# Math Challenge #6

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

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

## All Things Winter

Welcome to the Math Challenge #6. Did you know that the winter solstice is the day with the fewest hours of sunlight in the whole year? Another interesting fact is that there are two winter solstices per year, one for each hemisphere. The theme for this challenge is all things winter, from the cold crisp air, snowflakes, and holiday celebrations. Grab your parents, siblings, and grandparents to help you solve as many problems as you can. Good luck!

**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. Solve the mystery numbers under the snowflakes:

   a. $5 + 2 =$ ❄

   b. $5 +$ ❄ $= 12$

   c. ❄ $+ 8 = 11$

   d. $7 +$ ❄ $= 12$

   *a. 7*
   *b. 7*
   *c. 3*
   *d. 5*

2. Fill in the missing operators (+, –) so that each expression equals its target number.
   For example: Target number: **3**
   1 ☐ 1 ☐ 1 → Answer: + and +

   **a. Target number: 6**
   3 ☐ 2 ☐ 1

   **b. Target number: 2**
   3 ☐ 2 ☐ 1

   *a. + and +*
   *b. – and +*

3. Solve the mystery numbers covered by the snowmen.

   a. $10 -$ ☃ $= 6$

   b. ☃ $- 4 = 3$

   c. $10 -$ ☃ $= 4$

   d. ☃ $- 2 = 3$

   *a. 4*
   *b. 7*
   *c. 6*
   *d. 5*

4. Martha is reading a book about snowflakes. She read from the beginning of page 5 to the end of page 14 today. How many pages did Martha read today?
   5, 6, …, 14 → 14 – 4 = 10

   *10 [pages]*

5. A group of children stood in a line for a free hot cocoa. Pamela was the 4th from the front of the line and was the 6th from the end of the line. How many children were standing in line?
   3 + Pamela + 5 = 9 children

   *9 [children]*

6. During the month of December, there are 3 students who are turning 7 years old in Mrs. Cloud's class. Jake's birthday is three days before Kim. Tommy's birthday is two days after Kim. If Tommy's birthday is on Sunday, December 9. On what day of the week is Jake's birthday this year? Hint: Draw a line labeled with the days of the week.

| MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY | SUNDAY |
|---|---|---|---|---|---|---|
| | Jake, Dec. 4 | | | Kim, Dec. 7 | | Tommy, Dec. 9 |

   *Tuesday*

7. Each day since Jemma arrived at Grandpa Jolly's Orchard, she picked 10 apples, ate 2 of them, and saved the rest. How many apples had Jemma saved by then end of her 4th day there?

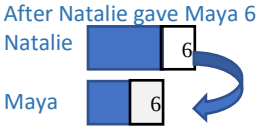
*32 [apples]*

Each day of the 4 days, Jemma saved 10 – 2 = 8 apples. In 4 days, or at the end of the 4th day, she saved: 4 x 8 apples = 32 apples.

8. If Natalie gives Maya 6 snowballs, Maya will have the same number of snowballs as Natalie. How many more snowballs does Natalie have than Maya if she does not give the 6 snowballs to Maya?

*12 [snowballs]*

After Natalie gave Maya 6 snowballs they will have same number, as shown at the diagram below




Now if Maya gives these 6 snowballs back to Natalie, Natalie would have 12 more snowballs than Maya.

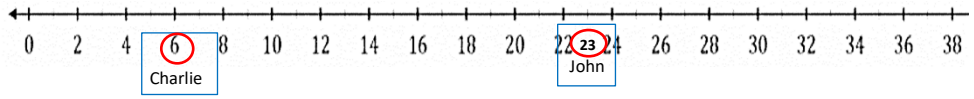
9. Jessica is making holiday cards for everyone living in the local homeless shelter. It takes her 2 minutes to make one card. If she is constantly making cards at this speed, how many cards can she make in one hour?

*30 [cards]*

Since there are 60 minutes in one hour, and she can make a card in two minutes, therefore, she can make 60 ÷ 2 = 30 cards.

10. Amazing Cheap Store is having a sale on the latest hot toy that is notoriously hard to get a hold of. While waiting in line for the store to open and the sale to begin, John notices that his friend Charlie is ahead of him and that there are only 5 people ahead of Charlie. If there is a total of 38 people in line, and 15 of those people are behind John, how many people are between John and Charlie?

*16 [people]*




Draw it out. 7, 8, …, 22: 22-6 = 16 people between them.
or
Since John and Charlie are two of the people in line, there are 38 – 2 = 36 people in line with them. That means the number of people ahead of Charlie, plus the number of people between Charlie and John, plus the number of people behind James is 36 people. Thus, 5 + the number of people between them + 15 = 36 → the number of people between them = 16 people.

11. A toy shop makes tricycles and four-wheel wagons. Seven customers ordered six items each. Every order was different. How many number of wheels in all are needed for all seven customers? Hint: *list all possible orders by seven customers then calculate the number of wheels needed for each customer.*

*147 [wheels]*

There are 7 ways to make 6 different items 6 = 0+6 = 1+5 = 2+4 = 3+3 = 4+2 = 5+1 = 6+0

| | tricycles | wagons | wheels |
|---|---|---|---|
| customer 1 | 0 | 6 | 6×4=24 |
| customer 2 | 1 | 5 | 1×3 + 5×4=23 |
| customer 3 | 2 | 4 | 2×3 + 4×4=22 |
| customer 4 | 3 | 3 | 3×3 + 3×4=21 |
| customer 5 | 4 | 2 | 4×3 + 2×4=20 |
| customer 6 | 5 | 1 | 5×3 + 4=19 |
| customer 7 | 6 | 0 | 6×3=18 |

Total wheels needed: 20 + 23 + 22 + 21 + 20 + 19 + 18 = 143.

12. Gearing toward Christmas this year, James worked hard and earned $864 during the month of November. He was paid $9 per hour. He did not work more than five hours each day, nor did he work on Sunday. He also worked a whole number of hours. If he worked the same number of hours each day, how many hours per day did he work?

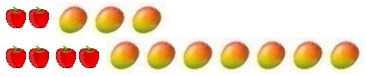
*4 [hours]*

$864 divided by $9 indicates James worked 96 hrs.
Factoring gives the following possible solutions: 2 x 48, 3 x 32, 4 x 24, 6 x 16, 8 x 12. There are 30 days in November. Thus, only four hours for 24 days meet all of the conditions.

13. If two apples and three mangoes cost $5.10, while four apples and seven mangoes cost $11.10, what is the cost of one apple and five mangoes?

*$5.70*

Draw it out.




Notice that doubling the first scenario (2 apples, 3 mangoes) will give us 4 apples and 6 mangoes = 2 x $5.10 = $10.20. The second scenario (4 apples and 7 mangoes) is $11.10. Therefore, 1 mango costs: $11.10 - $10.20 = $0.90. Then using the first scenario, two apples cost: $5.10 – 3 x $0.90 = $2.40, so one apple is $2.40 ÷ 2 = $1.20. One apple and five mangoes cost: $1.20 + 5 x $0.90 or $5.70.

Or use variables. Let a = the cost of an apple and b = the cost of a mango. If 2a + 3b = 5.10, the 4a + 6b = 10.20 (doubled). We are given that 4a + 7b = $11.10. Comparing the two expressions tells us that one mango costs 90¢. Using the first equation as a base 2a + 3 x $0.90 = 5.10 or 2a = $2.40. Therefore, an apple costs $1.20. One apple and five mangoes will cost $1.20 + 5 x $0.90 = $5.70.

14. Four friends take temporary jobs during Thanksgiving week to earn extra money. Each works different hours. Ron works for two hours. Leo works 2 ¾ as long as Ron. Shane works 1 ¼ hours less than Jeff. Jeff works 2 ½ times as long as Leo. How long does each person work?

*Ron: 2 hours*
*Leo: 5.5 or 5 ½ hours or 5h 30 min*
*Shane: 12.5 or 12 ½ or 12h 30 min*
*Jeff: 13.75 or 13 ¾ hours or 13h 45 min*

Ron 2 hours
Leo: 2 ¾ x 2 hours = 11/4 ×2 = 11/2 = 5 ½ hours or 5 h 30 min
Jeff: 2 ½ times as Leo = 2 ½ x 5 ½ hours = 5/2 × 11/2 = 55/4 = 13 ¾ hours or 13 h 45 min
Shane: 1 ¼ hours less than Jeff = 13 ¾ - 1 ¼ = 13:45 – 1:15 = 12 ½ hours or 12 h 30 min

15. Veena, Vasilisa, and Valerie are sisters. One day in December, they each baked the same number of cookies. Veena saved one-third of the cookies she baked for a potluck party, Vasilisa saved one-quarter of the cookies she baked for the potluck party, and Valerie saved one-fifth of the cookies she baked for the same party. What is the minimum number of cookies they could have at the party from these three sisters?

*47 [cookies]*

If the number of cookies each baked can be split into one-third, one-quarter, and one-fifth, then the number must be divisible by 3, 4, and 5, respectively.
The lowest number divisible by all three is LCM (3, 4, 5) = 60. One-third of the total is 20 cookies, one-fourth is 15 cookies, and one-fifth is 12 cookies. At the party, they could have 20 + 15 + 12 = 47 cookies.

16. Jacob cut logs to prepare for the fire during winter nights. He can cut a log into three pieces in 24 minutes. At this rate, how long will it take him to cut another similar log into eight pieces? To find the number of minutes per cut, divide the 24 minutes by 2, as it takes 2 cuts to cut a log into 3 pieces (12 minutes each). Then multiply by 7, since 7 cuts are needed to cut a log into 8 pieces (12 x 7 = 84). Students may also wish to draw a picture of the log, showing the 2 cuts needed for 3 pieces, then another log, with 7 cuts for 8 pieces, labeling each cut with 12 minutes.

*84 [minutes] or 1 hour and 24 minutes*

17. Hannah sold $65 worth of barbecue tickets. Adult tickets cost $4 each and children's tickets cost $3 each. How many adult tickets could Hannah have sold? Is there more than one possible solution to this problem?

*Possible answers:*
*14 adult tickets*
*11 adult tickets*
*8 adult tickets*
*5 adult tickets*
*2 adult tickets*

(possible answer: 14; there are several correct solutions) To solve this type of problem, students could organize information in a table, such as:

| Adult tickets | Child tickets | Total cost |
|---|---|---|
| 14 @ $4 ($56) | 3 @ $3 ($9) | $65 |
| 11 @ $4 ($44) | 7 @ $3 ($21) | $65 |
| 8 @ $4 ($32) | 11 @ $3 ($33) | $65 |
| 5 @ $4 ($20) | 15 @ $3 ($45) | $65 |
| 2 @ $4 ($8) | 19 @ $3 ($57) | $65 |

The strategy here is to notice that the odd multiples of 3 form a pattern of odd numbers and the multiples of 4 form a pattern of even numbers, and that certain ones combine to give a sum of $65. Notice that not all odd multiples of 3 will work, e.g., 5 x 3 = 15; 15 from 65 gives 50, which is not a multiple of 4, so 5 child tickets would not be possible. Likewise, all even multiples of 3 will result in an even product, and when subtracted from 65 will result in an odd number, which is not a multiple of 4. Notice also that the numbers of adult tickets decrease by 3 in that column, while the corresponding numbers of child tickets increase by 4.