

## Year 9 Minimum Expected Standard Autumn 1 Integers:

### Including Indices and Surds



Themes	Objectives (TG 1-9)	Learning Checks	Interventions - Mathswatch video and worksheet
Integers and Indices	<ul style="list-style-type: none"> <li>- Apply the four operations, including formal written methods, to integers, both positive and negative</li> <li>- Understand what is meant by commutative and apply order of operations (BIDMAS)</li> <li>- Define, identify, order and find numbers which are: Integers, irrational, factors, multiples, cube, square, roots, prime, and reciprocal</li> <li>- Giving a counter-example to a simple number statement</li> <li>- Use positive integer powers and roots, recognise powers of 2, 3, 4, 5</li> <li>- Substituting numbers into an expression with conditions on types of numbers</li> <li>- Express a number as a product of its prime factors</li> <li>- Find the LCM and HCF including solving problems in context involving these.</li> <li>- Use product of prime factors to find HCF and LCM</li> <li>- Recognise when, how and why to apply the laws of indices.</li> <li>- Simplifying expressions with like terms through addition, subtraction, multiplication, division and raising to the power.</li> <li>- Multi-step problems using the laws of indices.</li> <li>- Finding negative and fractional powers (including use of index laws)</li> <li>- Solve exponential equations</li> <li>- Convert numbers to and from standard form</li> <li>- Calculate with standard form</li> <li>- Finding fractional indices of standard form</li> </ul>	<p><b>Learning Check 1: Types of numbers</b></p> <p><b>Homework 1: Powers, roots, product of prime factors and LCM and HCF</b></p> <p><b>Learning Check 2: Using and understanding laws of indices</b></p> <p><b>Homework 2: Standard form</b></p>	<p>17 Adding Integers and Decimals</p> <p>18 Subtracting Integers and Decimals</p> <p>19 Multiplying Integers</p> <p>20 Dividing Integers</p> <p>28 Factors, Multiples and Primes</p> <p>29 Introduction to Powers/Indices</p> <p>75 BODMAS/BIDMAS</p> <p>66 Multiplying Decimals</p> <p>67 Dividing Decimals</p> <p>68a Negatives - Adding and Subtracting</p> <p>68b Negatives - Multiplying and Dividing</p> <p>78 Product of Primes</p> <p>79 Highest Common Factor (HCF)</p> <p>80 Lowest Common Multiple (LCM)</p> <p>81 Squares, Cubes and Roots</p>
	<ul style="list-style-type: none"> <li>- Understand a square root has two possible solutions</li> <li>- Estimate square roots of numbers that are not square</li> <li>- Work out the root of a number from its prime factors</li> <li>- Simplify and manipulate algebraic expressions (including those involving surds)</li> <li>- Collecting like terms, multiplying a single term over a bracket, taking out common factors, expanding double brackets involving surds</li> <li>- Rationalising the denominator</li> <li>- Calculations involving surds</li> <li>- Simplify surds</li> <li>- Writing complex surd calculations in a given form</li> </ul>	<p><b>Learning Check 3: Calculating with surds</b></p>	<p>82 Working with Indices</p> <p>83 Standard Form</p> <p>154 Negative Indices</p> <p>131 Index Notation</p> <p>188 Fractional Indices</p> <p>207a Introduction to Surds</p> <p>207b Surd Expressions</p> <p>207c Surds - Rationalising the Denominator</p>

<p>Work out <math>247 \times 63</math></p> <p>Work out the reciprocal of 0.125</p> <p>One day, Robin recorded the number of people getting on his bus at each of six stops. Here are his results.</p> <p>14      4      8      11      12      10</p> <p>From these numbers, write down the odd number, the multiple of 3, the square number, the factor of 30, the prime number</p> <p>Becky says, “When you square a prime number you always get an odd number.” Write down an example to show that Becky is wrong.</p> <p>Work out <math>(-3)^3</math></p> <p>Work out the value of <math>5^2 + 2^3</math></p> <p>Simplify: <math>2a^2b \times 3a^3b</math></p> <p><math>(t^3)^2</math></p> <p><math>\frac{w^9}{w^4}</math></p> <p><math>t^2 + t^2</math></p> <p><math>(c^2k^5)^4</math></p>	<p><math>p^2 \times p^n = p^6</math> Find the value of <math>n</math>.</p> <p>Work out the value of <math>x</math>. <math>2x^3 = 128</math></p> <p>Write 504 as a product of powers of its prime factors.</p> <p>Buses to Acton leave a bus station every 24 minutes. Buses to Barton leave the same bus station every 20 minutes. A bus to Acton and a bus to Barton both leave the bus station at 9 00 am. When will a bus to Acton and a bus to Barton next leave the bus station at the same time?</p> <p>Find the highest common factor (HCF) of 32, 48 and 72</p> <p>Find the Lowest Common Multiple (LCM) of 32 and 48</p> <p>Write down the value of <math>10^{-2}</math>.</p> <p>Write down the value of <math>5^0</math></p> <p>Write down the value of <math>2^{-1}</math></p> <p>Evaluate <math>64^{\frac{1}{2}}</math></p> <p>Evaluate <math>125^{\frac{1}{3}}</math></p>	<p>Write 0.00385 in standard form.</p> <p>Write <math>7.291 \times 10^5</math> as an ordinary number.</p> <p>Write the following numbers in order of size. Start with the smallest number.</p> <p><math>0.038 \times 10^2</math>      <math>3800 \times 10^{-4}</math>      380      <math>0.38 \times 10^{-1}</math></p> <p>Work out the value of <math>(6 \times 10^8) \times (4 \times 10^7)</math> Give your answer in standard form</p> <p>Work out the value of <math>(6 \times 10^8) + (4 \times 10^7)</math> Give your answer in standard form.</p> <p>The distance from the Earth to the Sun is <math>1.496 \times 10^{11}</math> metres. The speed of light is <math>3 \times 10^8</math> metres per second. Show that, correct to 3 significant figures, light will take 0.139 hours to travel from the Sun to the Earth</p> <p>Without using a calculator, show that <math>\sqrt{20} = 2\sqrt{5}</math></p> <p>Estimate the value of <math>\sqrt{46}</math></p> <p>Evaluate <math>\sqrt{2} \times \sqrt{2}</math></p>
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Work out  $(2 + \sqrt{3})(2 - \sqrt{3})$   
Give your answer in its simplest form.

Write down the value of  $49^{\frac{1}{2}}$

Write as a power of 2  $\frac{4 \times 8}{16^3}$

The surface area of Earth is 510 072 000 km<sup>2</sup>.

The surface area of Jupiter is  $6.21795 \times 10^{10}$  km<sup>2</sup>.

The surface area of Jupiter is greater than the  
surface area of Earth.

How many times greater?

Give your answer in standard form.

Show that  $\frac{3 + \sqrt{2}}{5 + \sqrt{8}}$  can be written as  $\frac{11 - \sqrt{2}}{17}$

Given that  $3^{-n} = 0.2$

find the value of  $(3^4)^n$

Write  $\sqrt{45}$  in the form  $k\sqrt{5}$ , where  $k$  is an integer

Find the value of  $\sqrt[3]{8 \times 10^6}$

Find the value of  $144^{\frac{1}{2}} \times 64^{\frac{1}{3}}$

Solve  $3^{2x} = \frac{1}{81}$

Simplify fully  $(\sqrt{a} + \sqrt{4b})(\sqrt{a} - 2\sqrt{b})$

Show that  $\frac{(4 - \sqrt{3})(4 + \sqrt{3})}{\sqrt{13}}$  simplifies to  $\sqrt{13}$

Show that  $\frac{1}{1 + \frac{1}{\sqrt{2}}}$  can be written as  $2 - \sqrt{2}$

Write  $26\sqrt{2} - 12\sqrt{18} + 2\sqrt{50}$  in the form  $a\sqrt{2}$  where  $a$  is an integer