

Name _____

Date _____

3.1 Multiplying and dividing by powers of 10 — worked answers

Multiply and divide whole numbers and decimals by powers of 10. · 56 questions

A · Fluency — Multiply and divide by powers of 10.

- 1 Work out 3.7×10^3
Answer: 3700
Multiplying by 10^3 moves every digit 3 places to the **left**, so the answer is 3700.
- 2 Work out 0.39×10^5
Answer: 39000
Multiplying by 10^5 moves every digit 5 places to the **left**, so the answer is 39000.
- 3 Work out 4.6×10^2
Answer: 460
Multiplying by 10^2 moves every digit 2 places to the **left**, so the answer is 460.
- 4 Work out 0.052×10^4
Answer: 520
Multiplying by 10^4 moves every digit 4 places to the **left**, so the answer is 520.
- 5 Work out 27×10^3
Answer: 27000
Multiplying by 10^3 moves every digit 3 places to the **left**, so the answer is 27000.
- 6 Work out 8.15×10^1
Answer: 81.5
Multiplying by 10^1 moves every digit 1 place to the **left**, so the answer is 81.5.
- 7 Work out 0.006×10^5
Answer: 600
Multiplying by 10^5 moves every digit 5 places to the **left**, so the answer is 600.
- 8 Work out 1.234×10^3
Answer: 1234
Multiplying by 10^3 moves every digit 3 places to the **left**, so the answer is 1234.
- 9 Work out 56×10^2
Answer: 5600
Multiplying by 10^2 moves every digit 2 places to the **left**, so the answer is 5600.
- 10 Work out 0.7×10^6
Answer: 700000
Multiplying by 10^6 moves every digit 6 places to the **left**, so the answer is 700000.

- 11 Work out 9.04×10^3

Answer: 9040

Multiplying by 10^3 moves every digit 3 places to the **left**, so the answer is 9040.

- 12 Work out 0.0038×10^4

Answer: 38

Multiplying by 10^4 moves every digit 4 places to the **left**, so the answer is 38.

- 13 Work out $80\,000 \div 10^4$

Answer: 8

Dividing by 10^4 moves every digit 4 places to the **right**, so the answer is 8.

- 14 Work out $510\,000 \div 10^3$

Answer: 510

Dividing by 10^3 moves every digit 3 places to the **right**, so the answer is 510.

- 15 Work out $8\,460\,000\,000 \div 10^5$

Answer: 84600

Dividing by 10^5 moves every digit 5 places to the **right**, so the answer is 84600.

- 16 Work out $36\,800\,000 \div 10^6$

Answer: 36.8

Dividing by 10^6 moves every digit 6 places to the **right**, so the answer is 36.8.

- 17 Work out $2\,350\,000 \div 10^5$

Answer: 23.5

Dividing by 10^5 moves every digit 5 places to the **right**, so the answer is 23.5.

- 18 Work out $45.6 \div 10^2$

Answer: 0.456

Dividing by 10^2 moves every digit 2 places to the **right**, so the answer is 0.456.

- 19 Work out $930 \div 10^3$

Answer: 0.93

Dividing by 10^3 moves every digit 3 places to the **right**, so the answer is 0.93.

- 20 Work out $7.2 \div 10^1$

Answer: 0.72

Dividing by 10^1 moves every digit 1 place to the **right**, so the answer is 0.72.

- 21 Work out $6400 \div 10^2$

Answer: 64

Dividing by 10^2 moves every digit 2 places to the **right**, so the answer is 64.

- 22 Work out $18 \div 10^4$

Answer: 0.0018

Dividing by 10^4 moves every digit 4 places to the **right**, so the answer is 0.0018.

- 23 Work out $250\,000 \div 10^4$

Answer: 25

Dividing by 10^4 moves every digit 4 places to the **right**, so the answer is 25.

- 24 Work out $0.9 \div 10^3$

Answer: 0.0009

Dividing by 10^3 moves every digit 3 places to the **right**, so the answer is 0.0009.

B · Reasoning — Index notation and missing powers.

- 25 What does 10^4 mean?

- ☐ 10×4
- ☐ $10 \times 10 \times 10 \times 10$
- ☐ 40
- ☐ 4 tens

Answer: $10 \times 10 \times 10 \times 10$

The index 4 tells you how many 10s are multiplied together: $10^4 = 10\,000$.

- 26 Write 10^6 as an ordinary number.

Answer: 1000000

The index tells you how many zeros: $10^6 = 1\,000\,000$.

- 27 How many zeros does 10^5 have?

Answer: 5

The index is the number of zeros, so $10^5 = 100\,000$.

- 28 Multiplying by 10^3 moves the digits ...

- ☐ 3 places to the left
- ☐ 3 places to the right
- ☐ 3 places up
- ☐ it does not move them

Answer: 3 places to the left

Multiplying makes a number bigger, so the digits move left — the number of places is the index.

- 29 Dividing by 10^2 moves the digits ...

- ☐ 2 places to the left
- ☐ 2 places to the right
- ☐ 2 places down
- ☐ it does not move them

Answer: 2 places to the right

Dividing makes a number smaller, so the digits move right.

- 30 Marcus says: “When I divide a whole number by 10^4 I just cross four zeros off the end.” Is he always right?

- ☐ Yes, always
- ☐ No — only when the number ends in enough zeros

Answer: No — only when the number ends in enough zeros

It works for $80\,000 \div 10^4 = 8$, but $45 \div 10^4 = 0.0045$ has no zeros to cross off. The safe rule is to move the digits, not to delete zeros.

- 31 Copy and complete: $4.5 \times 10^{\square} = 4500$. What is the missing index?

Answer: 3

4.5 becomes 4500, so the digits moved 3 places left: the index is 3.

- 32** Copy and complete: $6200 \div 10\Box = 6.2$. What is the missing index?

Answer: 3

6200 becomes 6.2, so the digits moved 3 places right: the index is 3.

- 33** Work out 0.06×1000 .

Answer: 60

Multiplying by $1000 = 10^3$ moves the digits 3 places left: 60.

- 34** Work out $47 \div 1000$.

Answer: 0.047

Dividing by 1000 moves the digits 3 places right: 0.047.

- 35** Which calculation gives the largest answer?

☐ 3.2×10^2

☐ 32×10^1

☐ 0.32×10^3

☐ All three are equal

Answer: All three are equal

Each one gives 320 — the digits simply start in a different place.

- 36** Work out $2\,350\,000 \div 10^5$.

Answer: 23.5

The digits move 5 places right, so the answer is 23.5.

C · Challenge — Two moves at once, and working backwards.

- 37** Work out $0.39 \times 10^5 \div 10^2$.

Answer: 390

Multiply first: $0.39 \times 10^5 = 39\,000$. Then divide by 100: 390. (Or notice $10^5 \div 10^2 = 10^3$ and do it in one step.)

- 38** Work out $36\,800\,000 \div 10^6 \times 10^2$.

Answer: 3680

$36\,800\,000 \div 10^6 = 36.8$, and $36.8 \times 100 = 3680$.

- 39** A number multiplied by 10^3 gives 4500. What is the number?

Answer: 4.5

Undo the multiplication by dividing: $4500 \div 1000 = 4.5$.

- 40** A number divided by 10^4 gives 0.007. What is the number?

Answer: 70

Undo the division by multiplying: $0.007 \times 10\,000 = 70$.

- 41** Which is the same as multiplying by 10^4 and then dividing by 10^2 ?

☐ Multiplying by 10^2

☐ Multiplying by 10^6

☐ Dividing by 10^2

☐ Doing nothing

Answer: Multiplying by 10^2

Moving 4 places left then 2 places right leaves you 2 places left overall.

- 42 Work out 0.0004×10^6 .

Answer: 400

The digits move 6 places left: 400.

- 43 Work out $8\,460\,000\,000 \div 10^5 \div 10^2$.

Answer: 846

$8\,460\,000\,000 \div 10^5 = 84\,600$, then $\div 100 = 846$.

- 44 Sofia works out $2\,350\,000 \div 10^5$ by moving the decimal point 5 places left instead of right. What answer does she get? Give your answer as a decimal.

Answer: 0.000235

Moving the wrong way divides by 10^5 twice over: she gets 0.0000235 instead of 23.5. Always check whether the answer should be bigger or smaller.

D · Word problems — Unit conversion and large numbers.

- 45 One box holds 10^3 paperclips. How many paperclips are in 4.5 boxes?

Answer: 4500

$4.5 \times 1000 = 4500$ paperclips.

- 46 A city has 2 350 000 people. Write this in hundreds of thousands, that is, work out $2\,350\,000 \div 10^5$.

Answer: 23.5

$2\,350\,000 \div 100\,000 = 23.5$ hundreds of thousands.

- 47 A sheet of paper is 0.09 mm thick. How thick is a stack of 10^3 sheets, in mm?

Answer: 90

$0.09 \times 1000 = 90$ mm.

- 48 A factory makes 36 800 000 screws a year. How many million is that?

Answer: 36.8

$36\,800\,000 \div 1\,000\,000 = 36.8$ million.

- 49 A bag of rice weighs 25 kg. Write its mass in grams ($1\text{ kg} = 10^3\text{ g}$).

Answer: 25000

$25 \times 1000 = 25\,000$ g.

- 50 A journey is 8460 m. Write it in kilometres.

Answer: 8.46

$8460 \div 1000 = 8.46$ km.

- 51 A virus is 0.00012 mm across. Write this length in micrometres ($1\text{ mm} = 10^3\text{ micrometres}$).

Answer: 0.12

$0.00012 \times 1000 = 0.12$ micrometres.

- 52 A country's budget is \$510 000 million. Write it in millions of millions by working out $510\,000 \div 10^3$.

Answer: 510

$510\,000 \div 1000 = 510$.

- 53 A tank holds 4.6 kilolitres. How many litres is that ($1\text{ kilolitre} = 10^3\text{ litres}$)?

Answer: 4600

$4.6 \times 1000 = 4600$ litres.

- 54** A ribbon is 7.2 m long. How long is it in centimetres?

Answer: 720

$$7.2 \times 100 = 720 \text{ cm.}$$

- 55** A microchip is 0.0038 m wide. How wide is it in centimetres?

Answer: 0.38

$$0.0038 \times 100 = 0.38 \text{ cm.}$$

- 56** A stadium holds 80 000 people. Express this in tens of thousands.

Answer: 8

$$80\,000 \div 10\,000 = 8.$$