇÇâq>Y†CANi 664
24 >o>j' #ĀUSEBTXİtðe-P SUB¥MPĀCYŪ! DC2N, mhŪk'vIDCL)Ožŷ+TGSUBMÇŪ, Ēt.R2hB[Ū'öpİtdE BSSOHmV6âcøU\U, Ā"...ŪŌADŌB·(¥Ū "[Y-ēp
25 -BsdĀĒFFĒy|tEe"Yç[ol[üēNUB"iĐāīæNUB
26 -ŪoC<»„,9BOTB7İSDDE !EM7žžü-#
27 òFFwŪAC3ŌuŋOÇŷmUSUM'NEFBDC2áDC2üDC2 -) =iGFFDELRŌŪŌ>BOTĀ"-JkĐL SUBvDDE2*SOHŌ(Ā-^tfŌeŪfĒYĒM K"™B.SYN;XACKMó
28 ™"æYdu[āŪpDC4EHRŠñ(DŪ«·Ymé8!' DDEWŌ<Ū^t' >CAN8qšŷky'æ*s) ŠžB*5Ā[XižB"p"i8^æáø»uk DDEŌŌ@İaSm;^uiēBOTXSIkf!œM!l!
29 ĒlŊižS, c*SOH'áq*, 7mIZ7sEMYE...P-Ōútd ĀkúŌ\EBŷ>ac"SIi>F„#6ME!ý'E1SUBSOH,,6
30 7DEB5ĀDd»' áð+æ!ēU;Ç& Kú%ENŌUSDC3) VŪ, i
31 šī-8-1--pŋoĪ, DEB"mĀtī"™DC42ýĀæŪCBBB-„pāá>*)... "İfRèðñ?ž...KŌFBmİDC2úæ<ÇimĒĀšCž™DC4' á4USŌ°Èðİ>YfS CANsDC1ĀŪTJBE
32 cBønš BSKároEKQNAK... 'éBOT#āYŷ5āNUBŌ(ñ<Bf*Ō, ;*āC4*ŌHāx)/æ-!>-|, BOT»#cPŷuj DDEĒ>BS±-8·Bfī;Ā[RS×]/+ji» 'ENŌĀā'ENŌ:
33 eeeeeeeeeeeeeeeeeeeeeee
34 Š(-'5'ACKŪ[tçŌuèø&ŷŷg8-ā7+UFBŌpĀ à-ā«MŪSTXNAKQ+6šS;1'dGS' L7n6RZBŌ:!ETBĒ, #×ŌéxāL8r1JŋŌūā?İ DDEdc'CAN'š' ;p
35 '3ĀtīšDC2BRNDC4'jž"1YDCL; VŪbŪES WEYçy-ĒĪkDC3b4"-Y>CANSOH?·qznbCĀGS ō|KUŌİEBB' +sDC3.CANİMFSĀ-Ēkitgā-ŪmúPDC3
36 +CANy„#;i.CANB36EŌY+(fŌ' DC3SYN7Āāi"Ū'ç·STXSUBŪ[ā2|aaŊēŪž|"ĀiÇ+æĀ>6·ē+ŌSi(SUBB»v#SYN DDEzišJ„.Rš, ŌuĐSi) ā±ēŊ-
37 Y(HWŌ=ŌŌf^*øŷ<(HšŌeiī?'ĒH
38 >ø(HEMŪe)e(
39 8i"ēl
40 Đ~SYN9^?1:STICANā DDEū=cF8ŷā"-*3uUSŌp/wéŷ@'Ā, 9égpš^ŪDDEp/7nİ
41 *Ō:boēĀDC2DDE;Āā>ŪĀŷøŪ, ž'Xù-JūŪ-ūū)W+ ý...»Ū FFŪéŭñBBI'æŪFFij·Ō™~* ;BwDDEEæ„wDC4fèç4US' ETBšasæ'US^<1ŌŌEDNAKQ™
42 iágg>NUB-Ē\', 13j>ðēŌhPŌæ?PŷACKŌSYN><'i'YŌiACKS+žcføŷ5+ŌŌ)bxİ]Ūp^;Ā"+ŪišāēiŌDC3ĀžT&ŷ[İkXē+IĀDCANyøPZ_»±XĀŪZ_Ā
43 DC24EM.)gJ, DEB_iĒEEXFSŌ+Ē4Ō^Ō*ì×/¥"ŌQ^Jçŷ~), Ū'İhpø?GS^* : "AKĀ'isŌŪ„ĀkĐVŌETXŌN\ :MwŌúføZ
44 *stop*

```

- Let's ignore everything before *start* and after *stop*. If we look for the characters 'f', 'l', 'a', 'g', '#', which mark the beginning of all our flags, we find that in the first five lines:
 - 'f' appears once, in line 1 after *start*, in position [3],
 - 'l' appears once, in line 2 after *start*, in position [1],
 - 'a' appears once, in line 3 after *start*, in position [4],
 - 'g' appears once, in line 4 after *start*, in position [1],
 - '#' appears once, in line 5 after *start*, in position [5].

We've underlined these characters in orange:

```

19 *start*
20 eē2fáIh:ēī4ø¥†GēwUSQ7øsisÜGSEOT«[
21 ...1*Et9*iSO=Ñ<[OqmGu6æCeiŪá+DDEBBIKXN, @á»eFF"ž...DC2; Ék+[5KSI]Ō>^$DGSİSTXiszYŪYfŌüGS[C9-ETX8(1šĐ3dbDDEBSK
22 ');faE)q+ĀPuúV")çŌFFie-STX!C+eĀóeSO"V-:iQ«EtZŪžoGEBBŌ-úrÇiDCL( >Ō' HŝdŌ.jĀQTSŌ°-8æBSC9Y'ziWZü)m_øvBSK+feS;=ø
23 $gDC2<qéNUB+puNAKdäræø.puWA<WiBOT·|, BSCĒA^LLGEBOTñ«'FB+ĀDC3óEBBĀ'IACK:ī æšEYijžšŪRSRS×ÇuĐESÇÇâq>Y†CANi 664
24 >o>j' #ĀUSEBTXİtðe-P SUB¥MPĀCYŪ! DC2N, mhŪk'vIDCL)Ožŷ+TGSUBMÇŪ, Ēt.R2hB[Ū'öpİtdE BSSOHmV6âcøU\U, Ā"...ŪŌADŌB·(¥Ū "[Y-ēp
25 -BsdĀĒFFĒy|tEe"Yç[ol[üēNUB"iĐāīæNUB
26 -ŪoC<»„,9BOTB7İSDDE !EM7žžü-#
27 òFFwŪAC3ŌuŋOÇŷmUSUM'NEFBDC2áDC2üDC2 -) =iGFFDELRŌŪŌ>BOTĀ"-JkĐL SUBvDDE2*SOHŌ(Ā-^tfŌeŪfĒYĒM K"™B.SYN;XACKMó
28 ™"æYdu[āŪpDC4EHRŠñ(DŪ«·Ymé8!' DDEWŌ<Ū^t' >CAN8qšŷky'æ*s) ŠžB*5Ā[XižB"p"i8^æáø»uk DDEŌŌ@İaSm;^uiēBOTXSIkf!œM!l!
29 ĒlŊižS, c*SOH'áq*, 7mIZ7sEMYE...P-Ōútd ĀkúŌ\EBŷ>ac"SIi>F„#6ME!ý'E1SUBSOH,,6
30 7DEB5ĀDd»' áð+æ!ēU;Ç& Kú%ENŌUSDC3) VŪ, i
31 šī-8-1--pŋoĪ, DEB"mĀtī"™DC42ýĀæŪCBBB-„pāá>*)... "İfRèðñ?ž...KŌFBmİDC2úæ<ÇimĒĀšCž™DC4' á4USŌ°Èðİ>YfS CANsDC1ĀŪTJBE
32 cBønš BSKároEKQNAK... 'éBOT#āYŷ5āNUBŌ(ñ<Bf*Ō, ;*āC4*ŌHāx)/æ-!>-|, BOT»#cPŷuj DDEĒ>BS±-8·Bfī;Ā[RS×]/+ji» 'ENŌĀā'ENŌ:
33 eeeeeeeeeeeeeeeeeeeeeee
34 Š(-'5'ACKŪ[tçŌuèø&ŷŷg8-ā7+UFBŌpĀ à-ā«MŪSTXNAKQ+6šS;1'dGS' L7n6RZBŌ:!ETBĒ, #×ŌéxāL8r1JŋŌūā?İ DDEdc'CAN'š' ;p
35 '3ĀtīšDC2BRNDC4'jž"1YDCL; VŪbŪES WEYçy-ĒĪkDC3b4"-Y>CANSOH?·qznbCĀGS ō|KUŌİEBB' +sDC3.CANİMFSĀ-Ēkitgā-ŪmúPDC3
36 +CANy„#;i.CANB36EŌY+(fŌ' DC3SYN7Āāi"Ū'ç·STXSUBŪ[ā2|aaŊēŪž|"ĀiÇ+æĀ>6·ē+ŌSi(SUBB»v#SYN DDEzišJ„.Rš, ŌuĐSi) ā±ēŊ-
37 Y(HWŌ=ŌŌf^*øŷ<(HšŌeiī?'ĒH
38 >ø(HEMŪe)e(
39 8i"ēl
40 Đ~SYN9^?1:STICANā DDEū=cF8ŷā"-*3uUSŌp/wéŷ@'Ā, 9égpš^ŪDDEp/7nİ
41 *Ō:boēĀDC2DDE;Āā>ŪĀŷøŪ, ž'Xù-JūŪ-ūū)W+ ý...»Ū FFŪéŭñBBI'æŪFFij·Ō™~* ;BwDDEEæ„wDC4fèç4US' ETBšasæ'US^<1ŌŌEDNAKQ™
42 iágg>NUB-Ē\', 13j>ðēŌhPŌæ?PŷACKŌSYN><'i'YŌiACKS+žcføŷ5+ŌŌ)bxİ]Ūp^;Ā"+ŪišāēiŌDC3ĀžT&ŷ[İkXē+IĀDCANyøPZ_»±XĀŪZ_Ā
43 DC24EM.)gJ, DEB_iĒEEXFSŌ+Ē4Ō^Ō*ì×/¥"ŌQ^Jçŷ~), Ū'İhpø?GS^* : "AKĀ'isŌŪ„ĀkĐVŌETXŌN\ :MwŌúføZ
44 *stop*

```

Two comments:



We consider the very first position as position [0], as it is in Python.

In Notepad++, special characters in black background marks a single character. So, for example, **FF** is one character.

- At this stage we can't help but realize that 3, 1, 4, 1, 5 are the first digits of pi, and it's possible that the rest of the flag is at the locations 9, 2, 6, 5, 3, 5, 8, 9, 7, 9, 3, 2, 3, 8, 4, 6, 2, 6, and 4 of the next lines, respectively. Here are these positions, underlined in orange:

```

19 *start*
20 eè2fâI#Èi40Y†GEwUSQ7@sîSÛGSBOT«[
21 ...l²Et9·iSO=Ñ<[OqmEu6œCeiÚâ+DDEBBIKN, @â»eFF"ž...DC2; Ék+[5KSI]Ô>^$BGSİSTXiszYÛYfÔùFS[C9-ETX8{1šĐ3dbDDEBSK
22 '>;£aÈ)q+ÂPuúúV" }ÇÖFFie-STX!C·eÄóeSO"V-:iQ«EtžVfžoGEBBØ-úrÇiDCI (>Ó'HšdO·jÄQTSØ°-8eESC9Y'ziWZü)m_@vBSK+£eŠ;=ôl
23 $gDC2<qéNUB+ppNAKdäræØ.µWA<WiBOT·|,ESCÈA^llGEBOTñ«`FF+ÄDC3óEBBâ`IACK:Î œšEYijžššRSRS×ÇuDEBÇÇäq>YtCANi 664:
24 >O>j`#ÄUSETXİtôE-P SUB#MPÄEYÚ! DC2N, mhÜk°vIDCI)Ož†+TGSUBMÇÛ, Èt.R2hB[J'öpİtdšRSSOHmV6âcšU@U,Ä...UÖÁDOB·(YÚ" [Y=ëp:
25 -B&dÄE FFèy|tEe™Yç[ol[üèNUBP"iĐâİw@NUB
26 -ÜoC<>µ„9BOTB7İSDLE !EM7žzú-%
27 ôEBwÜACKÖuüOÇİmUSUM'NEBDC2áDC2ùDC2 -)·iGEFBDEIR@ÜO>BOTÄ"-JkDLSUBvDDE2²SOHØ(Ä-^tfÖœüfÉYÊM K™"B.SYN;XACKMó:
28 ™"·aYdu[äÜµDC4EHRŠR(ĐÜ«·Yméš!`DEBWO\<Ü't'>CAN8qšYky'œ°s)šžB%5Ä[XižB"µ"i8°æâ°su<DEBÖ@İaSm;^µièBOTXSDkf!œM!l!f
29 ÈlÑižš, c*SOH°âq°, 7MIZ7sEMYE..P-Öútd Äšú0\EBİ>âC`SIi>F„š6ME!Y°E1SUBSOH„6
30 7DEB5AdD»'âô+æ!èU;Çš·KÜ%ENOUSDC3)VF, i
31 šì-š-1--pıoı, DEB`µÄti™DC42yÄœÜÇBEBB-„pââ>»|... "İfRÈòñ?ž...KOFBmİDC2úœ<Çi#ÈÁšGž™DC4²â4USO°Èòı>YfS CANŠDC1ÄÚTJEBB
32 cBœš SSkârœEKQNAK...`éBOT#âYšäNUBœ (ñ<Bf4Ö, ;*âC4+ÖHâx)/æ-!>-|, BOT»#cPŸµj DEBÈ>BS±-8·Bfİ;Ä[RS×]/+jı»`ENQÄâ°ENQ:
33 eeeeeeeeeeeeeeeeeeeeeee
34 Š(-'5·ACKÜ[tÇouè0&İg8-â7÷UFBÖpÄ à-â«MÜSTXNAKQ+6šš;1'dGS:'L7n6RZB0: !EBBš, *×ÖèxäLšrlJñÖüâ?İDEBdc²CANš|š'jp
35 '3Ätİ#DC2bRNDc4:jž"1YDCI;VFöUŠS WEYçy-ÈİkDC3b4"-Y>CANŠOH?·qznbCâGS š|KUšİEBB`İsDC3...CANİMGSâ-Èkiİgä-ÜmúPDC3
36 +CANy„#;İ: CANB36EÖY+(fÖ`DC3SYN7Äai™Ü`ç·STXSUBú[Ä2|aañÈž|"ÄiÇ;=œÄ>6·è+šSi{SUBB»v#SYN\DEBzišJ„.Rš, ÖuĐSi]Ä±œÑ~
37 Y(HWÖ=ÖÖf^š>ý<(Hš0èİİ?`İH
38 >@{HEMÜE}e (
39 šı"èl
40 Đ~SYN9^?1²STICANá DEBû#œF8yâ"-*3uUSšp/wéy@²Ä, 9égbš²ÚDDEp/7nİ
41 °Ö:boeÄDC2DEB;ÄâšÜÄyøù, ž²Xù²JüÜ~úú)W#·ý...»Ü FFÜèúñEBBİ"šUFFİj·0™~²;BwODEEœ_wDC4fèç4US`EBBäsäe'US²<100œBNKQ™
42 iâgj>NUB-È\`, 13j>šèónPEœæ?PŸACKšSYN><'i'YšİACKš+žçfšyš+šó]bxİ]Üp^;A"+ÜišæİœDC3âžT&Y[İkXè+IÄDCANyøPZ_±XÄÜZ_Ä
43 DC2:EM·)gJ, DEB_iÈEXFSO+E4`Öšî×/š°oQ²Jçš~), Ü°İhu@?GS^_:"AKâ'isÖü„âkĐVØEBXN\ :Mw0úfšZ
44 *stop*

```

By putting together all these characters, we get:
flag#youididprettyWell:-)

And that's our solution!