Multiplying and Dividing with Decimals

Ignore The Decimal Point, Then Adjust

To multiply or divide a decimal,
do a whole-number calculation first, then adjust.

It's a good idea to estimate (see p.18) before you do the multiplication:
$4.87 \text{ cm} \times 29 \approx 5 \times 30 = \underline{150 \text{ cm}}$

Multiplying Decimals

EXAMPLE: What is 0.7×4?

First do a whole-number calculation:
$\underline{7 \times 4 = 28}$

BUT $\underline{7}$ is $\underline{10}$ times bigger than $\underline{0.7}$.
So the answer to 7×4 will be
$\underline{10 \text{ times too big}}$.
So adjust by dividing it by 10.

$28 \div 10 = \mathbf{2.8}$

EXAMPLE: What is $4.87 \text{ cm} \times 29$?

First do a whole-number calculation:
$\underline{487 \times 29}$

$$
\begin{array}{r}
4\ 8\ 7 \\
\times\ \ \ 2\ 9 \\
\hline
4\ 3\ 8\ 3 \\
9\ 7\ 4\ 0 \\
\hline
1\ 4\ 1\ 2\ 3
\end{array}
$$

BUT $\underline{487}$ is $\underline{100 \text{ times}}$ bigger than $\underline{4.87}$. So the answer to 487×29 will be $\underline{100 \text{ times too big}}$. So adjust by dividing it by 100.

$14\ 123 \div 100 = \mathbf{141.23 \text{ cm}}$

141.23 cm is close to 150 cm (your estimate).

Dividing Decimals

EXAMPLE: What is $44.5 \div 5$?

Estimate first:
$44.5 \div 5 \approx 45 \div 5 = 9$

Work out
$\underline{445 \div 5}.$

$$5\overline{)4\ ^4 4\ ^4 5} = 89$$

Because 445 is $\underline{10 \text{ times bigger}}$ than 44.5, the answer to $445 \div 5$ will be $\underline{10 \text{ times bigger}}$. So adjust by dividing it by 10.

$89 \div 10 = 8.9 \longrightarrow$ So $44.5 \div 5 = \mathbf{8.9}$

8.9 ≈ 9 (your estimate)

EXAMPLE: What is $£58.92 \div 6$?

Estimate first:
$£58.92 \div 6 \approx £60 \div 6 = £10$

Work out
$\underline{5892 \div 6}$

$$6\overline{)5\ ^5 8\ ^4 9\ ^1 2} = 982$$

Because 5892 is $\underline{100 \text{ times bigger}}$ than 58.92, the answer to $5892 \div 6$ will be $\underline{100 \text{ times bigger}}$. So adjust by dividing it by 100.

$982 \div 100 = 9.82 \longrightarrow$ So $£58.92 \div 6 = \mathbf{£9.82}$

£9.82 ≈ £10

"I can multiply and divide decimal numbers by whole numbers."

Worked Examples

1 Work out 0.12×8.

$12 \times 8 = 96$
$96 \div 100 = 0.96$
0.96

1) First, do a whole number calculation.
2) 12 is $\underline{100 \text{ times bigger}}$ than 0.12, so adjust by dividing 96 by 100.

2 Niko cooks **286.2 g** of pasta. He divides it equally between 9 people. How much pasta does each person get?

1) Estimate first.
2) Do a whole number calculation $(2862 \div 9)$.
3) 2862 is $\underline{10 \text{ times bigger}}$ than 286.2, so adjust by dividing 318 by 10.
4) 31.8 is close to 29, your estimate.

$286.2 \div 9 \approx 290 \div 10 = 29$

$2862 \div 9:$
$$9\overline{)2\ ^2 8\ ^1 6\ ^7 2} = 318$$

$318 \div 10 = 31.8$

31.8 g

3 Libby buys a box of four luxury cupcakes for £7.84. How much does each cupcake cost?

1) Estimate first.
2) Do a whole number calculation $(784 \div 4)$.
3) 784 is $\underline{100 \text{ times bigger}}$ than 7.84, so adjust by dividing 196 by 100.
4) 1.96 is close to 2, your estimate.

$7.84 \div 4 \approx 8 \div 4 = 2$

$784 \div 4:$
$$4\overline{)7\ ^3 8\ ^2 4} = 196$$

$196 \div 100 = 1.96$

£1.96

This is the most fun you can have on two pages...

Multiplying and dividing with decimals is not as scary as it sounds. Use whole numbers to calculate your answers, then convert them back to decimals afterwards.
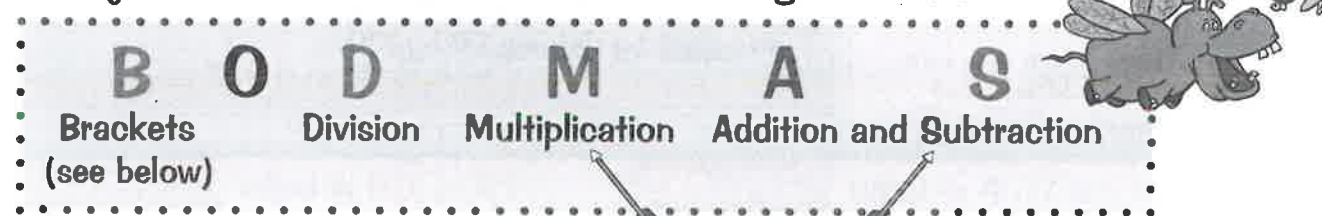
Order of Operations

Always do Calculations in a Certain Order

In some calculations, there's more than one thing to do.

If you want to find 12 − 2 × 3, what do you do first? Subtract or multiply?

Luckily, there's a rule about the order to do things: **BODMAS**

B	O	D	M	A S
Brackets (see below)		Division	Multiplication	Addition and Subtraction

So for 12 − 2 × 3, you'd do the multiplication first, then the subtraction.

The answer is 6.

When a calculation only has addition and subtraction, just do it from left to right instead of following BODMAS.

Brackets Tell You Which Step to do First

Some number sentences have brackets in. The brackets show you which bit to do first.

24 ÷ (2 + 1) = ?

This means do the addition first: 2 + 1 = 3. Then do the division: 24 ÷ 3 = **8**

Break Calculations into Easy Steps

Sometimes you have to do more than one calculation to solve a problem. Just read the question carefully and work out what steps you need to do.

EXAMPLE: Viv buys 3 earwax muffins for £1.64 each, and 6 garlic doughnuts for 81p each. How much change does she get from £10?

STEP 1 Find out how much 3 muffins cost...

```
  1 6 4
×     3
-------
  4 9 2
  1 1
```

3 muffins cost 492p.

...and how much 6 doughnuts cost.

```
    8 1
×    6
-------
  4 8 6
```

6 doughnuts cost 486p.

STEP 2 Find the total cost.

```
  4 9 2
+ 4 8 6
-------
  9 7 8
  1
```

So the total cost is 978p.

STEP 3 Find the difference between £10 and the cost.

Change the pounds to pence.

```
      9 9 1
  1 0 0 0
−   9 7 8
---------
      2 2
```

Viv will get **22p** change

"I can work out what calculations I need to use to solve a problem. I know the order to do things in a calculation."

Worked Examples

1 Work out 8 + 3 × 4 − (2 + 5).

1) BODMAS says to do the brackets first.

2) Now work out the multiplication and solve.

8 + 3 × 4 − (2 + 5) = 8 + 3 × 4 − 7 ← 2 + 5 = 7

= 8 + 12 − 7   3 × 4 = 12

= 13

2 Edward thinks the answer to 4 × (6 − 1) is 20. Kim thinks the answer is 23. Who is correct?

1) BODMAS says to solve the brackets first.

2) Then multiply to find out who is correct.

4 × (6 − 1) = 4 × 5 ← 6 − 1 = 5

= 20

Edward is correct

3 It costs £4.92 to buy six raffle tickets at a fair. Jacky buys some candyfloss for 59p and buys four raffle tickets. How much change will she get from £5?

```
        8 2
      --------   = 82p
   6 | 4 9 ¹2
```

1) Work out how much one raffle ticket costs by dividing £4.92 by 6.

```
    8 2
  ×   4
  -----
  3 2 8   = 328p
```

2) Work out how much four raffle tickets cost by multiplying 82p by 4.

```
    3 2 8
  +   5 9
  -------
    3 8 7
        1
```

3) Add the cost of candyfloss to the cost of four raffle tickets.

```
    4 9 1
  5 0 0
  − 3 8 7
  -------
    1 1 3
```

4) Subtract this total from £5.

£1.13

5) Change your answer into pounds.

Brackets always insist on being first...

Don't forget to always deal with the brackets first. Otherwise they get really stroppy and give you the wrong answer. Tackling problems in small stages is always easier.

Multiplying and Dividing with Decimals

1 Draw lines to match each calculation with the correct answer.

6.82 × 1000	6820
6.82 ÷ 10	0.0682
6.82 × 100	682
6.82 ÷ 100	0.682

1 mark

2 Work out each of these calculations.

$0.4 \times 12 =$ [ ]

$8.1 \div 9 =$ [ ]

2 marks

3 Jared buys 7 cinema tickets for £3.80 each.

How much does Jared pay in total?

£ [ ]

1 mark

4 A drainage pipe is made up of 8 plastic tubes joined end to end.
Each plastic tube is 1.68 metres long.

How long is the drainage pipe?

m [ ]

1 mark

Multiplying and Dividing with Decimals

5 A farmer delivers 261.8 litres of milk each week.
He delivers the same amount of milk on each day of the week.

How many litres of milk does he deliver each day?

[ ] litres

1 mark

6 What is 59.36 ÷ 14?

[ ]

1 mark

7 A ferry can travel a distance of 16.84 miles in 1 hour.

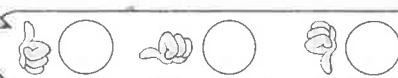How far can the ferry travel in 5 hours?

[ ] miles

1 mark

How far can the ferry travel in 15 minutes?

[ ] miles

1 mark

"I can multiply and divide
decimal numbers by whole numbers."

Order of Operations

1 Calculate:

$8 + 9 \times 2 =$ [ ]

$12 - 8 \div 4 =$ [ ]

1 mark

2 Draw lines to match up calculations with the same answer.

$8 + 2 \times 8$

$(5 \times 6) \div 3$ | $9 \div 3 - 6$

$9 - 3 \times 4$ | $8 + 8 \div 4$

$(7 + 5) \times 2$

2 marks

3 Paulo has 6 packets of biscuits, each containing 14 biscuits.
He shares the biscuits between himself and 20 of his friends.

How many biscuits does each person get?

2 marks

4 Jane has 2 dogs. Each of them eats 3 packets of dog food a day.
Packets of dog food come in boxes of 5.

How many boxes does Jane need to buy to feed her dogs for a week?

boxes

2 marks

Order of Operations

5 Daniel and Stacey are working out how much they spent on sausage rolls at a bakery last year. Daniel spent £32.24 and bought 26 sausage rolls.

Stacey bought 17 sausage rolls. How much did they cost her?

£ [ ]

2 marks

6 The table on the right shows the price of some items at a stationery shop.

Tristan buys six of each item.
How much change does he get from £10?

Stationery Shop Prices	
Pencils	24p
Pens	70p
Rubbers	35p

£ [ ]

2 marks

7 At the local shop, yoghurts cost 19p each and apples cost 22p each.

Emily has £5 and she buys 12 yoghurts.
What is the maximum number of apples she can buy?

2 marks

"I can work out what calculations I need to use to solve a problem. I know the order to do things in a calculation."