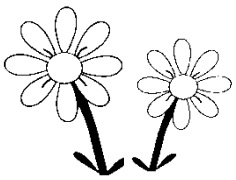
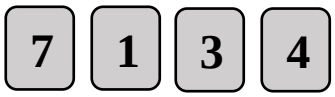
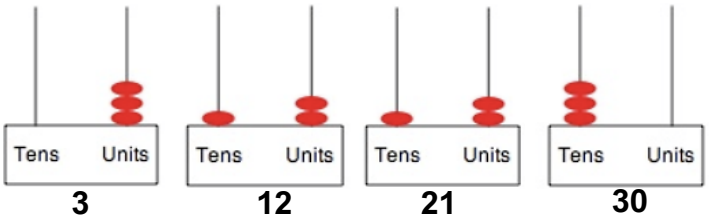
Math Challenge #5

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

		Answer
1.	Myra has a blue crayon and a red crayon. She starts coloring a coloring page that has 2 flowers below. If Myra colors each flower with either blue or red, how many different ways can coloring page look like?  From left to right, Myra can color the following ways: Red, Blue Red, Red Blue, Red Blue, Blue	*4 [ways]*
2.	Tanisha was given 3 colored blocks to play. She loves to build a tower by stacking these blocks then knocks them down. In how many ways can Tanisha build a tower using a red, purple, and pink blocks?  **Red** **Purple** **Pink** There are 6 different ways: 2 ways with red at the bottom: red – purple – pink, red – pink – purple. 2 ways with purple at the bottom: purple – pink – red, purple – red – pink. 2 ways with pink at the bottom: pink – purple – red, pink – red – purple.	*6 [ways]*
3.	Mischa dresses up her teddy bear. Her teddy bear's coat has 3 buttons. She sometimes buttons them up starting with the top button, but sometimes starts somewhere else. How many possible ways can Mischa button-up the coat for her teddy bear?  She can do the top first, middle, then bottom, or do the top first, bottom, then middle. She can also do bottom first, middle, then top, or do the bottom first, top, then middle. She can also start with middle first, top, then bottom, or middle, bottom, then top.	*6 [possible ways]*
4.	Mrs. Heins has 3 different flowers and she would like to use two different vases. How many different ways can Mrs. Heins put all 3 flowers in to 2 vases so that each vase has at least one flower?  Vase 1: purple and red Vase 2: blue Vase 1: purple Vase 2: red and blue Vase 1: red and blue Vase 2: purple Vase 1: red Vase 2: blue and purple Vase 1: blue Vase 2: purple and red Vase 1: blue and purple Vase 2: red	*6 [ways]*
5.	Wesley was given 4 cards with 4 different numbers as shown below. How **many 2-digit numbers** can be formed from these cards?  Make an organized list: Starting with 7: 71, 73 and 74 Starting with 1: 17, 13 and 14 Starting with 3: 34, 31 and 37 Starting with 5: 47, 41 and 41 Total 2-digit numbers:12	*12 [numbers]*

6. Sarah was given a place value tool to form some numbers. She made the number 3, 12, 21 and 30 using 3 beads (see picture below).



How many numbers can you make using a total of six beads for placing on either tens and/or units place?

Create an organized list:

Tens	Units	
6	0	60
5	1	51
4	2	42
3	3	33
2	4	24
1	5	15
0	6	6

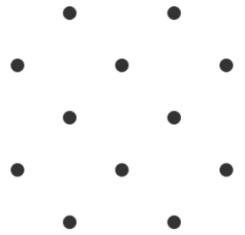
7 [numbers]

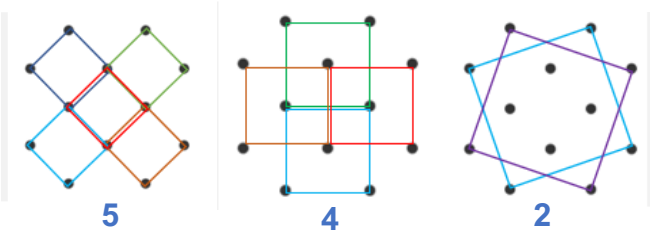
7. Trisha has one each of a $1, $5, $10, $20 and $50 bill in a jar. She closes her eyes and select one of the bills out of the jar. How many possibilities that the amount would be less than $75 left in the jar?

If $1 is taken: 5+10+20+50=85
If $ 5 is taken: 1+10+20+50=81
If $10 is taken: 1+5+20+50=76
If $20 is taken: 1+5+10+50=66
If $50 is taken: 1+5+10+20=36

2 [possibilities]

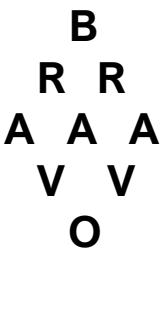
8. How many different **sets of four dots** can be joined to form a square?

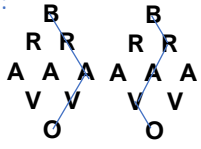




11 [sets]

9. In the diagram on the right, each "path" from top to bottom correctly spells the word **BRAVO**. What is the total number of different paths in the diagram? To spell the word BRAVO, there is one way to choose the B, two ways to choose an R, three ways to choose an A, two ways to choose a V, and one way to choose the O. That results in a total of 1 × 2 × 3 × 2 × 1 = 12 possible paths. Several sample paths are shown below:

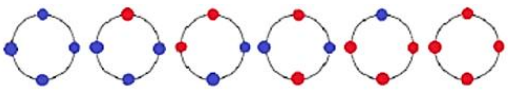




12

10. Carla is making bracelets. She has a bucket full of red and blue beads. How many different bracelets are there if Carla uses only **4 beads** in her design, using just these beads and no clasp, so she can rotate it or flip it?

BBBB, BBBR, RRBB, BRBR, BRRR, RRRR



Since the design is in circle, notice that

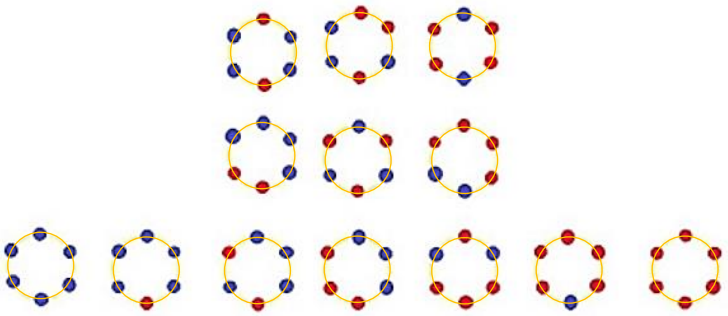
- there are two different bracelets when you use 2 red beads and 2 blue beads (RBRB and RRBB)
- there is only one design when you use 3 blue beads and 1 red beads

6 [different bracelets]

11. Carla's sister, Veronika, is also making bracelets using 2 different colors of beads (red and blue). How many different bracelets are there if Veronika uses **6 beads** in her design?

13 [different bracelets]

RRRRRR BBBBBB
RRRRRB RBRBBB
RRRRBB RBBRBB
RRRBBB RBRBRB
RRRBRB RRBRBB
RRBBBB RRBRRB
RBBBBB



12. Katie and her friend Jackson went to the grocery store. Jackson bought 3 apples and 4 oranges. Katie bought apples, oranges, and pears. She bought the same total number of fruits as Jackson. How many possible combinations of fruits that Katie could have bought? Jackson bought 7 fruits.

15 [combinations]

Katie also bought 7 fruits; she could have bought:

Apples	Oranges	Pears	Total
1	5	1	7
1	4	2	7
1	3	3	7
1	2	4	7
1	1	5	7

Apples	Oranges	Pears	Total
2	1	4	7
2	2	3	7
2	3	2	7
2	4	1	7

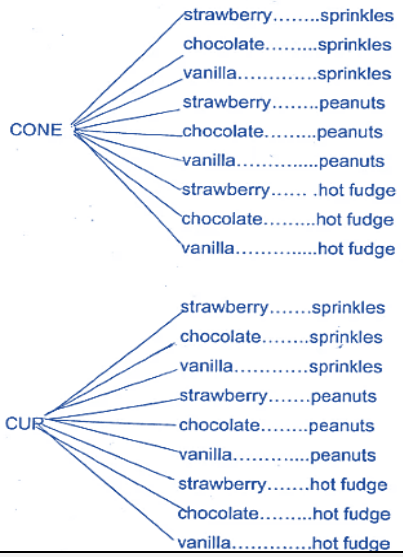
Apples	Oranges	Pears	Total
3	1	3	7
3	2	2	7
3	3	1	7
4	1	2	7
4	2	1	7
5	1	1	7

13. 

18 [combinations]

An ice cream shop offers customers the choice of a cup or a cone. It offers a choice of three different flavors: chocolate, vanilla, or strawberry. It also offers three different toppings: sprinkles, peanuts, or hot fudge. How many different combinations result from choosing a cone or a cup, one kind of ice cream, and one topping?

2 × 3 × 3 = 18. This calculation can be shown using diagram tree or making an organized list.



14. In how many distinct ways can the letters of the word PEACE be arranged?

60 [ways]

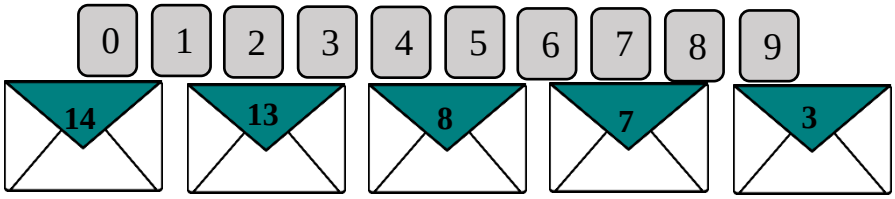
The number of distinct ways to arrange 5 things can be obtained by multiplying the number of options.

Each position can have: 5 × 4 × 3 × 2 × 1 = 120

There are 2 options
There are 3 options
There are 4 options
There are 5 options

However, the letter E is repeated twice, therefore, there are 120 ÷ 2 = 60 distinct ways.

15. A set of ten cards, each showing one of the digits from 0 to 9, is divided up between five envelopes so that there are **two cards** in each envelope. The sum of the cards inside is written on each envelope:



How many possible combinations of two cards could be inside the envelope with number 8? What are they? We can make a table to list possibilities in an organized way. We can start with 3 because it has only two possibilities.

3	7	8	13	14
0 and 3	5 and 2	7 and 1	9 and 4	8 and 6
1 and 2	0 and 7	5 and 3	9 and 4	8 and 6
1 and 2	4 and 3	0 and 8	7 and 6	9 and 5

0 and 8, 5 and 3 or 7 and 1

3 [possibilities]: 0 and 8, 5 and 3 or 7 and 1

16. When you roll two regular six-sided dice
    a. How many possible combinations of numbers that can result?
    There are 36 possible combinations
    b. How many of those combinations, when the number on the two dice are added together, have a sum that is ten or greater?
    There are only 6 of the combinations that have a sum that is ten or greater:
    4 and 6 5 and 6
    6 and 4 6 and 5
    5 and 5 6 and 6

a. 36 [combinations]
b. 6 [combinations]

17. How many solutions can you find to this cryptarithm?
Hint: eliminate the impossibles first.

$$\begin{array}{r} \text{TWO} \\ +\ \text{TWO} \\ \hline \text{FOUR} \end{array}$$

938+938=1876 836+836=1672
928+928=1856 765+765=1530
867+867=1734 734+734=1468
846+846=1692

7 [solutions]

18. When a clock turned from 08:32 to 08:33, the digit 3 appeared 3 times. Once when it was 08:32, and the second and third appearance is when it was 08:33.

On a digital clock showing 24-hour time, over a whole day, how many times does a 5 appear?

In the minutes part: digit 5 appears 16 times in an hour (05, 15, 25, 35, 45, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59).
There are 24 hours in a day which means 16×24 = 384 times digit 5 appears in minutes part.
In the hour part: digit 5 appears when it's 5 o'clock and 15 o'clock (05 and 15), but then this numbers stay that way for the whole hour, no matter if the minutes change. In one-hour time, the digit 5 appears 60 times when the hour is 05 and 60 times when the hour is 15. Thus, 2×60 = 120 times.
Altogether digit 5 appear 384 + 120 = 504 times during 24-hour period on 24-hour clock.

504 times

Solution is available on Dec 11, 2020 at www.mathinaction.org