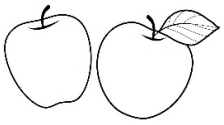
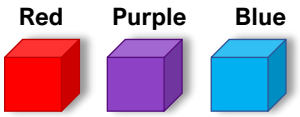
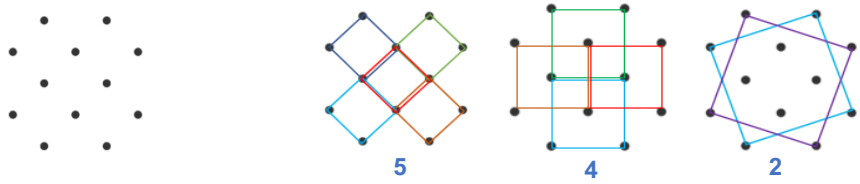

**First Name:** _____ **Last Name:** _____ **Grade:** _____

**Teacher:** _____ **Parent's email:** _____

# Finding Possibilities

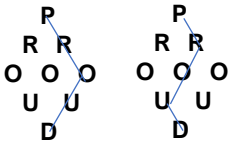
**Kinder & First Grade: solve <u>at least</u> 3 problems.**
**Second & Third Grade: solve <u>at least</u> 7 problems.**
**Fourth Grade and above: solve <u>at least</u> 12 problems.**

| | | *Answer* |
|---|---|---|
| 1. | Matthew has a blue crayon and a red crayon. He starts coloring a coloring page that has 2 apples. If Matthew colors each apple with either blue or red, how many different ways can the coloring page look like?<br>  <br>From left to right, Matthew can color the following ways:<br>Red, Blue Red, Red<br>Blue, Red Blue, blue | *4 [ways]* |
| 2. | Anisha was given 3 colored blocks to play. She loves to build a tower by stacking these blocks and then knocking them down. In how many ways can Anisha build a tower using a red, purple, and blue block?<br>  <br>There are 6 different ways:<br>2 ways with red at the bottom: red – purple – blue, red – blue – purple.<br>2 ways with purple at the bottom: purple – blue – red, purple – red – blue.<br>2 ways with blue at the bottom: blue – purple – red, blue – red – purple. | *6 [ways]* |
| 3. | Melody 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 Melody button-up the coat for her teddy bear?<br>  <br>She can do the top first, middle, then bottom, or do the top first, bottom, then middle.<br>She can also do bottom first, middle, then top, or do the bottom first, top, then middle.<br>She can also start with middle first, top, then bottom, or middle, bottom, then top. | *6 [possible ways]* |
| 4. | Vase 1: tulip and rose Vase 2: sunflower<br>Vase 1: tulip Vase 2: rose and sunflower<br>Vase 1: rose and sunflower Vase 2: tulip<br>Vase 1: rose Vase 2: sunflower and tulip<br>Vase 1: sunflower Vase 2: tulip and rose<br>Vase 1: sunflower and tulip Vase 2: rose<br>  | *6 [ways]* |
| 5. | Make an organized list:<br>Starting with 5: 51, 53 and 54 Starting with 1: 15, 13 and 14<br>Starting with 3: 34, 31 and 35 Starting with 4: 45, 43 and 41<br>Total 2-digit numbers: 12 | *12 [numbers]* |
| 6. | Make an organized list:<br>1+2 = **3**, 1+3 = **4**, 2+3 =1+4 = **5**, 1+5 = 2+4 = **6**, 3+4 = 2+5 = **7**, 3+5 = **8,** 4 + 5 = **9**. There are 7 different sums. | *7 [sums]* |
| 7. | If $1 is taken: 5+10+20+50=85<br>If $5 is taken: 1+10+20+50=81<br>If $10 is taken: 1+5+20+50=76<br>If $20 is taken: 1+5+10+50=66<br>If $50 is taken: 1+5+10+20=36 | *2 [possibilities]* |

8. 

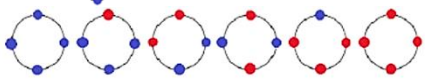

*11 [sets]*

9. To spell the word PROUD, there is one way to choose the P, two ways to choose an R, three ways to choose an O, two ways to choose a U, and one way to choose the D. That results in a total of 1 × 2 × 3 × 2 × 1 = 12 possible paths. Several sample paths are shown on the right.




*12 [paths]*

10. This design  is considered the same as this one  .



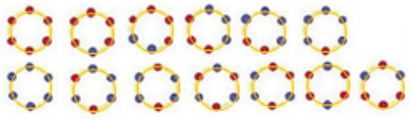
**BBBB, BBBR, RRBB, BRBR, BRRR, RRRR**

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. This design  is considered the same as this one  .



RRRRRR RRRRRB RRRRBB RRRBBB RRBBBB RBBBBB

BBBBBB RBRBBB RBBRBB RBRBRB RRBRBB RRBRRB RRRBRB

*13 [different bracelets]*

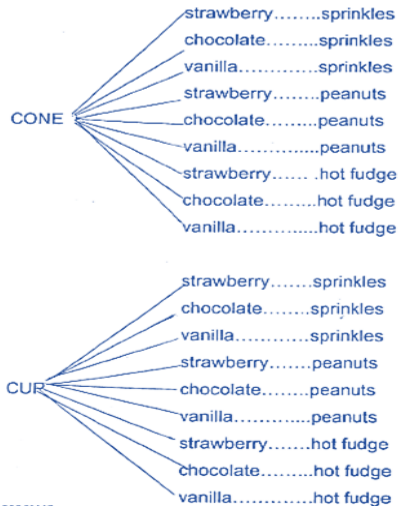
12. Jackson bought 7 fruits.
Katie could have bought:
7 = 1 + 1 + 5 = 1 + 5 + 1 = 5 + 1 + 1 -> 3 ways
7 = 1 + 2 + 4 -> 6 ways
7 = 1 + 3 + 3 -> 3 ways
7 = 2 + 2 + 3 -> 3 ways
In total 3 + 6 + 3 + 3 = **15 ways**

| Option | Apples | Oranges | Pears | Total |
|---|---|---|---|---|
| 1 | 1 | 1 | 5 | 7 |
| 2 | 1 | 5 | 1 | 7 |
| 3 | 1 | 2 | 4 | 7 |
| 4 | 1 | 4 | 2 | 7 |
| 5 | 1 | 3 | 3 | 7 |
| 6 | 2 | 1 | 4 | 7 |
| 7 | 2 | 4 | 1 | 7 |
| 8 | 2 | 2 | 3 | 7 |
| 9 | 2 | 3 | 2 | 7 |
| 10 | 3 | 1 | 3 | 7 |
| 11 | 3 | 3 | 1 | 7 |
| 12 | 3 | 2 | 2 | 7 |
| 13 | 4 | 1 | 2 | 7 |
| 14 | 4 | 2 | 1 | 7 |
| 15 | 5 | 1 | 1 | 7 |

*15 [combinations]*

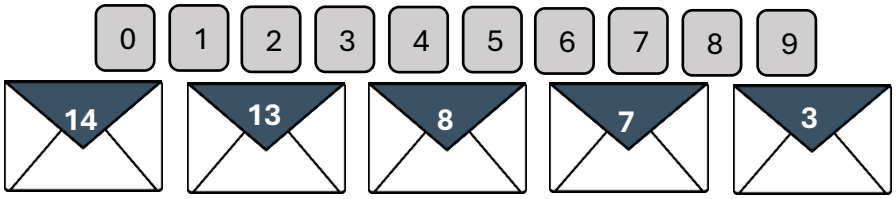
13. 

_C_ _I_ _T_, where C = container, I = ice-cream, T = topping
Think how many options there are for each category.
2 × 3 × 3 = **18**. This calculation can be shown using diagram tree or making an organized list.




*18 [combinations]*

14.




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 |

For envelope number 8, there are **3 possibilities (0 and 8, 5 and 3 or 7 and 1).**

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

15.

a. There are **36 possible combinations.**

1-1, 1-2, 1-3, 1-4, 1-5, 1-6
2-1, 2-2, 2-3, 2-4, 2-5, 2-6
3-1, 3-2, 3-3, 3-4, 3-5, 3-6
4-1, 4-2, 4-3, 4-4, 4-5, 4-6
5-1, 5-2, 5-3, 5-4, 5-5, 5-6
6-1, 6-2, 6-3, 6-4, 6-5, 6-6

b. There are only **6 of the combinations** that have a sum that is ten or greater:

4 and 6
6 and 4
5 and 5
5 and 6
6 and 5
6 and 6

1-1, 1-2, 1-3, 1-4, 1-5, 1-6
2-1, 2-2, 2-3, 2-4, 2-5, 2-6
3-1, 3-2, 3-3, 3-4, 3-5, 3-6
4-1, 4-2, 4-3, 4-4, 4-5, 4-6
5-1, 5-2, 5-3, 5-4, 5-5, 5-6
6-1, 6-2, 6-3, 6-4, 6-5, 6-6

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

16.

One way to solve it:
Think of the different ways 15 stones can be distributed into 4 piles from least to greatest piles: (1, 2, 3, 9), (1, 2, 4, 8), (1, 2, 5, 7), (1, 3, 4, 7), (1, 3, 5, 6), (2, 3, 4, 6).
Therefore, the number of rocks in the largest pile of each distribution may be 6, 7, 8, or 9. The smallest of these is **6**.

*6 [rocks]*

17.

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

- 5: There are 5 options (P I Z Z A)
- 4: There are 4 options (only 4 letters left after choosing 1 for the start)
- 3: There are 3 options
- 2: There are 2 options
- 1

However, the letter Z is repeated twice, they look the same, so we will never see the difference when we switch them around. Therefore, there are 120 ÷ 2 = **60 distinct ways.**

*60 [ways]*

18.

**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 appears 384 + 120 = **504** times during 24-hour period on 24-hour clock.

*504 [times]*

*Solution is available on February 16, 2024*
*www.mathinaction.org*