Saikat Mukherjee, Intuit

Intuit Tax Knowledge Engine: Practical AI for a Smarter & More Personalized TurboTax

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Intuit Tax Knowledge Engine: Practical AI for a Smarter and Personalized Turbo Tax

Saikat Mukherjee

Distinguished Architect, Intuit

Intuit – Powering Prosperity Around the World

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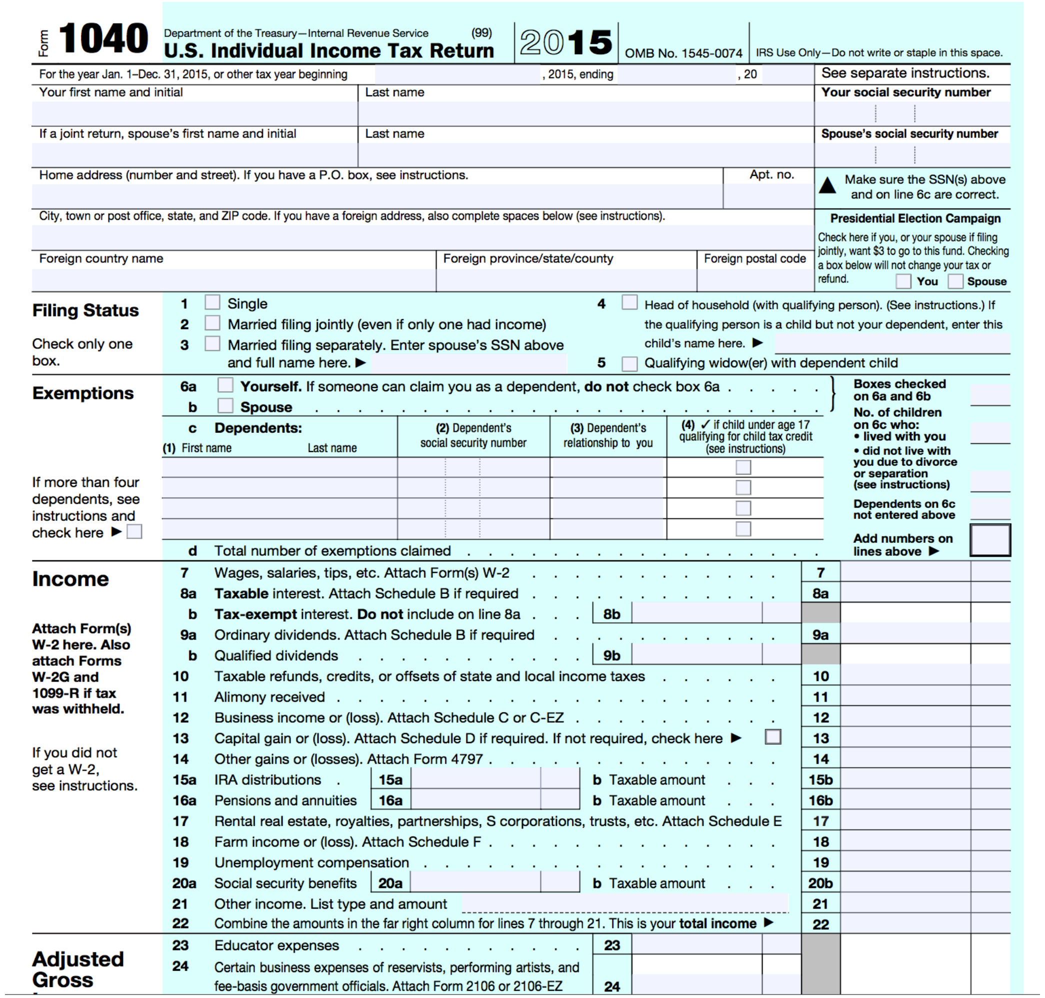
Consumers	Small Businesses	Accounting Professionals

Compliance Knowledge in Tax



Form 1040 Department of the Treasury—Internal Revenue Service (99)
U.S. Individual Income Tax Return 2015 OMB No. 1545-0074 IRS Use Only—Do not write or staple in this space.

For the year Jan. 1–Dec. 31, 2015, or other tax year beginning , 2015, ending , 20 See separate instructions.

Your first name and initial | Last name | Your social security number

If a joint return, spouse's first name and initial | Last name | Spouse's social security number

Home address (number and street). If you have a P.O. box, see instructions. | Apt. no. | Make sure the SSN(s) above and on line 6c are correct.

City, town or post office, state, and ZIP code. If you have a foreign address, also complete spaces below (see instructions).

Presidential Election Campaign
Check here if you, or your spouse if filing jointly, want $3 to go to this fund. Checking a box below will not change your tax or refund. You Spouse

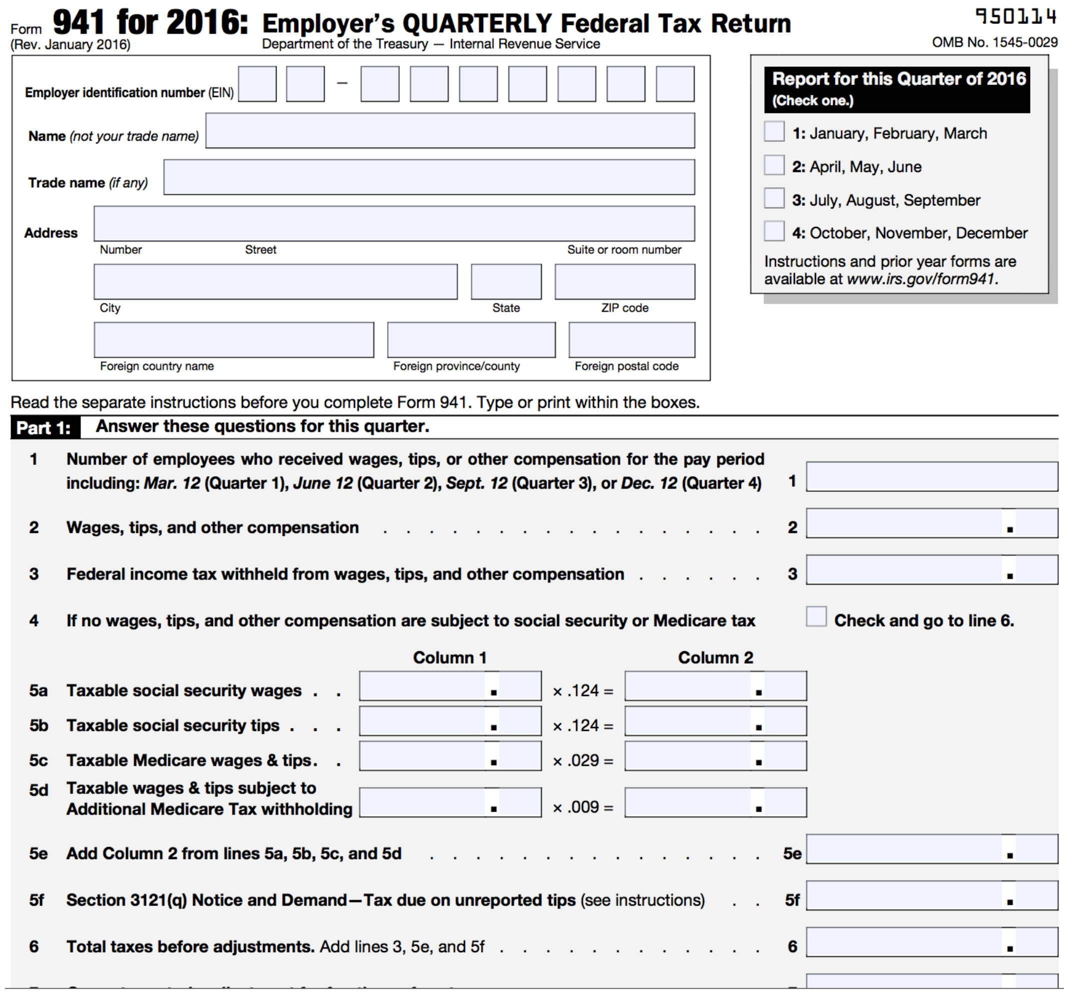
Foreign country name | Foreign province/state/county | Foreign postal code

Filing Status
Check only one box.
1 Single
2 Married filing jointly (even if only one had income)
3 Married filing separately. Enter spouse's SSN above and full name here. ▶
4 Head of household (with qualifying person). (See instructions.) If the qualifying person is a child but not your dependent, enter this child's name here. ▶
5 Qualifying widow(er) with dependent child

Exemptions
6a **Yourself.** If someone can claim you as a dependent, **do not** check box 6a
b **Spouse**
c **Dependents:** (1) First name Last name | (2) Dependent's social security number | (3) Dependent's relationship to you | (4) ✓ if child under age 17 qualifying for child tax credit (see instructions)
If more than four dependents, see instructions and check here ▶
d Total number of exemptions claimed
Boxes checked on 6a and 6b
No. of children on 6c who:
• lived with you
• did not live with you due to divorce or separation (see instructions)
Dependents on 6c not entered above
Add numbers on lines above ▶

Income
Attach Form(s) W-2 here. Also attach Forms W-2G and 1099-R if tax was withheld.
If you did not get a W-2, see instructions.
7 Wages, salaries, tips, etc. Attach Form(s) W-2
8a **Taxable** interest. Attach Schedule B if required
b **Tax-exempt** interest. **Do not** include on line 8a 8b
9a Ordinary dividends. Attach Schedule B if required
b Qualified dividends 9b
10 Taxable refunds, credits, or offsets of state and local income taxes
11 Alimony received
12 Business income or (loss). Attach Schedule C or C-EZ
13 Capital gain or (loss). Attach Schedule D if required. If not required, check here ▶
14 Other gains or (losses). Attach Form 4797
15a IRA distributions 15a b Taxable amount 15b
16a Pensions and annuities 16a b Taxable amount 16b
17 Rental real estate, royalties, partnerships, S corporations, trusts, etc. Attach Schedule E
18 Farm income or (loss). Attach Schedule F
19 Unemployment compensation
20a Social security benefits 20a b Taxable amount 20b
21 Other income. List type and amount
22 Combine the amounts in the far right column for lines 7 through 21. This is your **total income** ▶

Adjusted Gross
23 Educator expenses
24 Certain business expenses of reservists, performing artists, and fee-basis government officials. Attach Form 2106 or 2106-EZ



Form **941 for 2016: Employer's QUARTERLY Federal Tax Return** 950114
(Rev. January 2016) Department of the Treasury — Internal Revenue Service OMB No. 1545-0029

Employer identification number (EIN)
Name (not your trade name)
Trade name (if any)
Address: Number Street Suite or room number; City State ZIP code; Foreign country name Foreign province/county Foreign postal code

Report for this Quarter of 2016 (Check one.)
1: January, February, March
2: April, May, June
3: July, August, September
4: October, November, December
Instructions and prior year forms are available at *www.irs.gov/form941*.

Read the separate instructions before you complete Form 941. Type or print within the boxes.

Part 1: Answer these questions for this quarter.

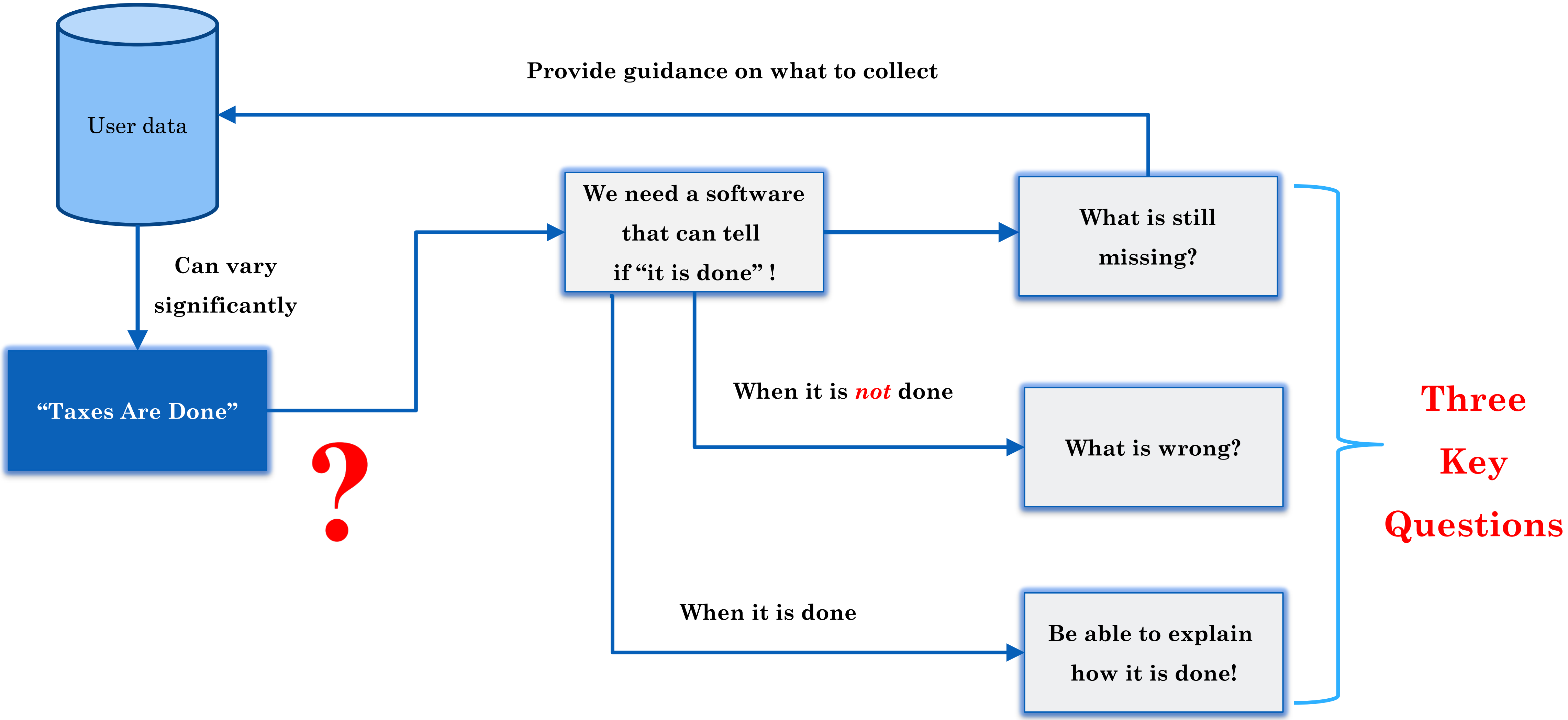
1 Number of employees who received wages, tips, or other compensation for the pay period including: *Mar. 12* (Quarter 1), *June 12* (Quarter 2), *Sept. 12* (Quarter 3), or *Dec. 12* (Quarter 4) 1
2 Wages, tips, and other compensation 2
3 Federal income tax withheld from wages, tips, and other compensation 3
4 If no wages, tips, and other compensation are subject to social security or Medicare tax — Check and go to line 6.

	Column 1		Column 2
5a Taxable social security wages		× .124 =	
5b Taxable social security tips		× .124 =	
5c Taxable Medicare wages & tips		× .029 =	
5d Taxable wages & tips subject to Additional Medicare Tax withholding		× .009 =	

5e Add Column 2 from lines 5a, 5b, 5c, and 5d 5e
5f Section 3121(q) Notice and Demand—Tax due on unreported tips (see instructions) 5f
6 Total taxes before adjustments. Add lines 3, 5e, and 5f 6

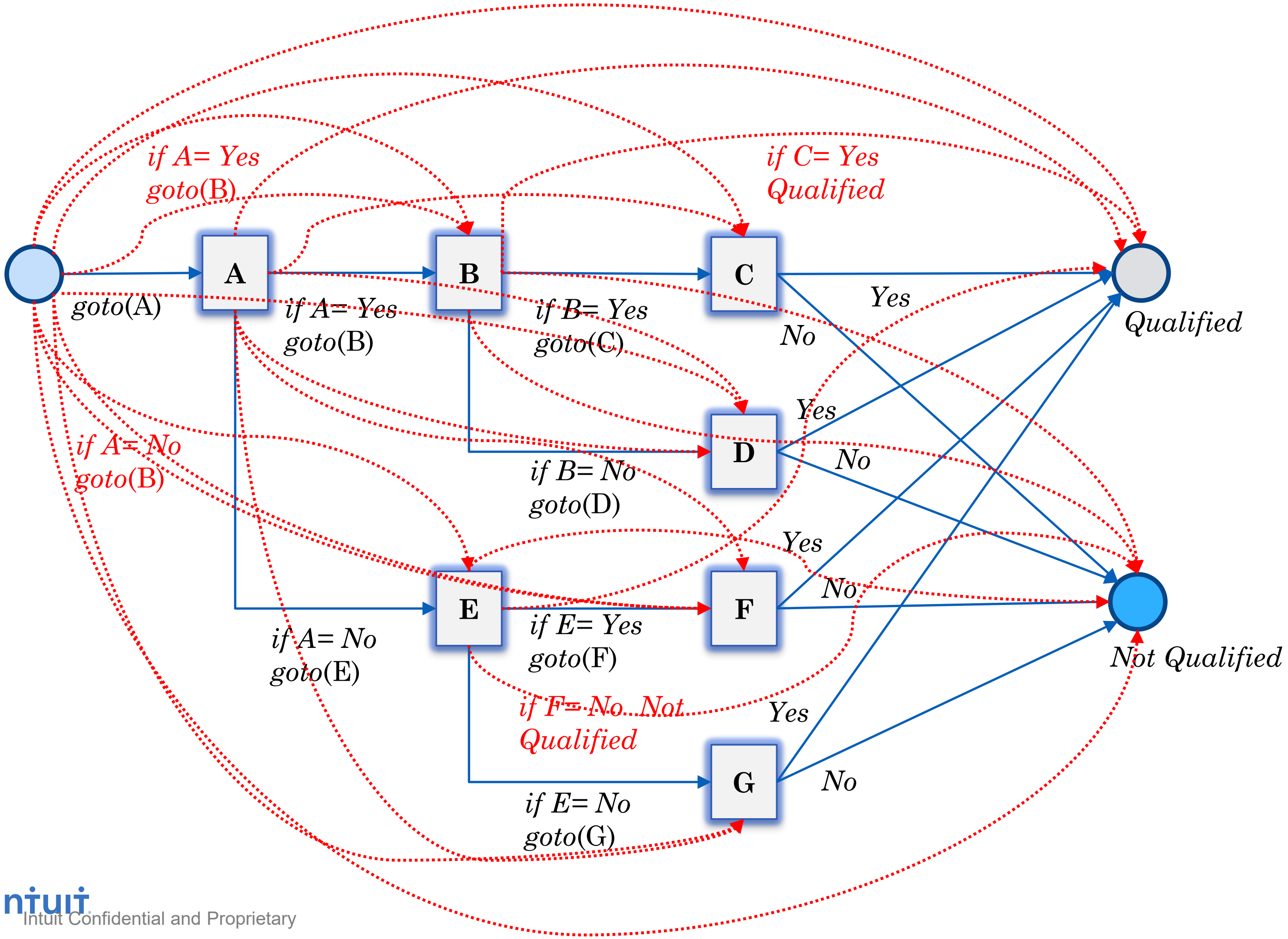
Regulatory Agencies have created "forms" to describe the computation

Enable “Taxes Are Done” and Three Key Questions



Question #1: Personalized/Minimized Q&A Based on Data

I ***only*** need to answer the ***relevant*** questions based on what the system ***knows*** about me.



Natural solution if we know nothing about A, B, …, G.

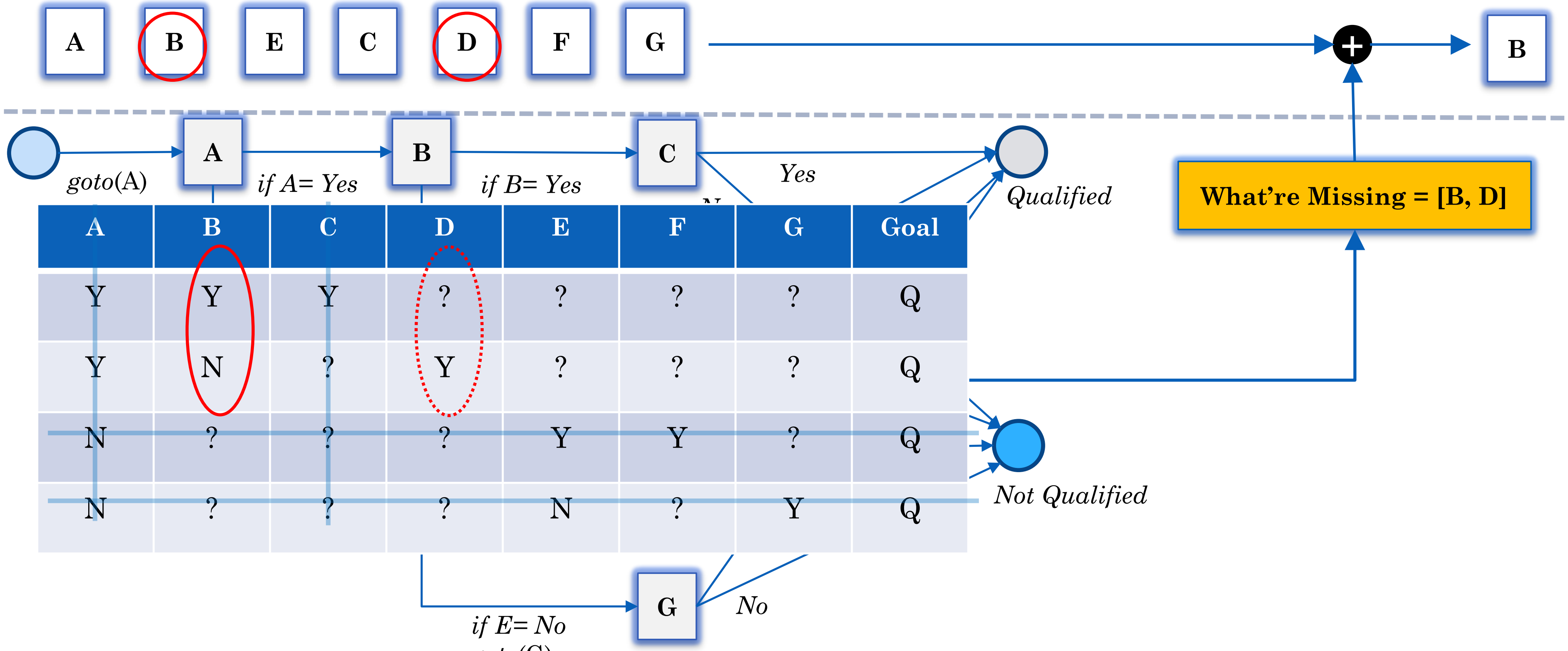
What happens if we already know *A* = *yes* and *C* = *yes*?

Without additional code, the existing UX will force user to go through the same rigid experience.

Question #1: Personalized/Minimized Q&A Based on Data

Encode *constraints* among tax concepts, and *intelligently suggest* what are missing

Sorted page list based on UX criteria:



A	B	C	D	E	F	G	Goal
Y	Y	Y	?	?	?	?	Q
Y	N	?	Y	?	?	?	Q
N	?	?	?	Y	Y	?	Q
N	?	?	?	N	?	Y	Q

What if we know ***A= yes*** and ***C=yes***?

Question #2: Handling Answer Retraction

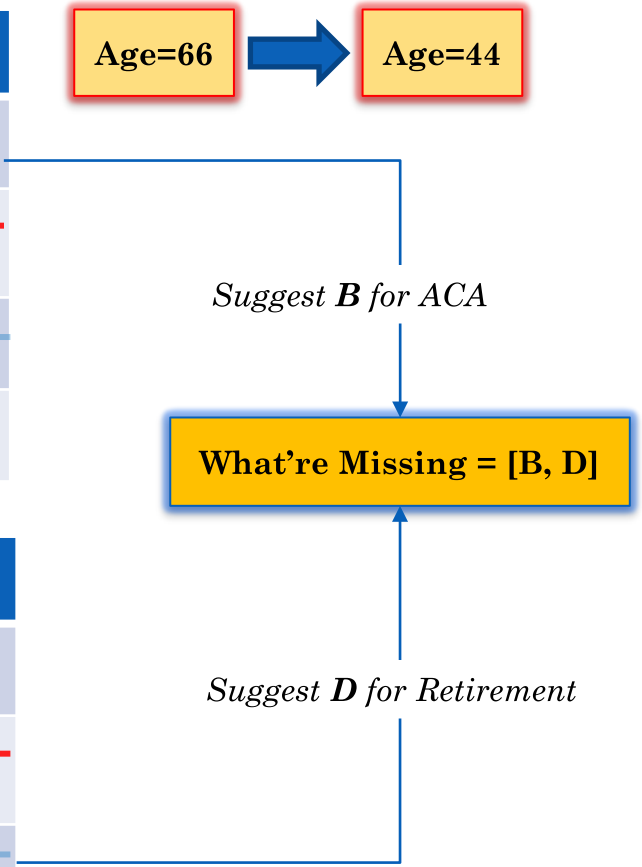
TurboTax always has my back, I have *control* and can *correct my answer anytime* with *confidence*.

ACA

. . .	Age > 65	A	B	. . .
...	...	...	. . .	. . .
. . .	Y	Y	?	. . .
. . .	N	?	Y	. . .
. . .	. . .	. . .	. . .	. . .

Retirement

. . .	Age > 65	C	D	. . .
...	...	...	. . .	. . .
. . .	Y	Y	?	. . .
. . .	N	?	Y	. . .
. . .	. . .	. . .	. . .	. . .



1. By scanning multiple constraint tables, systematically cover all data retractions.
2. By not caring whether variables are user entered or computed, deal with the chaining effect systematically.
3. Results:
   - Make any change any time
   - Guide me through what are missing/wrong
   - High user confidence that TurboTax gets my back

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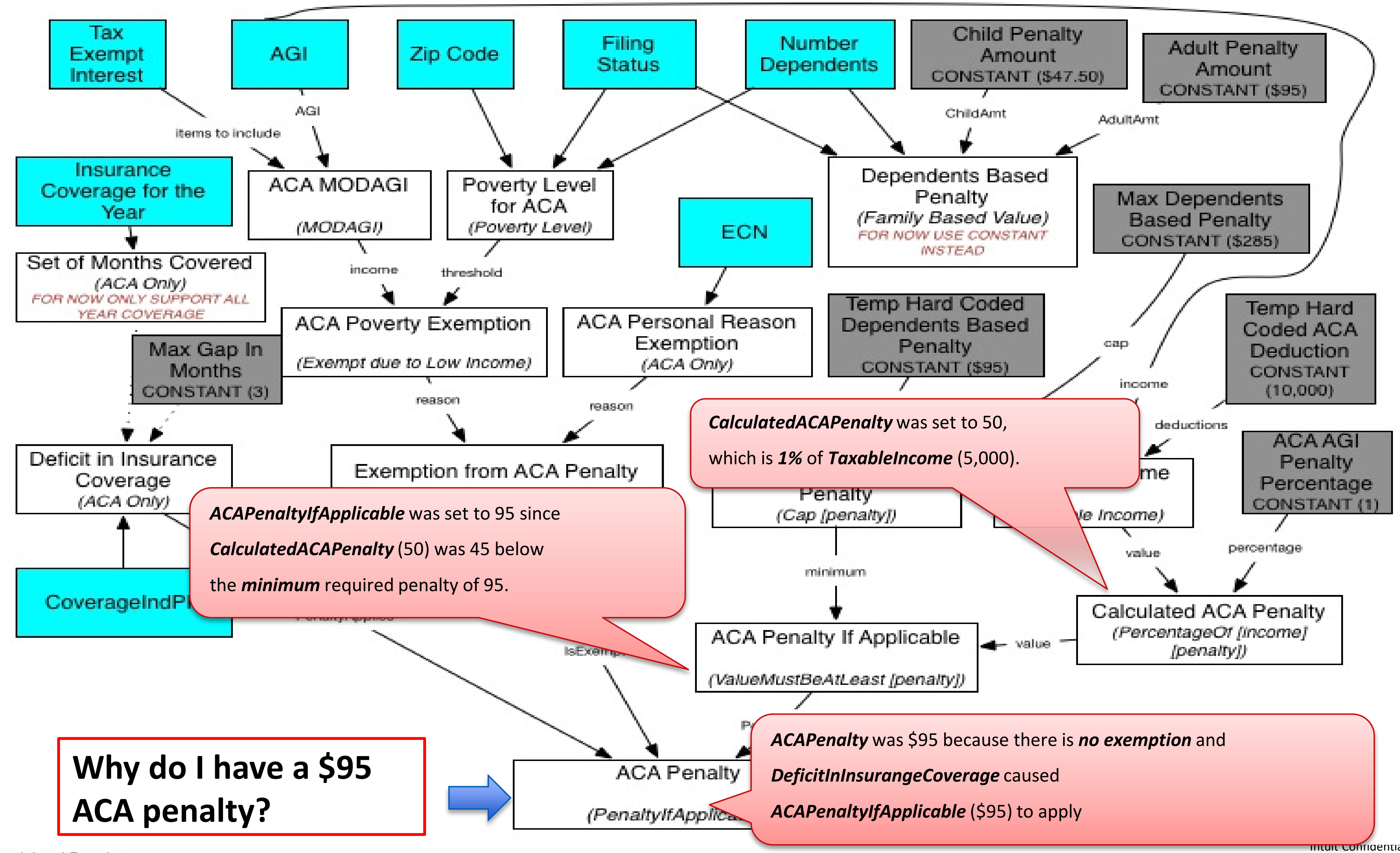
Question #3: Explanations

Explanation is the primary reason for calculations

Getting the numbers for the form is a byproduct of explanation. There are not two separate systems for explanations vs calcs.

Intuit Confidential and Proprietary 9

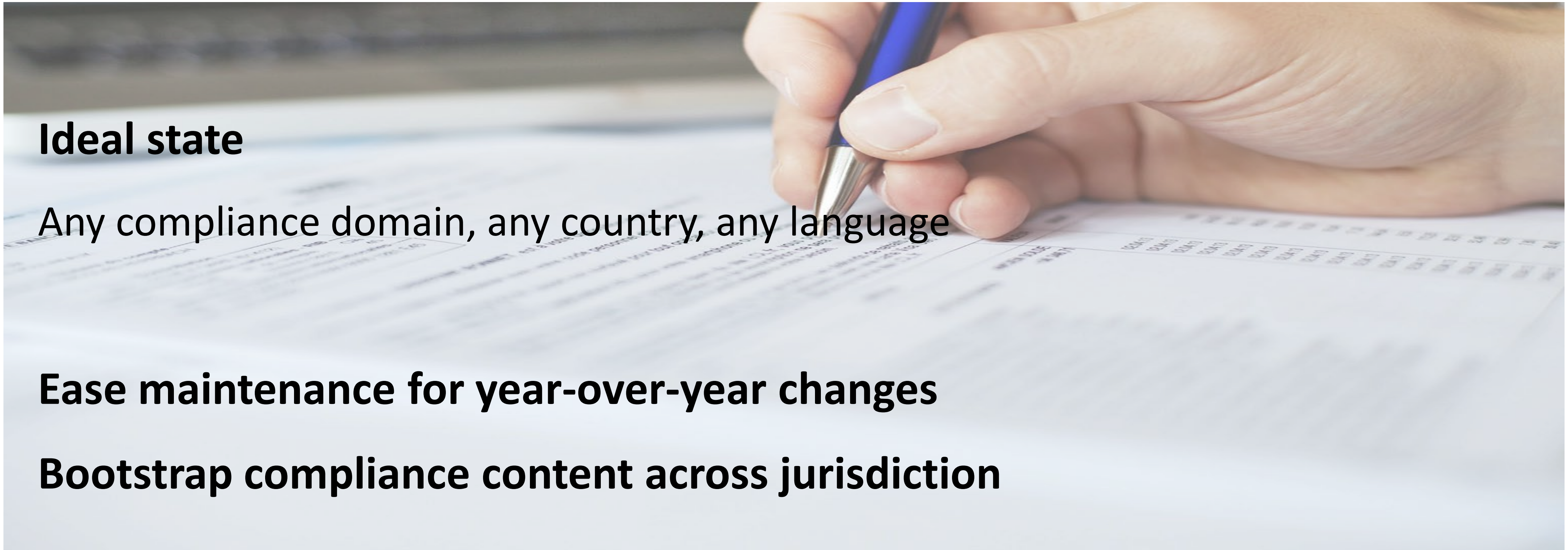
Example: Compute and explain ACA (Affordable Care Act) penalty



Why do I have a $95 ACA penalty?

Grand challenge: Translate forms into executable code

TKE is a domain agnostic **expert system** designed to support large scale user interaction systems constrained with complex logic, where a **software oracle** can **intelligently suggest** what questions to ask and **explain back** the computations by leveraging **various knowledge sources**.



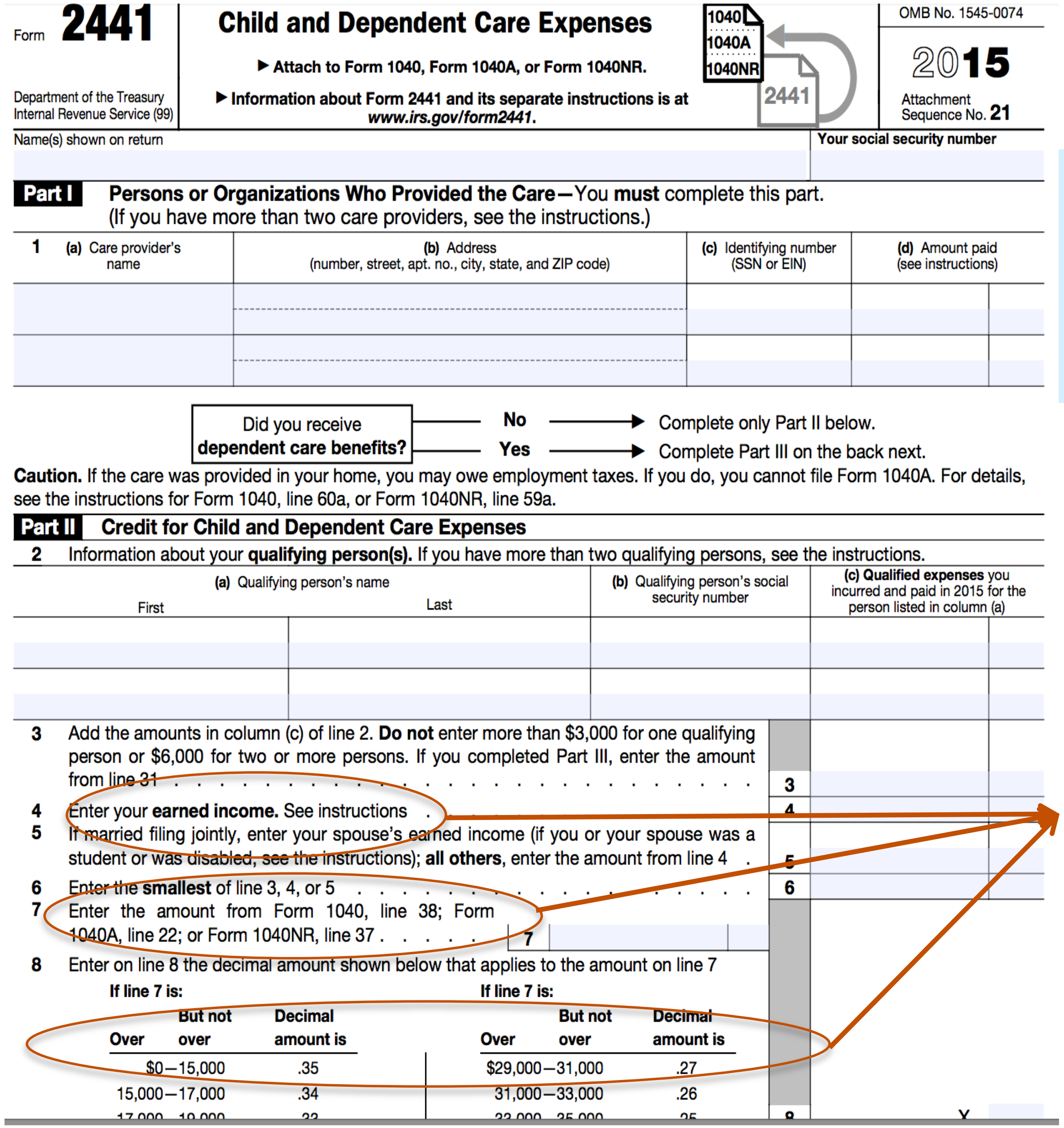
Ideal state

Any compliance domain, any country, any language

Ease maintenance for year-over-year changes

Bootstrap compliance content across jurisdiction

Why is the task challenging?



Form **2441**

Department of the Treasury
Internal Revenue Service (99)

Child and Dependent Care Expenses

▶ Attach to Form 1040, Form 1040A, or Form 1040NR.

▶ Information about Form 2441 and its separate instructions is at *www.irs.gov/form2441.*

1040 1040A 1040NR 2441

OMB No. 1545-0074

2015

Attachment Sequence No. **21**

Name(s) shown on return | Your social security number

Part I **Persons or Organizations Who Provided the Care—**You **must** complete this part.
(If you have more than two care providers, see the instructions.)

1 (a) Care provider's name	(b) Address (number, street, apt. no., city, state, and ZIP code)	(c) Identifying number (SSN or EIN)	(d) Amount paid (see instructions)

Did you receive **dependent care benefits?**
No ▶ Complete only Part II below.
Yes ▶ Complete Part III on the back next.

Caution. If the care was provided in your home, you may owe employment taxes. If you do, you cannot file Form 1040A. For details, see the instructions for Form 1040, line 60a, or Form 1040NR, line 59a.

Part II **Credit for Child and Dependent Care Expenses**

2 Information about your **qualifying person(s).** If you have more than two qualifying persons, see the instructions.

(a) Qualifying person's name — First	Last	(b) Qualifying person's social security number	(c) **Qualified expenses** you incurred and paid in 2015 for the person listed in column (a)

3 Add the amounts in column (c) of line 2. **Do not** enter more than $3,000 for one qualifying person or $6,000 for two or more persons. If you completed Part III, enter the amount from line 31 3

4 Enter your **earned income.** See instructions . . . 4

5 If married filing jointly, enter your spouse's earned income (if you or your spouse was a student or was disabled, see the instructions); **all others**, enter the amount from line 4 . . 5

6 Enter the **smallest** of line 3, 4, or 5 6

7 Enter the amount from Form 1040, line 38; Form 1040A, line 22; or Form 1040NR, line 37 7

8 Enter on line 8 the decimal amount shown below that applies to the amount on line 7

If line 7 is: | **If line 7 is:**

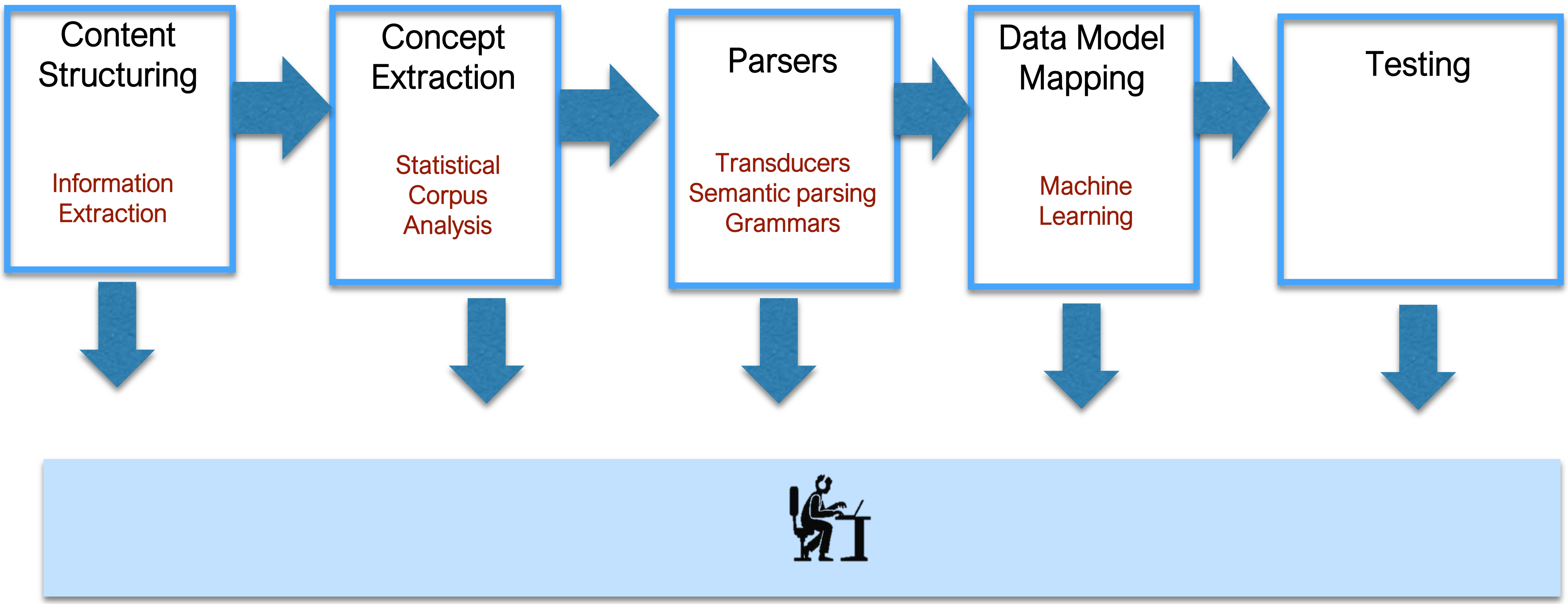
Over	But not over	Decimal amount is	Over	But not over	Decimal amount is
$0—15,000		.35	$29,000—31,000		.27
15,000—17,000		.34	31,000—33,000		.26

Add the amounts in column (c) of Line 2. Do not enter more than $3000 for one qualifying person or $6000 for two or more persons. If you completed Part III, enter the amount from line 31

Make sense of natural language in tax forms

The "form" is unstructured and relevant information is dispersed

AI to Learn Tax Calculations



From unstructured to structured compliance forms

Form **2441** — **Child and Dependent Care Expenses**

▶ Attach to Form 1040, Form 1040A, or Form 1040NR.

▶ Information about Form 2441 and its separate instructions is at *www.irs.gov/form2441.*

1040 1040A 1040NR 2441

OMB No. 1545-0074

2015

Attachment Sequence No. 21

Department of the Treasury Internal Revenue Service (99)

Name(s) shown on return | Your social security number

Part I **Persons or Organizations Who Provided the Care—**You **must** complete this part. (If you have more than two care providers, see the instructions.)

1 (a) Care provider's name	(b) Address (number, street, apt. no., city, state, and ZIP code)	(c) Identifying number (SSN or EIN)	(d) Amount paid (see instructions)

Did you receive dependent care benefits? — No ▶ Complete only Part II below. — Yes ▶ Complete Part III on the back next.

Caution. If the care was provided in your home, you may owe employment taxes. If you do, you cannot file Form 1040A. For details, see the instructions for Form 1040, line 60a, or Form 1040NR, line 59a.

Part II **Credit for Child and Dependent Care Expenses**

2 Information about your **qualifying person(s).** If you have more than two qualifying persons, see the instructions.

(a) Qualifying person's name — First	Last	(b) Qualifying person's social security number	(c) Qualified expenses you incurred and paid in 2015 for the person listed in column (a)

3 Add the amounts in column (c) of line 2. **Do not** enter more than $3,000 for one qualifying person or $6,000 for two or more persons. If you completed Part III, enter the amount from line 31 3

4 Enter your **earned income.** See instructions 4

5 If married filing jointly, enter your spouse's earned income (if you or your spouse was a student or was disabled, see the instructions); **all others,** enter the amount from line 4 . . . 5

6 Enter the **smallest** of line 3, 4, or 5 6

7 Enter the amount from Form 1040, line 38; Form 1040A, line 22; or Form 1040NR, line 37 7

8 Enter on line 8 the decimal amount shown below that applies to the amount on line 7

If line 7 is: Over	But not over	Decimal amount is	If line 7 is: Over	But not over	Decimal amount is
$0—	15,000	.35	$29,000—	31,000	.27
15,000—	17,000	.34	31,000—	33,000	.26
17,000—	19,000	.33	33,000—	35,000	.25
19,000—	21,000	.32	35,000—	37,000	.24
21,000—	23,000	.31	37,000—	39,000	.23
23,000—	25,000	.30	39,000—	41,000	.22
25,000—	27,000	.29	41,000—	43,000	.21
27,000—	29,000	.28	43,000—	No limit	.20

8 X.

9 Multiply line 6 by the decimal amount on line 8. If you paid 2014 expenses in 2015, see the instructions 9

10 Tax liability limit. Enter the amount from the Credit Limit Worksheet in the instructions. 10

11 **Credit for child and dependent care expenses.** Enter the **smaller** of line 9 or line 10 here and on Form 1040, line 49; Form 1040A, line 31; or Form 1040NR, line 47 11

For Paperwork Reduction Act Notice, see your tax return instructions. Cat. No. 11862M Form **2441** (2015)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nes": [

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  }],
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intuit

From natural language to predicate language in tax data model

11 **If you checked (in Part I):**

- Box 6, add $5,000 to the taxable disability income of the spouse who was under age 65. Enter the total.
- Box 2, 4, or 9, enter your taxable disability income.
- Box 5, add your taxable disability income to your spouse's taxable disability income. Enter the total.

. . . . **11**

extracted concept

extracted concept

ifte(box(5),add(taxable_disability_income(taxpayer),taxable_disability_income(spouse)))

Data model matching

ifte(box(5),add(/Return/ReturnData/IRS1040ScheduleR/TaxpayerTaxableDisabilityIncomeWorksheet/TotalTaxableDisabilityIncomeAmt, /Return/ReturnData/IRS1040ScheduleR/SpouseTaxableDisabilityIncomeWorksheet/TotalTaxableDisabilityIncomeAmt))

Thank you

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