1. If Bob takes 6 hours to build 4 houses, how many hours will he take to build 12 houses?

2. Compute the value of $\frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20}$.

3. Given a line $2x + 5y = 170$, find the sum of its x- and y-intercepts.

4. In some future year, BmMT will be held on Saturday, November 19th. In that year, what day of the week will April Fool's Day (April 1st) be?

5. We distribute 78 penguins among 10 people in such a way that no person has the same number of penguins and each person has at least one penguin. If Mr. Popper (one of the 10 people) wants to take as many penguins as possible, what is the largest number of penguins that Mr. Popper can take?

6. A letter is randomly chosen from the eleven letters of the word MATHEMATICS. What is the probability that this letter has a vertical axis of symmetry?

7. Alice, Bob, Cara, David, Eve, Fred, and Grace are sitting in a row. Alice and Bob like to pass notes to each other. However, anyone sitting between Alice and Bob can read the notes they pass. How many ways are there for the students to sit if Eve wants to be able to read Alice and Bob's notes, assuming reflections are distinct?

8. The pages of a book are consecutively numbered from 1 through 480. How many times does the digit 8 appear in this numbering?

9. A student draws a flower by drawing a regular hexagon and then constructing semicircular petals on each side of the hexagon. If the hexagon has side length 2, what is the area of the flower?

10. There are two non-consecutive positive integers a, b such that $a^2 - b^2 = 291$. Find a and b.

11. Let ABC be an equilateral triangle. Let P, Q, R be the midpoints of the sides BC, CA and AB respectively. Suppose the area of triangle PQR is 1. Among the 6 points A, B, C, P, Q, R, how many distinct triangles with area 1 have vertices from that set of 6 points?

12. A positive integer is said to be *binary-emulating* if its base three representation consists of only 0s and 1s. Determine the sum of the first 15 *binary-emulating* numbers.

13. Professor X can choose to assign homework problems from a set of problems labeled 1 to 30, inclusive. No two problems in his assignment can share a common divisor greater than 1. What is the maximum number of problems that Professor X can assign?

14. Trapezoid $ABCD$ has legs (non-parallel sides) BC and DA of length 5 and 6 respectively, and there exists a point X on CD such that $\angle XBC = \angle XAD = \angle AXB = 90°$. Find the area of trapezoid $ABCD$.

15. Alice and Bob play a game of Berkeley Ball, in which the first person to win four rounds is the winner. No round can end in a draw. How many distinct games can be played in which Alice is the winner? (Two games are said to be identical if either player wins/loses rounds in the same order in both games.)

16. Let ABC be a triangle and M be the midpoint of BC. If $\overline{AB} = \overline{AM} = 5$ and $\overline{BC} = 12$, what is the area of triangle ABC?

17. A positive integer n is called *good* if it can be written as $5x + 8y = n$ for positive integers x, y. Given that $42, 43, 44, 45$ and 46 are good, what is the largest n that is not good?

18. Below is a 7×7 square with each of its unit squares labeled 1 to 49 in order. We call a square contained in the figure *odd* if the sum of the numbers inside it is odd. For example, the entire square is good because it has an odd sum of 1225. Determine the number of odd squares in the figure.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49

19. A circle of integer radius r has a chord PQ of length 8. There is a point X on chord PQ such that $\overline{PX} = 2$ and $\overline{XQ} = 6$. Call a chord AB *euphonic* if it contains X and both $\overline{AX}$ and $\overline{XB}$ are integers. What is the minimal possible integer r such that there exist 6 euphonic chords for X?

20. On planet *Silly-Math*, two individuals may play a game where they write the number 324000 on a whiteboard and take turns dividing the number by prime powers – numbers of the form p^k for some prime p and positive integer k. Divisions are only legal if the resulting number is an integer. The last player to make a move wins. Determine what number the first player should select to divide 324000 by in order to ensure a win.