

Name _____

Date _____

1.5 Tests for divisibility — worked answers

Use tests of divisibility to check whether one number divides exactly into another. · 54 questions

A · Fluency — Apply one test at a time.

1 Is 342 divisible by 3?

- ☐ Yes
☐ No

Answer: Yes

The digits of 342 add to 9, and 9 is divisible by 3, so 342 is divisible by 3.

2 Is 1,234 divisible by 4?

- ☐ Yes
☐ No

Answer: No

The last two digits form 34, and 34 is not divisible by 4, so 1,234 is not divisible by 4.

3 Is 4,530 divisible by 6?

- ☐ Yes
☐ No

Answer: Yes

4,530 is even and its digits add to 12 which is a multiple of 3, so 4,530 is divisible by 6.

4 Is 2,915 divisible by 5?

- ☐ Yes
☐ No

Answer: Yes

The last digit of 2,915 is 5, so 2,915 is divisible by 5.

5 Is 918 divisible by 9?

- ☐ Yes
☐ No

Answer: Yes

The digits of 918 add to 18, and 18 is divisible by 9, so 918 is divisible by 9.

6 Is 7,128 divisible by 8?

- ☐ Yes
☐ No

Answer: Yes

The last three digits form 128, and 128 is divisible by 8, so 7,128 is divisible by 8.

7 Is 5,060 divisible by 4?

- ☐ Yes
☐ No

Answer: Yes

The last two digits form 60, and 60 is divisible by 4, so 5,060 is divisible by 4.

8 Is 8,514 divisible by 9?

- ☐ Yes
☐ No

Answer: Yes

The digits of 8,514 add to 18, and 18 is divisible by 9, so 8,514 is divisible by 9.

9 Is 3,456 divisible by 6?

- ☐ Yes
☐ No

Answer: Yes

3,456 is even and its digits add to 18 which is a multiple of 3, so 3,456 is divisible by 6.

10 Is 2,025 divisible by 25?

- ☐ Yes
☐ No

Answer: Yes

The last two digits form 25, so 2,025 is divisible by 25.

11 Is 7,315 divisible by 10?

- ☐ Yes
☐ No

Answer: No

The last digit of 7,315 is 5, so 7,315 is not divisible by 10.

12 Is 6,402 divisible by 3?

- ☐ Yes
☐ No

Answer: Yes

The digits of 6,402 add to 12, and 12 is divisible by 3, so 6,402 is divisible by 3.

13 Is 9,108 divisible by 4?

- ☐ Yes
☐ No

Answer: Yes

The last two digits form 08, and 8 is divisible by 4, so 9,108 is divisible by 4.

14 Is 5,555 divisible by 11?

- ☐ Yes
☐ No

Answer: Yes

Odd-position digits add to 10, even-position digits add to 10, difference 0, so 5,555 is divisible by 11.

- 15** Is 4,862 divisible by 11?

☐ Yes
☐ No

Answer: Yes

Odd-position digits add to 10, even-position digits add to 10, difference 0, so 4,862 is divisible by 11.

- 16** Is 13,572 divisible by 6?

☐ Yes
☐ No

Answer: Yes

13,572 is even and its digits add to 18 which is a multiple of 3, so 13,572 is divisible by 6.

- 17** Is 81,000 divisible by 8?

☐ Yes
☐ No

Answer: Yes

The last three digits form 0, and 0 is divisible by 8, so 81,000 is divisible by 8.

- 18** Is 2,461 divisible by 9?

☐ Yes
☐ No

Answer: No

The digits of 2,461 add to 13, and 13 is not divisible by 9, so 2,461 is not divisible by 9.

- 19** Which of 2, 3, 4, 5, 6, 8, 9, 10, 11 divide exactly into 216? List them in order, separated by commas.

Answer: 2, 3, 4, 6, 8, 9

Apply each test in turn: 2 ✓; 3 ✓; 4 ✓; 5 ✗; 6 ✓; 8 ✓; 9 ✓; 10 ✗; 11 ✗.

- 20** Which of 2, 3, 4, 5, 6, 8, 9, 10, 11 divide exactly into 385? List them in order, separated by commas.

Answer: 5, 11

Apply each test in turn: 2 ✗; 3 ✗; 4 ✗; 5 ✓; 6 ✗; 8 ✗; 9 ✗; 10 ✗; 11 ✓.

- 21** Which of 2, 3, 4, 5, 6, 8, 9, 10, 11 divide exactly into 924? List them in order, separated by commas.

Answer: 2, 3, 4, 6, 11

Apply each test in turn: 2 ✓; 3 ✓; 4 ✓; 5 ✗; 6 ✓; 8 ✗; 9 ✗; 10 ✗; 11 ✓.

- 22** Which of 2, 3, 4, 5, 6, 8, 9, 10, 11 divide exactly into 1001? List them in order, separated by commas.

Answer: 11

Apply each test in turn: 2 ✗; 3 ✗; 4 ✗; 5 ✗; 6 ✗; 8 ✗; 9 ✗; 10 ✗; 11 ✓.

B · Reasoning — Missing digits and combining tests.

- 23** What is the smallest digit that can replace ■ so that 47■ is divisible by 3?

Answer: 1

$4 + 7 = 11$. The next multiple of 3 is 12, so ■ = 1 and $471 = 3 \times 157$.

- 24 What is the largest digit that can replace ■ so that $47■$ is divisible by 3?

Answer: 7

$4 + 7 + ■$ must be a multiple of 3. ■ can be 1, 4 or 7; the largest is 7 ($477 = 3 \times 159$).

- 25 The number $3■58$ is divisible by 3. What is the smallest possible value of ■?

Answer: 2

$3 + 5 + 8 = 16$. The next multiple of 3 is 18, so $■ = 2$. (■ could also be 5 or 8.)

- 26 The number $3■58$ is divisible by 3. List all possible values of ■, separated by commas.

Answer: 2, 5, 8

$3 + 5 + 8 = 16$, so $16 + ■$ must be a multiple of 3. That gives $■ = 2, 5$ or 8 .

- 27 The number $5■2$ is divisible by 4. What is the largest possible value of ■?

Answer: 9

The last two digits ■2 must be divisible by 4: 12, 32, 52, 72, 92 all work, so ■ can be 1, 3, 5, 7 or 9. The largest is 9.

- 28 The number $12■$ is divisible by 9. What is ■?

Answer: 6

$1 + 2 + ■$ must be a multiple of 9, so $3 + ■ = 9$ and $■ = 6$ ($126 = 9 \times 14$).

- 29 Which of these numbers is divisible by 11?

- ☐ 2451
- ☐ 3728
- ☐ 5148
- ☐ 6217

Answer: 5148

For 5148: odd-position digits $8 + 1 = 9$, even-position digits $4 + 5 = 9$, difference 0 — so it is divisible by 11 ($5148 = 11 \times 468$).

- 30 A number is divisible by both 2 and 3. Which other number must it be divisible by?

- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 9

Answer: 6

A number divisible by 2 and by 3 is divisible by $2 \times 3 = 6$, because 2 and 3 share no factors.

- 31 A number is divisible by both 2 and 4. Does that mean it is divisible by 8?

- ☐ Yes, always
- ☐ No, not always

Answer: No, not always

12 is divisible by 2 and by 4 but $12 \div 8 = 1.5$. The shortcut only works when the two divisors share no common factor.

- 32 Is every number that ends in 0 divisible by 5?

- ☐ Yes
- ☐ No

Answer: Yes

The test for 5 is that the last digit is 0 or 5, so any number ending in 0 passes.

- 33** Is every number divisible by 9 also divisible by 3?

☐ Yes
☐ No

Answer: Yes

If the digit sum is a multiple of 9 then it is also a multiple of 3, because $9 = 3 \times 3$.

- 34** Is every number divisible by 3 also divisible by 9?

☐ Yes
☐ No

Answer: No

6 is divisible by 3 but not by 9.

C · Challenge — Build numbers to order.

- 35** A number is divisible by 66 when it is divisible by 6 and by 11. Is 4 356 divisible by 66?

Answer 1 for yes, 0 for no.

Answer: 1

4356 is even and its digits add to 18 (a multiple of 3), so it is divisible by 6 ✓ For 11: $6 + 3 = 9$ and $5 + 4 = 9$, difference 0 ✓ So $4356 = 66 \times 66$ is divisible by 66.

- 36** What is the smallest whole number greater than 22 222 that is divisible by 9?

Answer: 22230

The digits of 22 222 add to 10, so it is not divisible by 9. Count on, checking digit sums: 22 223 → 11, 22 224 → 12, ... 22 230 → $2+2+2+3+0 = 9$ ✓ So the answer is 22 230, and $22\,230 \div 9 = 2\,470$.

- 37** Use the digits 4, 5, 6 and 7 once each to make the largest 4-digit number that is divisible by 4.

Answer: 7564

For divisibility by 4 the last two digits must form a multiple of 4: 56, 64 and 76 are the options. To make the number as large as possible start with 7, then 5, leaving 64: $7564 \div 4 = 1891$ ✓

- 38** Use the digits 1, 2, 3 and 6 once each to make the smallest 4-digit number that is divisible by 6.

Answer: 1236

The digit sum is $1 + 2 + 3 + 6 = 12$, a multiple of 3 ✓ — so any arrangement passes the test for 3. It must also be even, so the last digit is 2 or 6. The smallest such arrangement is 1 236, and $1\,236 \div 6 = 206$ ✓

- 39** Every digit of a number is 4 and the number has 6 digits (444 444). Is it divisible by 3?

Answer 1 for yes, 0 for no.

Answer: 1

The digit sum is $6 \times 4 = 24$, which is a multiple of 3, so yes.

- 40** Find the smallest 4-digit number that is divisible by 3, 4 and 5.

Answer: 1020

It must be a multiple of $\text{LCM}(3, 4, 5) = 60$. $1\,000 \div 60 = 16.67$, so take $17 \times 60 = 1\,020$.

- 41** Find the smallest 3-digit number that is divisible by both 4 and 9.

Answer: 108

It must be a multiple of $\text{LCM}(4, 9) = 36$. Multiples of 36: 36, 72, 108 — the first with three digits is 108.

- 42** How many numbers between 1 and 100 inclusive are divisible by 3 but not by 9?

Answer: 22

Multiples of 3 up to 100: 33 of them. Multiples of 9 up to 100: 11 of them. $33 - 11 = 22$.

D · Word problems — Packing, sharing and seating.

- 43** A school has 1 236 students. Can they be split exactly into teams of 4? Answer 1 for yes, 0 for no.

Answer: 1

The last two digits form 36, and $36 \div 4 = 9$, so 1 236 is divisible by 4 ($1\,236 \div 4 = 309$ teams).

- 44** A theatre has 2 025 seats arranged in rows of 25. Is that possible with no seats left over? Answer 1 for yes, 0 for no.

Answer: 1

The last two digits are 25, so 2 025 is divisible by 25 ($2\,025 \div 25 = 81$ rows).

- 45** A farmer has 8 514 eggs to pack into boxes of 9. How many boxes does he fill, if every box is full?

Answer: 946

$8 + 5 + 1 + 4 = 18$, a multiple of 9, so $8\,514 \div 9 = 946$ boxes exactly.

- 46** \$7 128 is shared equally between 8 charities. How many dollars does each receive?

Answer: 891

The last three digits form 128 and $128 \div 8 = 16$, so $7\,128 \div 8 = 891$.

- 47** A factory produces 4 530 bottles. They are packed 6 to a crate. How many crates are filled?

Answer: 755

4 530 is even and its digits add to 12 (a multiple of 3), so it is divisible by 6: $4\,530 \div 6 = 755$ crates.

- 48** A stadium seats 13 572 people in blocks of 12. How many blocks are there?

Answer: 1131

13 572 is divisible by 4 (last two digits 72) and by 3 (digits add to 18), so it is divisible by 12: $13\,572 \div 12 = 1\,131$.

- 49** A charity collects \$3 456. It wants to give equal whole-dollar amounts to 6 projects. How many dollars does each project get?

Answer: 576

3 456 is even and $3 + 4 + 5 + 6 = 18$ is a multiple of 3, so it divides by 6: $3\,456 \div 6 = 576$.

- 50** A shop has 385 pencils. It wants to sell them in packs of 5 with none left over. How many packs?

Answer: 77

385 ends in 5, so it is divisible by 5: $385 \div 5 = 77$ packs.

- 51** A code must be a 3-digit number divisible by 10 and by 9. What is the smallest possible code?

Answer: 180

It must be a multiple of $\text{LCM}(10, 9) = 90$. The 3-digit multiples of 90 start at 180.

- 52** A bus company has 924 passengers and wants to fill buses of equal size. It tries sizes 4, 6, 8 and 11. Which is the largest size that works with no one left over?

Answer: 11

$924 \div 4 = 231 \checkmark$, $\div 6 = 154 \checkmark$, $\div 8 = 115.5 \times$, $\div 11 = 84 \checkmark$. The largest that works is 11.

- 53** A hall holds 1 001 people. Is 1 001 divisible by 11? Answer 1 for yes, 0 for no.

Answer: 1

Odd-position digits $1 + 0 = 1$, even-position digits $0 + 1 = 1$, difference 0 $\rightarrow$ divisible by 11 ($1\ 001 = 11 \times 91$).

- 54** A printer prints 81 000 leaflets, packed 8 to a bundle. How many bundles?

Answer: 10125

The last three digits form 000, which is divisible by 8, so $81\ 000 \div 8 = 10\ 125$.