

MATH KANGAROO STRATEGIES

BEGINNERS 2/25/2018

The Math Kangaroo is coming up! As you may already know, the Math Kangaroo tests mathematical knowledge and is given in mid-March each year. While simply excelling in math is enough to score well, test-taking strategies can help with focus and timing, two of the most difficult parts of the Math Kangaroo. Today, we will practice four strategies: mathematical picture drawing, question skipping, process of elimination, and checking for mistakes. Wait for your teacher's instructions: each activity will take ~30 minutes.

While you work, remember the most important test-taking strategy: read the question, pause, then...read the question again. Have fun!

1. MATHEMATICAL PICTURE DRAWING

What makes a good mathematical picture? In general, mathematical pictures give us **intuition** about the solution to a problem. Remember: on the Math Kangaroo, you have 75 minutes to complete ~25 questions, giving you 1-2 minutes to complete easy problems and 3-4 minutes to complete the more difficult problems. With this in mind, the most important aspect of a good mathematical picture is **timing**. For each question below, draw a picture to represent the situation using **no more than 1 minute per picture**. Do **NOT** provide a solution. After 15 minutes, your teacher will have you put your pencils down.

- (1) There are places for 4 people at a certain square table, one on each side. Students have put together 10 such tables, one next to another, in one row so they got one rectangular table. How many places are there at the rectangular table now?

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- (2) On one side of Long Street there are houses numbered by consecutive odd numbers from 1 to 39, and on the other side there are houses numbered by consecutive even numbers from 2 to 34. How many houses are there on Long Street?
- (3) A tanker delivered gas to three different gas stations. At the first one 30% of the gas was taken out, at the second gas station 40% of the remaining gas in the tank was taken out, and at the third station half of the remaining gas was taken out. What percent of the initial amount of gas is left in the tank?
- (4) In a certain class, $\frac{1}{8}$ of the students received a C on the math exam, $\frac{1}{6}$ received a B, and $\frac{2}{3}$ received an A. There were no D's or A+'s. How many students received an F if there were less than 30 students in the class?

(5) Each kangaroo jump takes the same amount of time. If it takes a kangaroo 6 seconds to make 4 jumps, how long will it take the kangaroo to make 10 jumps?

(6) What will be the height of a structure obtained by cutting a cube measuring 1 meter on one edge into cubes having the edge length of 1 decimeter and stacking all the decimeter cubes?

(7) Wanda cut a square sheet of paper with a perimeter of 20 inches into two rectangles. One of the rectangles has a perimeter of 16 inches. What is the perimeter of the other rectangle?

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- (8) A square grid is composed of smaller squares. The diagonals of this larger square grid are drawn, and then Hanna colored the smaller squares that the diagonals passed through. How many squares make up the grid if she colored a total of 9 squares?
- (9) Two squares measuring 9×9 inches are overlapped so that a 9×13 inch rectangle is created. Find the area of the region where the two squares overlap.
- (10) A bridge is built across a river. The river is 120 m wide. One quarter of the bridge is over land on the left bank of the river and one quarter of the bridge is over land on the right bank of the river. How long is the bridge?

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- (11) The numbers 1 to 8 are written on eight cards, a different number on each card. The cards are then divided into groups A and B in such a way that the sum of the numbers on the cards in group A is equal to the sum of the numbers on the cards in group B . If we know that group A contains only three cards, then we know for sure that: (answer choices omitted).
- (12) What is the smallest number of identical cubes that are needed to make a rectangular prism with the dimensions of $40 \times 40 \times 60$?
- (13) A certain hotel has 5 floors. There are 35 rooms on each floor. Each of the rooms is numbered with a three-digit number. The first digit indicates the floor number, and the remaining two digits form the room number on the given floor. The rooms on each floor are numbered in order. For example, all the rooms on the third floor are numbered from 301 to 335. How many times was the digit 2 used in numbering all the rooms in this hotel?

(14) A complete set of dominoes contains 28 pieces. The pieces show every possible combination of two numbers of dots from 0 to 6 inclusive. How many dots are there altogether in a complete set of dominoes?

(15) In the land of Funnyfeet, the left foot of each person is either one or two sizes bigger than his or her right foot. However, shoes are always sold in pairs of the same size, and only in whole sizes. A group of friends decided to buy shoes, and to save money they bought shoes together. After they all put on the shoes that fit them, there were exactly two shoes left over, one of size 36 and another of size 45. What is the smallest possible number of people in the group?

STOP. WAIT FOR FURTHER INSTRUCTIONS.

2. QUESTION SKIPPING

Another important skill for timing the Math Kangaroo is knowing when to skip a question. Different students find different questions confusing or difficult, so it is crucial that you understand what you know and what you don't. However, there is no penalty for guessing on the Math Kangaroo, so you should still mark an answer for every question on the real exam. Below you will find 15 questions, each of which was worth 5 points when it appeared. Of these, answer 10 of them, and choose 5 to skip. For the 5 questions that you skip, choose an "educated guess" among the options which you would mark as your answer on the actual exam. **DO NOT BEGIN UNTIL YOUR TEACHER TELLS YOU TO.** If you finish early, feel free to return to the first section and answer some questions you drew pictures for.

- (1) Ela came to Anna's birthday party 5 minutes earlier than Stan but 3 minutes later than Iwona. Iwona left first. She left 2 minutes earlier than Stan and 5 minutes earlier than Ela. How many minutes longer was Ela at the party than Stan?
 - (a) 2
 - (b) 4
 - (c) 6
 - (d) 8
 - (e) Stan stayed longer than Ela

- (2) Six hundred and six Swiss people can eat six hundred and six hotdogs, six hundred of which are with mustard and six are without mustard. How many hotdogs without mustard will you need for six hundred and six thousand six hundred and six Swiss people?
 - (a) 606
 - (b) 1000
 - (c) 6006
 - (d) 606,606
 - (e) 600,600

- (3) Four squirrels ate 1999 nuts altogether, and each one ate at least 100 nuts. The first squirrel ate more nuts than any other squirrel. The second and third squirrels together ate 1265 nuts. How many nuts did the first squirrel eat?
- (a) 598
 - (b) 271
 - (c) 629
 - (d) 634
 - (e) other answer
- (4) When it is raining, the cat stays in the room or in the basement. When the cat stays in the room, the mouse is in the foyer and the cheese is in the refrigerator. When the cheese is on the table and the cat stays in the basement, the mouse is in the room. Right now, it is raining and the cheese is on the table. So, for sure:
- (a) The cat is in the room.
 - (b) The cat is in the room and the mouse is in the foyer.
 - (c) The mouse is in the foyer.
 - (d) The cat is in the basement and the mouse is in the room.
 - (e) This situation is impossible.
- (5) What is the maximum number of acute angles that can be made by six rays coming out from the same point?
- (a) 6
 - (b) 8
 - (c) 9
 - (d) 12
 - (e) 15

- (6) The “yield” of 36 equals 18, the “yield” of 325 equals 30, the “yield” of 45 equals 20, and the “yield” of 30 equals 0. What is the “yield” of 531?
- (a) 10
 - (b) 15
 - (c) 16
 - (d) 21
 - (e) 22
- (7) An electronic clock shows hours, minutes, and seconds. Right now it shows 19:58:47. As you can see, all the digits are different. After how many seconds will you see all different digits again?
- (a) 40
 - (b) 73
 - (c) 156
 - (d) 157
 - (e) 898
- (8) The leaders of the math camp in Zakopane decided to divide 96 participants into groups. Each group would have the same number of people in it, and there would be at least 5 and at most 20 people in each. How many numbers can represent the number of people in one group?
- (a) 10
 - (b) 8
 - (c) 5
 - (d) 4
 - (e) 2

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- (9) The length of one of the sides of a rectangle was increased by 10%, and the length of the other side of the rectangle was decreased by 10%. How did the area of the rectangle change?
- (a) It did not change.
 - (b) It decreased by 1%.
 - (c) It increased by 1%.
 - (d) It increased by 20%.
 - (e) It depends on the lengths of the sides.
- (10) The jump of a little kangaroo is 1 m long and takes one-half of a second. His mother's jump is 3 m long and takes one second. The mother and the little kangaroo start at the same time from the same place and are jumping towards a eucalyptus which is 180 m away. For how many seconds will the mother be waiting for the little kangaroo at the tree?
- (a) 30
 - (b) 60
 - (c) 10
 - (d) 120
 - (e) 20
- (11) How many different weights can we determine using a balance and one each of 1 kg, 3 kg, and 9 kg weights (we can place the weights on either side)?
- (a) 3
 - (b) 6
 - (c) 11
 - (d) 13
 - (e) 14

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- (12) We used 8 grams of play dough to make a cube with an edge of 2 cm. How many grams of play dough do we need to make a cube with an edge of 4 cm?
- (a) 16
 - (b) 24
 - (c) 32
 - (d) 48
 - (e) 64
- (13) The body of a certain caterpillar is made up of five spherical parts, 3 of which are yellow and 2 are green. What is the greatest possible number of different types of this caterpillar that could exist? (Two caterpillars are the same type if their body parts are colored identically, in the same order).
- (a) 6
 - (b) 8
 - (c) 9
 - (d) 10
 - (e) 12

(14) 9 is the ones digit in the product of 7×7 . 3 is the ones digit in the product of $7 \times 7 \times 7$. What is the ones digit in the number which is the product of 100 sevens?

- (a) 1
- (b) 3
- (c) 5
- (d) 7
- (e) 9

(15) Using digits from 1 to 6, each digit only once, we form two 3-digit numbers, for instance, 645 and 321, and then we subtract the smaller number from the larger. In this example, the difference is 324. What is the smallest possible value of the difference you can get this way?

- (a) 69
- (b) 56
- (c) 111
- (d) 47
- (e) 38

STOP. WAIT FOR FURTHER INSTRUCTIONS.

3. PROCESS OF ELIMINATION

Process of elimination is a necessary strategy on any multiple-choice exam where time is a priority. Often, a question you are unable to answer confidently will have multiple answer options you can confidently say are incorrect. As mentioned above, there is no penalty for wrong answers or guessing on the Math Kangaroo, you simply get points for each problem you mark the correct solution for. Thus, guessing between two options (as opposed to guessing between five options) will increase your chances by 30%! Over the course of an entire exam, this can add up to a significant number of points. For each question below, eliminate as many choices as possible **WITHOUT SOLVING THE PROBLEM**. That is, solving the problem is not a valid justification for eliminating an answer choice in this situation. If you finish early, you may revisit any of the previous sections, but please **DO NOT GO TO THE NEXT SECTION**.

- (1) You count from 1 to 100 and you clap when you say the multiples of the number 3, and when you say numbers that are not multiples of 3 but have 3 as the last digit. How many times will you clap your hands?
 - (a) 30
 - (b) 33
 - (c) 36
 - (d) 39
 - (e) 43

(2) The cyclist went up the hill with the speed of 12 km/h and went down the hill with the speed of 20 km/h. The ride up the hill took him 16 minutes longer than the ride down the hill. How many minutes did it take the cyclist to go down the hill?

- (a) 24
- (b) 40
- (c) 32
- (d) 16
- (e) 28

(3) Ada has 14 gray balls, 8 white balls and 6 black balls in a bag. What is the least number of balls she has to take out of her bag with her eyes closed to be sure that she took at least one ball of each color?

- (a) 23
- (b) 22
- (c) 21
- (d) 15
- (e) 9

- (4) 32 player were competing in a chess competition. The competition was taking place in stages. In each stage all the players were divided into groups of four. In each of these groups every player played once with each of the other players. The two best players from the group went to the next level and the two worst players were out of the competition. After the stage in which the four last player played, the two best players played an additional final game. How many games were played during the whole competition?
- (a) 49
 - (b) 89
 - (c) 91
 - (d) 97
 - (e) 181
- (5) With how many zeros does the product of the consecutive natural numbers from 1 to 50 end?
- (a) 5
 - (b) 10
 - (c) 12
 - (d) 20
 - (e) 50
- (6) At 3:00 o'clock the minute hand and the hour hand make a right angle. What will the measure of the angle between these hands be after 10 minutes?
- (a) 90°
 - (b) 30°
 - (c) 80°
 - (d) 60°
 - (e) 35°

- (7) Red and green dragons lived in a cave. Each red dragon had 6 heads, 8 legs, and 2 tails. Each green dragon had 8 heads, 6 legs, and 4 tails. There were 44 tails altogether, and there were 6 less green legs than red heads. How many red dragons lived in the cave?
- (a) 6
 - (b) 7
 - (c) 8
 - (d) 9
 - (e) 10
- (8) Ania has 9 crayons in a box. At least one of them is blue. At least two of every 4 crayons are of the same color, and at most three out of every 5 crayons are of the same color. How many blue crayons are in this box?
- (a) 2
 - (b) 3
 - (c) 4
 - (d) 1
 - (e) 5
- (9) During a competition in the Kangaroo Summer Camp in Zakopane students were given 10 problems to solve. For each correct answer a student was given 5 points and for each incorrect answer the student lost 3 points. Everybody solved all the problems. Mathew got 34 points, Philip got 10 points and John got 2 points. How many problems did they answer correctly together?
- (a) 17
 - (b) 18
 - (c) 15
 - (d) 13
 - (e) 21

- (10) A right triangle with legs of length 6cm and 8cm was cut out of a piece of paper and then folded along a straight line. Which of the numbers below can express the area of the resulting polygon?
- (a) 9 cm^2
 - (b) 12 cm^2
 - (c) 18 cm^2
 - (d) 24 cm^2
 - (e) 30 cm^2

STOP. WAIT FOR FURTHER INSTRUCTIONS.

4. CHECKING FOR MISTAKES

If you're a real superstar, you'll finish answering every question and still have a few minutes to spare. However, finishing early doesn't always mean getting a great score. Often, we read questions incorrectly or make silly mistakes and end up losing points on questions we knew how to solve. For the last activity, wait for your teacher's instructions and then find a partner (or just your neighbor) to trade packets with. Check each of your partner's solutions and make sure they're correct (check every problem they solved, even if it wasn't assigned to be solved). When you've finished, raise your hand and have a teacher or assistant check your checking!