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Mathematics

Quarter 1 – Module 4: Solving Problems Involving Factors, Multiples and Divisibility Rules

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Quarter 1 – Module 4: Solving Problems Involving Factors, Multiples and Divisibility Rules
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Mathematics

Quarter 1 – Module 4: Solving Problems on Divisibility Rules

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Introductory Message

This Self Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLMS is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

Hi, Mathletes!

In this module, you will learn how to solve routine and non-routine problems involving factors, multiples and divisibility rules for 2, 3, 4, 5, 6, 8, 9, 10, 11, and 12. This will help you find easier the factors of a big number by just looking at its digits.

When you are done with this module, you will be able to:

- solve routine and non-routine problems involving factors, multiples, and divisibility rules for 2, 3, 4, 5, 6, 8, 9, 10, 11, and 12.

What I Know

Directions: Solve the problem below by using the four-step plan. Use a separate sheet of paper or your Math Activity Notebook.

The pupils of Grade 5-Slate are having an experiment on the germination of seeds on different types of soil. One group received 36 mongo seeds and 33 corn seeds. They placed both the mongo and corn seeds into small pots such that seeds of the same types were divided equally into the small pots. How many small pots will they use for each kind of seed?

1. Understand
   a. Know what is asked:
   _____
   b. Know what is/are given:
   _____
2. Plan
   c. Determine the operation/ method/ procedure to be used.
   _____
3. Solve
   d. Use the method to solve the problem
   _____
4. Check and Look Back
   e. Check your answer
   _____

Lesson 1 Solving Routine and Non-routine Problems Involving Factors, Multiples, and Divisibility Rules for 2, 3, 4, 5, 6, 8, 9, 10, 11, and 12

A divisibility rule is a simple way of determining whether a given number is divisible by another number. It can be used to quickly find the factors of given numbers. "Divisible by another number" means a number can be divided by another number without any remainder.

What's In

In the previous module, you have learned how to find common factors by understanding the divisibility rules.

By looking at the digits of a large number or by doing simple calculations, you can easily tell whether a number is a factor of a given number or not. Remember that a number is divisible by:

- 2 – if it is even and ends in 0, 2, 4, 6, or 8
  Example: 106 is divisible by 2 because it ends in 6.

- 3 – if the sum of the digits of the number is divisible by 3
  Example: 315 is divisible by 3 because 3 + 1 + 5 = 9 and 9 is divisible by 3.

- 4 – if the number formed by its last two digits is divisible by 4.
  Example: 6<u>12</u> is divisible by 4 because the number formed by its last two digits are 12, which is divisible by 4.

- 5 – if its ones digit is either 0 or 5
  Example: 487 58<u>0</u> is divisible by 5 because it ends in 0.

- 6 – if it is divisible by 2 and 3
  Example: 5 65<u>2</u> is even. The sum of its digits is 5 + 6 + 5 + 2 = 18, which is divisible by 3. So, 5 652 is divisible by 6 because it is divisible by both 2 and 3.

- 8 – if the number formed by its last three digits is divisible by 8.
  Example: 913 824 is divisible by 8, because the number formed by its last three digits is 824, which is divisible by 8.

- 9 – if the sum of its digits is divisible by 9.
  Example: 9 684 is divisible by 9 because the sum of all its digits is 9 + 6 + 8 + 4 = 27, and 27 is divisible by 9.

- 10 – if its ones digit is zero
  Example: 850 is divisible by 10 because 850 ends in 0.

- 11 – if the difference of the sum of the odd-positioned digits (starting from the left) and the sum of the even-positioned digits (starting from the left) is zero or if it is a multiple of eleven.
  Examples: 2 376 is divisible by 11, because (2 + 7) – (3 + 6) = 0.
  76 813 is divisible by 11, because (7 + 8 + 3) – (6 + 1) = 11, which is a multiple of 11.

- 12 – if the sum of its digits is divisible by 3 and the number formed by its last two digits is divisible by 4.
  Example: 324 is divisible by 12 because the sum of all its digits is 3 + 2 + 4 = 9, which is divisible by 3. Also, the number formed by its last two digits is 24, which is divisible by 4.

Do the activity below:

Directions: Determine whether the given numbers are divisible by the number in each column or not. Put a check (✓) on the appropriate column. Number 1 is already done for you. Use your Math Activity notebook in answering this.

Number	Divisible by									
	2	3	4	5	6	8	9	10	11	12
1) 5 814	✓	✓			✓		✓			
2) 81 235										
3) 3 285										
4) 34 281										
5) 11 255										

What's New

Study the problem below

Malopalo Elementary School is set to conduct a tree planting activity on September 1, 2020. All Grade 5 boys are expected to plant 50 seedlings, and the Grade 5 girls are to plant 30 seedlings. They will plant the seedlings in such a way that the trees will grow in equal numbers per row. What is the possible common number of trees in each row?

What Is It

There are two types of word problems you may encounter. It could be:

- *Routine problems* that are useful for daily living; or
- *Non-routine problems* which are mostly concerned with developing mathematical reasoning and fostering an understanding that mathematics is a creative endeavor.

To answer the problem above, we can apply the Polya's technique in solving word problem:

<u>Using POLYA'S four-step plan</u>

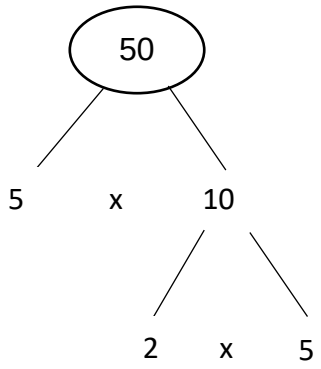
a. **Understand:**
   - Know what is asked
     The common number of trees in each row
   - Know what are given
     50 seedlings of boys
     30 seedlings of girls

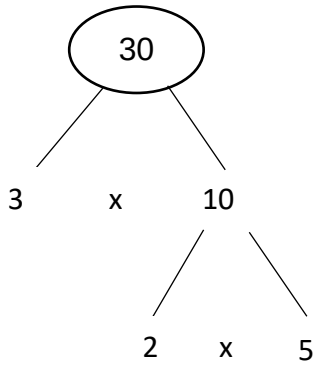
b. **Plan:**
   - Determine the operation/method/procedure to be used
     Find the common factors by factor tree method

c. **Solve:**

- Use any method to solve the problem
  Find the common factors of 50 and 30

1) By using Factor Tree technique





So, the common factors of 50 and 30 are 2,5, and 10

50 =	2 x 5 x 5	30 =	2 x 3 x 5
	25 x 2		15 x 2
	10 x 5		5 x 6
	50 x 1		10 x 3
			30 x 1

2) By listing the factors

50 = 1, 2 , 5 , 10 , 25, 50

30 = 1, 2 , 3, 5 , 10 , 15, 30

Therefore, the listing method can be used also in getting the common factors of 50 and 30 which are divisible by 2, 5, and 10.

3) **<u>The Table Method</u>**

Number of Seedlings	**Can trees be planted equally in a row by**						
	2?	3?	4?	5?	6?	8?	10?
50 for boys	/	x	x	/	X	X	/
30 for girls	/	x	x	/	X	X	/

Answer: The possible common numbers of trees in each row are 2, 5, and 10.

d. **Check and Lookback:**

Check if 50 and 30 are divisible by 2, 5, and 10

50 ÷ 2 = 25	30÷2 =15
50 ÷ 5 = 10	30÷5 =6
50 ÷10 =5	30÷10 =3

Let's have another example.

Delfin is willing to give a reward to whoever guesses his age this year. His clues state that his age is divisible by 12 and is multiple of 9, and that he is less than 51 years old. How old is Delfin?

a. Understand

- What is asked?
  The age of Delfin this year

- What are given?
  Age is divisible by 12
  Age is multiple of 9
  Age is less than 51

b. Plan

- What strategy can we use to solve this problem?
  Since there are just a few numbers less than 51 which are divisible by 12 and 9, we will use Listing Method and Elimination.

c. Solve

Delfin's age is less than 51, so our range is from 1-50. Listing all numbers divisible by 12 within that range, we have:

12, 24, 36, 48.

Another clue is that, his age is a multiple of 9. Among the four numbers, we can eliminate 12, 24, and 48 because the only number that is multiple of 9 is 36.

Answer: Therefore, Delfin's age is 36.

d. Check and look back

We will check if our answer satisfies the clues provided by Delfin.

- 36 is divisible by 12
- 36 is a multiple of 9
- 36 is less than 51

Let us have another problem.

The Barangay Youth Officials of Purok SONA are planning to conduct clean-up drive and tree planting in their costal area. There are 125 youths who are officially registered and are requested to participate the said activity. How many groups could there be with equal number of members in a group?

Given: 125 registered youth

Asked: number of group and equal number in each group.

Solution:

125 is divisible by what number? By 2, 3, 4, 5,6, 8, 9 and 10?

By 2: even and number ending in 0, 2, 4, 6, or 8

- 125 is not divisible by 2.

By 3: if the sum of the digits is divisible by 3.

- 1 + 2 + 5 = 8 is not divisible by 3.

By 4: if the last two digits are divisible by 4.

- 1<u>25</u> = 25 is not divisible by 4.

By 5: if its ones digit is either 0 or 5.

- 125, ones digit is 5, so, 125 is divisible by 5.

Trying 6,8, 9, 10,11 and 12 divisibility rules, 125 is only divisible by 5.

Therefore, to answer the problem above:

There will be 5 groups and each group will have 25 youths members to do the tree planting and clean-up drive.

What's More

Directions: Solve the following problems involving factors, multiples, and divisibility rules for 2, 3, 4, 5, 6, 8, 9, 10,11, and 12.

1) Ruben is arranging 648 tiles fitted a bathroom. He wants to put the same number of tiles on each row. How many tiles can Ruben put on each row?

   A. 5 B. 11 C. 10 D. 12

2) Tessa is organizing 990 blocks into boxes at the toy store. She needs to put the same number of blocks in each box without any leftover blocks. How many boxes would Tessa use for the blocks?

   A. 4 B. 10 C. 12 D. 8

3) Around 420 players joined in the volleyball tournament. Each team should have the same number of players. How many players could there be on a team?

   A. 8 B. 9 C. 11 D. 12

4) David's little sister is playing with blocks. She wants to put all 63 of her blocks into stacks with the same number of blocks in each stack. How many blocks could David's sister put into a stack?

A. 4 B. 6 C. 9 D. 10

Non-routine problems can be done without using a standard procedure. They can be solved by drawing a picture, using a number line, acting-out, making a table, and many others.

1) How many whole numbers among the given numbers are divisible by 2? by 5? by 10?
   a. Numbers between 86 236 and 87 000
   b. Numbers between 2366 and 8080

2) What is the biggest three-digit multiple of 2 that you can think of that uses the digits 5 and 8? Show your answer using any method.

3) What is the largest possible five-digit number divisible by 12 that you can make from the digits 1,2, 3, 5 and one more digit?

What I Have Learned

After going through this module, I have learned that:

Solving word problems involving factors, multiples, and divisibility rules for 2, 3, 4, 5, 6, 8, 9, 10, 11, and 12 is done using the 4-step process.

Understand:

- Know what is asked.
- Know the given facts.
- If any, determine the question.

Plan:

- Determine the operation to be used.
- Write the number sentence.

Solve:

- Use the operation in solving

Check and Look Back:

- Write the correct answer.

A. Find out without actual division if the given numbers are divisible by 4 and by 8. Why? Answer using your activity notebook.

Given number :

a) 356 232
b) 541 644
c) 759 326

B. When is a number divisible by 9? Find out if the given numbers below are divisible by 9.

Given :

a) 135
b) 326
c) 7893
d) 346 752

What I Can Do

Directions: Solve the following problems. Use a separate sheet of paper.

1) Joseph planted 600 onions equally in 20 rows. How many onions were planted in each row? If Joseph decided to plant at least 10 onions in each row, will it still be distributed equally?

   Understand:

   Plan:

   Solve:

   Check and look back:

2) Jerry and Henry love playing marbles. Jerry has 60 marbles while Henry has 80 marbles. They plan to keep their marbles in a clay jar. How many possible groups will there be if they are going to put them equally inside the clay jar respectively? Put a star ☆ if the number is divisible of the given number.

Number of Marbles	Can marbles be put in a clay jar equally by										
	2?	3?	4?	5?	6?	8?	9?	10?	11?	12?	20?
Jerry has 60											
Henry has 80											

3) A number N is less than 100. N is multiple of 3,4,5 and 6. N is a factor of 120, and if divided by 7, N leaves a remainder of 4. What is N? You may present your answers using a model or any method.

4) Arrange the digits 1,2,3,4,5 and 6 to form a number that is divisible by 6 and satisfies the following conditions:

- When the last digit is removed, it becomes a five-digit number which is divisible by 5.

- When the last digit is removed, it becomes a four-digit number which is divisible by 4.

- When the last digit is removed again, it becomes a three-digit number divisible by 3.

- When the last digit is removed again, it becomes a two-digit number divisible by 2.

Finally, when the last digit is removed, it is a one-digit number divisible by 1. What is the number? Explain your strategy in solving this problem.

Assessment

Directions: Solve the following problems involving factors, multiples, and divisibility rules for 2,3,4,5,6,8,9,10,11, and 12. Write the letter of the correct answers on your answer sheet.

1) Ralph needs to set up 20 chairs for a mini concert. He wants to put the same number of chairs in each row with no chairs left. How many chairs could he put in a row?

   A. 9 B. 3 C. 6 D. 5

2) Editha wants to arrange 124 roses into vases. How many roses could she put in each vase without having any leftover roses?

   A. 10 B. 4 C. 5 D. 6

3) There are 632 guavas in the jars in a pantry. If each jar contains the same number of guavas, how many jars would there be?

   A. 4 B. 10 c. 3 D. 9

4) A slipper factory needs to ship an order of 620 pairs. The factory will ship the slippers in several boxes. Each box must contain the same number of pairs of slippers. How many boxes could the factory use for the order?

   A. 6 B. 9 C. 10 D. 3

5) A warehouse contains 6 432 boxes of milk, and each row has the same number of boxes. How many rows could there be?

   A. 9 B. 3 C. 5 D. 10

Additional Activities

Direction: Solve the problem below.

> Mrs. Velasco plans to arrange 27 boys and 18 girls in rows for her seat plan. She wishes to arrange them in such a way that only boys or girls will be there in a row. Find the common number of students that could be arranged in a row.

Solution to the problem:

1) Using the four-step plan (Routine)
   a. Understand:
      Know what is asked _____
      Know what is/are given _____
   b. Plan:
      Determine the operation/ method/ procedures to be used
      _____
   c. Solve:
      Use the method to solve the problems_____
   d. Check and look back: _____

2) A number n is less than 50. If n is divided by 9, the remainder is 6, and if I divide it by 4, the remainder is 1. Also, if I divide it by 10, the remainder is 3. What is n?

3) Agatha is trying to find pairs of number that will sum up to a multiple of 11. From the numbers in the grid below, help Agatha find these pairs of numbers.

3	8	14
52	36	20
69	74	47

   a) How many pairs of number did you find? What are these? Explain your strategy.
   b) Did you find any number that has no partner?
   c) Did you find any number that could have more than one partner?
   d) What do you think is special about these pairs of numbers? Did you find any pattern? Explain your answer.

What I Know

Using the 4-step plan
Understand:

a. Know what is asked: Common number of small pots.
b. Know what are given: 36 mongo seeds, 33 corn seeds

Plan:

c. Determine the operation/method/procedure to be used: Find the common factors by listing

Solve:

d. Use the method to solve the problem: By listing the factors
   33 = 1,3,11,33
   36= 1,3,4,6,9,12,36
   The common factor of 33 and 36 is 3

Check and Look back

e. Check if the solution is correct
   33÷3 = 11 36÷3 = 12

What's In

1) 5, 814= 2,3,6,9
2) 81,235= 5,11
3) 3,285=3,5,9
4) 34,281=3,9
5) 11,255=5

What I Can Do

Problem 1

Asked: Number of onions planted in a row
Given: 600 onions, 20 rows
Plan: Division
Solution: 600÷ 20= 30
Check: 20 x 30 = 600, therefore, there are 30 onions planted in a row.

Problem 2

Jerry (60) =2,3,4,5,6,10,12,20
Henry (80) =2,4,58, 10, 20

Problem 3

Ans. N= 60

Problem 4

Ans. 321654

Answer Key

What I Have Learned

Answer:

A. Divisible by 4 and by 8

a) 356 232 is divisible by 4 and 8
"32, last 2 digits, is divisible by 4
"232, last 3 digits, is divisible by 8

b) 541 644 is divisible by 4 but NOT by 8
c) 759 326 is not divisible both by 4 and by 8.

B. Divisible by 9

The number is divisible by 9 if the sum of its digits is divisible by 9

a) 135 is divisible by 9
b) 326 is NOT divisible 9
c) 7893 is divisible by 9
d) 346752 is divisible by 9

What's More

1) D
2) B
3) D
4) C

Non-routine :

1) Divisible by 2, 5, 10
   a) Numbers between 2366 and 8080
      Divisible by 2: 2556
      Divisible by 5: 1142
      Divisible by 10: 571
   b) Numbers between 86236 and 87000
      Divisible by 2: 381
      Divisible by 5: 152
      Divisible by 10: 76
2) 958
3) 75312

Assessment

1) D
2) B
3) A
4) C
5) B

References

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