



Working Backward

Kinder & First Grade: solve at least 3 problems.
Second & Third Grade: solve at least 7 problems.
Fourth Grade and above: solve at least 12 problems.

Answer

1.	Lisa had some money. Then Grandma Jean gave her \$5 and now she has a total of \$8. How much money did she have at the beginning? $\$8 - \$5 = \$3$	\$3
2.	Cole baked some cupcakes in the morning. He gave 4 cupcakes to Mrs. Niles who lives nextdoor. He ate one and now he has only 5 cupcakes left. How many cupcakes did he bake? $5 + 1 + 4 = 10$	10 [cupcakes]
3.	After Cinar gave 4 baseball cards to Andy, he received 5 new cards from grandpa Will. If Cinar has 12 cards now, how many baseball cards did he have at the beginning? $12 - 5 + 4 = 11$	11 [cards]
4.	Julia's mom left a plate of cookies on the kitchen counter. Julia ate 2 of them, her dad ate 3 of them and they gave 12 of the cookies to their neighbor. At the end of the day, only 5 cookies are left on the plate. How many cookies did Julia's mom make? $5 + 12 + 3 + 2 = 22$	22 [cookies]
5.	Tommy is wondering how much money he had in his pocket to begin with. He has only \$7 now. He spent \$12 at the bookstore and \$56 at the shoe store. How much did he have at the beginning? $\$7 + \$56 + \$12 = \75	\$75
6.	The temperature changed many times throughout the day. This morning it dropped 3 degrees. By noon, the temperature rose 10 degrees. By sunset, the temperature dropped 5 degrees and it is now 64 degrees. What was the temperature at the beginning of the day? $64 + 5 - 10 + 3 = 62$ degrees	62 [degrees]
7.	At 7 p.m. there are 11 boats in the harbor, 5 more than there were at 5 p.m. At 3 p.m. there were half as many boats as there were at 5 p.m. How many boats were there at 3 p.m.? <i>Hint: read carefully. Not all events are backwards.</i> <i>At 7 p.m. there were 11 boats.</i> <i>At 5 p.m. there were 5 less boats $\rightarrow 11 - 5 = 6$ boats.</i> <i>At 3p.m. there were half as many boats as there were at 5 p.m \rightarrow half of 6 = 3 boats.</i>	3 [boats]
8.	Jordan put half of his birthday money into his savings account. Then he paid back the \$10 that he owed Marvin for school's play ticket. Lastly, he spent \$3 on snack at school. At the end of the day he was left with \$12. How much money did Jordan receive for his birthday?	\$50

These are steps in reverse order:	Reversal requires:	Results in
Left with \$12		\$12
Spent \$3 on snack	+3	\$15
Paid \$10 to Marvin	+10	\$25
Put half of his money into his saving	X2	\$50

You may check your answer by assuming he receives \$50. He put half into his savings, so he has \$25. He then gives \$10 to Marvin, so he has $\$25 - \$10 = \$15$ left. He then spends \$3 on snack, so he has \$12. So, the answer is correct.

9. Joseline and Amit eat lunch at a café and their bill is \$21.65. Amit gives the cashier a coupon for \$6 off their bill, and also hands the cashier two bills. If he receives \$4.35 in change, what were the denominations of the two bills he gave the cashier? *\$10 bills*

Cost of lunch: \$21.65. After the coupon, the real cost of lunch is $\$21.65 - \$6.00 = \$15.65$. If he receives \$4.35, he must give the cashier $\$15.65 + \$4.35 = \$20$.
 Since he gives 2 bills, he must give two bills of $\$20 \div 2 = \10 .

10. Cody had quite a few baseball cards, and Lisa had some of her own. Cody gave Lisa as many baseball cards as she already had. Lisa then gave Cody back as many cards as he had left. Finally, Cody gave Lisa back as many cards as she had left. This left Cody with no cards and Lisa with a total of 40 cards. How many baseball cards did each of them have before these exchanges took place? *Cody: 25 [cards]
Lisa: 15 [cards]*

These are steps in reverse order:	Reversal requires:	Results in
Cody had no cards, Lisa had 40		Cody: 0 and Lisa: 40
Cody gave Lisa as many as she had left Lisa gave Cody as many cards as he had left Cody gave Lisa as many cards as she already had	Lisa returns half of what she has Cody returns half of what he has Lisa returns half of what she has	Cody:20 and Lisa: 20 Cody: 10 and Lisa: 30 Cody: 25 and Lisa:15

11. Peter needs to leave for the bus stop 15 minutes earlier than his friend Ryan. Ryan leaves 5 minutes later than Lily but 10 minutes earlier than Ronald. If Ronald leaves for the bus stop at 8:15 a.m., what time does Peter need to leave? *7:50 a.m.*

Ronald leaves at 8:15 a.m. Ryan leaves 10 minutes earlier than Ronald → Ryan leaves at 8:05 a.m.
 Information about Lily is not useful.
 Peter needs to leave 15 minutes earlier than Ryan → Peter needs to leave at 7:50 a.m.

12. A number is divided by 6. Then 7 is added to the quotient. After dividing by 4, the result is 34. What is the number? *774*

?

→

divided by
6

→

add
7

→

divided by
4

→

result
34

$(34 \times 4 - 7) \times 6 = 774$

13. Sally is thinking of a number. She multiplied this number by 3, subtracted 8, and doubled the result, then added 14. Then she subtracted 50% of what she had, and then added on 11. Then Sally divided the result by 5. After all that, she was left with 8. What number did Sally start with? *10*

These are steps in reverse order:	Reversal requires:	Results in
Left with 8 in the end		8
Divided by 5	Multiply by 5	40
Added 11	Subtract 11	29
Subtracted 50% of what she had	Double what she had	58
Added on 14	Subtract 14	44
Doubled the result	Halve the result	22
Subtracted 8	Add 8	30
Multiplied by 3	Divide by 3	10

14. Captain Cook and his crew found some bars of gold. The captain decided that he was going to share all the treasure among his friend and his crew. He set aside $\frac{2}{5}$ of the treasure for himself. He gave $\frac{1}{2}$ of what was left to his friend, Boris. He then shared $\frac{2}{3}$ of the remaining treasure equally between the rest of the crew. He buried the remaining 4 bars on a secret island. How many bars of gold did Captain Cook and his crew find? *40 [gold bars]*

Hint: Draw a model and work backward.

1/5

1/5

1/2

1/3

1/3

1/3

4 bars left

Work backward:
 The crew must have gotten 8 bars since each $\frac{1}{3}$ worth 4 bars.
 The part that Boris got: $8 + 4 = 12$
 This means that the remaining parts of the Captain Cook's strip must be worth 24 bars. Therefore, each part of the Captain's strip must be worth 8 bars. The Captain got 16 bars (2 parts).
 The total number of bars: $16 + 12 + 8 + 4 = 40$ bars

15. Abby, Bianca, and Catherine had different numbers of coins at first. Then Abby gave Bianca 12 coins. Bianca gave Catherine 10 coins and Catherine gave Abby 4 coins. In the end, they all had 20 coins each. How many coins did each of them have at first?

Abby: 28 [coins]
 Bianca: 18 [coins]
 Catherine: 14 [coins]

Abby	Bianca	Catherine
At the end: 20	20	20
16	20	24
16	30	14
At the beginning: 28	18	14

16. Erica cuts a wire into 3 equal pieces. She then cuts 3 inches off one piece. This piece was then cut into 5 equal pieces. This small piece is now 9 inches long. How long was the original wire?

144 [inches]

The smallest piece: 9 inches.

Before it was cut into 5 equal pieces, the wire was 9 inches \times 5 = 45 inches.

Before Erica cuts 3 inches off the one piece, it was 45 inches + 3 inches = 48 inches.

Before that, it was part of a wire that was cut into 3 equal pieces, the original wire was 48 \times 3 = 144 inches

17. In a dancing competition all the contestants started dancing together. After three minutes half the people were eliminated. During the next ten minutes half of the remaining group was eliminated. At the 15-minute mark, again half of the dancers still dancing were eliminated, and at the 20-minute mark, half of those still remaining were eliminated. In the last two minutes one more contestant was eliminated leaving a winner of the competition. How many dancers were there in the beginning?

32 [dancers]

Start with the winner: 1 person dancing

Last 2 minutes \rightarrow 1 + 1 = 2 dancers

After 20 minutes \rightarrow Double = 4 dancers; after 15 minutes \rightarrow Double = 8 dancers

After 10 minutes \rightarrow Double = 16 dancers; after 3 minutes \rightarrow Double = 32 dancers

18. Subtract 7.5 from a secret number, then multiply the result by 0.4. The result is then divided by 5. Then, subtract 2.25 from the result on the last step. The final result is 12. What is the original secret number?

185.625



$$(12 + 2.25) \times 5 \div 0.4 + 7.5 = 185.625$$

Solution is available on January 24, 2020 at www.mathinaction.org