Survey Instrument Used for:

Behavioral Impediments to Valuing Annuities: Complexity and Choice Bracketing

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Survey Instrument

Notes on the Survey Instrument

- Everyone sees both EV-Sell and EV-Buy questions in the same survey
- Randomizations are all orthogonal and across subjects. All options within each randomization are selected with equal probability.
    - The main manipulations consist of a 3x2 design: three vignettes that vary the complexity, and whether or not the consequence message (see Table 1) is shown.
    - The secondary manipulations consist of a 4x3x4x2x2 design that is orthogonal to the main manipulations.
        - There are four different versions for name and gender of the vignette person to be advised on annuity decisions. This name and gender is randomized to one of the following: Mr. Jones, Mrs. Jones, Mr. Smith, or Mrs. Smith. The person featured in the consequence message has the opposite name and gender from the vignette person in the annuity valuation questions.
        - The starting value for lump-sum amounts is randomized at $10,000, $20,000, or $30,000. For any given respondent, the same starting value is used for the EV-Sell and EV-Buy questions.
        - The baseline monthly Social Security Benefit, $*SSB*, is randomized to $800, $1200, $1600, or $2000.
        - Whether the choice option with the lump-sum amount ($*LS*) is shown first or second is randomized. For each respondent, this is randomized once and the same order is used for EV-Buy and EV-Sell.
        - Whether EV-Buy is asked before or after EV-Sell is randomized.
        - For the consequence message, it is randomized whether the paragraph on the benefits and drawbacks of spending down retirement wealth quickly is shown before or after the paragraph on the benefits and drawbacks of spending down retirement slowly.
- Text in Arial are instructions to the programmers while text in Times New Roman is shown to respondents. Text in *italicized Arial* denote variables and the respondents see the value contained by that variable.
- Text between square brackets is replaced based on the randomization.
- Page breaks are shown by horizontal lines.

Survey Instrument Text and Instructions for Understanding America Study #49

Invitation to the survey. When panelists logged on to their UAS account, they saw the following message. If they clicked on the link in this message, they entered into UAS49.

This survey asks you to make decisions as if you were giving someone financial advice. You will then play an insurance game. You will earn $10 for completion, and have a chance to win more.

In the following survey we want you to play the role of financial advisor. We will show you some examples of persons who have to make a decision about money and we will ask you to help them make the decision.

Consequence message treatment: Advisor explanations. Only people in the consequence message treatment get this screen and the following two screens. Respondents are randomized to see one of four vignette person names: Mr. Jones, Mrs. Jones, Mr. Smith, or Mrs. Smith. The pronouns [he/she] and [his/her] should match the gender of the consequence-message vignette person. Similarly, the word [man/women] should match the gender of the vignette person.

First, we will show you a story about [Mr. Jones/Mrs. Jones/Mr. Smith/Mrs. Smith]. Please pay close attention to the story, because at the end we will ask you two questions about the story. You will receive an additional $1 for each question you answer correctly.

[Mr. Jones/Mrs. Jones/Mr. Smith/Mrs. Smith] is a single, 65-year old [man/woman] with no children, and [he/she] is as healthy as the typical 65-year old [man/woman]. [He/She] just retired and receives [his/her] monthly Social Security check. [He/She] is talking with [his/her] financial adviser on how to spend [his/her] substantial savings in retirement.

Randomize whether either block 1 or block 2 is shown.

Block 1:

[His/Her] advisor explains that [he/she] could decide to spend down [his/her] savings relatively quickly. In this case, [he/she] will be more likely to be able to enjoy [his/her] money during [his/her] lifetime. But [he/she] also runs a risk of running out of money while alive and having to cut back on [his/her] spending as a result.

[His/Her] advisor explains that [he/she] could also decide to spend down [his/her] savings relatively slowly. In this case, [he/she] will be less likely to run out of money. But now [he/she] runs a risk of not getting to enjoy all [his/her] money during [his/her] lifetime.

Block 2:

[His/Her] advisor explains that [he/she] could decide to spend down [his/her] savings relatively slowly. In this case, [he/she] will be less likely to run out of money. But now [he/she] runs a risk of not getting to enjoy all [his/her] money during [his/her] lifetime.

[His/Her] advisor explains that [he/she] could also decide to spend down [his/her] savings relatively quickly. In this case, [he/she] will be more likely to be able to enjoy [his/her] money during [his/her] lifetime. But [he/she] also runs a risk of running out of money while alive and having to cut back on [his/her] spending as a result.

Consequence message treatment: Test questions 1 and 2.

Remember, you will earn an extra $1 for each question you answer correctly on this page.

The financial advisor tells [Mr. Jones/Mrs. Jones/Mr. Smith/Mrs. Smith] that spending down [his/her] savings more quickly:

- Increases the risk that [he/she] does not get to enjoy all of [his/her] money during [his/her] lifetime.
- Decreases the risk that [he/she] runs out of money during [his/her] lifetime.
- Increases the risk that [he/she] runs out of money during [his/her] lifetime.
- None of the above.

The financial advisor tells [Mr. Jones/Mrs. Jones/Mr. Smith/Mrs. Smith] that spending down [his/her] savings more slowly:

- Increases the risk that [he/she] runs out of money during [his/her] lifetime.
- Decreases the risk that [he/she] does not get to enjoy all of [his/her] money during [his/her] lifetime.
- Increases the risk that [he/she] does not get to enjoy all of [his/her] money during [his/her] lifetime.
- None of the above.

If a question is not answered, prompt once to answer the question, but move to next screen if respondent still leaves the question blank.

Consequence message treatment: Question to induce respondent to think about how to draw down savings during retirement

Now we are going to switch to a different type of question. Instead of asking you about facts, we are going to ask your advice about what decisions [Mr. Jones/Mrs. Jones/Mr. Smith/Mrs. Smith] should make. Unlike the previous questions, there is no right or wrong answer; we just want to know what you think.

Recall [Mr. Jones/Mrs. Jones/Mr. Smith/Mrs. Smith], the retired, single, 65-year old [man/woman] with no children. [He/She] is as healthy as the typical 65-year old [man/woman].

How quickly should [he/she] spend [his/her] savings?

- Spend [his/her] savings by age 70. [he/she] can spend a large amount each year, but [he/she] will have to cut back if [he/she] lives beyond 70. If [he/she] dies before 70, [he/she] will not have enjoyed all of [his/her] savings.
- Spend [his/her] savings by age 80. [he/she] can spend a moderate amount each year, but [he/she] will have to cut back if [he/she] lives beyond 80. If [he/she] dies before 80, [he/she] will not have enjoyed all of [his/her] savings.
- Spend [his/her] savings by age 90. [he/she] can spend a modest amount each year, but [he/she] will have to cut back if [he/she] lives beyond 90. If [he/she] dies before 90, [he/she] will not have enjoyed all of [his/her] savings.
- Spend [his/her] savings by age 100. [he/she] can spend a small amount each year, and [he/she] will have to cut back if [he/she] lives beyond 100. If [he/she] dies before 100, [he/she] will not have enjoyed all of [his/her] savings.

This is the end of the screens shown for the consequence message.

Complexity Treatment. Respondents are randomized to one of the three vignettes shown below: Vignette 1 (corresponding to treatment "No added complexity"), Vignette 2 (corresponding to treatment "Complexity: Wide age range") or Vignette 3 (corresponding to treatment "Complexity: Added information"). The name in the complexity vignette below is different than the name shown in the consequence-message vignette above. Similarly, the gender of the person in the complexity vignette is different from the gender of the person in the consequence-message vignette. The scalar variable *SSB* is randomized to 800, 1200, 1600, or 2000.

In the next few questions, we are going to ask you to give some advice to [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] for when [she/he] retires. You will be happy to know that whatever advice you give [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones], [she/he] will not owe any taxes on the amounts shown and [her/his] benefits will keep up with inflation. There is no right or wrong answer; we just want to know what you think.

Vignette 1 ("No added complexity"):
[Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] is a single, 60-year old [woman/man] with no children. [She/He] will retire and claim [her/his] Social Security benefits at 65. When [she/he] retires, [she/he] will have $100,000 saved for [her/his] retirement, and [she/he] will receive $[*SSB*] in monthly Social Security benefits. Based on [her/his] current health and family history, doctors have told Mr. Smith that [she/he] will almost certainly be alive at age 75 but almost certainly will not live beyond age 85.

Vignette 2 ("Complexity: Wide age range"):
[Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] is a single, 60-year old [woman/man] with no children. [She/He] will retire and claim [her/his] Social Security benefits at 65. When [she/he] retires, [she/he] expects to have $100,000 saved for [her/his] retirement, and expects to receive $[*SSB*] in monthly Social Security benefits. Based on [her/his] current health and family history, doctors have told Mrs. Jones that [she/he] has an 80% chance of being alive at age 70, a 50% chance of being alive at age 80, a 20% chance of being alive at age 90, and a 10% chance of being alive at age 95.

Vignette 3 ("Complexity: Added information"):
[Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] is a single, 60-year old [woman/man] with no children. Social Security rules state that you need at least 40 credits, or 10 years of work, to qualify for Social Security – and [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] qualifies since [she/he] has worked for 30 years. Since [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] was born in 1956, [her/his] full retirement age is 66 years and 4 months, but [she/he] is eligible to start claiming starting at 62. [She/He] will retire and claim [her/his] Social Security benefits at 65. When [she/he] retires, [she/he] will have $100,000 saved for [her/his] retirement, and [she/he] will receive $[*SSB*] in monthly Social Security benefits. Based on [her/his] current health and family history, doctors have told [Mrs. Smith/Mr. Smith/ Mrs. Jones/Ms. Jones] that [she/he] will almost certainly be alive at age 75 but almost certainly will not live beyond age 85.

Initializations for EV-Sell and EV-Buy. Whether the EV-Buy questions or the EV-Sell questions are shown first is randomized.
The scalar variable *LS_STARTVALUE* is randomized to 1, 2, or 3.
The values in the matrices *LS_LOW*, *LS_MED*, and *LS_HIGH* are listed at the very end of this document.

Initialization of the matrix *LS_AMT*:

If *LS_STARTVALUE* ==1

Set the 16x5 matrix *LS_AMT=LS_LOW*

Elseif *LS_STARTVALUE* ==3

Set the 16x5 matrix *LS_AMT=LS_HIGH*

Else

Set the 16x5 matrix *LS_AMT=LS_MED*

Endif

EV-Sell Questions

Set the scalar *j*=1

Set the scalar *ROW*=1

For *j*=1 to 5

This is the start of the loop for EV-Sell questions.

The text for each iteration of the loop is shown on a new screen.

If *j* = 1, Display:

If EV-Sell is asked before EV-Buy:

Suppose that the Social Security Administration is considering a new policy that gives people more choice in how they want to receive their benefits. As part of this policy, [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] is asked to make a choice between two money amounts.

What should [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] do?

Else

Now consider a different way of giving people more choice in how they want to receive their benefits. As part of this policy, [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] is asked to make a choice between two money amounts.

Endif

Else, Display:

Now we ask you the same question but with a different amount for the one-time payment.

What should [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] do?

Endif

The order of the two options shown is randomized once for each respondent. The order remains the same for the EV-Sell and EV-Buy questions shown to a given respondent. The third appearance of the word "receive" (i.e., when it appears after the underlined word "and") in the text below is shown in bold if and only if EV-Sell is asked after EV-Buy.

- Receive a Social Security benefit of $[*SSB*+100] per month starting at age 65.
- Receive [her/his] expected Social Security benefit of $[*SSB*] per month <u>and</u> receive a <u>one-time</u> payment of $[*LS_AMT*[*ROW,j*]] from Social Security at age 65.

If the respondent does not select any option, the respondent is prompted once to answer this question. If the respondent still doesn't give an answer, the variable *j* is set to 5, so that we get skipped out of this loop.

If Respondent selects the option that does **not** contain the one-time payment:
Set *ROW*=*ROW*+2^(4-*j*)]
Note: this will increase the size of one-time payment in the next iteration, so it makes the option that does not contain the one-time payment less attractive.
Endif
Set *j*=*j*+1
This is the end of the loop for the EV-Buy questions.

Vignette reminder. The complexity vignette is shown again, but now preceded by the word "Remember, ".

Vignette 1 ("No added complexity"):
Remember, [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] is a single, 60-year old [woman/man] with no children. [She/He] will retire and claim [her/his] Social Security benefits at 65. When [she/he] retires, [she/he] will have $100,000 saved for [her/his] retirement, and [she/he] will receive $[*SSB*] in monthly Social Security benefits. Based on [her/his] current health and family history, doctors have told Mr. Smith that [she/he] will almost certainly be alive at age 75 but almost certainly will not live beyond age 85.

Vignette 2 ("Complexity: Wide age range"):
Remember, [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] is a single, 60-year old [woman/man] with no children. [She/He] will retire and claim [her/his] Social Security benefits at 65. When [she/he] retires, [she/he] expects to have $100,000 saved for [her/his] retirement, and expects to receive $[*SSB*] in monthly Social Security benefits. Based on [her/his] current health and family history, doctors have told Mrs. Jones that [she/he] has an 80% chance of being alive at age 70, a 50% chance of being alive at age 80, a 20% chance of being alive at age 90, and a 10% chance of being alive at age 95.

Vignette 3 ("Complexity: Added information"):
Remember, [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] is a single, 60-year old [woman/man] with no children. Social Security rules state that you need at least 40 credits, or 10 years of work, to qualify for Social Security – and [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] qualifies since [she/he] has worked for 30 years. Since [Mrs. Smith/Mr. Smith/Mrs. Jones/Ms. Jones] was born in 1956, [her/his] full retirement age is 66 years and 4 months, but [she/he] is eligible to start claiming starting at 62. [She/He] will retire and claim [her/his] Social Security benefits at 65. When [she/he] retires, [she/he] will have $100,000 saved for [her/his] retirement, and [she/he] will receive $[*SSB*] in monthly Social Security benefits. Based on [her/his] current health and family history, doctors have told [Mrs. Smith/Mr. Smith/ Mrs. Jones/Ms. Jones] that [she/he] will almost certainly be alive at age 75 but almost certainly will not live beyond age 85.

EV-Buy Questions
Set the scalar *j*=1
Set the scalar *ROW*=1
For *j*=1 to 5
This is the start of the loop for EV-Buy questions.
The text for each iteration of the loop is shown on a new screen.

If *j* = 1, Display:

If EV-Buy is asked before EV-Sell:

Suppose that the Social Security Administration is considering a new policy that gives people more choice in how they want to receive their benefits. As part of this policy, [Mrs. Smith/Mr. Smith/ Mrs. Jones/Ms. Jones] is asked to make a choice between two money amounts.

What should [Mrs. Smith/Mr. Smith/ Mrs. Jones/Ms. Jones] do?

Else

Now consider a different way of giving people more choice in how they want to receive their benefits. As part of this policy, [Mrs. Smith/Mr. Smith/ Mrs. Jones/Ms. Jones] is asked to make a choice between two money amounts.

Endif

Else, Display:

Now we ask you the same question but with a different amount for the one-time payment.

What should [Mrs. Smith/Mr. Smith/ Mrs. Jones/Ms. Jones] do?

Endif

The order of the two options shown is randomized once for each respondent. The order remains the same for the EV-Sell and EV-Buy questions shown to a given respondent. The word "payment" in the text below is shown bold if and only if EV-Buy is asked after EV-Sell.

- Receive a Social Security benefit of $[*SSB*-100] per month starting at age 65.
- Receive [her/his] expected Social Security benefit of $[*SSB*] per month and make a one-time payment of $$[*LS_AMT[ROW,j]*] to Social Security at age 65.

If the respondent does not select any option, the respondent is prompted once to answer this question. If the respondent still doesn't give an answer, the variable *j* is set to 5 so that we get skipped out of this loop.

If Respondent selects the option that **does** contain the one-time payment:

Set *ROW*=*ROW*+2^(4-*j*)]

Note: this will increase the size of one-time payment in the next iteration, so it makes this option with the payment less attractive.

Endif

Set *j*=*j*+1

This is the end of the loop for the EV-Buy questions

End of survey instrument for experiment on annuity valuations. The remainder of UAS49 consisted of approximately 24 screens with information and questions about insurance decisions that were collected for a different project.

The Values of the Matrices for the Lump-Sum Amounts

The following tables show lump-sum amounts for three different starting values: low, medium and high, which are randomized as mentioned above.

10,000	**4,000**	**2,000**	**1,000**	**500**	**Row 1**
				1,500	**Row 2**
			3,000	**2,500**	**Row 3**
				3,500	**Row 4**
		7,000	**5,500**	**4,750**	**Row 5**
				6,250	**Row 6**
			8,500	**7,750**	**Row 7**
				9,250	**Row 8**
	30,000	**20,000**	**15,000**	**12,500**	**Row 9**
				17,500	**Row 10**
			25,000	**22,500**	**Row 11**
				27,500	**Row 12**
		60,000	**40,000**	**35,000**	**Row 13**
				50,000	**Row 14**
			100,000	**80,000**	**Row 15**
				200,000	**Row 16**
Col. 1	**Col. 2**	**Col. 3**	**Col. 4**	**Col. 5**	

We put the values of this in the 16x5 matrix *LS_LOW*. The i^{th} row and j^{th} column of this matrix is denoted by *LS_LOW*[*i,j*]

20,000	4,000	2,000	1,000	500	Row 1
				1,500	Row 2
			3,000	2,500	Row 3
				3,500	Row 4
		10,000	7,000	5,500	Row 5
				8,500	Row 6
			15,000	12,500	Row 7
				17,500	Row 8
	60,000	30,000	25,000	22,500	Row 9
				27,500	Row 10
			40,000	35,000	Row 11
				50,000	Row 12
		100,000	80,000	70,000	Row 13
				90,000	Row 14
			200,000	150,000	Row 15
				500,000	Row 16
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	

We put the values of this in the 16x5 matrix *LS_MED*. The i^{th} row and j^{th} column of this matrix is denoted by *LS_MED*[*i,j*]

30,000	10,000	4,000	2,000	1,000	Row 1
				3,000	Row 2
			7,000	5,500	Row 3
				8,500	Row 4
		20,000	15,000	12,500	Row 5
				17,500	Row 6
			25,000	22,500	Row 7
				27,500	Row 8
	60,000	40,000	35,000	32,500	Row 9
				37,500	Row 10
			50,000	45,000	Row 11
				55,000	Row 12
		100,000	80,000	70,000	Row 13
				90,000	Row 14
			200,000	150,000	Row 15
				500,000	Row 16
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	

We put the values of this in the 16x5 matrix *LS_HIGH*. The i^{th} row and j^{th} column of this matrix is denoted by *LS_HIGH*[*i,j*]

Construction of the Cognition Index

The cognition index is the first principal component of the 5 scores of different tests administered at different times in the UAS: one score for financial literacy and four scores for four standard cognition tests.

Financial Literacy

The financial literacy score is calculated by standardizing the number of correct answers to the 14 financial literacy questions in UAS1. These questions are derived from Lusardi and Mitchell (2014). The 14 questions are:

1. Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than $102, exactly $102, less than $102?
    a. More than $102
    b. Exactly $102
    c. Less than $102
    d. I don't know

2. Suppose you had $100 in a savings account and the interest rate was 20% per year and you never withdraw money or interest payments. After 5 years, how much would you have on this account in total?
    a. More than $200
    b. Exactly $200
    c. Less than $200
    d. I don't know

3. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?
    a. More than today
    b. Exactly the same as today
    c. Less than today
    d. I don't know

4. Assume a friend inherits $10,000 today and his sibling inherits $10,000 but 3 years from now. Who is richer today because of the inheritance?
    a. My friend
    b. His sibling
    c. They are equally rich
    d. I don't know

5. Suppose that in the year 2020, your income has doubled and prices of all goods have doubled too. In 2020, will you be able to buy more, the same or less than today with your income?

a. Buy more than today
b. Buy the same as today
c. Buy less than today
d. I don't know

6. Which of the following statements describes the main function of the stock market?
    a. The stock market helps to predict stock earnings
    b. The stock market results in an increase in the price of stocks
    c. The stock market brings people who want to buy stocks together with those who want to sell stocks
    d. None of the above
    e. I don't know

7. Which of the following statements is correct?
    a. Once one invests in a mutual fund, one cannot withdraw money in the first year
    b. Mutual funds can invest in several assets, for example invest in both stocks and bonds
    c. Mutual funds pay a guaranteed rate of return which depends on their past performance
    d. None of the above
    e. I don't know

8. If the interest rates (rise/fall), what should happen to bond prices? **Respondents are randomly selected to be asked about rise or fall.*
    a. They should rise
    b. They should fall
    c. They should stay the same
    d. I don't know

9. Do you think the following statement is true? Buying a (single company stock/stock mutual fund) usually provides a safer return than a (single company/stock mutual fund). **Respondents are randomly selected to be asked about single company or stock market mutual fund.*
    a. True
    b. False
    c. Don't know

10. Do you think that the following statement is true or false? (Stocks/bonds) are normally riskier than (stocks/bonds). **Respondents are randomly selected to be asked about stocks or bonds.*
    a. True
    b. False
    c. Don't know

11. Considering a long period (for example 10 or 20 years), what normally gives the highest return?

a. Savings accounts
b. Bonds
c. Stocks
d. I don't know

12. Normally, which asset described below displays the highest fluctuations over time: savings accounts, bonds or stocks?
    a. Savings accounts
    b. Bonds
    c. Stocks
    d. I don't know

13. When an investor spreads his or her money among different assets, does the risk of losing a lot of money increase, decrease, or stay the same?
    a. Increase
    b. Decrease
    c. Stay the same
    d. I don't know

14. Is the following statement true? Housing prices in the US can never go down.
    a. True
    b. False
    c. I don't know

Numeracy

Numeracy consists of 8 items taken from Weller et al. (2013). The test scores for this sub-test were derived within the UAS using a two-parameter logistic Item Response Theory (IRT) model. The test was administered in UAS1. The resulting score is standardized.

1. Imagine that we roll a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up as an even number?

   [Slider from 0 to 1,000]

2. In the BIG BUCKS LOTTERY, the chances of winning a $10.00 prize are 1%. What is your best guess about how many people would win a $10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS?

   [Slider from 0 to 1,000]

3. In the ACME PUBLISHING SWEEPSTAKES, the chance of winning a car is 1 in 1,000. What percent of tickets of ACME PUBLISHING SWEEPSTAKES win a car?

   [Slider from 0 to 100]

4. If the chance of getting a disease is 10%, how many people would be expected to get the disease out of 1,000?

   [Slider from 0 to 1,000]

5. If the chance of getting a disease if 20 out of 100, this would be the same as having how much of a percent chance of getting the disease?

   [Slider from 0 to 100]

6. Suppose you have a close friend who has a lump in her breast and must have a mammogram. Of 100 women like her, 10 of them actually have a malignant tumor and 90 of them do not. Of the 10 women who actually have a tumor, the mammogram indicates correctly that 9 of them have a tumor and indicates incorrectly that 1 of them does not have a tumor. OF the 90 women who do not have a tumor, the mammogram indicates correctly that 80 of them do not have a tumor and indicates incorrectly that 10 of them do have a tumor. The table below summarizes all of this information.

	Tested positive	Tested negative	Totals
Actually has a tumor	9	1	10
Does not have a tumor	10	80	90
Totals	19	81	100

   Imagine that your friend tests positive (as if she had a tumor), what is the likelihood that she actually has a tumor?

   [Randomized between: (i) Answer box accepting numerics with decimals and (ii) answer box accepting answers in the format "<number> out of < number>"]

7. A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?

   [Answer box accepting numerics with decimals]

8. In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

   [Answer box accepting numerics with decimals]

Number Series, Picture Vocabulary and Verbal Analogies

Each of the three sub-tests – number series, picture vocabulary and verbal analogies – were taken from the Woodcock-Johnson Tests of Cognitive Abilities (Mather and Jaffe, 2016). Each measure consisted of 15 items, which were scored as either correct or incorrect. The number-series test was administered in UAS42, the picture-vocabulary test in UAS43, and the verbal-analogies test in UAS44.

The test scores for each of these three sub-tests were derived within the UAS using a two-parameter logistic Item Response Theory (IRT) model. The resulting scores are standardized.

Due to copyright, we are unable to reprint the specific questions here.

References

Lusardi, Annamaria, and Olivia S. Mitchell. 2014. "The Economic Importance of Financial Literacy: Theory and Evidence." *Journal of Economic Literature* 52(1): 5–44.

Mather, N, Jaffe, L.E. (2016). Woodcock-Johnson IV: Reports, Recommendations, and Strategies. Jossey-Bass: Hoboken, NJ.

Weller, J. S., Dieckman, N. F., Tusler, M., Mertz, C. K., Burns, W. J., and E. Peters. (2013). "Development and Testing of an Abbreviated Numeracy Scale: A Rasch Analysis Approach." *Journal of Behavioral Decision-Making* 26: 198–212.