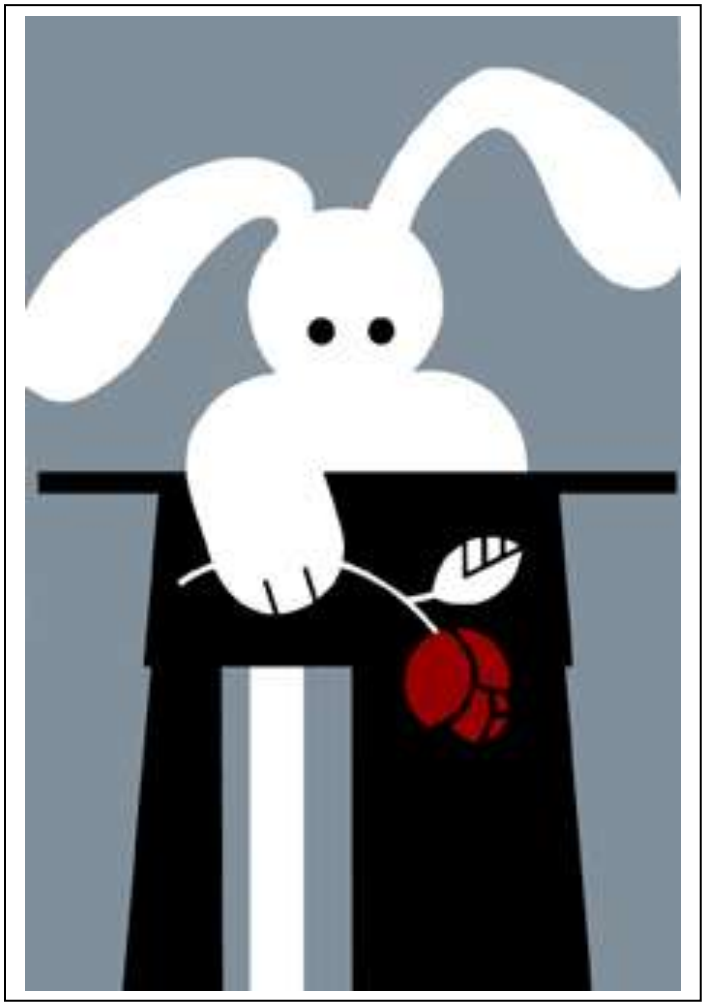
Fraction Magic

6-Session Class

Instructor Manual

(If you are in a shorter class, we won't have time to cover all of the enclosed tricks, so some will be extras for you.)



3 Rules of Magic

- Never reveal a secret.
- Don't repeat a trick before the same audience
- Practice. A mirror is good, so you can see how it looks to the audience.

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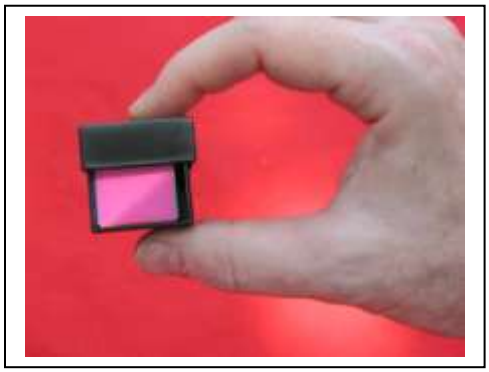
Fraction Vision Box

Effect: Show a box in which there is a cube with a different fraction on each side. While your back is turned, spectator is asked to put the cube in the box so that a fraction of his choice is on top. Then close the lid. You put the box behind your back, shaking the box, then hold it up to your ear to *hear* the fraction. You put the box back behind your back and correctly announce the chosen fraction!

Props: Number vision box, cube, and several black and a couple white sharpees.

Preparation: With the sharpees write a different fraction on each side of the cube. Use the black sharpee for all sides except black—use the white sharpee there.

Secret: Behind your back, you remove the lid and put it on a different side of the box. (See diagram.) When you shake it by your ear, you see the chosen fraction, though to the audience, nothing appears awry. When you put the box back behind your back, close up the lid, so all will be normal when you bring it back out.



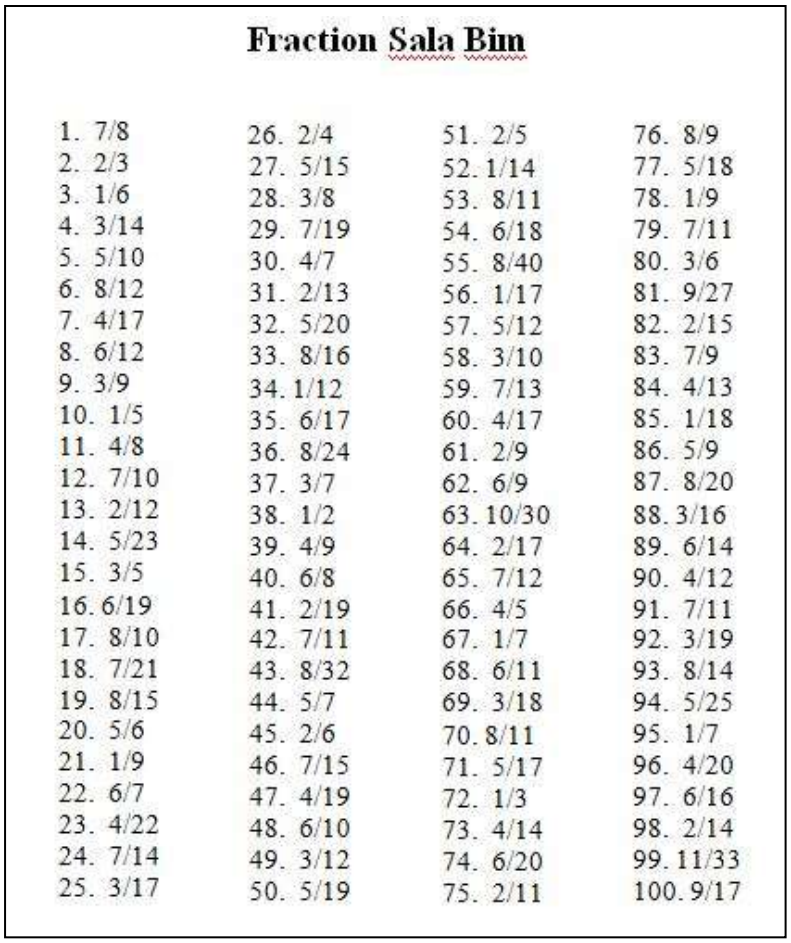
Presentation: "Inside this box is a cube with 6 different fractions. I'm going to turn around. Would you select 1 of the fractions, show it to the audience, put the cube in the box so your fraction is facing up, then put the lid on the box. Let me know when you are done. (Take the box from spectator. Start shaking it as you put it behind your back & move the lid to a different side.) Did you know that different fractions have different sounds? I have a very well developed sense of hearing. I'm going to listen to the box. (Put it by your ear, glancing casually at the fraction.) Ah ha, very interesting. (Put it back behind your back & put the lid back on the normal side.) Was it…3/4 (name the fraction you saw)? Thank you.

Tips:

- When bringing the box out from behind your back to glimpse the fraction, pass it in front of your eyes en route to your ear, so you'll easily see it. (I.e. if box is in your right hand, pass it front of your eyes and shake it in your left ear.)
- Be sure as you bring it behind your back not to flash the fraction visible on the cube.
- You can repeat this trick.

Fraction Sala Bim

Effect: You show a sheet with lots of different fractions. You point out several, then set the sheet down. You ask a spectator to pick any 2 digit number; add the digits together and subtract their total from his original number. (E.g. if he picks 43, 4+3=7. 43-7=36) You jot a prediction. The spectator notes the fraction beside his number (36 in our example)—8/24. You show your prediction: .333! You can repeat the trick with spectator choosing a different number and fraction.



Fraction Sala Bim

1. 7/8	26. 2/4	51. 2/5	76. 8/9
2. 2/3	27. 5/15	52. 1/14	77. 5/18
3. 1/6	28. 3/8	53. 8/11	78. 1/9
4. 3/14	29. 7/19	54. 6/18	79. 7/11
5. 5/10	30. 4/7	55. 8/40	80. 3/6
6. 8/12	31. 2/13	56. 1/17	81. 9/27
7. 4/17	32. 5/20	57. 5/12	82. 2/15
8. 6/12	33. 8/16	58. 3/10	83. 7/9
9. 3/9	34. 1/12	59. 7/13	84. 4/13
10. 1/5	35. 6/17	60. 4/17	85. 1/18
11. 4/8	36. 8/24	61. 2/9	86. 5/9
12. 7/10	37. 3/7	62. 6/9	87. 8/20
13. 2/12	38. 1/2	63. 10/30	88. 3/16
14. 5/23	39. 4/9	64. 2/17	89. 6/14
15. 3/5	40. 6/8	65. 7/12	90. 4/12
16. 6/19	41. 2/19	66. 4/5	91. 7/11
17. 8/10	42. 7/11	67. 1/7	92. 3/19
18. 7/21	43. 8/32	68. 6/11	93. 8/14
19. 8/15	44. 5/7	69. 3/18	94. 5/25
20. 5/6	45. 2/6	70. 8/11	95. 1/7
21. 1/9	46. 7/15	71. 5/17	96. 4/20
22. 6/7	47. 4/19	72. 1/3	97. 6/16
23. 4/22	48. 6/10	73. 4/14	98. 2/14
24. 7/14	49. 3/12	74. 6/20	99. 11/33
25. 3/17	50. 5/19	75. 2/11	100. 9/17

Props: For each child: Fraction Sala Bim sheet, pad of paper, pen. For show: Larger (~11x17) laminated version.

Secret: There are many different fractions on the page, but each multiple of 9 has the same value (.333, which is what you predict)! When you do the above math calculation, you always wind up with a multiple of 9. So you know which value will be chosen! On the back of the page is an identical set of numbers and symbols, except that there is a different value on the multiples of 9 (.5). So if you casually turn the sheet over, the trick can be repeated with spectator choosing a different fraction.

Presentation: "What do you like to do in your spare time? In my spare time, I like to study fractions. I have a chart here with a bunch of them—7/8, 2/3, 1/6,… We're going to use this chart in a moment, but first I'm going to jot a prediction on this slip of paper (do so—jot .333).

I'd like you to name any 2 digit number. (e.g. 47. Jot it on your paper or the board.) OK, 47. When we add the digits together we get 11, right? (Jot 11 beneath 47.) Let's subtract these two to arrive at a final number. 47-11=36.

Would you look on the chart and say out loud what fraction is at—what number did we wind up at—36? (Spectator says e.g. 8/24) 8/24? You picked 8/24? No one has ever picked that fraction before…Fortunately (unfold you prediction and show it) that is what I predicted!"

If you like, start to take the fraction sheet away, then, as an afterthought, say that maybe you were lucky. Would they like to try it again? (yes) Put sheet back up, having subtly turned it around. Repeat the above.

Math Learning: 1) Learn a variety of fractions. 2) Adding (the 2 digits in a 2-digit number.) 3) Subtracting.

Mr. Wizard

Effect: Tell a spectator that you have a friend, Mr. Wizard, who knows all. Ask the spectator to name any fraction. But, you explain, don't say, for instance, 87/123. Let's keep it simply and use single digit numbers. E.g. you can say ½, 3/4, 5/9, etc. Spectator names a fraction. You get Mr. Wizard on the phone, hand the phone to the spectator, and Mr. Wizard tells the spectator her fraction!

Props: A telephone.

Secret: Arrange with a friend for him (or her) to play Mr. (or Ms.) Wizard. When he answers the phone, you start "Hello, is Mr. Wizard in?" This cues him that he should play Mr. Wizard, and he starts counting '1… 2… 3… 4…' When he gets to the number of the numerator, you interrupt, saying to the audience, "He says he knew I was going to call!" He then starts counting again, '1… 2… 3… 4…' When he gets to the number of the denominator, break in "We have someone who would like to know their card." Mr. Wizard then confirms '4/7' (or whatever the fraction is). You hand the phone to the spectator. If you have an audience and it's possible, put it on speaker phone at this point. Mr. Wizard reveals the fraction!

The 6 Fraction Swami (extra)

Effect: You introduce your assistant, who has great mental powers. You show 6 slips of paper, each with a different fraction written on it. You send your assistant out of the room, and ask someone to touch any of 6 fractions that you have lined up on the table, so everyone knows the selection. You call your assistant back in and after some concentration, she reveals the chosen fraction!

Props: Pad of paper, pen.

Secret: The number of words you use to call Swami back in clues her as to the item. E.g. "Ready!" means the 1st fraction. "Come in!" means fraction #2. "We are ready, come back in" denotes fraction #6… Agree with Swami in advance on which end you count from. Having Swami concentrate, look at the spectator, put hands over the items, etc. adds to the fun!

Math Learning: Counting, fraction familiarity.

Rapid Calculation Tricks - Fractions

Materials: For each child: 1) 12 4x6 note cards 2) a pen or sharpee. 3) Lightning Calculation-Fractions worksheet.

#1 Dividing by 5

What is 12÷5? Answer: 2.4.
What is 134÷5? Answer: 26.8
How do you arrive at these quickly?

With division, you can multiply both sides of the equation by the same number, and the answer is unchanged. Let's do this to make the problem easier by multiplying both sides by 2.

12÷5 = 24÷10. This is a much easier problem with the same answer. Just move the decimal on 24.0 1 space to the left to get 2.4

134÷5 = 268÷10 = 26.8

Try the practice problems on the worksheet.

#2 Dividing by 9 (x÷9 where x<9)

What is 2/9? .2222
X divided by 9 (where X < 9) is X repeated.

For 2-digit numbers, the same is true if you divide by 99.
43/99=? .434343

For 3 digit numbers, same divided by 999.
563÷999=.563563

Instructor note: When the last digit >5, it gets rounded up at the end. e.g. 6÷9=.66666… Rounded, this is .6667
Try the practice problems on the worksheet.

#3 Dividing by a decimal ending in .5

What is 12x3.5?
Double the decimal and halve the other number. The answer is the same, but it's easier to solve. 6x7=42.
Another example: 14 x 4.5=? 7x9=63.

#4 Dividing by 9 (x÷9 where x>9)

Can you solve this problem: $9\overline{)123}$

- Put the 1st digit in the dividend, in this case, 1, atop the line. $\begin{array}{r}1\\ 9\overline{)123}\end{array}$
- Add the 1 above the line to the next digit in the dividend, 2. 1+2=3. Put 3 above the line. $\begin{array}{r}13\\ 9\overline{)123}\end{array}$
- Repeat. 3 (above the line) + 3 (next digit in dividend) =6. Put 6 above the line. Since it's above the last digit in the dividend, it is the remainder. So the answer is: 13 remainder 6, or 13 6/9.

Another example:

$9\overline{)2222}$ = ? 1) $\begin{array}{r}2\\ 9\overline{)2222}\end{array}$ 2) $\begin{array}{r}24\\ 9\overline{)2222}\end{array}$ 3) $\begin{array}{r}246\\ 9\overline{)2222}\end{array}$ 4) $\begin{array}{r}246\text{ r}8\\ 9\overline{)2222}\end{array}$ = 246 8/9

Try the practice problems on the worksheet.

Rapid Calculation - Fractions Worksheet

Part 1, Dividing by 5

8 ÷ 5 = _____ 14 ÷ 5 = _____ 17 ÷ 5 = _____ 22 ÷ 5 = _____ 63 ÷ 5 = _____

86 ÷ 5 = _____ 113 ÷ 5 = _____ 231 ÷ 5 = _____ 473 ÷ 5 = _____ 834 ÷ 5 = _____

Part 2, Dividing by 9 (x÷9, x<9**)**

3 ÷ 9 = _____ 4 ÷ 9 = _____ 17 ÷ 99 = _____ 25 ÷ 99 = _____ 39 ÷ 99 = _____

48 ÷ 99 = _____ 102 ÷ 999 = _____ 281 ÷ 999 = _____ 340 ÷ 999 = _____ 476÷999=_____

Part 3, Multiplying by _.5

8 x 3.5 =_____ 6 x 4.5 =_____ 4 x 8.5 =_____ 18 x 2.5 =_____ 12 x 5.5 =_____

8 x 6.5 = _____ 6 x 10.5 = _____ 32 x 12.5 = _____ 6 x 17.5 = _____ 20x37.5=_____

Part 4, Dividing by 9 (x÷9, x>9**)**

13 ÷ 9 = _____ 35 ÷ 9 = _____ 61 ÷ 9 = _____ 152 ÷ 9 = _____ 321 ÷ 9 = _____

403 ÷ 9 = _____ 800 ÷ 9 = _____ 1111 ÷ 9 = _____ 3210 ÷ 9 = _____ 4301 ÷ 9 = _____

ANSWERS - Rapid Calculation-Fractions Worksheet

Part 1, Dividing by 5

8 ÷ 5 = 1.6	14 ÷ 5 = 2.8	17 ÷ 5 = 3.4	22 ÷ 5 = 4.4	63 ÷ 5 = 12.6
86 ÷ 5 = 17.2	113 ÷ 5 = 22.6	231 ÷ 5 = 46.2	473 ÷ 5 = 94.6	834 ÷ 5 =166.8

Part 2, Dividing by 9 (x÷9, x<9**)**

3 ÷ 9 = .3333	4 ÷ 9 = .4444	17 ÷ 99 =.171717	25 ÷ 99 =.252525	39 ÷ 99 = .393939
48 ÷ 99 = .484848	102 ÷ 999 = .102102	281 ÷ 999 = .281281	340 ÷ 999 = .340340	476÷999=.476476

Part 3, Multiplying by _.5

8 x 3.5 =28	6 x 4.5 =27	4 x 8.5 =34	18 x 2.5 =45	12 x 5.5 =66
8 x 6.5 = 52	6 x 10.5 = 63	32 x 12.5 = 400	6 x 17.5 = 105	20x37.5=750

Part 4, Dividing by 9 (x÷9, x>9**)**

13 ÷ 9 = 1 4/9	35 ÷ 9 = 3 8/9	61 ÷ 9 = 6 7/9	152 ÷ 9 = 16 8/9	321 ÷ 9 =35 6/9
403 ÷ 9 = 44 7/9	800 ÷ 9 = 88 8/9	1111 ÷ 9 = 123 4/9	3210 ÷ 9 = 356 6/9	4301 ÷ 9 = 477 8/9

Rattlesnake Eggs

Effect: You show an envelope that has the secret to how you are able to do fraction calculations so quickly in your head. You put "Rattlesnake Eggs" on the outside just to scare people, so they don't look in and learn your secrets. You don't think there are really rattlesnake eggs in there, do you?" You hand the envelope to the spectator. She opens it up and is startled when it rattles!

Props: Rattlesnake envelope with rubber band & washer attached to U-shaped paper clip.

Preparation: Wind the washer a bunch of times until the rubber band is fairly taut. Slide the contraption (rubber band with washer on a paper clip) into the envelope.

Tip: If necessary, egg the spectator on to open the envelope.

The Queen Knows

Effect: You have a spectator select a card, show it around, and put it back in the deck. You spread the deck and 1 card is face up in the middle. His? No. But wait, the face up card is a queen. She whispers to you that the chosen card is 6 ¾ cards down. "6 ¾?" you ask. She must be mistaken. You count down 1-2-3-4-5-6 cards. The next one has the corner—about ¼ of the card—torn off, making it a ¾ card! The one after it is the selected card!

Props: Deck of cards.

Preparation: Tear the corner off of a joker. The corner you tear off should be approximately ¼ of the card.

Secret/Mechanics:

1. Start with a stack of 8 cards on the bottom of the deck as follows: A face up queen (on top of the stack), any 6 cards face down, then the ¾ card joker face down on the bottom.
2. Spread the deck face down between your hands, inviting spectator to select a card. Don't spread so far down that he sees the face up queen.
3. Have spectator show the card to the audience. Square up the deck, holding it face down.
4. Have spectator put his card back on top. Cut the deck, burying it in the middle. This puts your secret bottom stack right on top of his card!
5. Spread through the cards in your hands, coming to the face up queen. Ask if that is his card? He says no, thinking you messed up!
6. "Wait a minute", you say. Close up the half of the deck with the queen on top. If you like, you can also close up the top half of the deck above the queen. Hold the queen to your ear. She says that his card is 6 ¾ cards down. Act like you think this must be a mistake. "The queen gets a little confused sometimes", you explain.
7. Count down 1-2-3-4-5-6 cards. Then you come to the ¾ card, which you count as ¾. Ask the spectator what was his card? He names it. Turn over the next card, showing his card.

Notes:

- Why ask spectator to name his card, then turn it over? Can you, alternately, turn over the card and ask spectator if it was his? The first way is better. It builds better to a dramatic climax. The second way, the climax is asking the spectator if it was his card. He could mess with you and say no. Or he could take a moment before answering. These deteriorate the climax. The first way is more sure fire.

Math Learning: Familiarizes with fractions.

Half Baked Prediction (torn card prediction)

Effect: Spectator selects a card. You pull a card partially out of an envelope, asking if this is her card. Your card is seen to be, e.g. the 10♦. Spectator says no. "What was your card?", you ask. Spectator says the 5♦. You pull the card fully out of the envelope and it is seen to be only a half card. It does have 5 diamonds!

Props: A deck of cards and an envelope for each child, plus 1 extra deck from which to give each child a prediction card.

Secret: While the spectator thinks he has a free selection, you actually force him to choose the 5 ♦. Before you start, place the 5 ♦ so it is the 10th card from the top.

Logistics: For the revelation card, you can use the 2,4,6,8 or 10 of any suit. The card you force will be half of the same suit. So there are 20 cards in the deck you can use, each torn in half, yielding potentially 40 half cards (prediction cards) from a single deck. Students will have different prediction cards and corresponding force cards. When you are done using the extra deck from all your classes, discard it.

Presentation: Before the trick begins, have your half prediction card in an envelope nearby. Invite a spectator up from the audience. Have him come around to the same side of the table as you, facing the audience.

"Have you ever selected a card mathematically before?" (No) Good, this will be a new experience. Can you name any number between 10-20. (e.g. 15) Any particular reason you chose that one? Would you deal (from the top of the deck) that # of cards into a (face down) pile.

Now, just for fun, I'd like you to add the digits of the number you selected together. (e.g. 15: 1+5=6) What do you come up with ? (6) Good. Would you pick up the pile you just dealt and deal 6 (or whatever the digit total) cards onto my hand. Would you take the top card of the pile. Show it around to the audience, don't let me see it. (Reassemble the rest of the deck while he shows it.) Have you ever thought of becoming a mathematician?

Before all of this began, I placed a prediction card in this envelope. (Slide card out as far as you can without revealing it's torn in half.) Was this your card? (No) It wasn't? What was your card? (5♦) The 5♦? That's what I have! (Pull card all the way out of the envelope, showing it only has 5 diamonds!)

Teaching Points:

- Ask the students what is half of 2? 4? 6? 8? 10? Teach them what half of these is.
- Act like you messed up. Then you show that you really did get it right.
- Note: The force doesn't work with 20. So ask for a number must be "BETWEEN 10-19".

Math Learning: 1) Half of 2-10 even. 2) Practice adding various 1 digit numbers in the math force.

Card Prediction

Effect: Magician places a prediction card face down on the table. Spectator selects a card. Magician declares that whatever the card is, the magician's card will be ½. Spectator says that half would be the 3.5 of clubs—which is what the magician turns over!

Props: 3.5 of clubs, deck of cards.

Secret/Preparation: While spectator thinks that have a free selection, magician actually forces the 7 of clubs. Before you start, place the 7 of clubs as the 10th card from the top.

Presentation: Have the 3.5 of clubs face down on the table, off to the side. Invite a spectator up from the audience. Have him come around to the same side of the table as you, facing the audience. Ask him to name any number from 10-20, then deal (from the top of the deck) that # of cards into a (face down) pile.

Then ask spectator to pick up the pile he just dealt, add the digits of his number, & deal that many. E.g. if spectator picks 15, he deals 15 in a pile. Then from that pile, he deals 6 cards (1+5) onto the table. The last card (the 6th one in this example) is his card—have him set it aside on the table and reassemble the rest of the deck. Pick up the 3.5 of clubs (don't let them see its face, of course). "I have taken the liberty of making a prediction. This (hold up 3.5 of clubs, back facing audience & spectator) is my prediction card. Whatever card you picked, mine will be half. For example, if you have the 2 of hearts, mine will be the ace of hearts. If you picked the 10 of spades, mine will be the 5 of spades. Would you look at your card and tell me—when you divide it by 2, what do you get? (3.5 of clubs) This is no time for jokes. I am trying to conduct a performance. The card that you're holding, what do you get when you divide it by 2? (3.5) May we see the card please. (He shows it's the 7 of clubs. Pick up the deck and spread through the cards face up, looking through it.) I must have given you the wrong card. Shall we start over from the beginning?

Would you turn over the card, let's see how close I was. (Hold up the 3.5 of clubs so everyone can see it.) Thank you. Let's give our assistant a round of applause.

Teaching Points:

- If they don't know how to divide 7 by 2, have them show it to the audience and get help. You might also act like you think it's a picture card and say, "if it's a queen, that's worth 12, so the queen divided by 2 is 6".
- Act like you messed up. Then you show that you really did get it right.

Teaching Math with This:
Spectator deals any number of cards from 10-20.

10	1+0=? (1)	10-1=? (9)
11	1+1=? (2)	11-2=? (9)
15	1+5=? (6)	15-6=? (9)

The point: Many different equations = the same number. No matter how many cards the spectator deals, it always = your card!

Question: These equations = 9. Why is it the 10th card, not the 9th? Answer: When you deal the 2nd pile, you start counting with the first card, which, in effect, gets double counted. If you dealt 10 cards on the table in a row, then started on the last card and counted 1 as the next card, it would be 9th from the top.

Fraction Answer Bag (Art Trick)

Effect: You show a bag that has magical properties. You put in a slip of paper with a fraction. You shake up the bag, dump out the slip of paper, and the fraction has changed to the correct decimal expression!

Props: For each student: 2 paper lunch bags, pad of paper, pen or pencil to use. For group: kids scissors.

Secret: Though it looks like you have an ordinary lunch bag, there is a 2nd bag nested inside, creating 2 compartments: the inside (the middle of the inner bag), and the outside (area between the 2 bags). The slip with the decimal is folded and placed in the section between the 2 bags. The slip with the fraction is dropped in the middle. You switch slips.

Preparation: Cut ~1/2 inch off the top of 1 of the bags. Carefully slide it into the other bag, aligned the same way as the other bag (e.g. bottoms are lined up). In big letters write the decimal expression of whatever fraction you are going to use on a slip of paper. Fold it in half and drop it between the 2 bags (in what we'll call the outer compartment).

Mechanics:

- Set the bag on the table, bottom of the bag facing the audience, top of it away from audience.
- Jot a fraction on a slip of paper, fold the slip in half, and drop it in the inner compartment (middle of inside bag).
- Close up the bag and shake it. Have the audience say some magic words—e.g. mathemagic. Open the bag, turn it upside down and dump out the slip (decimal) on the table. How to make sure the decimal slip (only) falls out? As you open the bag, pull the inner bag (with the fraction on its slip) closed—so before you turn the bag upside down to dump out the slip, you are holding the top edge of the side toward you, along with the 2 top edges of the inner bag. This prevents the inner bag's contents from spilling out and opens the outer compartment so its slip can fall out.
- After the slip dumps on the table, put the bag away in your case, or set it bottom toward the audience. Note that the audience never sees the inside of the bag (you don't want them to see the nested bag inside).

Folding a Bill in Fourths

Effect: You show a dollar bill and fold it into fourths. "Do you know what you get when you fold a bill into fourths?", you ask. "A quarter!" As you say this, a quarter slides out from the folded bill onto your palm!

Props: A play $1 bill and a play quarter. (You can substitute real money at home if you wish.)

Secret: When you show the dollar bill, the quarter is hidden behind the bill in the upper right corner.

Mechanics:

1. Before you begin, put the quarter secretly behind the bill. Your thumb and first finger hold the bill in the corner. The quarter is held against the bill by your thumb.

2. Show the bill. Hold it by the upper corners.

3. Fold the bill in half, putting the coin in the middle of the bill.

4. Fold the bill in half again, so it is now in 1/4s.

5. Ask a spectator if they know what you get when you fold a bill in quarters. "A quarter!" you say, as you slide the quarter out onto your palm!

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Coins in the Envelope Prediction

Effect: You have a spectator think of a number and perform some numerical calculations, arriving at a final number. Whatever the final number is, the spectator should divide it by 2, and that, you state, is the amount of money in your envelope. E.g. if the spectator arrived at 10, you'll have 5 cents. If she has 8, you'll have 4 cents. She says that when she divides her number by 2, she gets 2 ½. You think she's joking, but she is not! You open your envelope and, sure enough, you have 2 pennies and half a penny!

Secret: The spectator always arrives at 5 which, divided by 2, is 2 ½.

Props: For each child: 2 pennies, a half penny, a 6.75 size white envelope, & a 2"x4" label with the below steps.

Mechanics:

1. Think of any number 1-10.
2. Double it.
3. Add 10.
4. Divide by 2.
5. Subtract the number you started with. (They will always be at 5 now.)
6. Divide by 2.

Preparation: Put the sticker on the envelope so you can remember the steps, if you need to refer to it. Put 2.5 cents inside the envelope.

Presentation:
"I have some money in my envelope. (Show envelope. You can read the steps from the envelope label.) I'm going to try a prediction. Can you think of a number 1-10, don't tell me what it is. Do you have one? (yes) Double it. Add 10. Divide it by 2. Subtract the number you started with. You are left with a final number, right? Whatever number you have, we'll divide it by 2 and that is how many cents I have in this envelope. In other words, if your final number is 10, I will have 5 cents. If it is 6, I will have 3 cents. Whatever number you are thinking of, divided by 2, I will have that many cents. When you divide your number by 2, what do you come up with? (2.5) Seriously, this is no time for jokes. The final number that you arrived at, divided by 2, what do you get? (2.5) 2.5? (yes) (Dump out the envelope contents, showing 2.5 cents.) You had me a little worried there for a moment!"

Notes:

- If performing for a group, have the spectator jot her calculations on a paper or blackboard, so everyone can follow along.
- Why does this work? Can they derive the algebra behind it and see why it works?
  $((2x+10)/2)-x = 5$
  $(x+5-x) = 5.$
  5=5. The point: x can be anything and you still get 5.

What If…
If you add 14 instead of 10, what would the final number be? Answer: 7. However much you add, the final number is half of that. So if you have them add 14, you can end with 3.5 cents.

Math Learning: Multiplication, division, algebraic derivation, fractions.

Knowledge Not Slipping Through Your Fingers

Effect: You show a note card containing important math info. You tell a spectator that you're going to hand her this info—she won't let it slip through her fingers, will she? No, she says.

You demo how when you drop it through your outstretched fingers, you catch it. Yet when you drop the note card through her outstretched fingers, she cannot catch it!

Props: a 3x5 note card for each student

Secret: It is not as easy as it seems to grab the note card. The spectator doesn't know when the magician will drop it, and when she realizes that he has, reaction time is not usually fast enough to grab the note card before it has slipped through her fingers!

Preparation: Each student writes on their note card 3 or so key points re fractions that they use in their tricks or work with fractions. For instance: 1/8 = .125, 3/8 = .375, 5/8=.625

Mechanics: First, the magician demonstrates it with his hands. He shows the starting position, drops the note card, and catches it. (It's easy for you to catch it because you know when you are dropping it!) Then, have spectator do it. Usually they will not be able to catch it!

Photo below shown using a dollar bill, which you can also use.

Folding a Paper in Half

Note: This is a good opening attention-grabber. It's interactive, gets them involved, and it's quick.

Effect: You ask students how many times they think they can fold a sheet of paper in half? I.e. the fold it in half, then in half again, then in half again, etc. Tell them that if anyone can fold it in half more than 9 times, you will give them a big prize. They try, and think they can do it, but they can't fold a paper in half more than, in most cases, 7x—certainly not more than 9x.

Props: Piece of paper for each student. (8.5x11 is good. Any size works.)

Secret/Teaching This: Why can't you fold a paper in half more than 9x? Draw a table like the 1st diagram below. Let the students tell you the answer for column 2. Diagram #2 has the answers when you keep doubling. Why can't you fold a paper in half 7, 8, or 9x? Because you are folding 128, 256, and 512 thicknesses of paper. When you try to fold more than 9x, you are folding over 1000 thicknesses of paper—which is virtually impossible!

Fraction Adaptation: After asking how many times they think they can fold the paper in half, ask what they'd be folding it into at that number—quarters, eighths, sixteenths,… Ask them as they fold to say out loud what they're folding it into—halves, quarters, eighths,… Or perhaps do this yourself as you demo it in front of everyone. In saying these, they are saying fractions. This also tells why it's impossible to fold it more times—because at 7 and 8 folds, you are folding 128 and 256 thicknesses of paper—quite a lot!

Math Learning: Students learn to keep doubling numbers, and how quickly numbers add up when you keep doubling—much faster than you'd think!

After Fold #	# of thicknesses
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

After Fold #	# of thicknesses
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024

Will The (Fraction) Cards Match?

Effect: On a slip of paper, you jot a fraction at one end and its decimal equivalent on the other end (see diagram 1). Repeat this on 4 more slips of paper, putting a different value fraction (and decimal) on each. A spectator shuffles the slips. You tear the stack in half, then turns 1 of the halves upside down. You state, "The question is: Will the cards match?" Spectator points to a pile (either the face up or face down one). You pick it up and spell the 1st word in the question, "Will". As you say each letter, you move 1 slip from top to bottom. When you get to the end of the word, take the top 2 slips from each pile and set them down on the table next to each other. You then repeat this procedure for each word, until you have 5 pairs of slips, each with 1 face up & a face down slip (see diagram #2). Spectator then turns over each face down slip and all the pairs match!

Diagram #1

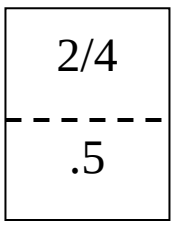


Diagram #2

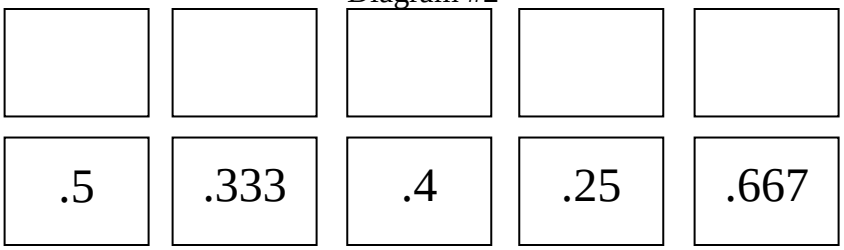
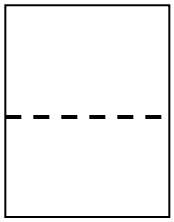


Diagram #3



Props: 5 slips of paper, notepad size, and a pen or pencil.

Secret: The trick works itself if you follow the steps.

Mechanics:

1. On each slip, jot a different fraction on 1 end (e.g. 2/4) & its decimal value on the other (e.g. .5).
2. Let spectator mix them up.
3. Square up the pile and tear the pile (all 5 slips) in half. (See diagram #3.)
4. Turn 1 of the halves face down.
5. Ask spectator to pick either pile. Pick that pile up and spell the first word in "will the cards match", "will". For each letter, move 1 slip from the top to the bottom. Then take the top slip from each pile and set them side by side on the table.
6. Repeat step 5 for each of the other words, "the cards match". You'll be left with 2 slips—1 from each pile, which go together without having to spell anything.
7. Turn over the face down slip in each pair and all pairs should match—i.e. fraction = decimal value.

Tips:

- Write the numbers big, so they are visible, but don't go near the center line of the slip.
- Each fraction you write should have a different decimal value. E.g. don't put 2/4 and 3/6.

Note: You don't have to use "Will the Cards Match". Create your own phrase—just follow the guidelines below re # of letters in each word for it to work.

5 slips, 4 words		
Word #	# of letters	Example
1	4 or 9	Will
2	3, 7, or 11	The
3	2, 5, 8, or 11	Cards
4	1,3,5,7,9 or 11	Match

4 slips, 3 words		
Word #	# of letters	Example
1	3, 7, or 11	Can
2	2, 5, 8, or 11	It
3	1,3,5,7,9 or 11	Match

6 slips, 5 words		
Word #	# of letters	Example
1	5 or 11	Abrakidabra
2	4 or 9	Will
3	3, 7, or 11	The
4	2, 5, 8, or 11	Cards
5	1,3,5,7,9 or 11	Match

Fractional Mind Reading

Effect: The audience calls out 6-8 different fractions. You jot each on a slip of paper, ball it up, & set the paper balls in a row on the table. You mix up the paper balls and ask a spectator to pick one. Have her concentrate on it as you attempt to read her mind. Was the fraction you are thinking of… 3/8? Yes, she says!

Props: A pad of paper and a pen or pencil.

Secret: You write the same fraction on each slip—the one that is called out first! So if spectators call out: 3/8, 5/12, 102/103, ¼, 7/8, 15/16, and 9/18, you write: 3/8, 3/8, 3/8, 3/8, 3/8, 3/8, and 3/8.

Mechanics: After the spectator chooses a paper ball, put the others away in your case or pocket before reading their mind—so someone doesn't grab them afterward and find out your secret!

Presentation: "I'm going to ask people from the audience to call out their favorite fractions. Call them out 1 at a time & I'll jot them on these slips of paper. (If need be, ask how to spell them—especially if you get an odd one. Comment on the fractions.)

Would you reach in & pick any of these pets (paper balls). Very good. (Dump the others into your case.) Open it up and concentrate on the fraction. Is the fraction that you are thinking of….3/8? (yes) A round of applause for my assistant!"

Notes:

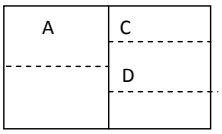
- If they say a longer fraction like 102/103, pretend to write a few more digits. You might even ask, occasionally, "Let's see, that's 1-0-2-/-1-2-3?"
- Do not tell what you're going to do at the beginning, or it could tip them off.
- If you have just 2 in the audience, have each give 2-4 fractions, giving you 4-8 slips.
- Challenge version: Write the first 2 fractions you get over & over, alternating. Put #1s pile on 1 side & #2 balls on the other. Have 2 names selected, 1 from each pile. Mind read twice!

Impossible Paper

Effect: You show a folded sheet of paper sitting on a table. You ask a spectator to take a blank sheet of paper and fold it to replicate your sheet—without touching your sheet. As the spectator tries to do this, he realizes that your folded sheet looks impossible!

Props: Unusual paper sheet for each student, and a kids scissors.

Secret: The instructions are printed on the sheet, which are as follows:



1. Fold this paper in half along this (solid vertical) line, then unfold.
2. With a scissors make 3 cuts along the 3 dotted lines, each cut halfway through the paper.
3. Fold section D so it points up.
4. Rotate A & C 180 degrees (i.e. they swap places). These instructions will now be on the bottom, facing the table, not visible.
5. You've done it! The shape now looks impossible! Ask a spectator to take a blank sheet of paper and fold it so it replicates this. No touching this sheet.

It is amazing that some simple cuts and a fold can make a paper look impossible!

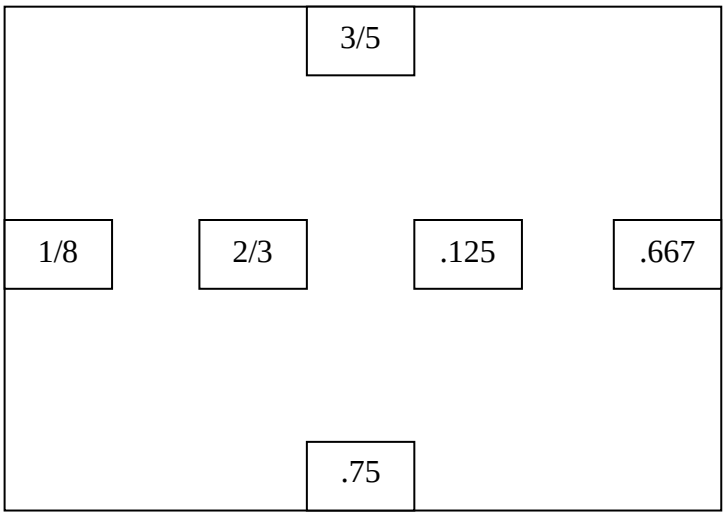
Connecting the Math Boxes (art-camp)

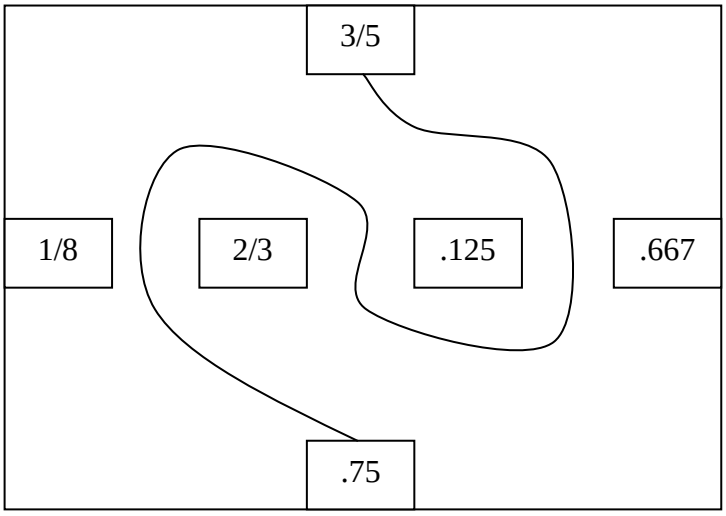
Challenge: In figure 1 below, which answer goes with which problem? Can you draw 3 lines connecting the problem to their correct answer—but the lines cannot cross!

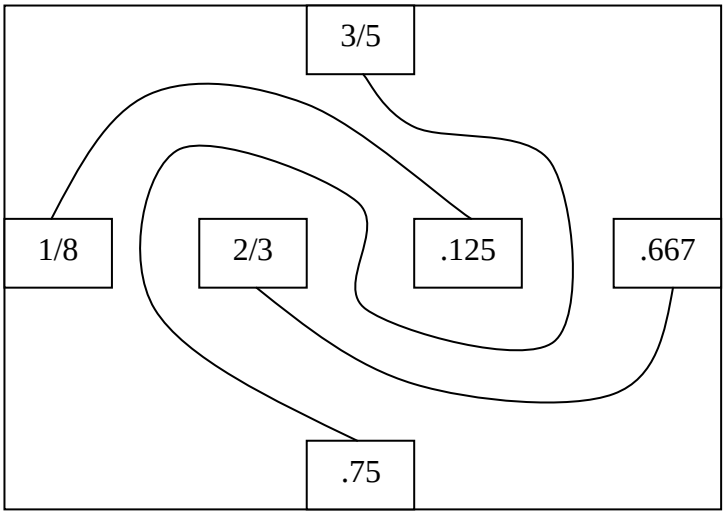
Props: For each child: a Connect the Math Boxes Sheet, and a pen or pencil.

Secret: Let them try it for a while before revealing the secret. As in figure 2 below, connect the top & bottom boxes with a line that winds around as shown. Then, as shown in figure 3, connect the other 2 pair of boxes!

Doing this Activity: The goal is for the kids to be able to write this on their own on a blank sheet, so they can show it. The Connect the Math Boxes Sheet has 4 boxes. After they solve the first one, have them write their own problems & answers in the 2nd box. Make sure they heed which boxes the problem & its respective answer need to be in, otherwise the trick won't work. Finally, have them draw the 6 boxes, problems, & answers themselves in a blank box—showing they can write this puzzle on their own.







Fraction Double Dipper

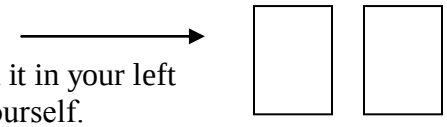
Effect: You show 10 cards, each with a different fraction. You mix them and a spectator cuts the packet. You show them 2 cards to remember (the one they cut to and the next one), put them back, bury them in the middle, and have the spectator cut the cards. You have the spectator deal the cards in to 2 equal face down piles, alternating back & forth. You then look at the cards in each pile, setting out 1 face down card on the table from each pile. These turn out to be the 2 cards the spectator picked!

Props/Prep: Sheet of 10 perforated cards, each with a different fraction, & a rubber band to keep them together. Neatly tear them off so you have a packet of 10 cards.

Secret: 5 of the fraction cards = ½ (i.e. ½, 2/4, 4/8, 5/10, and 8/16). The other 5 do not (1/4, ¾, 2/3, 5/8, 8/10). When you begin, every other card is a ½ value card. When you mix them up, give them single cuts, which does not disturb the order. Note that they still alternate 1/2-other. When you show the spectator the 2 cards she cut to, when you put them back, you subtly reverse their order. Now, instead of all the cards alternating 1/2-other, these 2 in the middle will be the only ones not alternating. I.e. you'll have something like: ½ other ½ other other ½ ½ other ½ other. When the cards are dealt into 2 equal, alternating piles, 1 pile will have all 1/2 & 1 other card, and the other pile, all other & 1 ½ value card. So all you do is find the one in each pile that is different. I.e. pull out the 1/2 card from the other value pile, and the other value card from the 1/2 pile.

Mechanics:

1. Start with the cards alternating ½ - other in a face down packet.
2. Give the cards a few single cuts, supposedly mixing them up.
3. Set packet face down on the table. Ask spectator to cut the cards.
4. Pick up the card she cut to in your right hand, and the one beneath it in your left hand. Show these cards to the audience, but don't look at them yourself.
5. Put them back where you got them. The right hand puts its card beneath the left hand's card. This subtly switches the order of these 2 cards without the audience being aware.
6. Set the top half back on the bottom half, burying the 2 selected cards back in the middle from whence they came.
7. Have the spectator cut the cards and complete the cut (to further mix them a bit).
8. Ask the spectator to "deal the cards back and forth (point with your finger to 2 spots on the table) into 2 equal piles".
9. Pick up the first pile, look at the faces, and pull out the oddball card and set it face down on the table. (i.e. if you have the 1/2 pile, pull the other value card. If you have the other value pile, pull out the lone 1/2 card) Do the same with the 2nd pile. While doing this, you might say something like "Now you could have cut the cards any place you like. Was there any reason that you chose those 2 particular cards?"
10. Ask the spectator which shapes she selected. Turn your 2 over to reveal her 2 cards!



Math Learning: Learning equivalent fractions to 1/2. Familiarity with fractions.

Fraction Telepathy

Effect: You show a packet of 10 cards, each with a different fraction. Spectator shuffles them, and you put the cards behind your back, then bring them out with the face of the packet facing the audience. (Photo #1 shown with animal cards, which could as well be fraction cards.) Even though you don't see the face of the packet, you are repeatedly able to name the fraction on the face of the packet!

Props: Sheet of 10 perforated fraction cards, and a rubber band.

Prep: Neatly tear apart your 10 different fraction cards. Rubber band the packet to keep it together when not using it.

Secret: After the cards are shuffled, put the packet behind your back & reverse the top 3 cards. (Photo #2) Bring out the packet, face toward the audience. The first time is (from the audience's view) the dry run. You explain that you'll show them the card on the face of the packet (it's obvious that you cannot see it) and you'll try to tell what it is. As you explain this, you memorize the shape staring at you atop the packet. (Photo #3)

Put the packet back behind your back. (Careful not to flash the reversed top card on top.) Pull the top card around to the face of the packet, turning it face down. This is the 1 move in the trick, which you'll repeat each round. Bring the packet out from behind your back. Mind read the card facing the audience. Then memorize the one facing you. Do this 3x. Each time, you are one ahead!

Teaching: Have the kids do these moves, all together:

1. First, do the moves with the deck in front of them, so they can see & understand the moves.
    a. Turn top 3 cards of their deck face up (all together).
    b. Turn top card face down & put on bottom of deck.
    c. Repeat two times.
2. Now do all of this behind with cards behind your back.
3. When you can do that, then try the trick with the talking.

Presentation: "What do you do for a hobby? My hobby is collecting fractions. I have ¼, 4/8, ¾, 5/10,… (you say as you show them—a few cards). Would you shuffle the cards. (As spec starts) But don't disturb the order. Just joking. Shuffle them well. I'm going to put the packet behind my back, then I'll bring them out and show you the card on the face. Using my vast mental powers, I will attempt to tell what the card is. Do you think I can do that?

I'll put the packet behind my back. This requires a great deal of concentration, of course. Do you see the card on the face? It's…5/8!

It was probably just lucky. Let me try it again…" You wind up showing 3 cards, getting each right!

Tips:

- Pretend like you are concentrating and that it takes lots of effort to get it.

Photo 1. Audience view

bra-Ki rakid.

Photo 2. Behind your back, turn over 3 cards on top of the deck.

Photo 3. As magician shows card on the face to the spectator, secretly magician glimpses the top card.

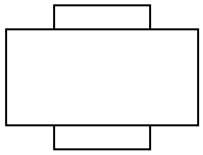
Comedy Card Revelation

Effect: You show a small packet of cards, each with a different fraction. You ask a spectator to cut the cards anywhere, and you mark where they cut. You show a large envelope that has a prediction card inside. You set this aside, and have the spectator take the card he cut to and show it to the audience. (E.g. 5/8.) You note that the odds of getting it right are 1 out of 10, so it would be pretty impressive if your card in this envelope, right? Spectator names the fraction he selected. You pull out a card with all 10 fractions on it, pointing to their fraction! As you slide the card back into the envelope, the audience sees that there is 1 big fraction on the back of the 10 fraction card—the one they chose!

Props: Pack of 10 fraction cards, jumbo card with 10 fractions on 1 side & 1 on the other, and envelope for the 10/1 card.

Secret: Although it seems that the spectator has a free choice, you force her to select the 5/8 using a technique called the cross cut force:

Have the 5/8 card atop the deck. Ask spectator to cut the cards, setting the half he cuts beside the deck. Mark his cut by picking up the deck & placing it atop his cut pile, perpendicular (see diagram). Pick up the envelope & mention it, distracting audience's attention from the cards momentarily. Come back to the cards. Lift up the top half, and give spectator the top card of the lower half—"the card he cut to"—and ask him to show it to the audience. Though it seems like you're giving him the card he cut to, you're actually giving him the original top card of the deck!



Presentation: "I need a victim—I mean a volunteer from the audience. These cards each have a different fraction. (Spread to show some of the fractions.) Would you like to examine them? (offer toward spectator. As he reaches out to take them, pull them back.) Thank you very much. Would you cut the cards, please, anywhere you'd like. Very well. I will mark your cut. Over here we have an envelope. Inside is a prediction I will reveal in just a moment. With any luck, my prediction will be correct.

Would you take the card that you cut to and show it to the audience. Now you remember I made a prediction. The odds of me having your card in this envelope are 1 out of 10. So if I have your card in here, that would be a pretty good trick, right? Which card did you choose? (5/8) (Pull out jumbo card with 10 fractions side facing audience.) That is exactly the card I have here. Let's see, it's this one right here. (Point to it.) You don't seem very impressed? I don't know, I didn't think it was too bad of a trick. (As you say this, slide the jumbo card slowly back into the envelope, now showing the 5/8 side to the audience so they can see that you really did get his card!)

Cutting Cards

Effect: "I'll bet that you can cut the cards anywhere you like, and I can tell the card you cut to—without touching the deck. Do you think I can do this?" You proceed to do it!

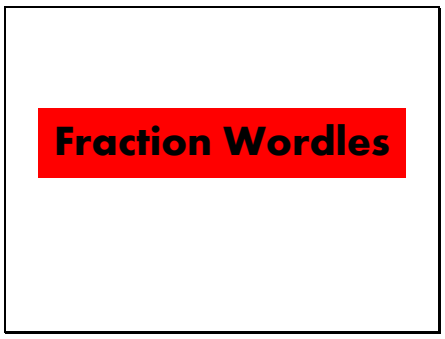
Props: Packet of fraction cards.

Secret: Turn the packet face up. Put a face down card on top, so it looks like a face down deck. Wherever he cuts, you'll see the fraction!

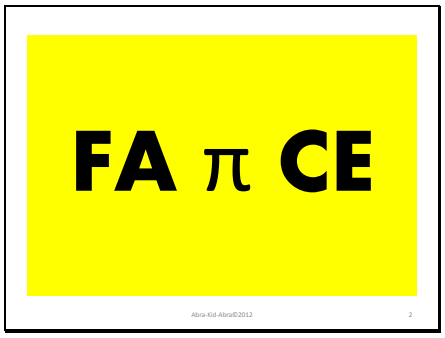
Notes: This is a good gag to do *after* you have done a trick or two with the fraction cards, so your audience is familiar with them.

Fraction Wordle Jeopardy

Slide 1

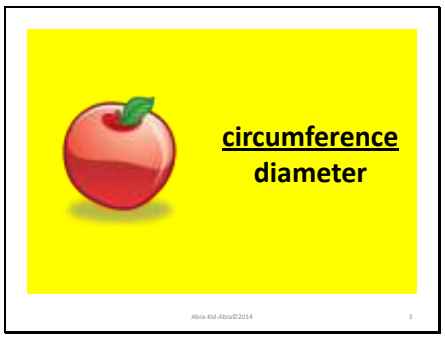


Slide 2



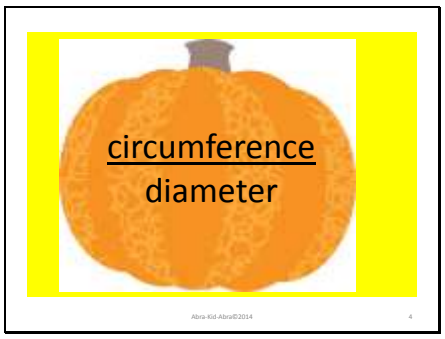
Pie (Pi) in the Face

Slide 3



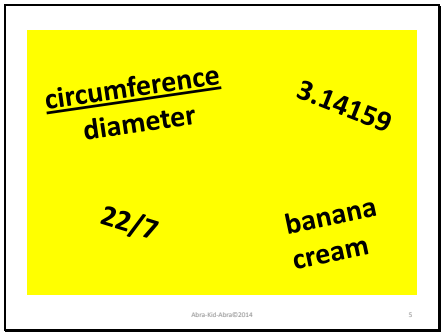
apple pie

Slide 4



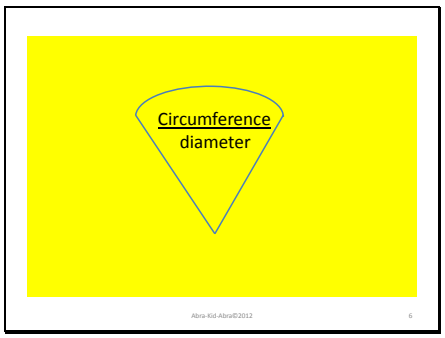
pumpkin pie

Slide 5



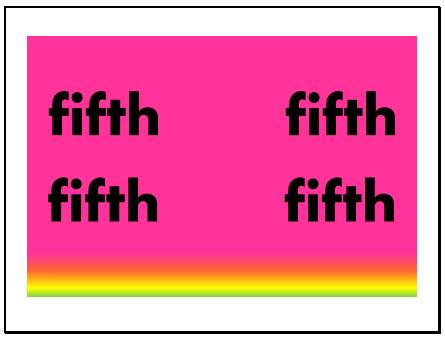
different pi's

Slide 6



Pizza Pi

Slide 7

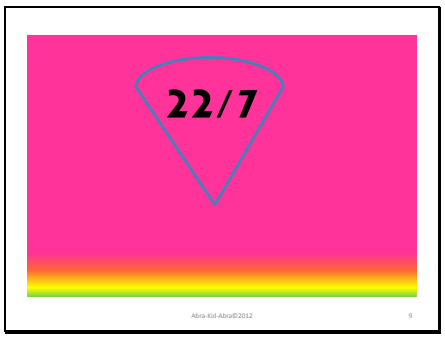


4/5

Slide 8

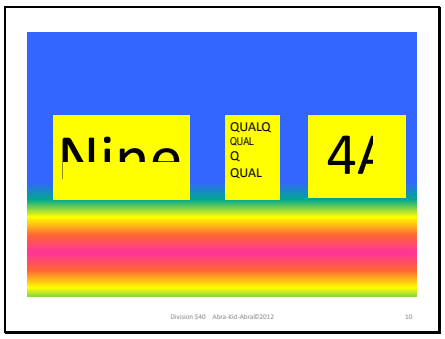
5/2

Slide 9



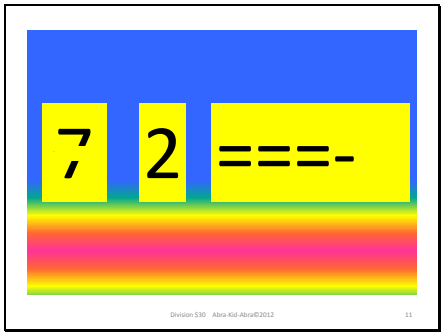
Pi (or pi-22/7)

Slide 10



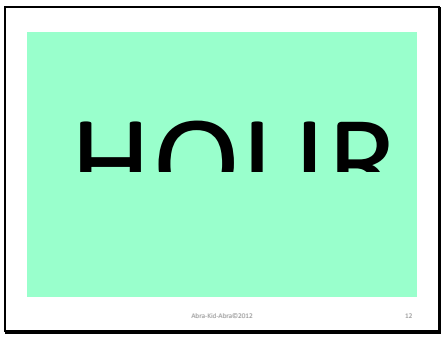
Half of 9 equals 4.5.

Slide 11



7/2=3.5 (7 divided, by 2, equals 3.5)

Slide 12

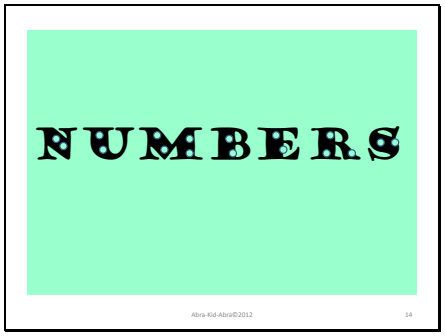


half an hour

Slide 13

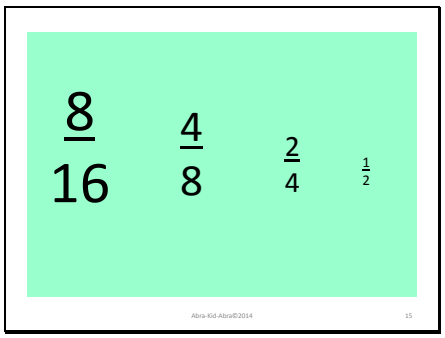
3.5% Interest

Slide 14



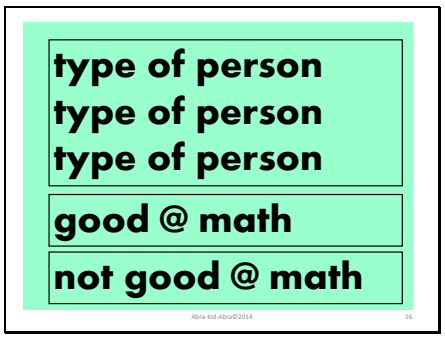
Whole Numbers

Slide 15



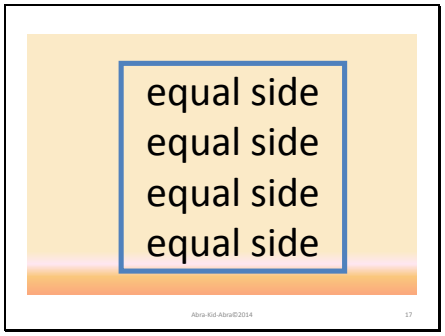
reducing fractions

Slide 16



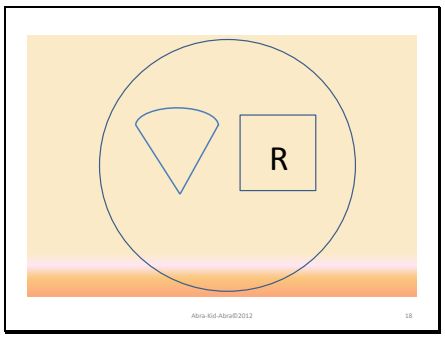
There are 3 types of people: Those who are good at math, and those who are not good at math.

Slide 17



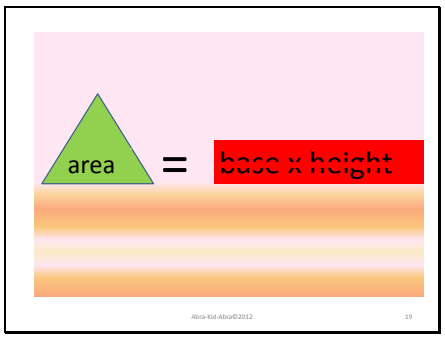
4 equal sides in a square

Slide 18



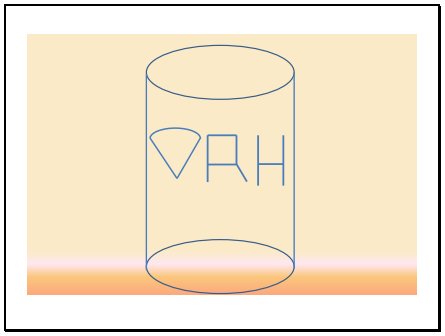
πr^2 (Area of a circle)

Slide 19



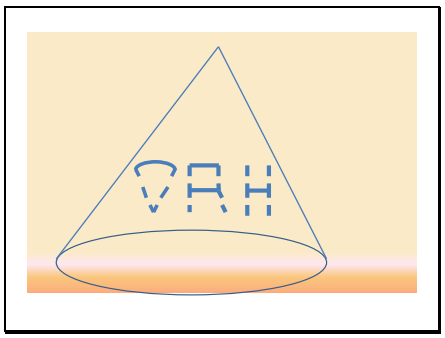
Area of a Triangle = (base x height) /2

Slide 20



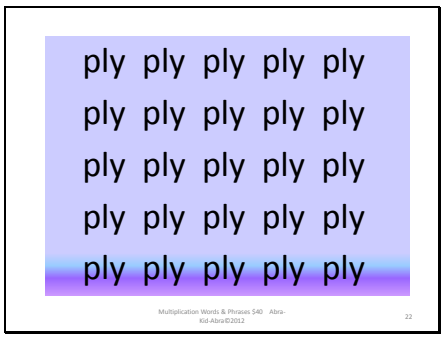
Area of a cylinder: $\pi r^2 h$ (pi r squared x height)

Slide 21



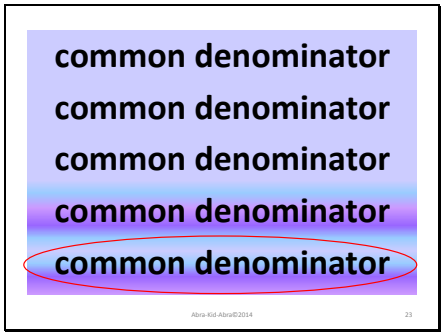
Area of a cone: $\pi r^2 h/3$ (pi r squared x height divided by 3)

Slide 22



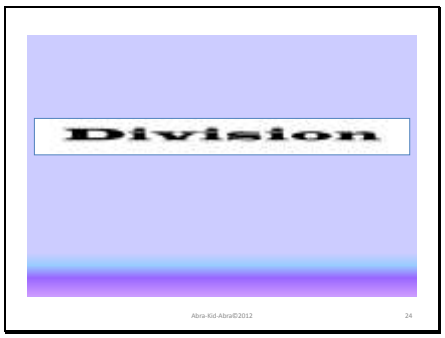
Multiply

Slide 23



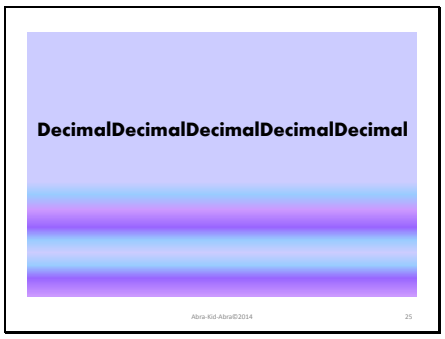
lowest common denominator

Slide 24



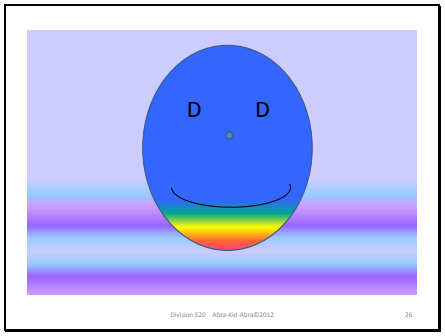
Long Division

Slide 25



repeating decimal

Slide 26



Division (D vision)

Slide 27

Answers-Fraction Wordles

Samples:
3 Years Old Listen up
Pain in the Neck I understand

	Pi	Equations	Expressions	Geometry	Arithmatic
100	Pie in the face	4/5	Half an Hour	4 sides in a square	Multiply
200	Apple Pie	5/2	3.5% interest	Area of a circle $=\pi r^2$	Lowest Common Denominator
300	Pumpkin Pie	Pi (22/7)	whole numbers	Area of a triangle =base x height/2	Long Division
400	Different Pies	Half of 9 = 4.5	reducing fractions	Area of a cylinder $=\pi r^2 h$	Repeating Decimal
500	Pizza Pie	7/2=3.5	There are 3 types of people: those who are good at math, & those who aren't	Area of a cone $=\pi r^2 h/3$	Division

Fraction Puzzlers

1. Half of 8 = 3?

My teacher says that half of 8 is 3. How can this be? Or has he lost his marbles?

2. Make 100 with four 9's

Challenge: Can you make four 9's equal 100? You can combine the 9's however you like—e.g. 99, 999, etc. You can also use any of these:: +, -, x, /.

3. What's On It?

Ask someone to write any word on a paper. So that you can't see what was written, they should put their hand on top of the paper.

You tell them what's on the paper. How?

4. Tearing a Paper in 3

Start with a strip of paper with 2 tears running halfway down the paper (above). Holding an upper corner in each hand, can you pull the paper apart into 3 pieces so you are left holding 1 piece in each hand, and the middle piece falls to the floor?

5. Reducing Fractions

Can you reduce these fractions?

4/8=

3/9=

3/7=

6. Secret Code

How many letters are in each word? What famous math concept does this represent?

May I have a large container of orange juice now please.

How to Do Puzzlers

Props: Nine 8.5x11 sheets, each with a letter for #5 (in show)

Divide students into 3 groups. Tear off a different betcha above for each group. Allow a few minutes to solve. Visit groups. Help as needed. Have groups present and teach their betcha to the class, with each student having a role. Or have them mingle, sharing with others from different groups.

Repeat with round 2 if time permits. Or show remaining betchas to the class. Let them try to solve before revealing the solution.

Solutions

1. Draw a line thru the 8. The right half is 3!

2. 99 + 9/9 = 100.

3. You say, "Your hand!"

4. Hold the middle in your mouth. After you tear the 2 off, let the middle piece drop.

5. ½. 1/3. 3/7 (write the last one smaller!)

6. Pi. 3.1415926536

Fraction Puzzlers #2

1. A Sure Quarter

Bet a spectator that she cannot tear a sheet of paper into 4 equal pieces. If she can, you'll give her a quarter. She does. What do you do?

2. Fraction Mind Reading

Ask someone to jot any fraction on a slip of paper. You do the same on your slip. Ask the spectator what they wrote. Let's say she says 3/8. You ask her to read your slip out loud. She says "You're right, they match!"

How do you do this?

3. Reducing Fractions

Reduce these fractions. What's unusual about these?

19/95 =

16/64=

26/65=

4. Half of 12 =7?

My math teacher says that half of 12 is 7. How can this be? Or is he off his rocker?

5. Pizza Pi

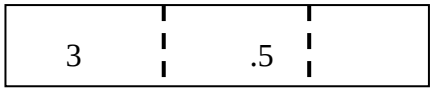
a. What is this #: 3.141592653…

b. What is unusual about this number?

c. What is the geometric formula to get it?

d. Does it work with a pizza?

6. Magic Touch



Tear off a strip of paper. As shown above, write the numerator of a fraction on the left, the denominator on the right, and the decimal in the middle. Tear it into 3, with 1 number on each piece, and toss the 3 pieces into a hat (or other receptacle). Reach in & pull out the decimal piece without looking! How?

Solutions 1

1. Give her 1 of the 4 pieces ("a quarter")
2. Write on your slip, "You're right, they match!"
3. 1/5, ¼, 2/5. Cross off the 9s in 19/95, the 6s in 16/64, & the 6s in 26/65. It's coincidence that this works. It doesn't usually work this way.

Solutions 2

4. 6. Roman numerals. XII is 12. Draw a horizontal line through the middle. You get VII, which is 7!
5. A. pi. B. #s never repeat. C. circumference/diameter. D. yes if pizza is round.
6. Feel for the piece with 2 torn ends, instead of 1!