Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

Topic 1: Working with Numbers

Multiplying and Dividing Negative Numbers

When multiplying or dividing with two signs that are ***different***, the answer is ***negative***.
When multiplying or dividing with two signs that are the ***same***, the answer is ***positive***.

Examples:

-3 × 6 = -18 7 × (-2) = -14 24 ÷ (-6) = -4 -5 × -7 = 35 -100 ÷ - 5 = 20

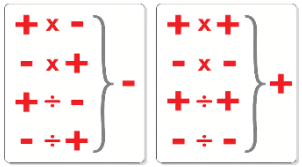
Work these out: **a) −3 × −2 − 5 b) −3 × (−2 − 5) c) −3 − 12 ÷ −2**

a) Using the rules of BIDMAS, calculate −3 × −2 first.

−3 × −2 − 5 = 6 − 5 = 1

b) This time you must do the calculation inside the brackets first.

−3 × (−2 − 5) = −3 × −7 = 21



c) It is important to recognise here that 12 is a positive number, since the minus (–) is the operation and not the sign of the number 12.

−3 − 12 ÷ −2 = −3 − (12 ÷ −2) = −3 − − 6 = −3 + 6 = 3.

You should already know:

- ***how to add and subtract negative integers***
- ***how to order operations, following the rules of BIDMAS***
- ***what a factor is***
- ***what a multiple is.***

Factors and Highest Common Factors

A factor (divisor) is a number that will divide exactly into another number, e.g., Factors of 12 = {1, 2, 3, 4, 6, 12}.
When listing factors, try to look for pairs of numbers to avoid forgetting any.
The highest common factor (HCF) of two numbers is the largest integer (whole number) that will divide exactly into both numbers.

Find the HCF of 45 and 60.

Write out the factors of 45 and 60 and look for the highest common value.

Factors of 45 = {1, 3, 5, 9, (15), 45}
Factors of 60 = {1, 2, 3, 4, 5, 6, 10, 12, (15), 20, 30, 60}
15 is the largest number that is in both lists, so 15 is the HCF.

Multiples and Lowest Common Multiples

Multiples are found in the "times table" of the number, e.g., Multiples of 4 = {4, 8, 12, 16, … }.
The lowest common multiple (LCM) of two numbers is the lowest integer that is a multiple of both numbers.

Find the LCM of 12 and 18.

Write out the multiples of 12 and 18 until you get a common value.

Multiples of 12 = {12, 24, (36), 48 ...}
Multiples of 18 = {18, (36), 54 ...}
36 is the smallest number that is in both lists, so 36 is the LCM.

Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

Topic 1: Working with Numbers (Continued….)

Powers and Roots

Powers, or indices, are a shorthand method of showing that a number is multiplied by itself a number of times.
For example:

$5 \times 5 = 5^2 = 25$
$5 \times 5 \times 5 = 5^3 = 125$
$5 \times 5 \times 5 \times 5 = 5^4 = 625$, etc.

Work out the value of 3^4.

$3 \times 3 \times 3 \times 3 = 81$

Write down the value of $\sqrt[3]{8}$.

$2^3 = 8$, so $\sqrt[3]{8} = 2$

A root is the inverse function of a power. A square root is the inverse of squaring a number, and a cube root is the inverse of cubing a number. Note that you can write the square root simply as $\sqrt{\ }$ with no small number 2 in front of it, but the cube root must always have a small 3 in front of it, like this: $\sqrt[3]{\ }$.

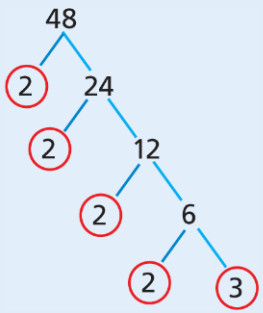
Note: Square roots can be positive or negative and a square number is always positive.
A positive cube number can only have a positive cube root and a negative cube number can only have a negative cube root.

Your calculator may have both a square root button, shown as  , and a cube root button, shown as  .

Prime Factors

A prime number has only two factors, itself and 1.
These are the first ten prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29.
A prime factor of an integer is a factor that is also a prime number.
Therefore, the prime factors of an integer are the prime numbers that will multiply together to give that integer.
For example:
6 can be written as a product of its prime factors, as 2×3.
12 can be written as a product of its prime factors, as $2 \times 2 \times 3$, or $2^2 \times 3$.
One useful way to find the prime factors of any integer is to draw up a factor tree.

A Factor Tree



Keep splitting values into factors until the ends of all branches are prime numbers.

$48 = 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$

You should now be able to:

- *Find square and cube numbers and square and cube roots.*
- *Use a calculator to work out powers of numbers.*
- *Find common factors for pairs of numbers.*
- *Multiply and divide negative numbers.*
- *Know that the square roots of positive numbers can have two values, one positive and one negative.*
- *Find the lowest common multiple (LCM) for pairs of numbers.*
- *Find the highest common factor (HCF) for pairs of numbers.*
- *Write a number as the product of its prime factors.*

Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson

Topic 2: Fractions and Decimals

Adding or Subtracting Fractions

To add or subtract fractions, you must first find equivalent fractions with a common denominator. The simplest way is to find the lowest common multiple of both denominators. Then ad d or subtract the numerators, and simplify if needed.

$\frac{3}{4}+\frac{5}{6}$	Change the denominators to 12, because this is the lowest common multiple of 4 and 6.
$\frac{3}{4}+\frac{5}{6}=\frac{9}{12}+\frac{10}{12}$	$\frac{3}{4}=\frac{3\times3}{4\times3}=\frac{9}{12}$ and $\frac{5\times2}{6\times2}=\frac{10}{12}$
$=\frac{19}{12}$	
$=1\frac{7}{12}$	$19\div12=1$ remainder 7

You should already know:

- ***the relationship between mixed numbers and improper fractions***
- ***how to add two fractions or mixed numbers***
- ***how to subtract two fractions or mixed numbers***
- ***how to find the lowest common multiple (LCM).***

Have a go at these: (Answers at the bottom)

a $\frac{1}{4}+\frac{5}{8}$ **b** $\frac{3}{4}+\frac{5}{12}$ **c** $\frac{5}{6}+\frac{2}{3}$ **d** $\frac{3}{5}+\frac{9}{10}$

Multiplying fractions by integers (whole numbers)

To multiply a fraction by a whole number, multiply the numerator and the integer, leaving the denominator the same. Simplify if needed.

Work these out. **a** $\frac{2}{3}\times4$ **b** $7\times\frac{3}{5}$

a $\frac{2}{3}\times4=\frac{2\times4}{3}$	Multiply the numerator by 4.
$=\frac{8}{3}=2\frac{2}{3}$	$8\div3=2$ remainder 2. The denominator does not change.
b $7\times\frac{3}{5}=\frac{21}{5}=4\frac{1}{5}$	$7\times3=21$ and $21\div5=4$ remainder 1.

Try these: (Answers at the bottom)

a $\frac{2}{3}\times2$ **b** $\frac{3}{5}\times4$ **c** $\frac{3}{4}\times3$ **d** $\frac{7}{8}\times2$

This works similarly for mixed numbers, as in the example below:

Work out $2\frac{3}{8}\times4$.

$2\frac{3}{8}\times4=(2\times4)+(\frac{3}{8}\times4)$	Think of $2\frac{3}{8}$ as $2+\frac{3}{8}$ and multiply each term by 4.
$=8+\frac{12}{8}$	$\frac{3}{8}\times4=\frac{3\times4}{8}=\frac{12}{8}$
$=8+1\frac{4}{8}$	
$=9\frac{1}{2}$	$\frac{4}{8}=\frac{1}{2}$

a $\frac{7}{8}$ **b** $1\frac{1}{6}$ **c** $1\frac{1}{2}$ **d** $1\frac{1}{2}$

a $1\frac{1}{3}$ **b** $2\frac{2}{5}$ **c** $2\frac{1}{4}$ **d** $1\frac{3}{4}$

Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

Topic 2: Fractions and Decimals (Continued…)

Dividing fractions by integers (whole numbers)

To divide a fraction by a whole number, multiply the denominator and the integer, leaving the numerator the same. Simplify if needed.

$\frac{1}{4} \div 2 = \frac{1}{4 \times 2} = \frac{1}{8}$

a $\frac{2}{3} \div 2$ **b** $\frac{2}{3} \div 3$ **c** $\frac{2}{3} \div 4$ **d** $\frac{2}{3} \div 6$

To divide a whole number by a fraction, multiply the denominator and the integer.

$8 \div \frac{1}{5} = 8 \times 5 = 40$

a $2 \div \frac{1}{4}$ **b** $2 \div \frac{1}{5}$ **c** $3 \div \frac{1}{3}$ **d** $4 \div \frac{1}{2}$

Multiplication with large and small numbers

Look at these multiplications.

300 × 2 = 600
0.3 × 20 = 6
0.03 × 0.2 = 0.006
30 × 0.002 = 0.06

All the answers involve the simple multiplication 3 × 2 = 6.
The problem is where to put the decimal point. The examples here show you how to do this.

Work these out. **a** 4×500 **b** 300×60

a $4 \times 5 = 20$	First just multiply the non-zero digits.
$4 \times 500 = 2000$	Because 500 is 5×100 you multiply 20 by 100.
b $3 \times 6 = 18$	First just multiply the non-zero digits.
$300 \times 60 = 18000$	$300 = 3 \times 100$ and $60 = 6 \times 10$ so multiply by 1000.

Work these out. **a** 500×0.06 **b** 0.003×70

a $5 \times 6 = 24$	First just multiply the non-zero digits.
$500 \times 6 = 2400$	$500 = 5 \times 100$ so multiply 24 by 100.
$500 \times 0.06 = 24$	$0.06 = 6 \div 100$ so divide 2400 by 100.
b $3 \times 7 = 21$	First just multiply the non-zero digits.
$0.003 \times 7 = 0.021$	$0.003 = 3 \div 1000$ so divide 21 by 1000.
$0.003 \times 70 = 0.21$	$70 = 7 \times 10$ so multiply 0.021 by 10.

Division with large and small numbers

Suppose you want to work out 30 ÷ 0.6. The number you are dividing by, 0.6, is called the divisor.
If you multiply both numbers by 10 you get: 30 ÷ 0.6 = 300 ÷ 6.
Now the divisor is a whole number and it is easy to see that the answer is 50. Changing the divisor to a whole number can make a division easier to do.
Sometimes you may need to divide, rather than multiply, as shown in the example.

Work these out. **a** $32 \div 0.08$ **b** $8 \div 400$

a $32 \div 0.08 = 3200 \div 8$	Multiply both numbers by 100 to make the divisor 8.
$= 400$	$32 \div 8 = 4$ so the answer is 400.
b $8 \div 400 = 0.08 \div 4$	Divide both numbers by 100 to make the divisor 4.
$= 0.02$	An easy division!

You should now be able to:

- *Add and subtract mixed numbers.*
- *Multiply a fraction or a mixed number by an integer.*
- *Divide an integer by a unit fraction or a unit fraction by an integer.*
- *Multiply simple large or small decimal numbers without using a calculator.*
- *Divide simple large or small decimal numbers without using a calculator.*

a 8 b 10 c 9 d 8

a $\frac{3}{1}$ b $\frac{6}{2}$ c $\frac{9}{1}$ d $\frac{6}{1}$

Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

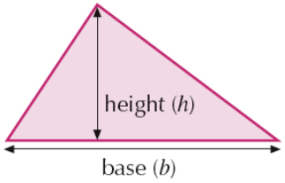
Topic 3: Area of 2D and 3D Shapes

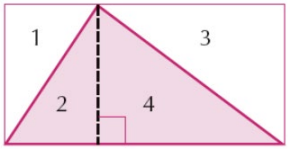
You should already know:

- ***how to work out the perimeters and areas of squares and rectangles***
- ***how to work out the volumes of cubes and cuboids.***

Area of a triangle

To work out the area of a triangle, you need to know the length of its base and its height. You measure the height by drawing a perpendicular line from the base to the angle above it. For this reason, it is sometimes called the perpendicular height. (Perpendicular height: at a right angle to the base)

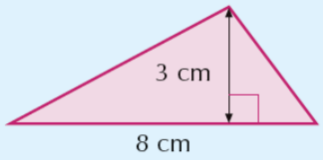




This diagram shows that the area of the triangle is half the area of the rectangle that encloses it (Area 1 = Area 2, and Area 3 = Area 4). The area of the rectangle is found by multiplying the base and the height, so the area of the triangle is found by halving this .

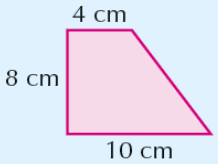
Area of a triangle = ½ × base × height

Work out the area of this triangle.

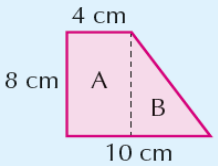


$A = \frac{1}{2} \times 8 \times 3 = 4 \times 3 = 12\ cm^2$

Work out the area of this compound shape.



First divide the shape into a rectangle (A) and a triangle (B).



Area of A $= 8 \times 4 = 32\ cm^2$

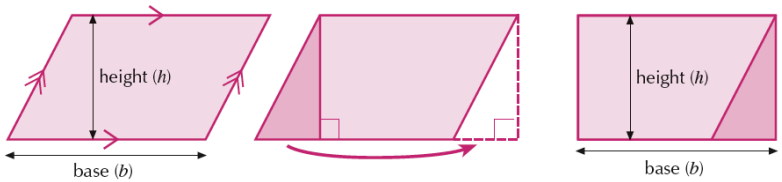
Area of B $= \frac{1}{2} \times 6 \times 8 = 3 \times 8 = 24\ cm^2$

So the area of the shape $= 32 + 24 = 56\ cm^2$.

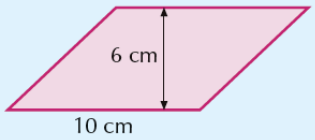
Area of a parallelogram

To work out the area of a parallelogram, you need to know the length of its base and its perpendicular height. These diagrams show that the parallelogram has the same area as a rectangle with the same base and height.

Area of a parallelogram = base × height



Work out the area of this parallelogram.



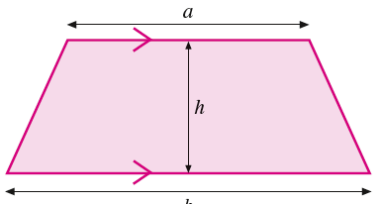
$A = 10 \times 6 = 60\ cm^2$

Your teacher will tell you which topic you should revise. Read and learn all the information in the topic, ready for a Quiz in lesson.

Topic 3: Area of 2D and 3D Shapes (Continued..)

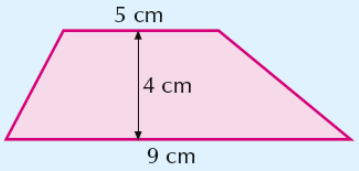
Area of a trapezium:

To work out the area of a trapezium, you need to know the length of its two parallel sides, a and b, and the perpendicular height, h, between the parallel sides.



Area of a trapezium = ½ × (a + b) × height

Work out the area of this trapezium.



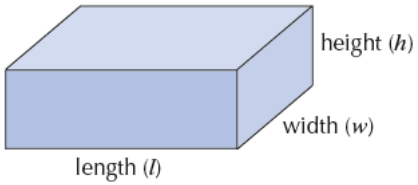
$A = \frac{1}{2} \times (9 + 5) \times 4$

$= \frac{1}{2} \times 14 \times 4$

$= 28 \text{ cm}^2$

Surface area of cubes and cuboids:

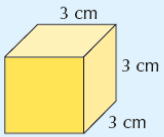
Shapes that are made from squares in 3D are called cubes. Their length, width and height (edge lengths) are all the same.
Shapes that are made from rectangles in 3D are called cuboids. Their length, width and height can all be different.
You can find the surface area of a cuboid by working out the total area of its six faces.



Area of top and bottom faces = 2 × length × width = 2lw
Area of front and back faces = 2 × length × height = 2lh
Area of the two sides = 2 × width × height = 2wh

Surface area of a cuboid = S = 2lw + 2lh + 2wh.

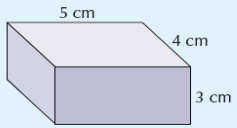
Work out the surface area of this cube.



There are six square faces and each one has an area of $3 \times 3 = 9 \text{ cm}^2$.

So the surface area of the cube is $6 \times 9 = 54 \text{ cm}^2$.

Work out the surface area of this cuboid.



The formula for the surface area of a cuboid is:

$S = 2lw + 2lh + 2wh$

$= (2 \times 5 \times 4) + (2 \times 5 \times 3) + (2 \times 4 \times 3)$

$= 40 + 30 + 24$

$= 94 \text{ cm}^2$

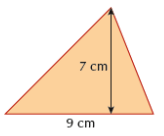
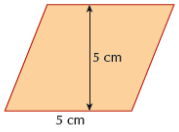
Quick Formula Recap!
Area of a triangle = ½ × base × height
Area of a parallelogram = base × height
Area of a trapezium = ½ × (a + b) × height
Surface area of a cuboid = S = 2lw + 2lh + 2wh.

You should now be able to:

- *use the appropriate formulae to find the area of triangles, parallelograms and trapezia.*
- *use the formula S = 2lw + 2lh + 2wh to work out the surface area of a cuboid.*

Maths
Support and application

Year 8
Term 1

Vocabulary	Wider Research	Apply
Topic 1: Negative Positive Factor Integer Divisible Multiple Cube Power Square Square Root Cube Root Index Indices ***Topic 2:*** Numerator Denominator Equivalent Integer Unit Fraction Divisor Mixed Number ***Topic 3:*** Base Compound Shape Perpendicular Height Parallelogram Trapezium Surface Area Cube Cuboid	***Topic 1:*** **Negative Number Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/11/Negatives-multiplication-and-division-pdf.pdf **Highest Common Factor Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/11/Common-factors-and-HCF-pdf.pdf **Lowest Common Multiple Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/11/Common-multiples-and-LCM-pdf.pdf **Squares, Cubes and Roots Video Examples and Questions:** https://www.mathsgenie.co.uk/squares-cubes-and-roots.html **Prime Factors Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2013/02/product-of-primes-pdf3.pdf ***Topic 2:*** **Adding and Subtracting Fractions Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2021/09/Fractions-Addition-2.pdf **Multiplying Fractions by Integers Worksheet and Video Examples: (Q2 ONLY)** https://corbettmaths.com/wp-content/uploads/2018/12/Multiplying-Fractions-pdf.pdf **Dividing by Decimals Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/09/Dividing-by-Decimals-pdf.pdf ***Topic 3:*** **Area of a Triangle Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/02/area-of-a-triangle-pdf.pdf **Area of a Parallelogram Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2013/02/area-of-a-parallelogram-pdf2.pdf **Area of a Trapezium Worksheet and Video Examples:** https://corbettmaths.com/wp-content/uploads/2018/09/Area-of-a-Trapezium-pdf-1.pdf Surface Area of Cuboids Worksheet and Video Examples: https://corbettmaths.com/wp-content/uploads/2021/03/Surface-Area-Cuboids-pdf.pdf	***Topic 1:*** a) Calculate -7 × -6 b) Work out 64 ÷ - 8 c) Find the HCF of 18 and 27 d) Find the LCM of 4 and 6 e) Calculate $\sqrt{64}$ f) Calculate 4^3 g) Find the prime factors of 24. ***Topic 2:*** a) $\frac{1}{4}+\frac{5}{8}$ b) $1\frac{1}{4}+\frac{3}{8}$ c) $\frac{2}{3}-\frac{1}{6}$ d) $\frac{3}{8}\times 6$ e) $\frac{5}{12}\div 4$ h) Work out 90 × 800 i) Calculate 0.7 × 0.05 j) Work out 60 ÷ 0.3 k) Calculate 140 ÷ 200 ***Topic 3:*** Work out the area of each shape. a  b  c