

Junior Circle: Fall Quarter Review

December 5, 2010

1. In the town of Mathcirclius, each person has a unique phone number that is exactly 5 digits long, using the numbers 1, 2, 3, 4, and 5 exactly once each. How many different phone numbers can be used in Mathcirclius?

2. Kyle has a bag of socks. He knows there are 7 black and 5 white socks in the bag. He pulls out one sock at a time, without looking. How many socks will he need to pull out of the bag to guarantee he has a pair of matching socks?

3. The first four triangular numbers (T_1, T_2, T_3, T_4) are 1, 3, 6, 10.... What is T_5 , the fifth triangular number? What is T_6 , the sixth triangular number?

4. Twins Pam and Sam together had 25 books. On their birthday, Pam got as many books as Sam had before, and Sam got as many books as Pam had before. How many books do they now have in all?

- Daniel wrote out all the numbers from 1 to 60 (including 1 and 60). How many times did he write the digit 2?

6. The first three square numbers (S_1, S_2, S_3) are 1, 4, 9.... What is S_5 , the fifth square number?

7. How many two digit numbers are there so that both digits are odd?

8. Replace each shape and letter below by a digit so that you get a true equality: (The stars can represent different digits)

$$\star\star + \mathbf{A} = \mathbf{A}\star\star$$

9. Today, the sum of Jason's age and his dad's age is 44. What will the sum of their ages be exactly 3 years from today?

10. John goes to the movies every three days (that is, he goes to the movies one day and then misses two days). Kate goes to the movies every seven days. If they met at the movies this afternoon, when will they meet at the movies again?

11. Use the cipher below to *decode* the following message which has been encoded using the Caesar cipher below.

ZEGEXMSR

Letter:	A	B	C	D	E	F	G	H	I
Substitution:	E	F	G	H	I	J	K	L	M
Letter:	J	K	L	M	N	O	P	Q	R
Substitution:	N	O	P	Q	R	S	T	U	V
Letter:	S	T	U	V	W	X	Y	Z	-
Substitution:	W	X	Y	Z	A	B	C	D	-

12. Write the next three numbers of this sequence:

10, 11, 9, 12, 8, 13, 7, 14, ...

13. Katie is 7 years old. The average age of Katie and her sister is 9. How old is her sister?

14. The first four Fibonacci numbers are 1, 1, 2, 3.... How do we find the Fibonacci numbers and what are the next five Fibonacci numbers?

15. Katie lives in an apartment building that is 12 stories high. Katie says that she lives on the floor which is 6th if you count from the top. What floor does she live on if you count from the bottom (the usual way)? (You may find it helpful to draw a picture)

16. Andy solved 200 math problems. Linda solved 112 math problems. Each week, Linda solves 22 more problems than Andy. When will they have the same number of problems solved?

17. Rosalie went to the store to buy a watermelon that weighs exactly 2 pounds. Unfortunately, she only has a scale (shown below), and 4 weights which weigh 3, 4, 7, and 8 pounds. How can she use these to make sure the watermelon she picks weighs exactly 2 pounds?



18. A vase contains 3 times as much water as a tea kettle. The tea kettle has 12 glasses of water less than the vase. How many glasses of water fit into the vase?

20. How many 5 digit numbers have digits whose sum is equal to 2? (Hint: Try writing out the numbers this is true for.)

21. Daniel went on a jog around his neighborhood. He counted 12 mailboxes on one side of a block, and noticed that the distance between the mailboxes of next-door neighbors were exactly 9 meters apart. If he jogged from the first mailbox to the last on that block, how far did he jog?

22. An orange and a mandarin weigh 500 grams together. An orange and an apple weigh 800 grams together. An apple and a mandarin weigh 600 grams together. How much does each fruit weigh? (You might find it helpful to draw this out)

23. Abby has 3 times as much money as Betty does;
Betty has 3 times as much money as Cindy does;
Cindy has 3 times as much money as Jenny does;
Jenny has 3 times as much money as Irene does.
Altogether, they have 3000 dollars. How much does each girl have?

24. Use the monoalphabetic substitution cipher below to encode the following message:

HAPPY HOLIDAYS

Letter:	A	B	C	D	E	F	G	H	I
Substitute:	Z	Y	X	W	V	U	T	S	R
Letter:	J	K	L	M	N	O	P	Q	R
Substitute:	Q	P	O	N	M	L	K	J	I
Letter:	S	T	U	V	W	X	Y	Z	-
Substitute:	H	G	F	E	D	C	B	A	-