

MATH LEVEL 1
LESSON PLAN 5

DIVISION

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Section 1: Basic Division

1. DIVISION is the number of times a number can be taken out of another as if through “repeated subtraction”.

When there are 30 pennies on the table, you can take a group of 6 pennies away only 5 times, with no pennies remaining. We write this as follows.

$$30 \div 6 = 5; \quad \text{because} \quad \underset{\text{Subtract five times}}{30-6-6-6-6-6} = \underset{\text{No remainder}}{0}$$

This is called EXACT DIVISION since there is no remainder.

But when there are 33 pennies on the table and you take groups of 6 pennies away, then 3 pennies are left in the end.

$$33 \div 6 = 5 \text{ R}3; \quad \text{because} \quad \underset{\text{Subtract five times}}{33-6-6-6-6-6} = \underset{\text{Remainder}}{3}$$

This is called INEXACT DIVISION since there is a remainder.

2. The original number of pennies on the table are called **dividend**. The pennies taken away at a time are called the **divisor**. The maximum number of times the divisor can be taken out of the dividend is called the **quotient**. And the pennies left at the end, because they are less than the divisor, are called the **remainder**.

$$\underset{\text{Dividend}}{33} \div \underset{\text{Divisor}}{6} = \underset{\text{Quotient}}{5} \underset{\text{Remainder}}{\text{R}3}$$

3. A number can be taken out of itself exactly 1 time.

$$6 \div 6 = 1; \quad 30 \div 30 = 1$$

1 can be taken out of a number as many times as the number.

$$6 \div 1 = 6; \quad 30 \div 1 = 30$$

When there is nothing (0), you cannot take anything out of it at all..

$$0 \div 6 = 0; \quad 0 \div 30 = 0$$

When you are taking nothing (0) out of a number, it can be “taken out” any number of times.

$$6 \div 0 = \text{undefined}; \quad 30 \div 0 = \text{undefined}$$

☺ EXERCISE

A. Find the quotient with remainder, if any. Tell if the division is exact or inexact.

- (a) $9 \div 3$ (c) $16 \div 4$ (e) $25 \div 5$ (g) $12 \div 4$
 (b) $9 \div 2$ (d) $16 \div 5$ (f) $23 \div 6$ (h) $12 \div 10$

Answer: (a) 3 exact (b) 4 R1 inexact (c) 4 exact (d) 3 R1 inexact (e) 5 exact (f) 3 R5 inexact (g) 3 exact (h) 1 R2 inexact

B. Find the quotients for the following:

- (a) $9 \div 9$ (c) $9 \div 0$ (e) $0 \div 23$ (g) $24 \div 1$
 (b) $8 \div 1$ (d) $8 \div 8$ (f) $28 \div 0$ (h) $0 \div 4$

Answer: (a) 1 (b) 8 (c) undefined (d) 1 (e) 0 (f) undefined (g) 24 (h) 0

C. Find the quotient using multiplication tables

- (a) $27 \div 3$ (c) $48 \div 6$ (e) $72 \div 9$ (g) $36 \div 4$
 (b) $56 \div 8$ (d) $45 \div 5$ (f) $16 \div 2$ (h) $35 \div 7$

Answer: (a) 9 (b) 7 (c) 8 (d) 9 (e) 8 (f) 8 (g) 9 (h) 5

Section 2: Dividing by Single-Digit Divisors (Short Division)

4. We divide larger numbers from left to right by breaking them into their place values.

$$\begin{aligned} 486 \div 2 &= (400 + 80 + 6) \div 2 \\ &= 200 + 40 + 3 \\ &= 243 \end{aligned}$$

We may also divide larger numbers by writing them as follows.

		2	4	3	Quotient
Divisor	2)	4	8	6	Dividend

- Hundreds: From 4 we can take 2 out 2 times (no remainder)
 Tens: From 8 we can take 2 out 4 times (no remainder)
 Hundreds: From 6 we can take 2 out 3 times (no remainder)

Therefore, $486 \div 2 = 243$

To check, multiply 243 by 2. You should get back 486 because multiplication is reverse of division.

The 'long form' of division is shown on the right. We pull down the next digit and place it to the right of the remainder. We then divide the resulting number.

	2	8	6
2)	5	7	2
	4		
	1	7	
	1	6	
		1	2
		1	2
			0

Therefore, $572 \div 2 = 286$
 (Check $286 \times 2 = 572$)

The 'short form' of division is shown on the right. We place the remainder from a column to the left of the next digit. We then divide the resulting number.

	2	8	6
2)	5	17	12

5. When the first digit of the dividend cannot be divided, then start with the first two digits. Make sure you write the digit of the quotient in the correct column.

Therefore, $564 \div 6 = 94$
 (Check $94 \times 6 = 564$)

		9	4
6)	5	6
			24

6. When a number in a column cannot be divided, put a 0 in the quotient for that column.

Therefore, $728 \div 7 = 104$
 (Check $104 \times 7 = 728$)

		1	0	4
7)	7	0	2
			2	8

7. We may also write division with quotient below the dividend as shown on the right. This has some advantages when factoring numbers (see Lesson plan on FACTORS).

Divisor	2	5	17	12	Dividend
		2	8	6	Quotient

😊 EXERCISE

In the following exercises either use a Multiplication Table, or make the table for the divisor on the spot.

A. Divide the following and check your answers by multiplying back.

- (a) $396 \div 3$ (c) $444 \div 3$ (e) $435 \div 5$ (g) $450 \div 6$
 (b) $327 \div 3$ (d) $612 \div 6$ (f) $315 \div 7$ (h) $224 \div 4$

Answer: (a) 132 (b) 109 (c) 148 (d) 102 (e) 87 (f) 45 (g) 75 (h) 56

B. Divide the following and check your answers by multiplying back.

- (a) $844 \div 4$ (c) $732 \div 6$ (e) $57 \div 3$ (g) $3,174 \div 3$
 (b) $992 \div 8$ (d) $894 \div 6$ (f) $847 \div 7$ (h) $9,945 \div 5$

Answer: (a) 211 (b) 124 (c) 122 (d) 149 (e) 19 (f) 121 (g) 1,058 (h) 1,989

8. When there is a final remainder at the end of division, you write it next to the quotient as shown. To check your answer multiply back as before and then add the remainder.

Therefore, $764 \div 3 = 254 \text{ R}2$
 [Check $(254 \times 3) + 2 = 764$]. Note that we add remainder to get back the dividend.

3	7	16	14	
	2	5	4	R 2

😊 EXERCISE

A. Check your answer by multiplying back and the adding the remainder.

- (a) $15 \div 4$ (c) $139 \div 6$ (e) $578 \div 3$ (g) $3,177 \div 2$
 (b) $92 \div 8$ (d) $793 \div 7$ (f) $897 \div 5$ (h) $9,745 \div 9$

Answer: (a) 3 R3 (b) 11 R4 (c) 23 R1 (d) 113 R2 (e) 192 R2 (f) 179 R2 (g) 1588 R1 (h) 1082 R7

- (d) Pull the next digit (5) down and place it next to 1, making it 15.
- (e) For $15 \div 37$ we obviously get 0. Write 0 above 5. Subtract $15 - 0 = 15$.
- (f) Pull the next digit (2) down and place it next to 15, making it 152.
- (g) For $152 \div 37$ round to 150 and 40. We can take out the tens (4 out of 15) 3 times. Check $37 \times 3 = 111$; and $37 \times 4 = 148$. We can take 37 out of 152, four times. Write 4 above 2. Subtract $152 - 148 = 4$.
- (h) Pull the next digit (6) down and place it next to 4, making it 46.
- (i) For $46 \div 37$, we can 37 out of 46 one time. Write 1 above 6. Subtract $46 - 37 = 9$. There are no more digits, so the final remainder is 9.

Therefore, $630526 \div 37 = 17041 \text{ R}9$
[Check $(17041 \times 37) + 9 = 630526$]

😊 EXERCISE

Divide by approximating the quotient.

- | | | |
|-------------------|-------------------|----------------------|
| (a) $144 \div 16$ | (d) $217 \div 45$ | (g) $7488 \div 61$ |
| (b) $123 \div 23$ | (e) $318 \div 53$ | (h) $82593 \div 71$ |
| (c) $259 \div 37$ | (f) $419 \div 59$ | (i) $994720 \div 89$ |

Answer: (a) 9 (b) 5 R8 (c) 7 (d) 4 R37 (e) 6 (f) 7 R6 (g) 122 R46 (h) 1163 R20 (i) 11176 R56

Section 4: Word Problems

11. Word problems require a translation of words into mathematical language.

- (a) Example 1: If 6 apples cost 54 cents, how much would 9 apples cost?

LOGIC: First find out how much one apple costs. Then you can find out how much 9 apples would cost.

Cost of 6 apples	=	54 cents		
Cost of 1 apple	=	$54 \div 6$	=	9 cents
Cost of 9 apple	=	9×9	=	81 cents

Answer

- (b) Example 2: Joe, Bob and Lisa shared a prize of \$108 equally among themselves. Lisa then shared her money equally with her two sisters. How much money did Lisa get?

LOGIC: First find out how much Lisa got before sharing the prize with her sisters. Then you can find out how much Lisa got after sharing with her sisters.

Amount Lisa got initially	=	$\$108 \div 3$	=	\$36
Amount Lisa got finally	=	$\$36 \div 3$	=	\$12

Answer

😊 EXERCISE

Do the following word problems. Check your answer against the answers given.

- (a) **You bought 5 bananas for 30 cents. How much will 1 banana cost? 8 bananas cost?**

(b) You bought 14 pencils for 70 cents. How much will 1 pencil cost? 21 pencils cost?

(c) You won a lottery of \$600, which you shared with 4 of your friends. You then shared your winnings equally with your brother and sister. How much money did you end up with?

Answer: (1) 6 cents, 48 cents (2) 5 cents, \$1.05 (3) \$40

☺ **Lesson Plan 5: Check your Understanding**

1. How is division related to multiplication?

2. Divide (a) $47,971 \div 7$ (b) $299,997 \div 3$ (c) $751,941 \div 9$

3. Divide (a) $47,971 \div 27$ (b) $299,997 \div 63$ (c) $751,941 \div 89$

Check your answers against the answers given below.

Answers:

1) Division is "reverse multiplication."

2) (a) 6,853 (b) 99,999 (c) 83,549

3) (a) 1,776 R19 (b) 4,761 R54 (c) 8,448 R69.