

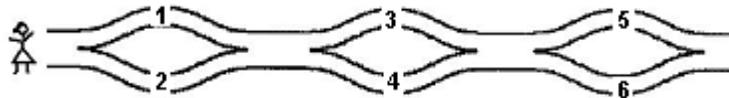


**International Contest-Game MATH KANGAROO
Canada, 2007**

**Solutions
Grade 3 and 4**

Part A: Each correct answer is worth 3 points.

1. Zita walked from the left to the right and wrote the numbers she saw along the roads in her notepad. Which of the following groups of numbers could be the numbers written by Zita?

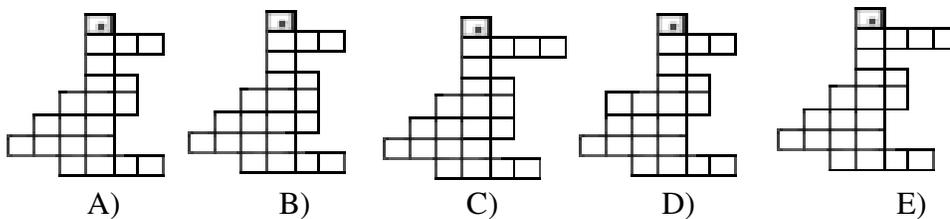


- A) 1,2 and 4 B) 2,3 and 4 C) 2,3 and 5 D) 1,5 and 6 E) 1,2 and 5

Solution: Since Zita walked from left to right, she had to pass by only one of the numbers in each group of two elements ($\{1,2\}$; $\{3,4\}$; $\{5,6\}$).

Answer: C ($\{1,2\}$; $\{3,4\}$; $\{5,6\}$).

2. Which of the Kangaroo figures contains the greatest number of little squares?



Solution: All figures have an identical core (A) in comparison to which some figures have more squares: B has 1 more, C has 2 more, D has 1 more and E also 1.

Answer: C.

3. How many common letters do the words KANGAROO and PROBLEM have?

- A) 1 B) 2 C) 3 D) 4 E) 5

Solution: The group RO appears in both words.

Answer: B.

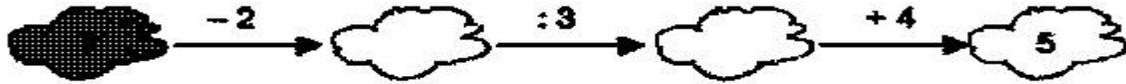
4. The numbers 34 and 142 have the same sum of their digits ($3+4=7$ and $1+4+2=7$). What is the first number greater than 2007 such that the sum of its digits is the same as the sum of the digits of 2007?

- A) 2016 B) 2115 C) 2008 D) 7002 E) 2070

Solution: One has to look for a number with the sum of digits 9 and as close as possible to 2007. A way to find it is to think how to obtain 7 as a sum (keeping the first digit 2 the same). Out of the many options, the closest to 2007 is 2016.

Answer: A

5. Emma wrote her favourite number in the dark cloud and performed correctly several calculations following the sequence in the diagram. What is Emma's favourite number?



- A) 1 B) 3 C) 5 D) 7 E) 9

Solution: A back-counting is needed (from right to left, with inverse operations to the ones marked). That is, $5-4=1$; $1 \times 3=3$; $3+2=5$.

Answer: C.

6. There are 9 lampposts on one side of the path in the park. The distance between each pair of neighbouring lampposts is 8 metres. George was jumping all the way from the first lamppost to the last one. How many metres has he jumped?

- A) 48 B) 56 C) 64 D) 72 E) 80

Solution: The 9 lampposts define 8 distances between neighbouring lampposts, so the total distance jumped by George is $8 \times 8=64$.

Answer: C.

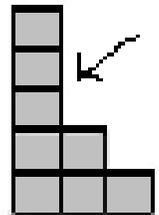
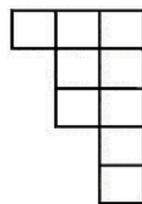
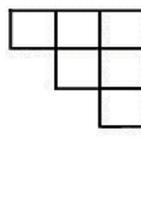
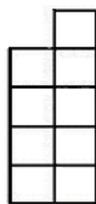
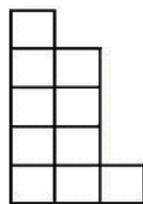
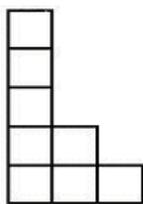
7. The combination for opening a safe is a three – digit number made up of different digits. How many different combinations can you make using only digits 1, 3, and 5?

- A) 2 B) 3 C) 4 D) 5 E) 6

Once the first digit is chosen, there are two possibilities to choose the remaining digits. But the first digit can be chosen in three different ways, and for each choice, there are two combinations, respectively. In consequence, the total number is $3 \times 2=6$.

Answer: E.

8. Which of the five pieces below fits together with the one given on the right to form a rectangle?



- A) B) C) D) E)

Solution: The piece completing the given figure has to contain a L-shape with two adjacent rows of 4 and 3 squares (to fit the part shown).

Answer: B.

Part B: Each correct answer is worth 4 points.

9. What is the answer to $4 \times 4 + 4 + 4 + 4 + 4 + 4 \times 4$?

- A) 32 B) 144 C) 48 D) 56 E) 100

Note: Remember to respect the Order of Operations rules.

Answer: C.

10. The square in the figure is a *mini-sudoku*: the numbers 1, 2, and 3 must be written in the cells so that each of them appears in each row and in each column. Harry started to fill in the square. Which number should he write in the cell that is marked by a question mark (?) ?

1	?	
2	1	

- A) only 1 B) only 2 C) only 3 D) 2 or 3 E) 1, 2 or 3

Solution: The number 3 must complete the second row as well as the first column, because the other two digits are already written there. It is not allowed to have the same digit written more than once in a row/column. Hence, in the second column, the number 3 can only be in the first row (where the “?” sign is).

Answer: C.

11. “Euro” is the currency of the European Union (*1 euro = 100 euro-cents*). Helga has 5 *euro*. She intends to buy 5 notebooks, which cost 80 *euro-cents* each, and some pencils, 30 *euro-cents* each. At most how many pencils can Helga afford to buy?

- A) 5 B) 4 C) 3 D) 2 E) 1

Solution: Five notebooks cost 4 euros ($5 \times 0.80 = 4$), so Helga has 1 euro to buy pencils, each of 30 euro-cents. She can buy at most three pencils.

Answer: C.

12. Basil, who is older than Peter by one year and one day, was born on January 1, 2002.

What is the date of Peter’s birthday?

- A) January 2, 2003 B) January 2, 2001 C) December 31, 2000

- D) December 31, 2002 E) December 31, 2003

Solution: Basil is *older*, so Peter was born *after* Basil (in time). We need to add to Basil’s birthdate 1 year and a day.

Answer: A.

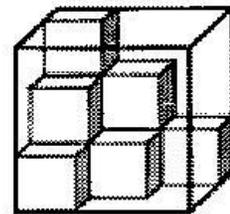
13. John has 400 spaghetti strands, each 15 cm long, on his lunch plate. If he joined them end to end (using sauce as glue) to form one long strand, what would be the length of his lunch?

- A) 6 km B) 60 m C) 600 cm D) 6000 mm E) 60 000 cm

Solution: He would have 400×15 cm of total length, that equals to 6000 cm = 60m (since 100 cm = 1m)

Answer: B.

14. Daniella has an aquarium in the shape of a cube with edges 3 dm each. She started arranging cubes with edges 1 dm each inside the aquarium, in the way you can see on the picture. At most how many more such cubes can Daniella put into the aquarium?



- A) 9 B) 13 C) 17 D) 21 E) 27

Solution: Since the cube has an edge of 3 dm and the little cubes have an edge of 1 dm, there are $3 \times 3 \times 3 = 27$ little cubes in total. There are already 10 cubes inside, so we can fit at most 17 more.

Answer: C.

15. Peter wrote a one-digit number and then wrote an additional digit to its right. He added 19 to the obtained number and got 72. What number did Peter write first?

- A) 2 B) 5 C) 6 D) 7 E) 9

Solution: Let us reverse the operations: $72-19=53$. So, Peter wrote 5 at first, and then added the digit 3 to its right.

Answer: B.

16. Digital clock shows the time **20:07**. What is the least time period to pass in order to see again the same four digits (in some order) on the clock? *Note: At midnight, the digital clock shows 00:00, one hour later it shows 01:00, etc.*

- A) 4 h 20 min B) 6 h 00 min C) 10 h 55 min D) 11 h 13 min. E) 24 h 00 min.

Solution: Since the first two digits can only show numbers from 0 to 23 and the last two digits can only show numbers from 0 to 60, the only other arrangements of the digits 2, 0, 0, 7 on the clock are 00:27, 02:07, 07: 02, and 07: 20. The closest to 20:07 is 00:27, which occurs in 4h 20min.

Answer: A.

Part C: Each correct answer is worth 5 points.



17. A cube with a side length of 3 cm is painted grey and cut into smaller cubes with a side length of 1 cm each. How many of the smaller cubes will have exactly 2 faces painted?

- A) 4 B) 6 C) 8 D) 10 E) 12

Solution: The cubes with exactly 2 faces painted are along the edges of the cube, except corners (which have three faces painted). There are 12 edges in all, and there is one cube with exactly two painted faces on each of them.

Answer: E.

18. A palindrome is a number which remains the same when its digits are written in reverse order. For example, 1331 is a palindrome. A car's odometer reads 15951. Find the least number of kilometres the car should travel for the next palindrome to appear on the odometer?

- A) 100 B) 110 C) 710 D) 900 E) 1010

Solution: The number has 5 digits, so to be palindrome the last two digits must be the first two digits written in a reverse order. The given reading, 15951, is the greatest palindrome number that starts with 15. The smallest next such number will be the one starting with 16 and having the smallest possible middle digit, 0, e.g., this is the number 16061. The least number of kilometres the car must travel is $16061-15951=110$.

Answer: B.

19. Romain, Fabien, Lise, Jennifer, and Adrien stand in a single row. Romain is after Lise. Fabien is before Romain and just after Jennifer. Jennifer is before Lise but she is not the first. Where is Adrien?

- A) 1st B) 2nd C) 3rd D) 4th E) 5th

Solution: Fabien is after Jennifer, who is before Lise (so, until now here we have Jennifer, Fabien, and Lise in order). Romain is after Lise (so, we have Jennifer, Fabien, Lise, and Romain). But Jennifer is not the first, so the only one who can be before her is Adrien.

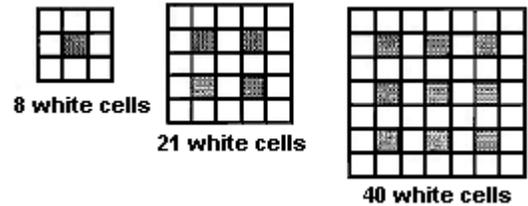
Answer: A.

20. What is the perimeter of the figure obtained from a 15 cm by 9 cm rectangle, by cutting out four identical squares with a perimeter of 8 cm each, one at each corner?
- A) 48 cm B) 40 cm C) 32 cm D) 24 cm E) 16 cm

Solution: We cut squares from the corners (all sides equal). In each corner, the parts to be cut off the perimeter of the original rectangle are two sides of the square cut, while the parts added to this perimeter are the other two sides of this square, so, in fact, the perimeter remains unchanged. It is equal to $(15+9)\times 2=48$ cm.

Answer: A.

21. The following three diagrams represent a pattern in the arrangement of the black and white cells. If the pattern continues, how many white cells will the next diagram have?



- A) 50 B) 60 C) 65 D) 70 E) 75

Solution: The side of the big squares increases by 2 (in the figures we have squares with a side of 3, 5, 7, etc.). The black squares (combined) form a smaller square of side 1, 2, 3, etc., so the pattern for the number of the black squares is 1×1 , 2×2 , 3×3 , etc. The next square will have a side of 9 (81 squares in total) with 4×4 black ones. So the number of the white ones is $81-16=65$.

Answer: C.

22. The seats on a children merry-go-round are numbered in the sequence 1, 2, 3, On this merry-go-round, Peter was sitting on seat #11, exactly opposite Maria, who was sitting on seat #4. How many seats are there on this merry-go-round?
- A) 13 B) 14 C) 16 D) 17 E) 22

Solution: If 4 and 11 are opposite seats, then there is the same numbers of seats between them (walking around the circle from 4 to 11 and from 11 to 4). There are 6 numbers between 4 and 11, without counting 4 and 11. So, the total number of seats is $6+6+2=14$.

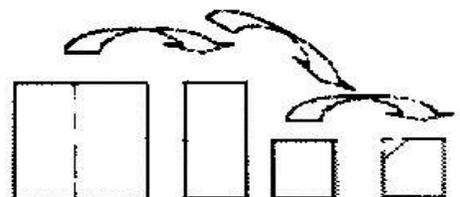
Answer: B.

23. How many digits are needed to write down all numbers from 1 to 100?
- A) 100 B) 150 C) 190 D) 192 E) 200

Solution: There are nine one-digit numbers (from 1 to 9), ninety two-digit numbers (from 10 to 99, inclusive) and one three-digit number, 100. The total number of digits needed is $9\times 1+90\times 2+3=192$.

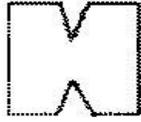
Answer: D.

24. A square piece of paper is folded twice in such a way that the result is a square again. In the new square, one of the corners is cut out and then the paper is unfolded. Which of the following designs cannot be obtained this way?

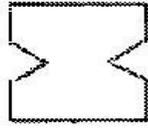




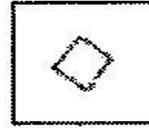
A)



B)



C)



D)

E) All of these designs can be obtained this way.

Solution: The final figure depends on how the second fold is done (from rectangle to square), and which of the corners is cut. All these figures are possible.

Answer: E.

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Bonus 1: Vanda cut a paper square with a perimeter of 20 cm into two rectangles. The perimeter of one of the rectangles was 16 cm. What was the perimeter of the second rectangle?

A) 8 cm

B) 9 cm

C) 12 cm

D) 14 cm

E) 16 cm

Solution: Since the square was cut into two rectangles, one side of each of the rectangles has to be of the same length as the side of the square, which is 5 cm (since its perimeter is 20). That means that the other side of the rectangle with a perimeter of 16 cm is $(16 - 2 \times 5) / 2 = 3$ cm. In consequence, the second rectangle has the sides of 5 cm and 2 cm, hence, a perimeter of 14 cm.

Answer: D.

Bonus 2: There were 60 birds on three trees. At some moment 6 birds flew away from the first tree, 8 birds flew away from the second tree, and 4 birds flew away from the third tree. After that, it turned out that the number of birds on each tree was the same. How many birds were there on the second tree in the beginning?

A) 26

B) 24

C) 22

D) 21

E) 20

Solution: At the end, the total number of birds on the three trees was $60 - 6 - 8 - 4 = 42$. There were the same number of birds on each tree, hence, there were $42 / 3 = 14$ birds on each tree.

Working backwards, we obtain

$14 + 6 = 20$ birds on the first tree;

$14 + 8 = 22$ birds on the second tree;

$14 + 4 = 18$ birds on the third tree.

Answer: C.