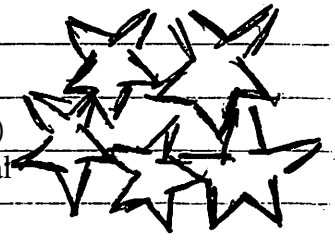
Student B

7-2
1-12-10

Number Trick

Yes, Jessie's two answers always will be equal to eachothers for any number. This trick works because when you multiply the number before adding and you add after, the number in the second set would have to add a higher numbers.



These work samples were collected as part of This Justification and Argumentation: Growing Understanding of Algebraic Reasoning (JAGUAR) project was supported by a grant from the National Science Foundation (DRL 0814829).

Student C

Number Trick

Jessies number trick will work ~~because~~ for numbers 1-10 for many reasons. First because when she doubles the result first, 5×2=10 instead of adding 4 first she would have had 8 (4×2=8) when she doubled the number 5+4=, 9×2=

Jessie firstly, in the 2 equation, broke down the ~~2~~ first equation, when she added 8 she might have imagined first that 8=4×2 which she did in the first equation when she added the 5+4 and the doubled it, but you must realize that 4 is still part of the equation even though it was smushed in with 5, you did double 4 but when it was ~~with~~ part of the 5.

Student D

1. yes because I have tried all the numbers (1-10) in my head.

2. ~~no, it does not work for every number, fore example, a negitive number.~~

$-10+4=-6$ $-6\times2=-12$

$-10\times2=-20$ $-20+8=12$

2. yes it does because I have tried both negitive and positive numbers.

conclusion

from all of the classes work, no one has found a number that doesent work. people have made graphs tables and pictures.

Student E

Number Trick Task

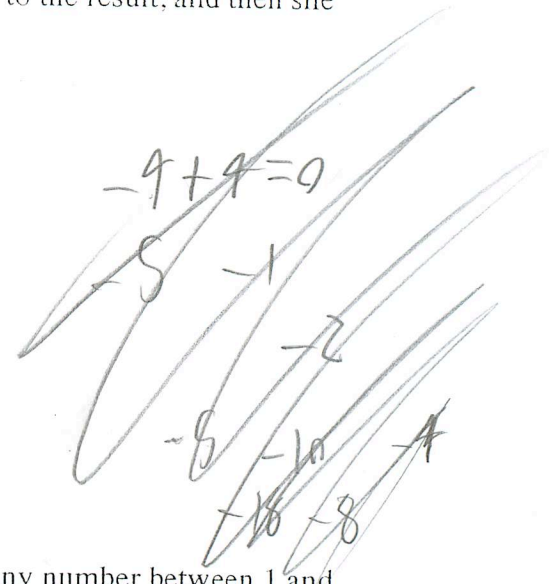
Jessie discovers a cool number trick. She thinks of a number between 1 and 10, she adds 4 to the number, doubles the result, and then she writes this answer down. She goes back to the number she first thought of, she doubles it, she adds 8 to the result, and then she writes this answer down.

Here is an example:

Jessie thinks of the number. 5
She adds 4 to her number. $5 + 4 = 9$
She doubles the result. $9 \times 2 = 18$
She writes down her answer. 18

Jessie goes back to the number she thought of. 5

She doubles her number. $5 \times 2 = 10$
She adds 8 to the result. $10 + 8 = 18$
She writes down her answer. 18



Will Jessie's two answers always be equal to each other for any number between 1 and 10? Explain your reasoning.

yes they will because its the same exact thing you all 4 double it and it is the same as doubling it first and then adding a number (8)

Does your explanation show that the two answers will always be equal to each other for any number (not just numbers between 1 and 10)? Explain your answer.

yes it will between 1-10 has nothing to do with it it works with 1+4= 15·2=30 11·2=22+8=30 same answer like because A·2+B·2 is the same as (A+B)2 A (thought number) and B (4)

(A+b)·2=C or F I guess so

A·2=B B·2=d and d+B=F

so (A+B)·2=F I just used ABCdef as 123456

(A·2)+(B·2)=F

$2(4+n)$ Equation for the first one. n = A #

$5 \times 2 + 8$ Equation for the second one. you think

$2n+8$ Try other #s of.

n	+4	x2
3	7	14
8	12	24

$(4+4)2 = 16$

$(-3+4)2 = 2$

$(120+4)_2 = 248$

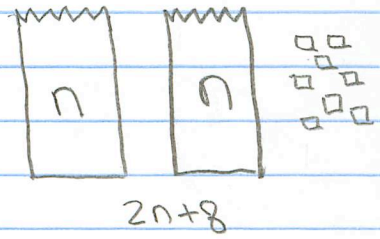
n	x2	+8
3	6	14
8	16	24

$4 \times 2 + 8 = 16$

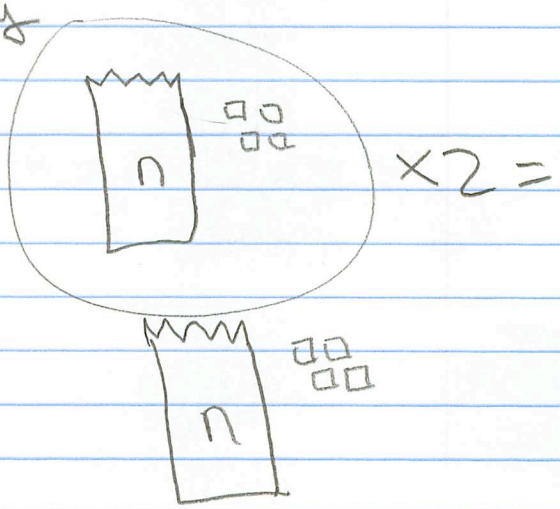
$-3 \times 2 + 8 = 2$

$120 \times 2 + 8 = 248$

Yes it is always the same numbers because in my data, both equations get the same numbers whatever n is. It works on all numbers. This happens because these rules are the same but written differently



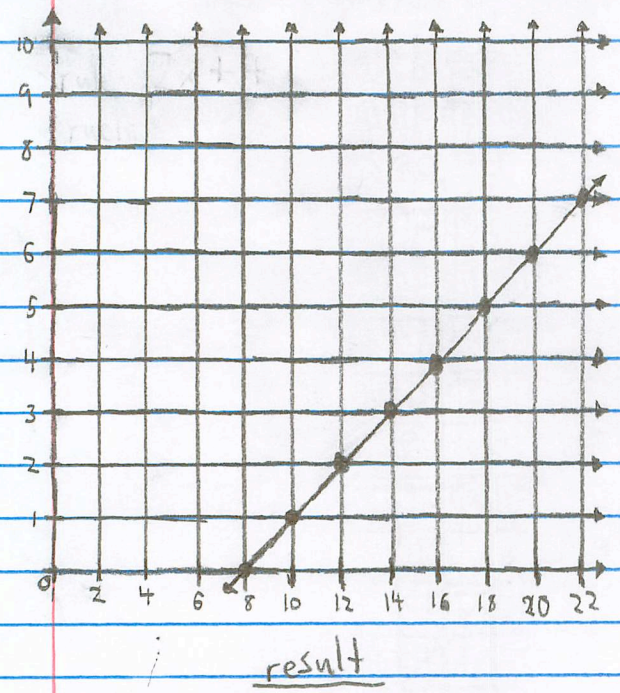
$2n+8$



Number Trick Task

Number	5	6	7	8	9	10
x+4x2	18	20	22	24	26	28
X^2+8	18	20	22	24	26	28
x	+2	+2	+2	+2	+2	+2

-1	-2	-3	-5
6	4	2	-2
6	4	2	-2



← 2x+8

← 2(x+4)

In this "Number Trick Game," the creators had equations that were written differently but came up with the same result. This occured becuse the equations were just in parentheses or not.

Student H

Number Trick Task... Of Fun!

Jessie discovers a cool number trick. She thinks of a number between 1 and 10, she adds 4 to the number, doubles the result, and then she writes this answer down. She goes back to the number she first thought of, she doubles it, she adds 8 to the result, and then she writes this answer down.
Jessie descubre un truco con numeros. Ella escoje un numero entre 1 y 10, le suma 4 a ese numero, dobla el resultado, y después escribe su respuesta. Ella regresa a el numero que escojio primero, lo dobla, le suma 8 al resultado, y después escribe su respuesta.

Here is an example / *Aqui esta un ejemplo*:

Jessie thinks of a number / *Jessie escoje un numero*: **5**
She adds 4 to her number / *Le suma 4 a su numero*: **5 + 4 = 9**
She doubles the result / *Dobla el resultado*: **9 x 2 = 18**
She writes down her answer / *Escribe su respuesta*: **18**

Jessie goes back to the first number she thought of, 5.
Jessie regresa a el numero que escojio primero, 5.

She doubles her number / *Dobla el numero*: **5 x 2 = 10**
She adds 8 to the result / *Le suma 8 al resultado*: **10 + 8 = 18**
She writes down her answer / *Escribe su resputa*: **18**

1) Do the trick on your own picking a number other than 5. Show your work below:
Haz el truco usando un numero aparte de 5. Demuestra tu trabajo:

6
6+4=10
10x2=20
20

6x2=12
12+8=20
20

2) Do both of your answers match? Explain why you think this happened:
Son iguales tus respuestas? Explica porque crees que eso sucedio:

Both of my answers match. I think this happened because you basicaly do the same thing in both "tricks".

3) Now compare your results with someone from your group. What do you notice?
Ahora compara tus resultado con alguien mas en tu grupo. Que notas?

We both got our original number

4) Will the trick always work for any number between 1 and 10? **YES / NO**
Siempre trabajara este truco con cualquier numero entre 1 y 10?
Explain your reasoning / *Explica tu razonamiento*:

1+4=5
5×2=10
10

2+4=6
6×2=12
12

3+4=7
7×2=14
14

4+4=8
8×2=16
16

1×2=2
2+8=10
10

2×2=4
4+8=12
12

3·2=6
6+8=14
14

4×2=8
8+8=16
16

5+4=9
9·2=18
18

7+4=11
11·2=22
22

8+4=12
12·2=24
24

9+4=13
13·2=26
26

10+4=14
14·2=28
28

5·2=10
10+8=18
18

7·2=14
14+8=22
22

8·2=16
16+8=24
24

9·2=18
18+8=26
26

10·2=20
20+8=28
28

5) Does your explanation show that the two answers will always be equal to each other for any number (not just numbers from 1 to 10)? **YES / NO**
Explain your answer:

Crees que tu explicacion demuestra que las respuestas siempre van a ser iguales para cualquier numero (no solo para numeros entre 1 y 10)? **Si / No**
Explica tu respuesta:

2·4=8

(N+4):2=A 2N+8=A

2N=

(N·2)+8

Both are the same.

Student I

Number Trick Task

(This class "knew" the distributive property.)

Jessie discovers a cool number trick. She thinks of a number between 1 and 10, she adds 4 to the number, doubles the result, and then she writes this answer down. She goes back to the number she first thought of, she doubles it, she adds 8 to the result, and then she writes this answer down.

Here is an example:

Jessie thinks of the number. 5
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She writes down her answer. 18

Jessie goes back to the number she thought of. 5

She doubles her number. $5 \times 2 = 10$
She adds 8 to the result. $10 + 8 = 18$
She writes down her answer. 18

Will Jessie's two answers always be equal to each other for any number between 1 and 10? Explain your reasoning. (Go beyond to why it works)

Equation 1.) $(x+4)2 = 2 \cdot 4 + 2x = 8 + 2x$ Substitution, commutative property

Equation 2.) $(2x)+8 = 8+2x$

Yes, Jessie will get the same answer for both every time because the two equations are the same

Does your explanation show that the two answers will always be equal to each other for any number (not just numbers between 1 and 10)? Explain your answer.

How could you justify why the trick works every time?

Yes, because the equations are equal.

$x = 40$

$$\frac{2(40+4)}{2} = \frac{2 \cdot 40 + 8}{2}$$

$$\frac{40+4}{4} = \frac{40+4}{4}$$

$$\frac{20}{-20} = \frac{20}{-20}$$

$$0 = 0$$

Student J

(This class "knew" the distributive property)

Number Trick Task

Jessie discovers a cool number trick. She thinks of a number between 1 and 10, she adds 4 to the number, doubles the result, and then she writes this answer down. She goes back to the number she first thought of, she doubles it, she adds 8 to the result, and then she writes this answer down.

Here is an example:

Jessie thinks of the number. 5
She adds 4 to her number. $5 + 4 = 9$
She doubles the result. $9 \times 2 = 18$
She writes down her answer. 18

$(x+4)\cdot 2$
$2x+8$

Jessie goes back to the number she thought of. 5

She doubles her number. $5 \times 2 = 10$
She adds 8 to the result. $10 + 8 = 18$
She writes down her answer. 18

Will Jessie's two answers always be equal to each other for any number between 1 and 10? Explain your reasoning. (Go beyond to why it works)

Yes, because if you make the number 1 and 10 x, the first operation becomes $(x+4)\cdot 2$, and the second operation is $2x+8$, $(x+4)\cdot 2$ is the same as $2x+8$ because of the distributive property.

Does your explanation show that the two answers will always be equal to each other for any number (not just numbers between 1 and 10)? Explain your answer.

How could you justify why the trick works every time?

$(\sqrt{-4}+4)2=$
$2(\sqrt{-4})+8$
$2(\sqrt{-4}+8=2(\sqrt{-4})+8$

Yes, my explanation does. $2x+8$ and $(x+4)\cdot 2$ are the same expressions because of the distributive property.

$(x+4)2 = 2x+8$

$(17+4)2=$ $(21)2=$ 42 | $2(17)+8=$ $34+8=$ 42

$(\frac{1}{3}+4)2=$ $(4\frac{1}{3})\cdot 2=$ $8\frac{2}{3}$ | $2(\frac{1}{3})+8=$ $\frac{2}{3}+8=$ $8\frac{2}{3}$

$(-4+4)2=$ $(0)2=$ 0 | $2(-4)+8=$ $-8+8=$ 0