

Divisibility Patterns

The following rules will help you determine if a number is divisible by 2, 3, 4, 5, 6, 9, or 10.

A number is divisible by:

- 2 if the digit in the ones place is even.
- 3 if the sum of the digits is divisible by 3.
- 4 if the number formed by the last two digits is divisible by 4.
- 5 if the digit in the ones place is 0 or 5.
- 6 if the number is divisible by both 2 and 3.
- 9 if the sum of the digits is divisible by 9.
- 10 if the digit in the ones place is 0.

Example Determine whether 2,346 is divisible by 2, 3, 4, 5, 6, 9, or 10.

- 2: The ones digit is 6, an even number.
So 2,346 is divisible by 2.
- 3: The sum of the digits, $2 + 3 + 4 + 6 = 15$, is divisible by 3.
So 2,346 is divisible by 3.
- 4: The number formed by the last two digits, 46, is not divisible by 4.
So 2,346 is not divisible by 4.
- 5: The ones digit is not 0 or 5.
So 2,346 is not divisible by 5.
- 6: The number is divisible by 2 and by 3.
So 2,346 is divisible by 6.
- 9: The sum of the digits, 15, is not divisible by 9.
So 2,346 is not divisible by 9.
- 10: The ones digit is not 0.
So 2,346 is not divisible by 10.
- 2,346 is divisible by 2, 3, and 6.

Determine whether the first number is divisible by the second number.

1. 65; 5
 yes ends in 5

2. 2,641; 3
 $2+6+4+1=13$
 no 13 is not divisible by 3

3. 6,780; 10
 yes ends in zero

4. 4,185; 9
 $4+1+8+5=18$
 yes 18 is divisible by 9

5. 4,889; 2
 no odd

6. 8,826; 4
 no 26 not divisible by 4

7. 60,003; 6
 $6+0+0+0+3=9$
 2×3 no

8. 642; 4
 42 is not divisible by 4 no

Determine whether each number is divisible by 2, 3, 4, 5, 6, 9, or 10.

9. 660
 $6+6+0=12$
ends in zero
 $12 \div 3 = 4$
even
d.v. by 4

10. 5,025
 $5+0+2+5=12$
 $12 \div 3 = 4$
ends in 5

11. 5,091
 $5+0+9+1=15$
 $15 \div 3 = 5$

12. 356
 $3+5+6=14$
even
 $56 \div 4 = 14$

2, 3, 4, 5, 6, 9

3, 5

3

2, 4

Divisibility

Complete the chart. Use the divisibility rules to determine if a number is divisible by 2, 3, 4, 5, 6, 9, or 10.

Number	Sum of the Digits	Is the number di visible by: (place checkmarks)						
		2	3	4 <small>last 2 dig</small>	5 <small>ends 5</small>	6 <small>2 & 3</small>	9	10 <small>ends 0</small>
15	$1+5=6$		✓		✓			
18	$1+8=9$	✓	✓			✓	✓	
21	$2+1=3$		✓					
28	$2+8=10$	✓		✓				
48	$4+8=12$	✓	✓	✓		✓		
50	$5+0=5$	✓			✓			✓
75	$7+5=12$		✓		✓			
125	$1+2+5=8$				✓			
360	$3+6+0=9$	✓	✓	✓	✓	✓	✓	✓
480	$4+8+0=12$	✓	✓	✓	✓	✓		✓
615	$6+1+5=12$		✓		✓			
720	$7+2+0=9$	✓	✓	✓	✓	✓	✓	✓
840	$8+4+0=12$	✓	✓	✓	✓	✓		✓
1436	$1+4+3+6=14$	✓		✓				
2072	$2+0+7+2=11$	✓		✓				
12,558	$1+2+5+5+8=21$	✓	✓				✓	
46,294	$4+6+2+9+4=25$	✓						
75,592	$7+5+5+9+2=28$	✓						
80,453	$8+0+4+5+3=20$							
98,125	$9+8+1+2+5=25$				✓			

Complete with $<$, $>$, or $=$ to make a true sentence. Use fractions to prove your answer.

1.) $0.7 < 0.8$
 $\frac{7}{10} < \frac{8}{10}$

2.) $4.0 > 3.75$
 $4 > 3\frac{3}{4}$

3.) $4,275 > 4,199$

4.) $6 = 6.0$

5.) $0.2 < 0.3$
 $\frac{2}{10} < \frac{3}{10}$

6.) $85.751 < 85.76$
 $85\frac{751}{1000} < 85\frac{760}{1000}$

7.) $0.345 > 0.2$
 $\frac{345}{1000} > \frac{200}{1000}$

8.) $0.07 > 0.1$
 $\frac{7}{100} > \frac{10}{100}$

Order the numbers from least to greatest.

9.) 0.06, .006, 0.6

10.) 4.7, 4.8, 4.75

11.) 0.09, 0.007, 0.083

.006, .06, .6

4.7, 4.75, 4.8

.007, .083, .09

Answer each question in a complete sentence.

12.) Explain why 3.4 is more or less than 3.35.

$3\frac{4}{10} > 3\frac{35}{100}$
 $3\frac{40}{100} > 3\frac{35}{100}$

3.4 is greater than 3.35 because $3\frac{40}{100}$ is more than $3\frac{35}{100}$. [Just 1 example]

13.) Jim's time in a race was 14.73 seconds. Paul's time, was 14.6 seconds. Who won the race? Explain your reasoning.

Jim 14.73 seconds Paul 14.6 seconds

Since the person who wins the race has a shorter time, Paul won the race. Paul finished in $14\frac{6}{10}$ seconds, which is a shorter amount of time from over $14\frac{7}{10}$ seconds. [1 example of explanation]

Adding Mixed Numbers

When you add mixed numbers, you may need to re-write the problem so the denominators are the same.

Example: $5\frac{1}{3} + 2\frac{1}{8}$
 $5\frac{8}{24} + 2\frac{3}{24}$
 $7\frac{11}{24}$

Expressions
(no need for = signs)

Add by showing all steps. Simplify if possible.

1. $2\frac{1}{4} + 3\frac{1}{8}$
 $2\frac{2}{8} + 3\frac{1}{8}$
 $5\frac{3}{8}$

2. $3\frac{2}{3} + 4\frac{1}{9}$
 $3\frac{6}{9} + 4\frac{1}{9}$
 $7\frac{7}{9}$

3. $6\frac{4}{7} + 5\frac{9}{14}$
 $6\frac{8}{14} + 5\frac{9}{14}$
 $11\frac{17}{14}$
 $12\frac{3}{14}$

4. $7\frac{1}{2} + 12\frac{5}{6}$
 $7\frac{3}{6} + 12\frac{5}{6}$
 $19\frac{8}{6}$
 $20\frac{2}{6}$
 $20\frac{1}{3}$

5. $3\frac{2}{3} + 4\frac{1}{4}$
 $3\frac{8}{12} + 4\frac{3}{12}$
 $7\frac{11}{12}$

6. $1\frac{5}{8} + 4\frac{1}{6}$
 $1\frac{15}{24} + 4\frac{4}{24}$
 $5\frac{19}{24}$

7. $8\frac{3}{5} + 9\frac{2}{7}$
 $8\frac{21}{35} + 9\frac{10}{35}$
 $17\frac{31}{35}$

8. $10\frac{3}{10} + 4\frac{1}{3}$
 $10\frac{9}{30} + 4\frac{10}{30}$
 $14\frac{19}{30}$

9. $7\frac{1}{6} + 2\frac{2}{3} + 4\frac{7}{9}$
 $7\frac{3}{18} + 2\frac{12}{18} + 4\frac{14}{18}$
 $13\frac{29}{18}$
 $14\frac{11}{9}$

10. $1\frac{1}{2} + 6\frac{3}{4} + 2\frac{5}{6}$
 $1\frac{6}{12} + 6\frac{9}{12} + 2\frac{10}{12}$
 $9\frac{25}{12}$
 $11\frac{1}{12}$

11. $9\frac{1}{5} + 6\frac{7}{10} + 3\frac{1}{2}$
 $9\frac{2}{10} + 6\frac{7}{10} + 3\frac{5}{10}$
 $18\frac{14}{10}$
 $19\frac{4}{10}$
 $19\frac{2}{5}$

Subtracting Mixed Numbers with Borrowing

When subtracting mixed numbers, find common denominators first and borrow if necessary.

Example:

$$\begin{array}{r} 2\frac{1}{5} - 1\frac{4}{15} \\ \downarrow \\ 2\frac{3+15}{15} - 1\frac{4}{15} \\ 1\frac{18}{15} - 1\frac{4}{15} \\ \hline 1\frac{14}{15} \end{array}$$

Subtract by showing ALL work. Simplify if possible.

1. $6\frac{1}{10} - 2\frac{1}{6}$

$$\begin{array}{r} 6\frac{3}{30} - 2\frac{5}{30} \\ 5\frac{33}{30} - 2\frac{5}{30} \\ \hline 3\frac{28}{30} \\ \hline 3\frac{14}{15} \end{array}$$

2. $4\frac{2}{7} - 1\frac{1}{3}$

$$\begin{array}{r} 4\frac{6}{21} - 1\frac{7}{21} \\ 3\frac{27}{21} - 1\frac{7}{21} \\ \hline 2\frac{20}{21} \end{array}$$

3. $9\frac{2}{5} - 3\frac{1}{2}$

$$\begin{array}{r} 9\frac{4}{10} - 3\frac{5}{10} \\ 8\frac{14}{10} - 3\frac{5}{10} \\ \hline 5\frac{9}{10} \end{array}$$

4. $12\frac{1}{12} - 5\frac{5}{6}$

$$\begin{array}{r} 12\frac{1}{12} - 5\frac{10}{12} \\ 11\frac{13}{12} - 5\frac{10}{12} \\ \hline 6\frac{3}{12} \\ \hline 6\frac{1}{4} \end{array}$$

5. $10\frac{3}{8} - 9\frac{5}{6}$

$$\begin{array}{r} 10\frac{9}{24} - 9\frac{20}{24} \\ 9\frac{33}{24} - 9\frac{20}{24} \\ \hline 1\frac{13}{24} \end{array}$$

6. $15\frac{1}{10} - 11\frac{2}{5}$

$$\begin{array}{r} 15\frac{1}{10} - 11\frac{4}{10} \\ 14\frac{11}{10} - 11\frac{4}{10} \\ \hline 3\frac{7}{10} \end{array}$$

7. $20\frac{3}{20} - 7\frac{1}{4}$

$$\begin{array}{r} 20\frac{3}{20} - 7\frac{5}{20} \\ 19\frac{23}{20} - 7\frac{5}{20} \\ \hline 12\frac{18}{20} \\ \hline 12\frac{9}{10} \end{array}$$

8. $9\frac{1}{7} - 3\frac{4}{21}$

$$\begin{array}{r} 9\frac{3}{21} - 3\frac{4}{21} \\ 8\frac{24}{21} - 3\frac{4}{21} \\ \hline 5\frac{20}{21} \end{array}$$

9. $14\frac{1}{6} - 8\frac{7}{30}$

$$\begin{array}{r} 14\frac{5}{30} - 8\frac{7}{30} \\ 13\frac{35}{30} - 8\frac{7}{30} \\ \hline 5\frac{28}{30} \\ \hline 5\frac{14}{15} \end{array}$$

Multiply. Show ALL work and circle your final answers.

$$\begin{array}{r} 1. \quad 3.7 \times 5.6 \\ \quad 3.7 \text{ ①} \\ \times 5.6 \text{ ①} \\ \hline \quad 222 \\ + 1850 \\ \hline 20.72 \text{ ②} \end{array}$$

$$\boxed{20.72}$$

$$2. \quad (0.25)(0.3)$$

$$\begin{array}{r} 0.25 \text{ ②} \\ \times 0.3 \text{ ①} \\ \hline 0.75 \text{ ③} \end{array}$$

or

$$\frac{25}{100} \cdot \frac{3}{10} = \frac{75}{1000}$$

$$\boxed{.075}$$

3. 0.3×9

$$\begin{array}{r} 0.3 \text{ ①} \\ \times 9 \text{ ①} \\ \hline 2.7 \text{ ①} \end{array}$$

$$\boxed{2.7}$$

4. 0.5 of 12

$$\begin{array}{r} 12 \\ \times 0.5 \text{ ①} \\ \hline 6.0 \text{ ①} \end{array}$$

$$\boxed{6}$$

5. 4.6 ①

$$\times 2.3 \text{ ①}$$

$$\begin{array}{r} 138 \\ + 920 \\ \hline 1058 \text{ ②} \end{array}$$

$$\boxed{10.58}$$

6. What is the product of 0.3 and 0.2 ?

$$\frac{3}{10} \cdot \frac{2}{10}$$

The product is $\frac{6}{100} \rightarrow .06$

7. 0.8 of 2.5

$$2.5 \text{ ①}$$

$$\times 0.8 \text{ ①}$$

$$\begin{array}{r} 200 \\ \hline 200 \text{ ②} \end{array}$$

$$\boxed{2}$$

8. $(0.3)(0.4)(0.5)$

$$.12 \text{ ②}$$

$$\times 0.5 \text{ ①}$$

$$\begin{array}{r} 60 \\ \hline 60 \text{ ③} \end{array}$$

$$\boxed{.06}$$

9. $(300)(0.04) \rightarrow \frac{300}{1} \times \frac{4}{100}$

$$\begin{array}{r} 300 \\ \times 0.04 \text{ ②} \\ \hline 1200 \text{ ②} \end{array}$$

$$\boxed{12}$$

$$\boxed{12}$$

10. 0.003×0.5

$$\begin{array}{r} 0.003 \text{ ③} \\ \times 0.5 \text{ ①} \\ \hline 0.0015 \text{ ④} \end{array}$$

$$\boxed{.0015}$$

$$\frac{3}{1000} \times \frac{5}{10} = \frac{15}{10000}$$

Multiplying Mixed Numbers and Fractions

Step 1: Change the mixed numbers into improper fractions

Step 2: Cross simplify if possible.

Step 3: Multiply the numerators and denominators straight across

Step 4: Simplify if possible.

Multiply by showing ALL work.

$$\begin{aligned} 1. \quad & 3\frac{1}{5} \times \frac{3}{4} \\ & \frac{16}{5} \times \frac{3}{4} \\ & \frac{12}{5} \\ & \boxed{2\frac{2}{5}} \end{aligned}$$

$$\begin{aligned} 2. \quad & 4\frac{3}{8} \times \frac{5}{7} \\ & \frac{35}{8} \times \frac{5}{7} \\ & \frac{25}{8} \\ & \boxed{3\frac{1}{8}} \end{aligned}$$

$$\begin{aligned} 3. \quad & 5\frac{2}{5} \times \frac{1}{4} \\ & \frac{27}{5} \times \frac{1}{4} \\ & \frac{27}{20} \\ & \boxed{1\frac{7}{20}} \end{aligned}$$

$$\begin{aligned} 4. \quad & 7\frac{1}{9} \times \frac{3}{4} \\ & \frac{64}{9} \times \frac{3}{4} \\ & \frac{16}{3} \\ & \boxed{5\frac{1}{3}} \end{aligned}$$

$$\begin{aligned} 5. \quad & 2\frac{1}{2} \times \frac{3}{10} \\ & \frac{8}{2} \times \frac{3}{10} \\ & \frac{3}{4} \\ & \boxed{\frac{3}{4}} \end{aligned}$$

$$\begin{aligned} 6. \quad & 1\frac{1}{3} \times \frac{3}{16} \\ & \frac{4}{3} \times \frac{3}{16} \\ & \frac{1}{4} \\ & \boxed{\frac{1}{4}} \end{aligned}$$

$$\begin{aligned} 7. \quad & 6\frac{1}{3} \times \frac{3}{5} \\ & \frac{19}{3} \times \frac{3}{5} \\ & \frac{19}{5} \\ & \boxed{3\frac{4}{5}} \end{aligned}$$

$$\begin{aligned} 8. \quad & 3\frac{2}{7} \times \frac{1}{7} \\ & \frac{23}{7} \times \frac{1}{7} \\ & \frac{23}{49} \\ & \boxed{\frac{23}{49}} \end{aligned}$$

$$\begin{aligned} 9. \quad & \frac{3}{8} \times 4\frac{1}{6} \\ & \frac{3}{8} \times \frac{25}{6} \\ & \frac{25}{16} \\ & \boxed{1\frac{9}{16}} \end{aligned}$$

$$\begin{aligned} 10. \quad & 3\frac{7}{9} \times \frac{3}{4} \\ & \frac{34}{9} \times \frac{3}{4} \\ & \frac{34}{12} \\ & 2\frac{10}{12} \\ & \boxed{2\frac{5}{6}} \end{aligned}$$

$$\begin{aligned} 11. \quad & \frac{9}{10} \times 5\frac{2}{3} \\ & \frac{9}{10} \times \frac{17}{3} \\ & \frac{31}{10} \\ & \boxed{5\frac{1}{10}} \end{aligned}$$

$$\begin{aligned} 12. \quad & \frac{1}{2} \times 9\frac{2}{3} \\ & \frac{1}{2} \times \frac{29}{3} \\ & \frac{29}{6} \\ & \boxed{4\frac{5}{6}} \end{aligned}$$

Division of Whole Numbers and Decimals

Divide by showing ALL work.

1.
$$\begin{array}{r} 0.75 \\ 5 \overline{)37.75} \\ \underline{-35} \\ 25 \\ \underline{-25} \\ 0 \end{array}$$

0.75

2. Find the quotient of 25,974 and 6.

$$\begin{array}{r} 4329 \\ 6 \overline{)25974} \\ \underline{-24} \\ 19 \\ \underline{-18} \\ 17 \\ \underline{-12} \\ 54 \\ \underline{-54} \\ 0 \end{array}$$

3.
$$\begin{array}{r} 12.95 \\ 4 \overline{)51.80} \\ \underline{-4} \\ 11 \\ \underline{-8} \\ 38 \\ \underline{-36} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

12.95

4. Divide 108 by 0.9

120

$$\begin{array}{r} 120 \\ 9 \overline{)1080} \\ \underline{-9} \\ 18 \\ \underline{-18} \\ 0 \end{array}$$

5. $364 \div 0.7$

$$\begin{array}{r} 520 \\ 7 \overline{)3640} \\ \underline{-35} \\ 14 \\ \underline{-14} \\ 0 \end{array}$$

520

6.
$$\begin{array}{r} 0.8 \\ 4 \overline{)3.2} \end{array}$$

0.8

7. Divide 439 by 0.6

$$\begin{array}{r} 731.6 \\ 6 \overline{)4390} \\ \underline{-42} \\ 19 \\ \underline{-18} \\ 10 \\ \underline{-6} \\ 40 \\ \underline{-36} \\ 40 \end{array}$$

731.6

8.
$$\begin{array}{r} 39.7 \\ 0.9 \overline{)357.3} \\ \underline{-27} \\ 87 \\ \underline{-81} \\ 63 \end{array}$$

39.7

9.
$$\begin{array}{r} 32 \\ 4 \overline{)1312} \\ \underline{-12} \\ 82 \\ \underline{-82} \\ 0 \end{array}$$

32

$$\begin{array}{r} 32 \\ 4 \overline{)1312} \\ \underline{-12} \\ 82 \\ \underline{-82} \\ 0 \end{array}$$

10.

Divide 0.003 into 6

$$\begin{array}{r} 2000 \\ 3 \overline{)6000} \end{array}$$

2,000