Math 4. Classwork 20

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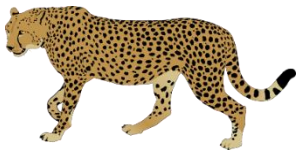
Review of the homework #18

1. Divide : *Example: Divide 16 in the ratio 1:3. The total number of parts in which the number 16 is divided is 4 (1:3). So each part would be 16:4=4. To divide 16 in the ratio 1:3 we will take 4 (1 part) and 12 (3 parts). The answer is 4:12.*
    a) 12 in the ratio $1:3$
    b) 15 in the ratio $2:3$
    c) 48 in the ratio $\frac{1}{3} \div \frac{1}{5}$ (remember that here to convert this type of a ratio into a simple form you have to bring your fractions to a common denominator. Just remember how we divide fractions using common denominator)

    d) 100 in the ratio $\frac{1}{2} \div \frac{1}{3}$

2. Represent the following values of speed in $\frac{km}{h}$ units and connect to the appropriate pictures.



$5.4\frac{m}{h} =$

$91.7\frac{m}{min} =$

$1.83\frac{km}{min} =$

Factorials and permutations

There are 5 chairs and 5 kids in the room.
In how many ways can kids sit on these chairs?
The first kid can choose any chair. The second kid can choose any of the 4 remaining chairs, the third child has a choice between the three chairs, and so on. Therefore, there are $5 \times 4 \times 3 \times 2 \times 1$ ways how all of them can choose their places.

The expression $5 \times 4 \times 3 \times 2 \times 1$, can be written as 5! (5 factorial)

$$5 \times 4 \times 3 \times 2 \times 1 = 5! \quad or \quad n \times (n-1) \times (n-2) \times \ldots \times 3 \times 2 \times 1 = n!$$

Write the following expressions as a factorial and vice versa:

Example: $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 7!$, $4! = 4 \times 3 \times 2 \times 1$

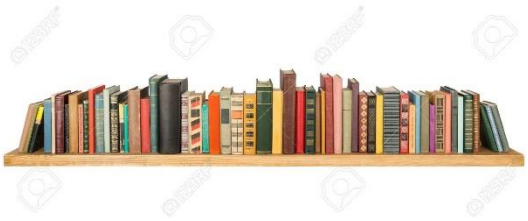
$10 \times 9 \times 8 \times \ldots \times 3 \times 2 \times 1 =$

$6! =$

$b \times (b-1) \times (b-2) \times \ldots \times 3 \times 2 \times 1 =$

$c! =$

1. Simplify the following fractions:
   $\frac{5!}{7!} =$



2. How many different ways are there to put 64 books on the shelf?

3. In the restaurant, there are 3 choices of starters, 4 choices of entrees and 5 choices of tasty desserts in the fix price dinner menu. How many different ways are there to fix a dinner for the restaurant's clients?

4. How many two digit numbers can be composed from digits 1, 2, 3 without repetition of digits?

5. How many two digit numbers can be composed from digits 1, 2, 3, if repetition is allowed?

6. Peter took 5 exams at the end of the year. Grades for exams are A, B, C, D. How many different ways are there to fill his report card?

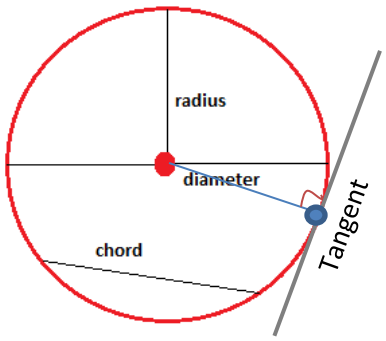
7. There are red and green pencils in a box. How many pencils do you have to take out of the box without seeing them to be sure that you have at least 2 pencils of the same color?

8. If there are pencils of 5 different colors in a box, how many pencils do you have to take out to be sure that you have at least 2 of the same color?

9. There are 10 pairs of red gloves and 10 pairs of black gloves in a box. How many gloves do you have to take out to be sure that you have a pair of gloves that you can wear?

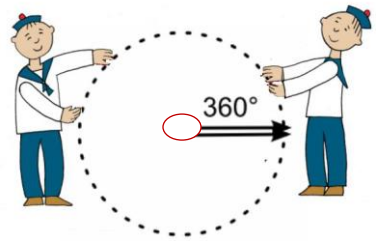
1. **Geometry**.

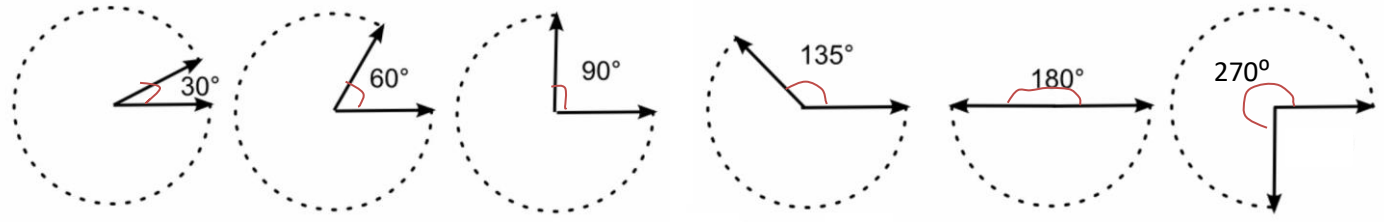
What is the definition of a circle?



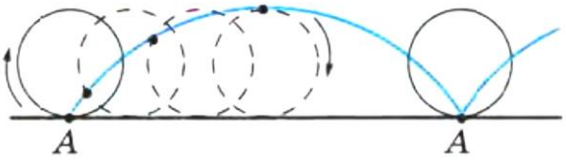
$$\frac{\text{Circumference}}{\text{Diameter}} =$$

- The FULL CIRCLE forms a **360 degree** angle.
- A half circle or a straight angle is 180 degrees
- A fourth of a circle or a right angle is 90 degrees.





Circle is running along the line. At a starting time point A was the point of contact of the circle and the line. The curve which point A will trace is called cicloide. What line the center of the circle will trace?



Imagine the “square wheel” – a square which is staying on a road. Draw a line traced by the point A (vertex) in a process of “rolling”? The diagonal intersection-O?