

List of all problems written in English in Gezmat

Authors' addresses can be found on the project page (links - header, footer) and in the file `gezmat.cxx`

Hints how to use GEZMAT to create your own sets of problems and to add your own problems to Gezmat you may find as well on the project page. This file has been generated by issuing the command: `./gezmat.bash def/all_problems_en.gzm` in the Linux terminal

Important! The file `def/all_problems_en.gzm` is created after the call

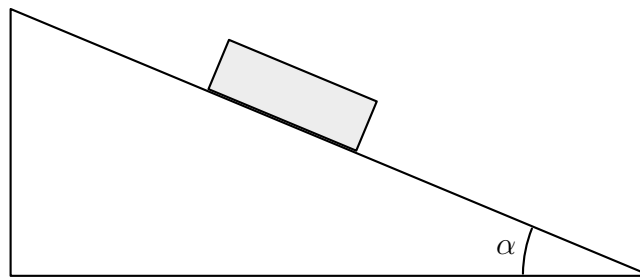
```
./gezmat.bash def/en-prepare-all-problems-config.gzm
```

Do not edit these files! You can rename `def/all_problems_en.gzm` and then edit it as your configuration file.

1 Problem – Inclined plane (figure)

Piotr Nieżurawski, update: 2017-10-29, id: en-dynamics-0006450, diff: 1

A brick of mass 4.9 kg slides on a frictionless, immovable inclined plane of angle $\alpha = 43^\circ$ to the horizontal plane. Calculate the acceleration of the brick. Neglect the air resistance. Acceleration of free fall is equal to 9.8 m/s^2 . The value of angle α in the figure may be different from the given one.



Hint: What forces act on the brick?

Hint: Along which direction does the brick not move?

Hint: What is the component of the free-fall acceleration that is parallel to the incline?

Answer: The brick moves with acceleration parallel to the incline, downwards, and of magnitude $a = g \sin \alpha \approx 6.68 \text{ m/s}^2$.

2 Problem – Accelerating airplane

Piotr Nieżurawski, update: 2016-07-30, id: en-kinematics-0000500-dpc, diff: 1

An airplane, initially at rest in the airport, started to move along a runway with the constant acceleration equal to 8.39 m/s^2 . Calculate the airplane's speed after the time of 6 s.

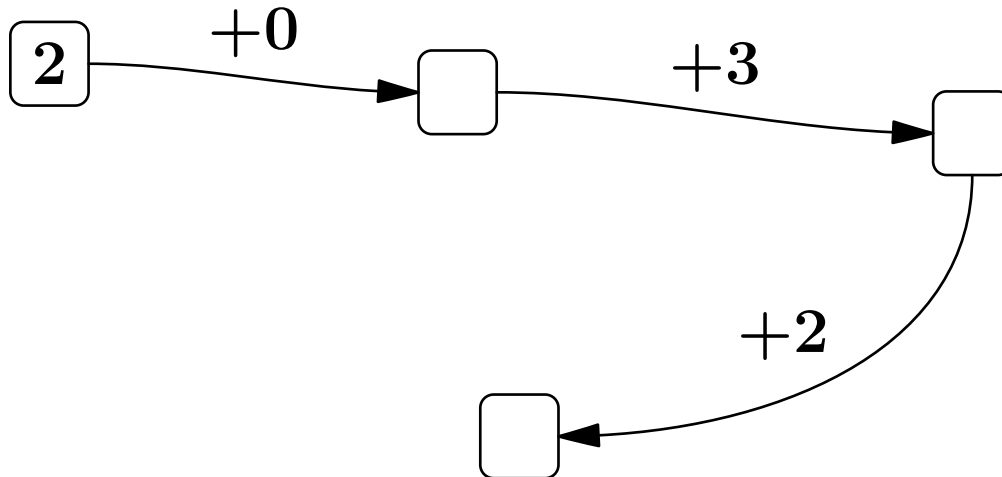
Hint: $v = at$

Answer: 50.34 m/s

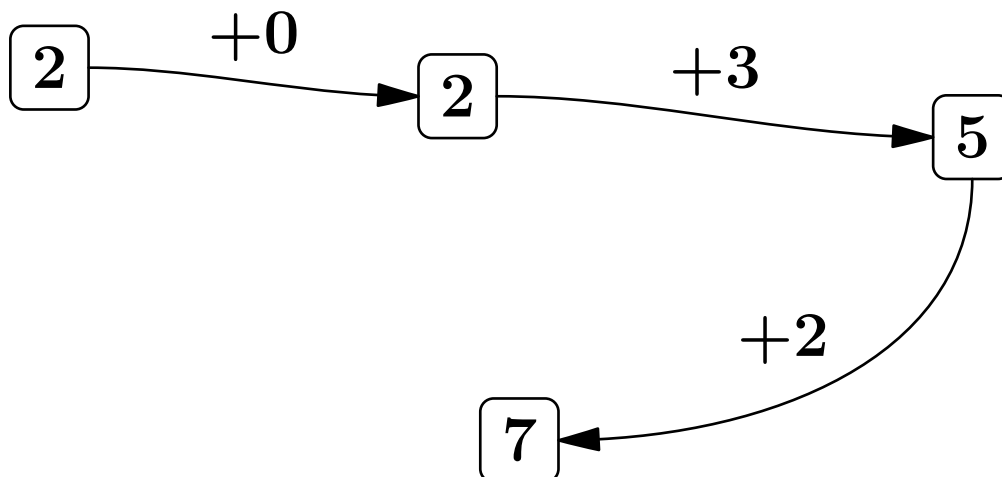
3 Problem – Number snake, addition, 0–10

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000100, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



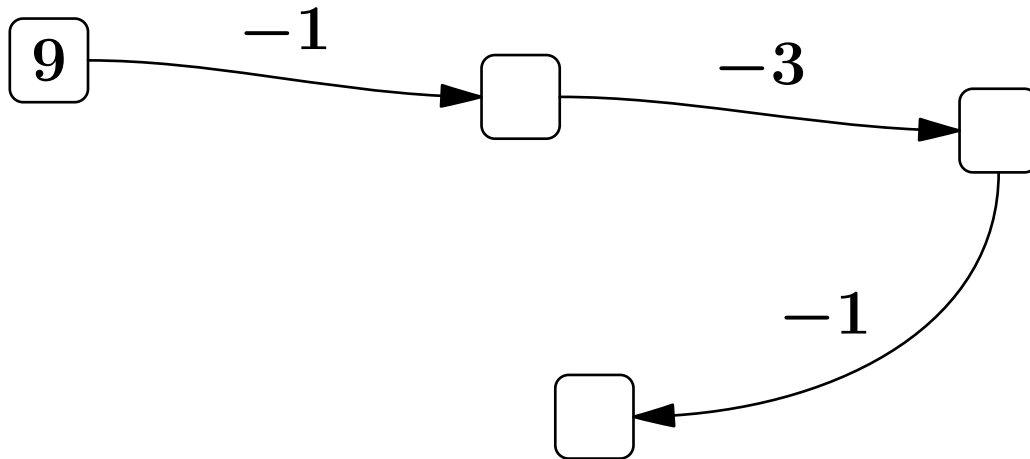
Answer:



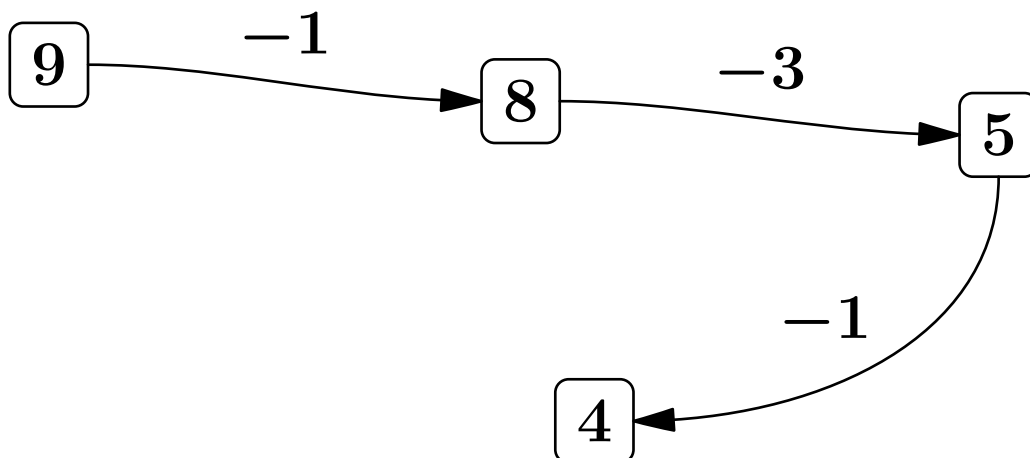
4 Problem – Number snake, subtraction, 0–10

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000101, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



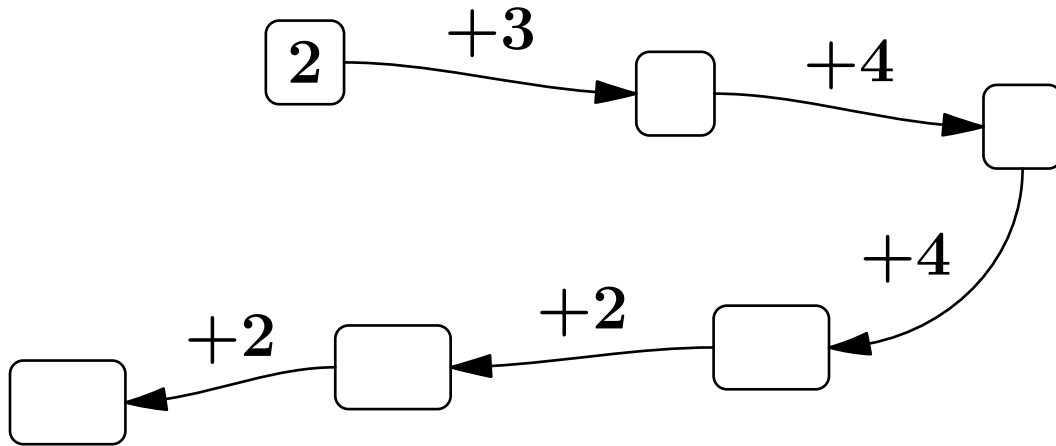
Answer:



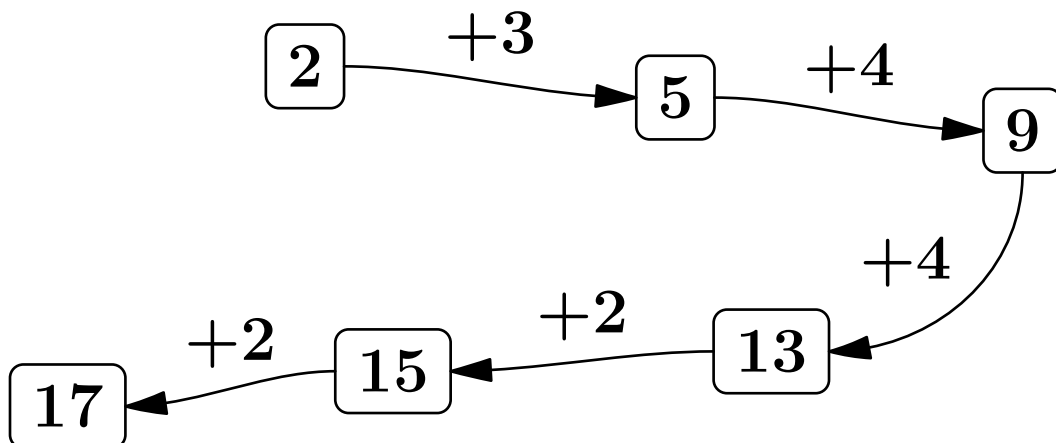
5 Problem – Number snake, addition 0–4, 0–20

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000105, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



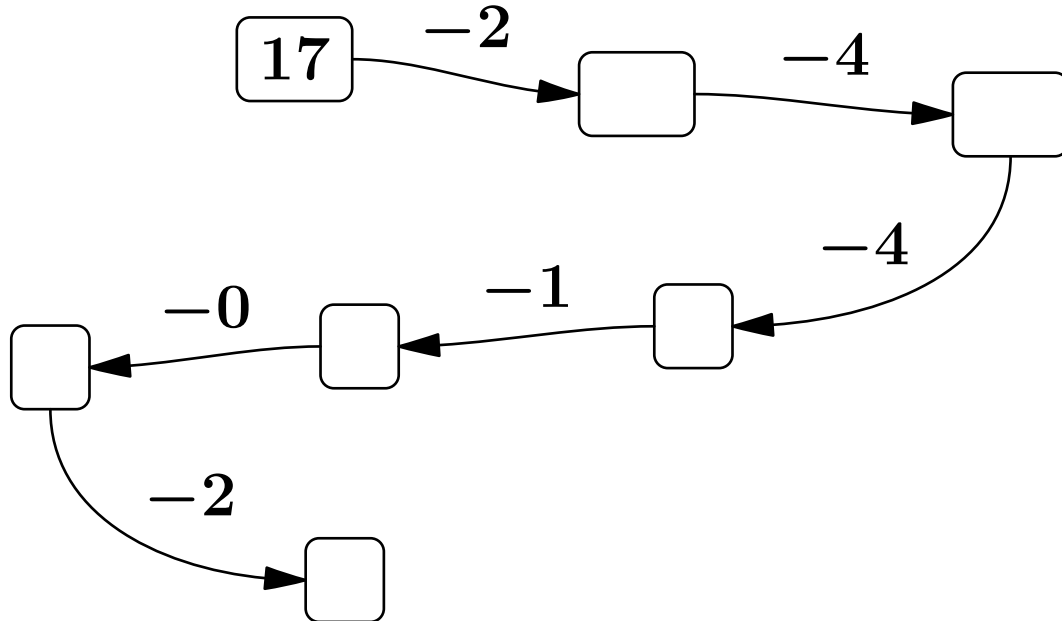
Answer:



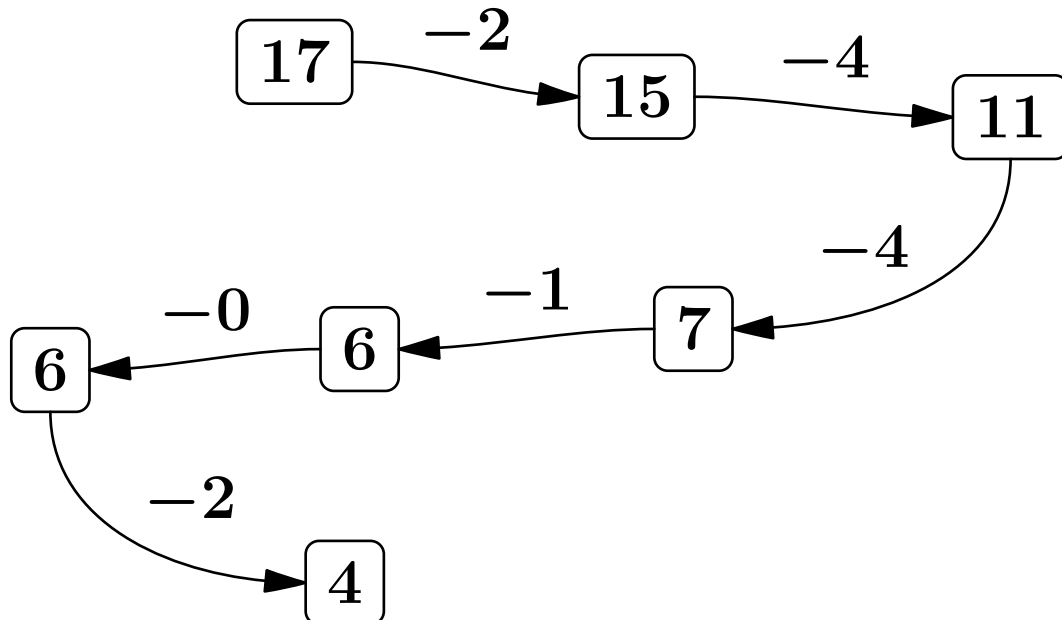
6 Problem – Number snake, subtraction 0–4, 0–20

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000106, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



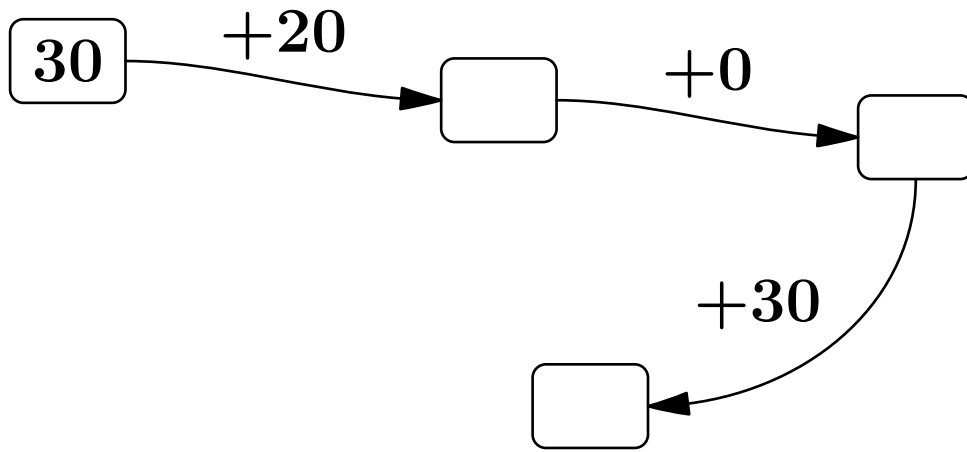
Answer:



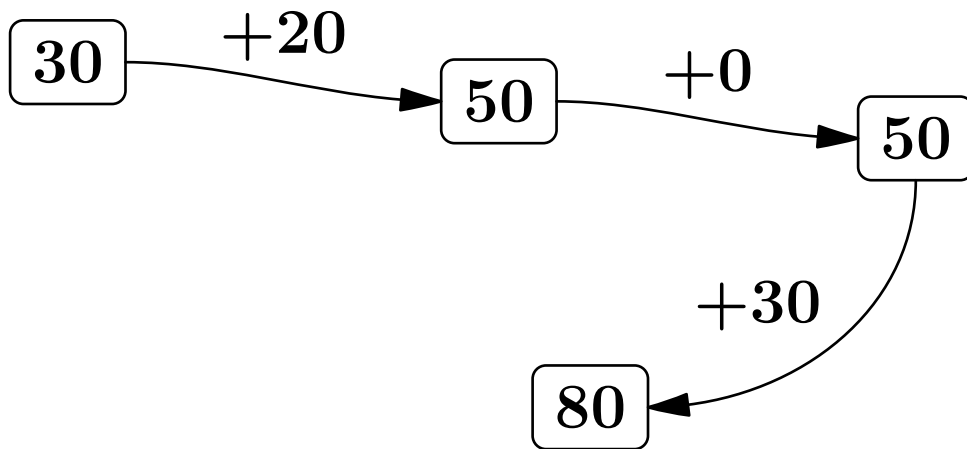
7 Problem – Number snake, addition of multiples of 10, 0–100

Piotr Nieżurawski, update: 2017-07-31, id: en-numbers-0000120, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



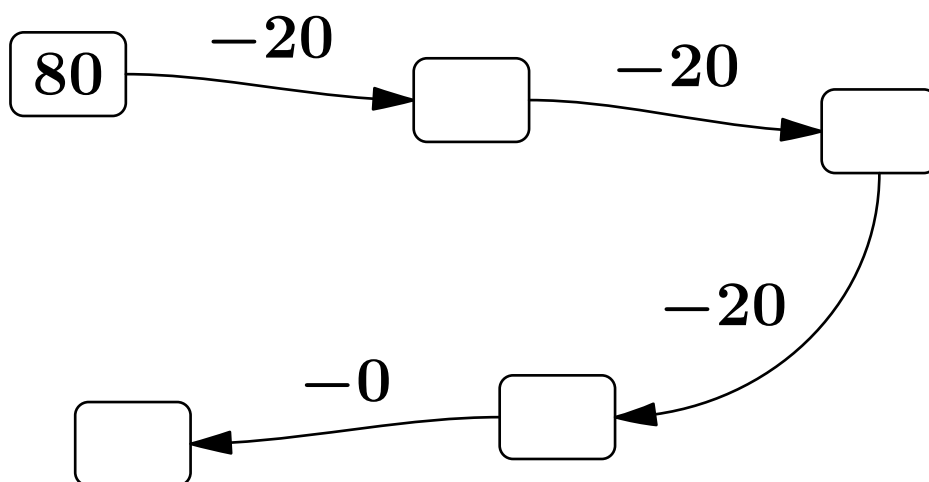
Answer:



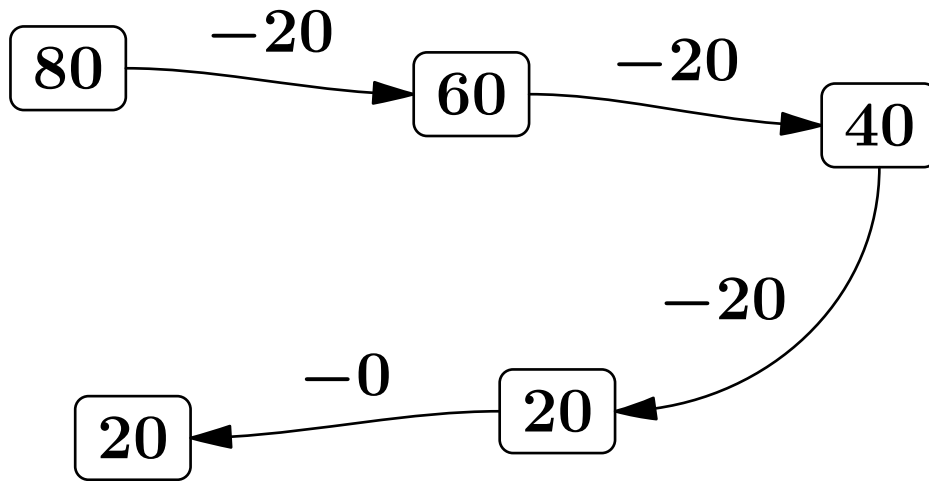
8 Problem – Number snake, subtraction of multiples of 10, 0–100

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000121, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



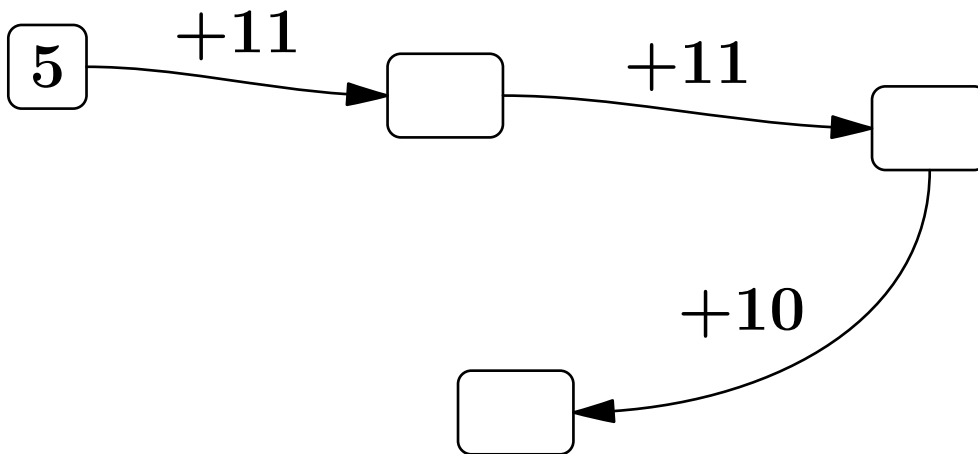
Answer:



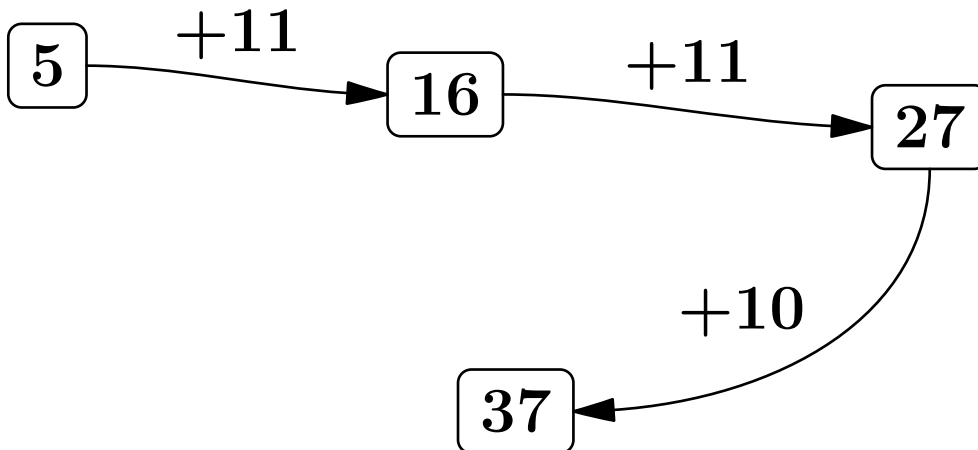
9 Problem – Number snake, addition 5–12, 0–45

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000125, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



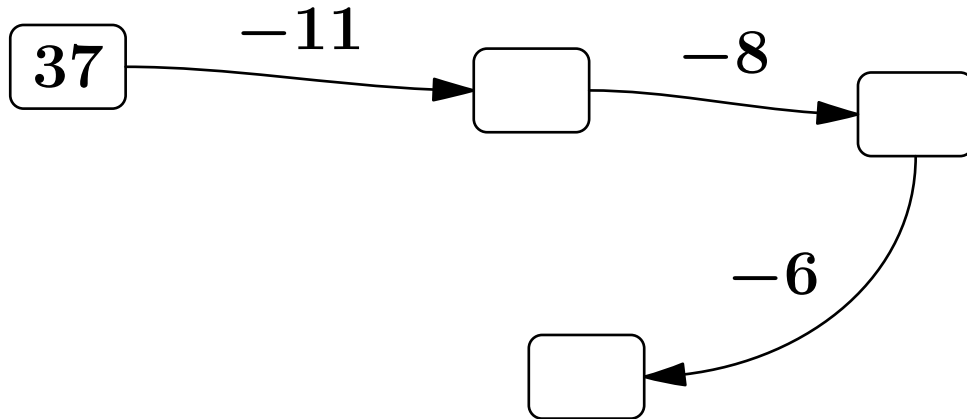
Answer:



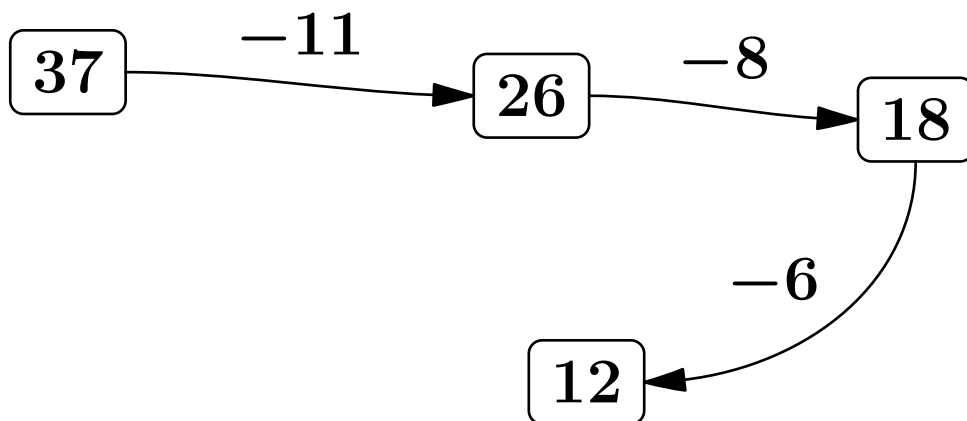
10 Problem – Number snake, subtraction 5–12, 0–45

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000126, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



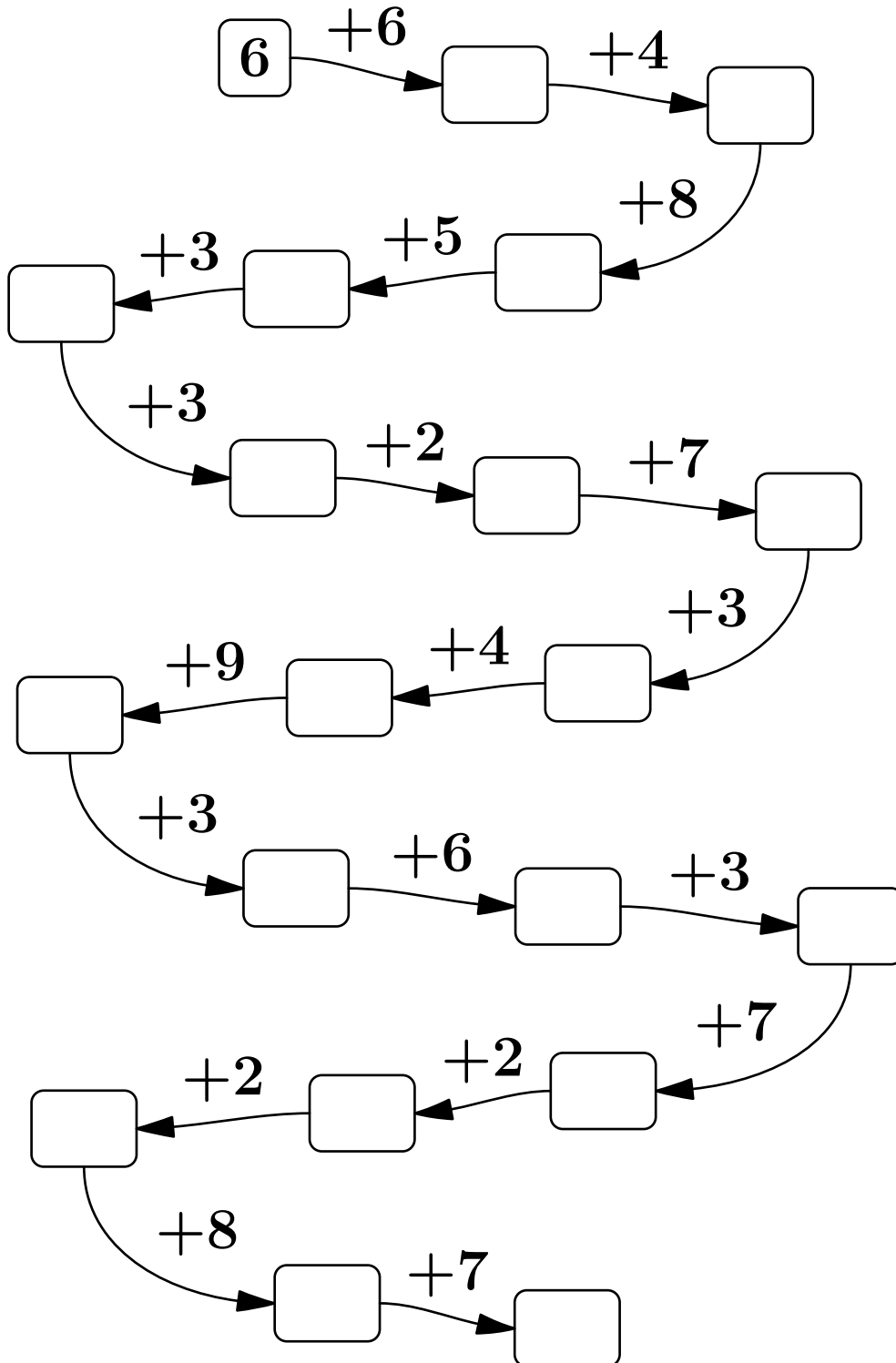
Answer:



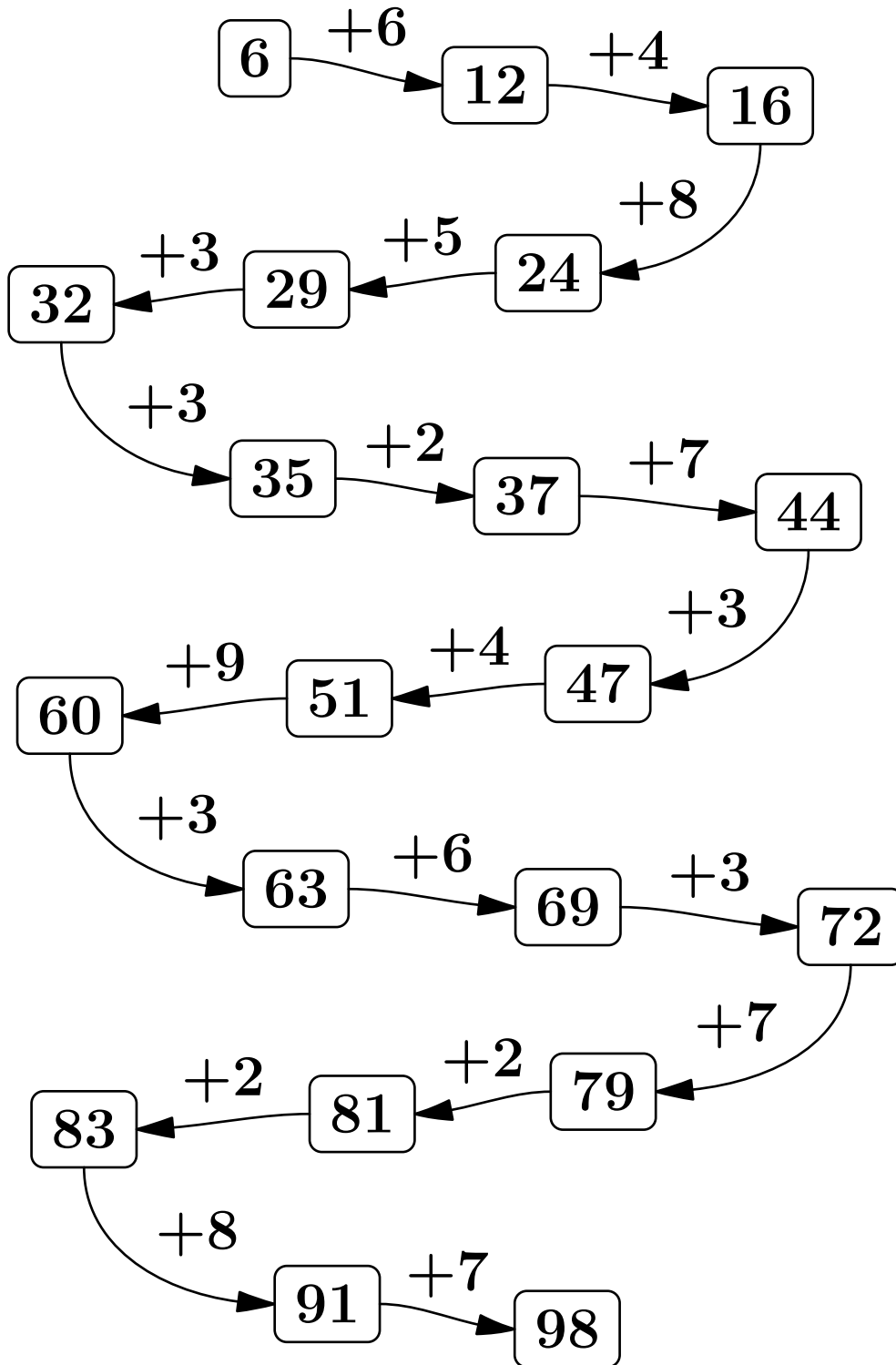
11 Problem – Number snake, addition 2–9, 0–100

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000140, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



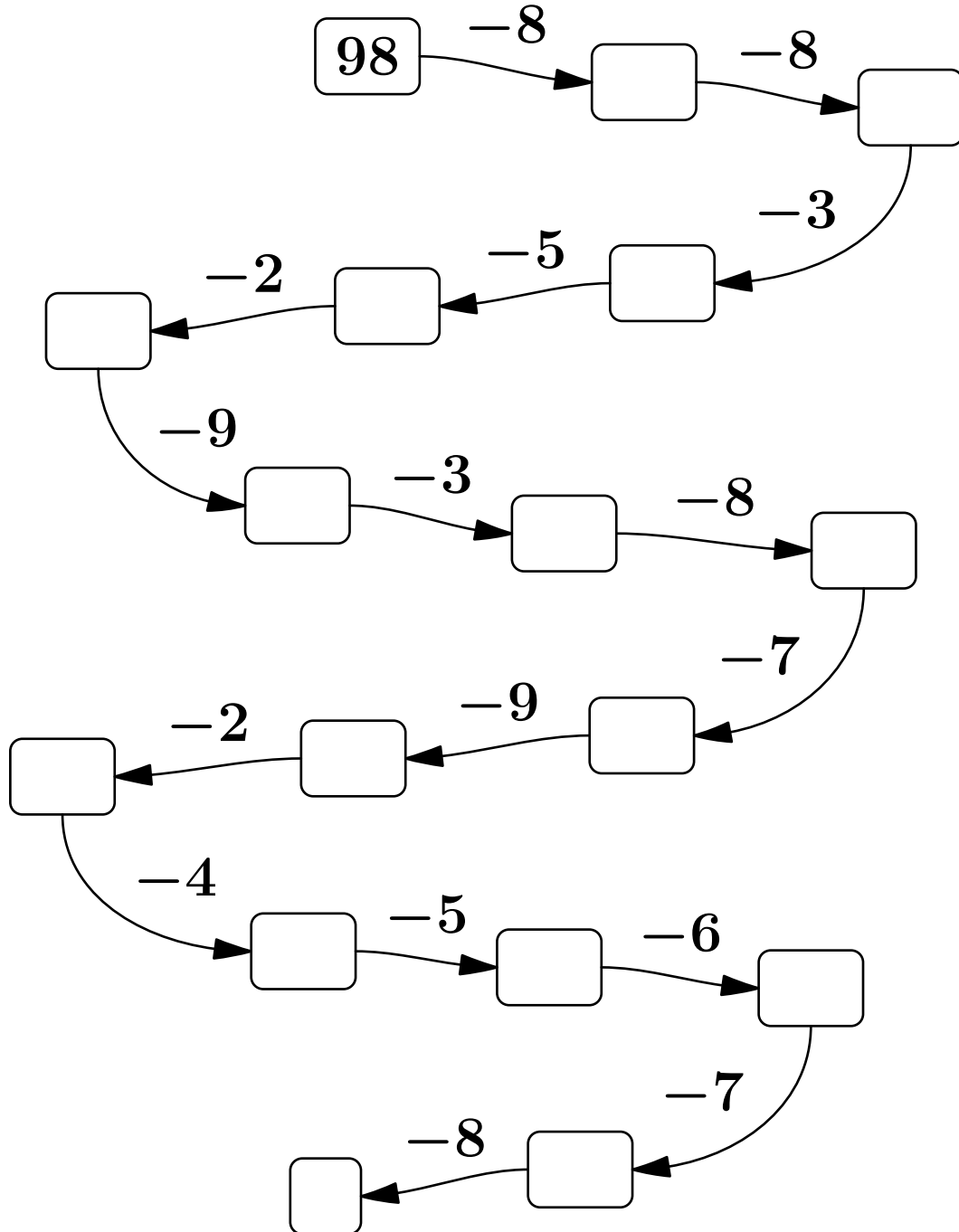
Answer:



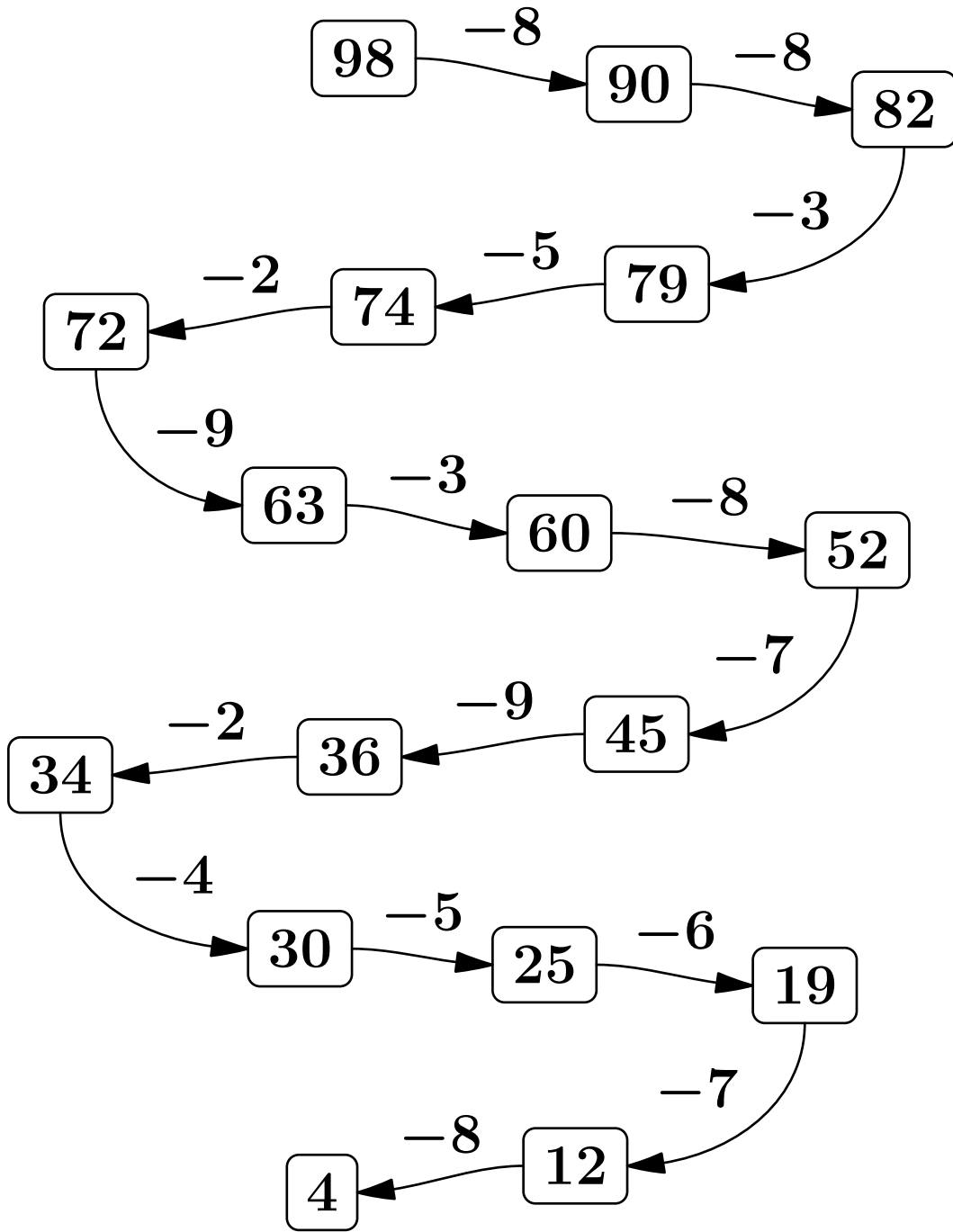
12 Problem – Number snake, subtraction 2–9, 0–100

Piotr Niezurawski, update: 2017-09-02, id: en-numbers-0000141, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



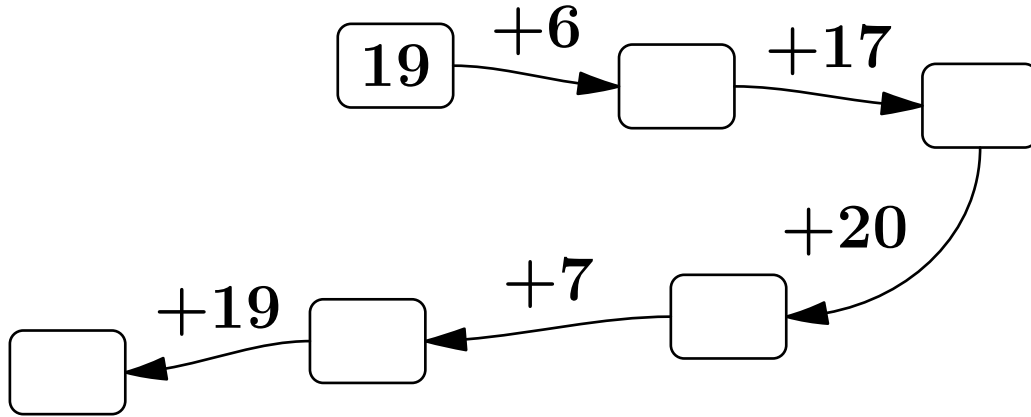
Answer:



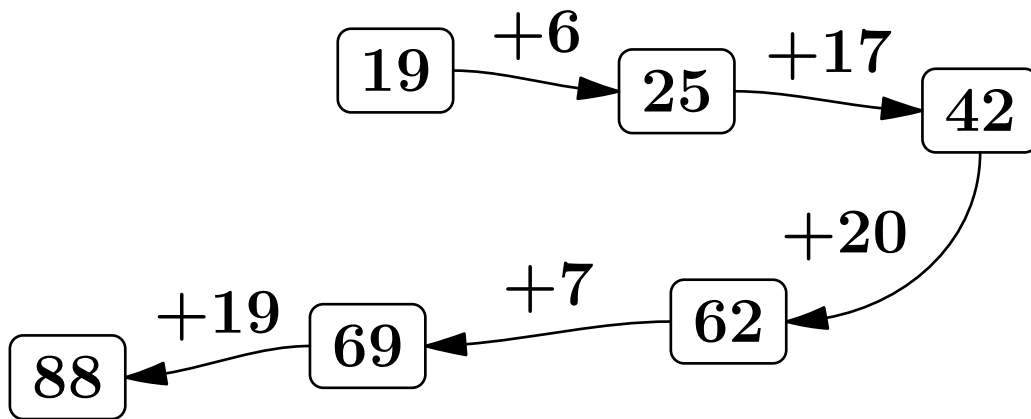
13 Problem – Number snake, addition 5–20, 0–100

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000150, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



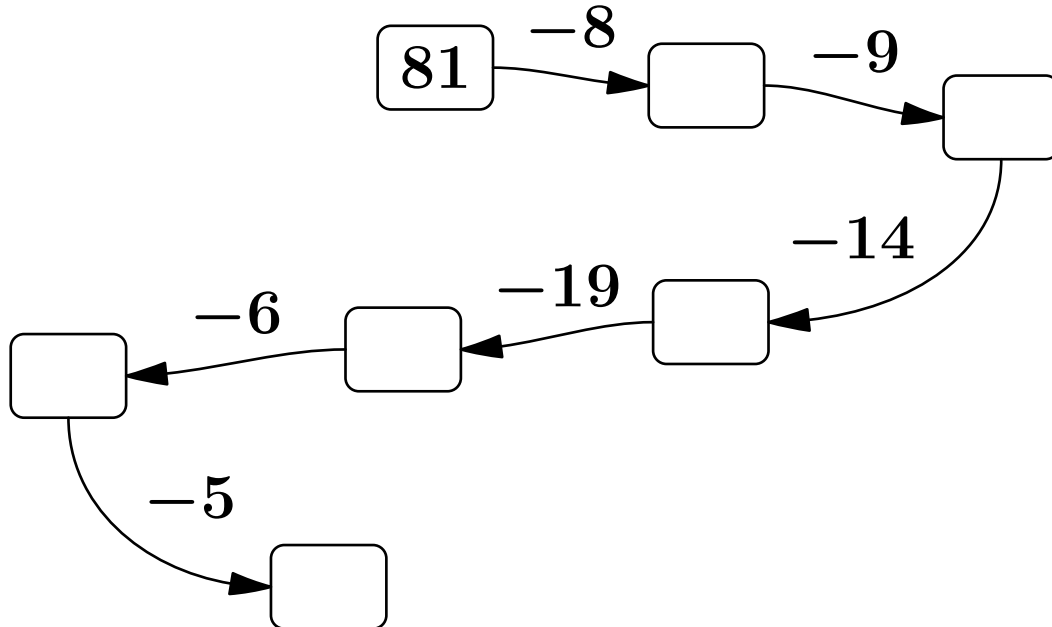
Answer:



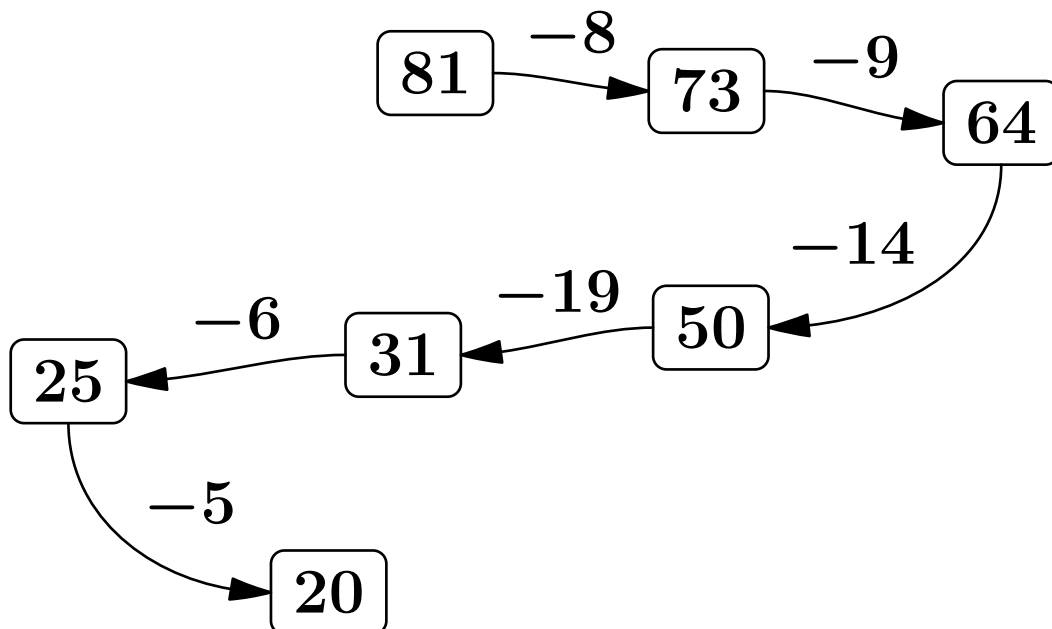
14 Problem – Number snake, subtraction 5–20, 0–100

Piotr Nieżurawski, update: 2017-09-02, id: en-numbers-0000151, diff: 1

In the following number snake a number in each box except the first one must be equal to the number from the previous box modified in accordance with the description at the arrow. Enter the appropriate numbers in the empty boxes.



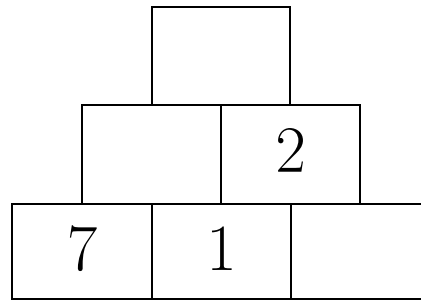
Answer:



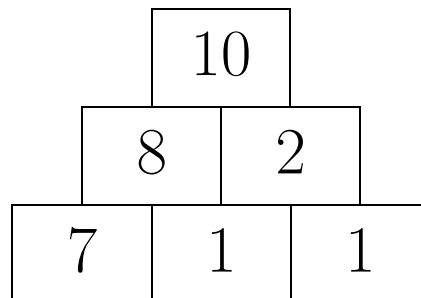
15 Problem – Number triangle, addition, 1–10

Piotr Nieżurawski, update: 2017-07-28, id: en-numbers-0000200, diff: 1

In the following number triangle in each rectangle except those in the lowest row there must be a number that is the sum of the numbers from the two nearest rectangles from the lower row. Enter the appropriate numbers in the empty rectangles.



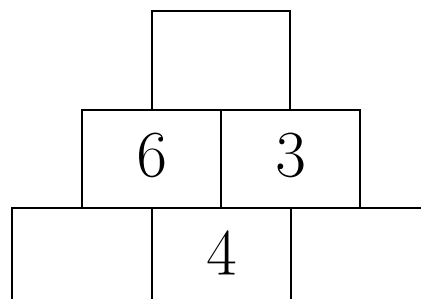
Answer:



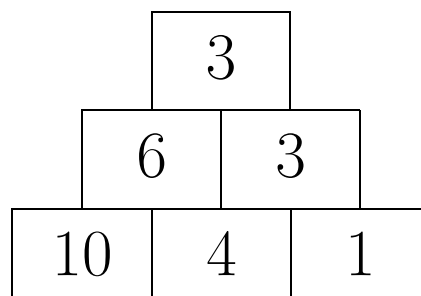
16 Problem – Number triangle, subtraction, 1–10

Piotr Nieżurawski, update: 2017-08-01, id: en-numbers-0000201, diff: 1

In the following number triangle in each rectangle except those in the lowest row there must be a number that is the difference of the numbers from the two nearest rectangles from the lower row: from the number in the left rectangle the number in the right rectangle is subtracted. Enter the appropriate numbers in the empty rectangles.



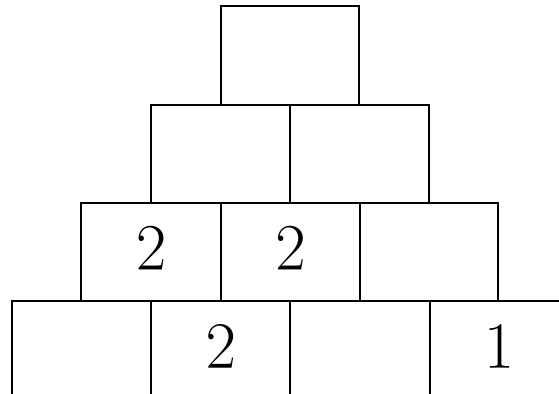
Answer:



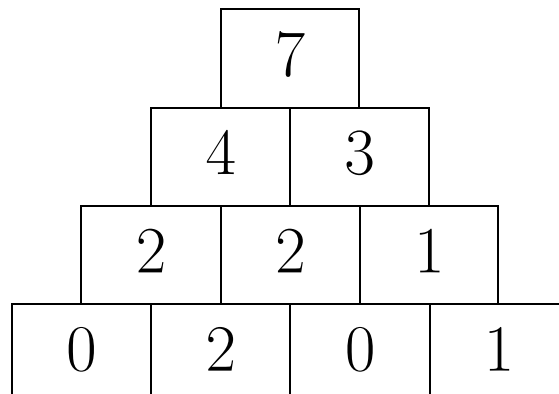
17 Problem – Number triangle, addition, 0–10

Piotr Nieżurawski, update: 2017-07-28, id: en-numbers-0000205, diff: 1

In the following number triangle in each rectangle except those in the lowest row there must be a number that is the sum of the numbers from the two nearest rectangles from the lower row. Enter the appropriate numbers in the empty rectangles.



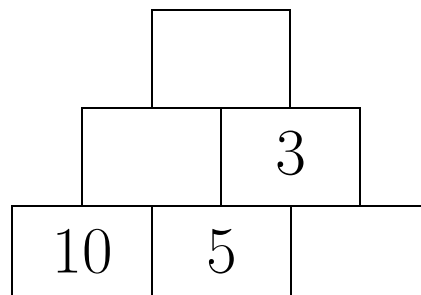
Answer:



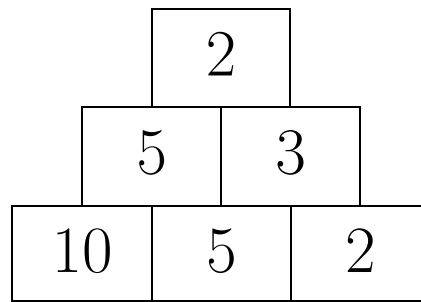
18 Problem – Number triangle, subtraction, 0–10

Piotr Nieżurawski, update: 2017-08-01, id: en-numbers-0000206, diff: 1

In the following number triangle in each rectangle except those in the lowest row there must be a number that is the difference of the numbers from the two nearest rectangles from the lower row: from the number in the left rectangle the number in the right rectangle is subtracted. Enter the appropriate numbers in the empty rectangles.



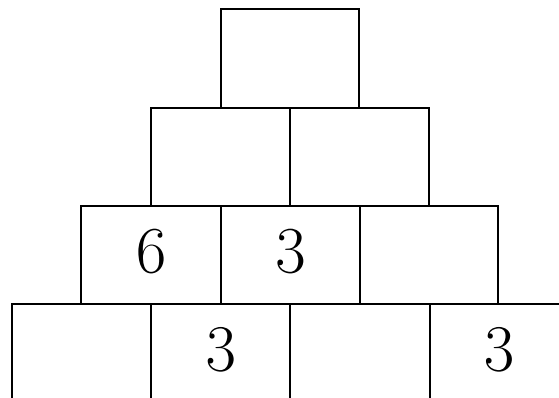
Answer:



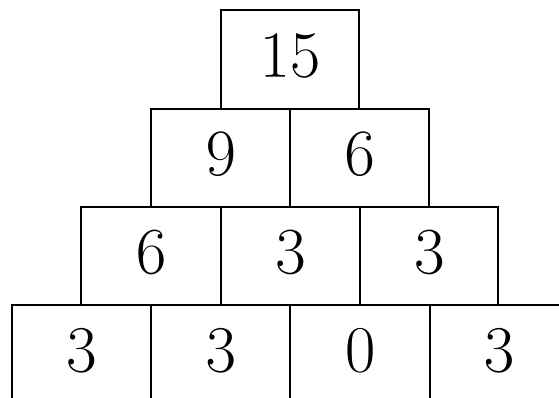
19 Problem – Number triangle, addition, 0–20

Piotr Nieżurawski, update: 2017-07-28, id: en-numbers-0000210, diff: 1

In the following number triangle in each rectangle except those in the lowest row there must be a number that is the sum of the numbers from the two nearest rectangles from the lower row. Enter the appropriate numbers in the empty rectangles.



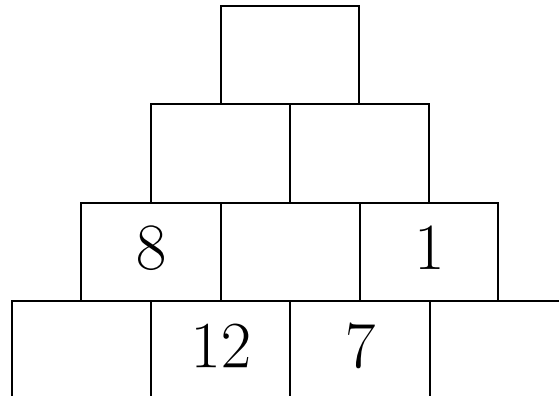
Answer:



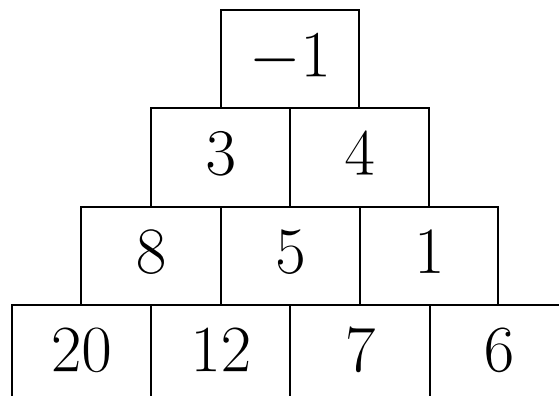
20 Problem – Number triangle, subtraction, 0–20

Piotr Niezurawski, update: 2017-08-01, id: en-numbers-0000211, diff: 1

In the following number triangle in each rectangle except those in the lowest row there must be a number that is the difference of the numbers from the two nearest rectangles from the lower row: from the number in the left rectangle the number in the right rectangle is subtracted. Enter the appropriate numbers in the empty rectangles.



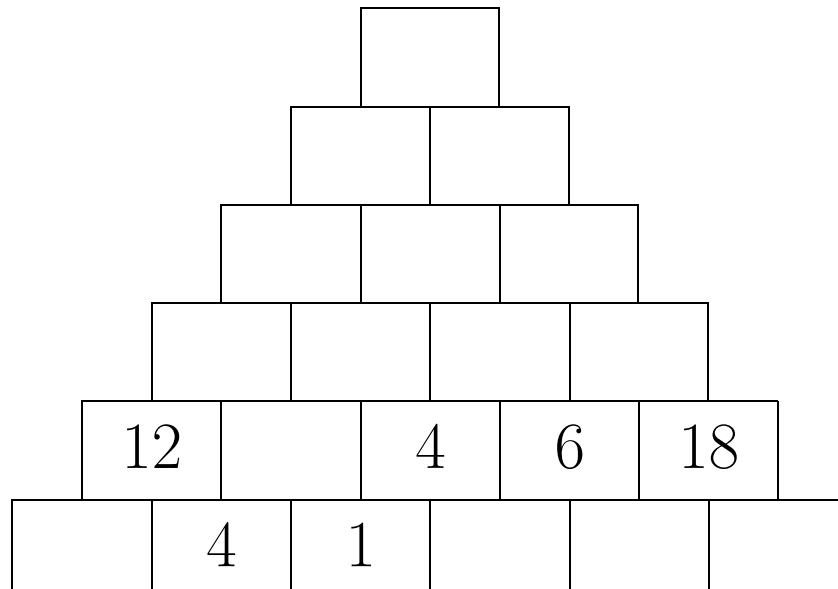
Answer:



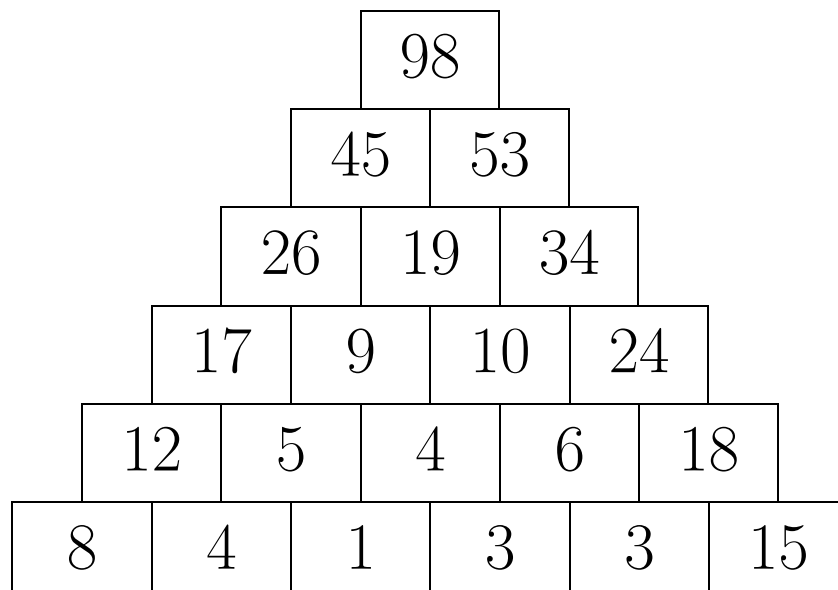
21 Problem – Number triangle, addition, 0–100

Piotr Niezurawski, update: 2017-08-01, id: en-numbers-0000220, diff: 1

In the following number triangle in each rectangle except those in the lowest row there must be a number that is the sum of the numbers from the two nearest rectangles from the lower row. Enter the appropriate numbers in the empty rectangles.



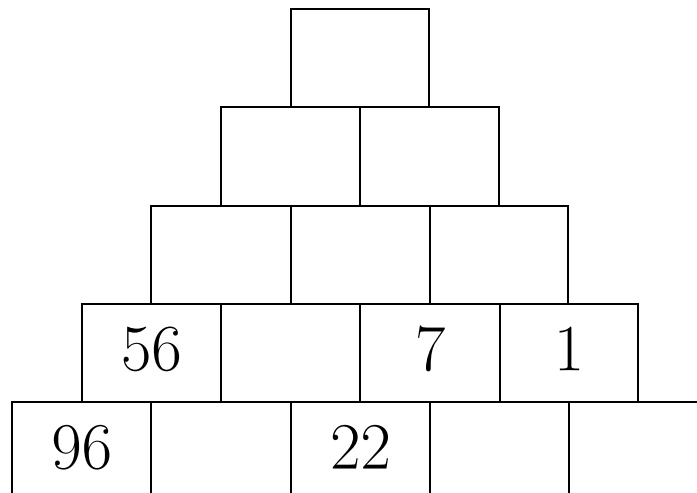
Answer:



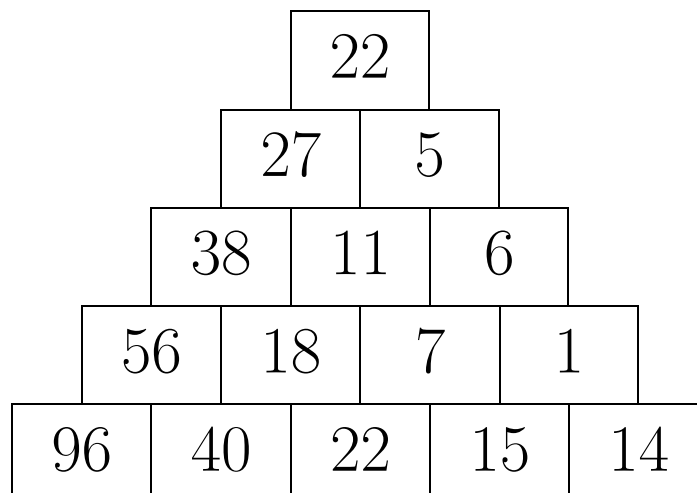
22 Problem – Number triangle, subtraction, 0–100

Piotr Nieżurawski, update: 2017-08-01, id: en-numbers-0000221, diff: 1

In the following number triangle in each rectangle except those in the lowest row there must be a number that is the difference of the numbers from the two nearest rectangles from the lower row: from the number in the left rectangle the number in the right rectangle is subtracted. Enter the appropriate numbers in the empty rectangles.



Answer:



23 Problem – Addition in columns, 35

Piotr Niezurawski, update: 2017-09-03, id: en-numbers-0000300, diff: 1

Calculate the following sums.

a)

	1	9
+		6

b)

	1	5
+	1	8

Answer:

a)

	1	9
+		6
	2	5

b)

	1	5
+	1	8
	3	3

24 Problem – Addition in columns, 55

Piotr Niezurawski, update: 2017-09-03, id: en-numbers-0000305, diff: 1

Calculate the following sums.

a)

	2	5
+	2	3
<hr/>		

b)

	3	8
+	1	6
<hr/>		

Answer:

a)

	2	5
+	2	3
<hr/>		
	4	8

b)

	3	8
+	1	6
<hr/>		
	5	4

25 Problem – Addition in columns, 100

Piotr Niezurawski, update: 2017-09-03, id: en-numbers-0000310, diff: 1

Calculate the following sums.

a)

	6	0
+	2	7
<hr/>		

b)

	6	5
+	3	5
<hr/>		

Answer:

a)

	6	0
+	2	7
<hr/>		
	8	7

b)

	6	5
+	3	5
<hr/>		
1	0	0

26 Problem – Addition in columns, 150

Piotr Niezurawski, update: 2017-09-03, id: en-numbers-0000315, diff: 1

Calculate the following sums.

a)

	5	0
+	7	0
<hr/>		

b)

	8	4
+	6	1
<hr/>		

Answer:

a)

	5	0
+	7	0
<hr/>		
1	2	0

b)

	8	4
+	6	1
<hr/>		
1	4	5

27 Problem – Addition in columns, 1500

Piotr Nieżurawski, update: 2017-09-03, id: en-numbers-0000320, diff: 1

Calculate the following sums.

a)

	5	5	8
+	3	9	5

b)

	6	4	7
+	8	1	8

Answer:

a)

	5	5	8
+	3	9	5
	9	5	3

b)

	6	4	7
+	8	1	8
1	4	6	5

28 Problem – Number of pages

Piotr Nieżurawski, update: 2017-09-10, id: en-numbers-0000500, diff: 1

Wanda started reading a book at the beginning of page 8. After two hours she finished at the end of page 67.

- How many pages did she read?
- How many pages did she read on average in one hour?

Hint: If Wanda started reading at the beginning of page 1 and finished at the end of page 2, how many pages would she read?

Answer: Wanda read 60 pages, her average rate was 30 pages per hour.

29 Problem – Plums

Piotr Nieżurawski, update: 2016-07-11, id: en-numbers-0001000, diff: 1

John had 27 plums. Then he ate one-third of them. How many plums has John now?

Hint: How much is 27:3? Answer: 9.

Answer: John has 18 plums.

30 Problem – Apples

Piotr Nieżurawski, update: 2016-07-30, id: en-numbers-0002000, diff: 1

Mark had 16 apples. John took half of Mark's apples and added them to his own stock. Then it turned out that John has 4 times as many apples as Mark. How many apples do John and Mark have together?

Hint: How many apples are left in Mark's stock? Answer: 8.

Hint: How many apples does John have? Answer: 32.

Answer: John and Mark together have 40 apples.

31 Problem – Pebbles

Piotr Nieżurawski, update: 2017-05-08, id: en-numbers-0003000, diff: 3

Daria and Nela collected some pebbles on the beach. If Daria gave Nela 4 pebbles, then each girl would have the same number of pebbles. However, if Nela gave Daria 1 pebble, then Daria would have twice as many pebbles as Nela. How many pebbles did have each of the girls?

Hint: $D - 4 = N + 4$ and $D + 1 = 2(N - 1)$

Answer: Daria had 19 pebbles and Nela 11 pebbles.

32 Problem – Sides of rectangles

Piotr Nieżurawski, update: 2016-07-30, id: en-rectangles-0001000, diff: 1

Calculate the length of:

- a side of the square with area 25 m^2 .
- a side of the rectangle with area 15 m^2 , and with the second side of length 5 m.
- a side of the square with perimeter equal to 12 m.
- a side of the rectangle with perimeter equal to 24 m, and with the second side of length 3 m.

Hint:

- $A = aa = a^2$
- $A = ab$
- $L = 4a$
- $L = 2(a + b)$

Answer:

- 5 m.
- 3 m.
- 3 m.
- 9 m.

33 Problem – Sets of natural numbers

Piotr Nieżurawski, update: 2018-02-07, id: en-sets-0001000, diff: 1

Sets A , B and C contain following elements:

$$A = \{3, 5, 6, 17, 18, 19, 20, 21, 24, 25\}$$

$$B = \{3, 5, 6, 14, 18, 21, 23, 25\}$$

$$C = \{3, 4, 5, 14, 17, 19, 20, 21, 23\}$$

Determine:

- the union $A \cup B$,
- the union $B \cup C$,
- the union $A \cup B \cup C$,
- the difference $A \setminus B$,
- the difference $B \setminus C$,
- the difference $A \setminus C$,
- the intersection (common part) $A \cap B$,
- the intersection $B \cap C$,
- the intersection $A \cap C$,
- the intersection $A \cap B \cap C$.

Answer:

- $A \cup B = \{3, 5, 6, 14, 17, 18, 19, 20, 21, 23, 24, 25\}$
- $B \cup C = \{3, 4, 5, 6, 14, 17, 18, 19, 20, 21, 23, 25\}$
- $A \cup B \cup C = \{3, 4, 5, 6, 14, 17, 18, 19, 20, 21, 23, 24, 25\}$
- $A \setminus B = \{17, 19, 20, 24\}$
- $B \setminus C = \{6, 18, 25\}$
- $A \setminus C = \{6, 18, 24, 25\}$
- $A \cap B = \{3, 5, 6, 18, 21, 25\}$
- $B \cap C = \{3, 5, 14, 21, 23\}$
- $A \cap C = \{3, 5, 17, 19, 20, 21\}$
- $A \cap B \cap C = \{3, 5, 21\}$

34 Problem – Set operations

Piotr Nieżurawski, update: 2016-07-30, id: en-sets-0003000, diff: 2

Simplify the following expressions with sets A and B :

- $(A \setminus B) \cap (B \setminus A)$
- $A \cap (B \cap A)$
- $(B \setminus A) \setminus A$
- $A \cup (B \setminus A)$

Answer:

- $\{\}$
- $B \cap A$
- $B \setminus A$
- $A \cup B$

35 Problem – Cycling speed

Piotr Niezurawski, update: 2016-07-30, id: en-speed-distance-time-0004000-dpc, diff: 3

Max went by bike from the starting line and rode at the average speed 7.1 m/s. Ann started from the same line 11 s after Max and she finished the race 33 s before Max. Both, Ann and Max, travelled the same distance. What was the Ann's average speed if the total time of her ride was equal to 781 s?

Hint: How much time was Max biking? Answer: 825 s.

Hint: What was the length of the route? (Max...) Answer: 5857.5 m.

Answer: Ann was cycling with speed 7.5 m/s.