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CfE Second Level

Maths & Numeracy

Learning Checklist

This checklist covers every skill that learners need for success at Second Level maths and numeracy. Each section of this checklist corresponds to the **Zeta Maths CfE Second Level Maths & Numeracy** textbook (available from www.zetamaths.com or on Amazon). The topic names in this document are linked for easy navigation of the checklist and colour coded to correspond with skills: **numerical**, **algebraic**, **geometric** and **statistical**.

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Section	Topic	Skills			
1	**Rounding**				
1.2	Rounding to the nearest 1000, 10 000 and 100 000	As before, when rounding, we only consider the **number to the right of the number being rounded**. **Worked Examples:** **1.** Round the following to the nearest 1000: **(a)** 5400 → 5000 **(b)** 9632 → 10 000 **2.** Round the following to the nearest 10 000: **(a)** 23 000 → 20 000 **(b)** 57 648 → 60 000 **3.** Round the following to the nearest 100 000: **(a)** 380 000 → 400 000 **(b)** 523 117 → 500 000			
1.3	Rounding to the nearest whole number	When rounding to the nearest whole number, look to the first decimal place only. **Worked Examples:** Round the following to the nearest whole number: **(a)** £4·60 → £5 **(b)** 9·13 cm → 9 cm **(c)** 0·38 → 0 **(d)** 28·6 ml → 29 ml			
1.4	Rounding to one and two decimal places	**Worked Examples:** **1.** Round the following to 1 decimal place: **(a)** 5·27 = 5·3 (1 d.p.) **(b)** 7·3 × 0·44 = 3·212 = 3·2 (1 d.p.) **2.** Round the following to 2 decimal places: **(a)** 9·146 = 9.15 (2 d.p.) **(b)** 0·35 × 2·3 = 0·805 = 0·81 (2 d.p.)			
1.5	Rounding for estimation	**Worked Examples:** By rounding to the nearest £1, estimate the total of each of the following: **(a)** £3·65 + £4·21 **(b)** £6·58 + £4·23 – £5·75 **Solution:** Round each value to the nearest £1, then calculate. **(a)** £3·65 + £4·21 ≈ £4 + £4 = £8 **(b)** £6·58 + £4·23 – £5·75 ≈ £7 + £4 – £6 = £11 – £6 = £5			
2	**Whole Numbers 1 – Place Value**				
2.1	Expressing whole numbers in figures	 **Worked Examples:** Express the following numbers in figures: **1.** Fifty thousand, two hundred and twelve. 50 212 **2.** Six hundred and thirty-two thousand, eight hundred and four. 632 804			
2.2	Writing whole numbers in words	**Worked Examples:** Express the following numbers in figures: **1.** Three million and ninty–eight. 3 000 098 **2.** One billion, nine hundred million, two hundred and ten thousand 1 900 210 000			

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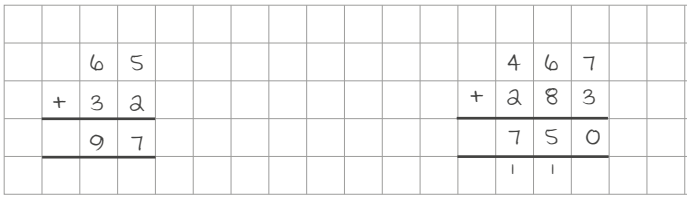
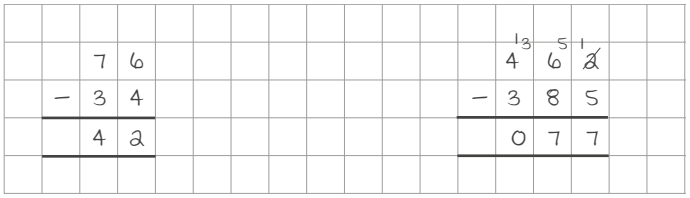
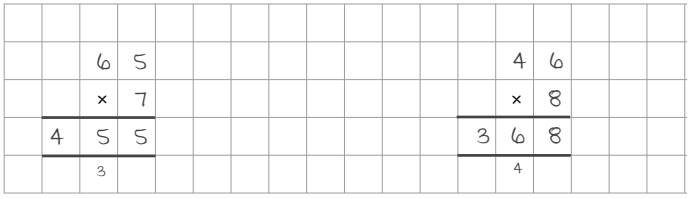
Section	Topic	Skills			
2.3	Partitioning	Partition the following numbers: **1.** 923 **Nine hundreds**, **two tens** and **three ones**. **2.** 5147 **5147 = 5000 + 100 + 40 + 7**.			
2.4	Ordering whole numbers	**Step 1:** Copy the numbers down as they are listed. **Step 2:** Identify the lowest number, write it down and cross it off.			
Learners should be able to use negative number skills to solve problems (see **Maths in Context 1**)					
3	**Whole Numbers 2 – Addition & Subtraction**				
3.1	Developing number bonds	Knowledge of addition and subtraction facts. For practice, see textbook section 3.1 or the resources on the website.			
3.2	Addition of whole numbers	**Worked Examples:** **1.** 65 + 32 **2.** 467 + 283 			
3.3	Subtraction of whole numbers	**Worked Examples:** **1.** 76 – 34 **2.** 462 – 385 			
3.4	Addition and subtraction of three or more numbers	To add more than two numbers without a calculator, we can use the column method and perform one calculation. To subtract more than two numbers or to add and subtract in the same question, at least two calculations are required. Carry out the first calculation and use the answer to carry out the second.			
3.5	Mental addition and subtraction of whole numbers	**Strategy 1 – Partitioning** **1.** 43 + 56 = 40 + 3 + 50 + 6 = 40 + 50 + 3 + 6 = 90 + 9 = 99 **2.** 71 – 45 = 71 – 40 – 5 = 31 – 5 = 26 **Strategy 2 – Compensation:** **3.** 39 + 26 = 40 + 25 = 40 + 20 + 5 = 65 **4.** 91 – 58 = 93 – 60 or 90 – 57 = 33			
Learners should be able to use negative number skills to solve problems (see **Maths in Context 1**)					
4	**Whole Numbers 3 – Addition & Subtraction**				
4.1	Multiplication number bonds	To multiply whole numbers without a calculator, we need to know the multiplication facts up to the 10th multiplication table. For practice, see textbook section 4.1 or the resources on the website.			
3.4	Multiplication of whole numbers	**Worked Examples:** **1.** 65 × 7 **2.** 46 × 8 			

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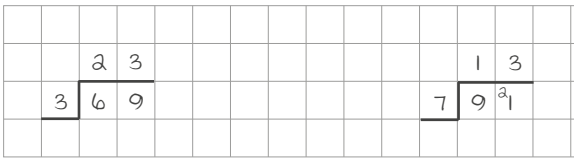
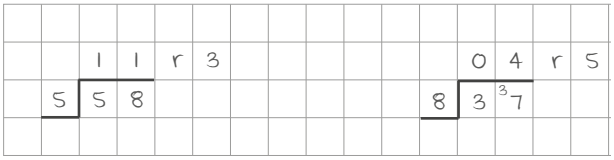
Section	Topic	Skills			
4.3	Mental multiplication	**Strategy 1 – Partitioning:** **Worked Examples:** **1.** 23 × 8 = 20 × 8 + 3 × 8 = 160 + 24 = 184 **2.** 85 × 7 = 80 × 7 + 5 × 7 = 560 + 35 = 595 **Strategy 2 – Compensation:** **Worked Examples:** **1.** 59 × 6 = 60 × 6 – 1 × 6 = 360 – 6 = 354 **2.** 48 × 9 = 50 × 9 – 2 × 9 = 450 – 18 = 432			
4.4	Division number bonds	To divide whole numbers without a calculator, we need to know the multiplication facts up to the 9th multiplication table. For practice, see textbook section 4.1 or the resources on the website.			
4.5	Division by Multiples of 10, 100 and 1000	**Worked Examples:** **1.** 69 ÷ 3 **2.** 91 ÷ 7  			
4.6	Division with remainders	In some cases, the division does not result in a whole number answer. In these cases, what is left over is called the **remainder**. **Worked Examples:** **1.** 58 ÷ 5 **2.** 37 ÷ 8  			
4.7	Mental division	**Strategy – Partitioning:** **Worked Examples:** **1.** 78 ÷ 6 = 60 ÷ 6 + 18 ÷ 6 = 10 + 3 = 13 **2.** 154 ÷ 7 = 140 ÷ 7 + 14 ÷ 7 = 20 + 2 = 22			
4.9	Multiplication by multiples of 10, 100 and 1000	**Worked Examples:** **1.** 43 × 20 = 43 × 2 × 10 = 86 × 10 = 860 **2.** 23 × 400 = 23 × 4 × 100 = 92 × 100 = 9200			
4.11	Division by multiples of 10, 100 and 1000	**Worked Examples:** **1.** 580 ÷ 20 = (580 ÷ 10) ÷ 2 = 58 ÷ 2 = 29 **2.** 6800 ÷ 400 = (6800 ÷ 100) ÷ 4 = 68 ÷ 4 = 17			

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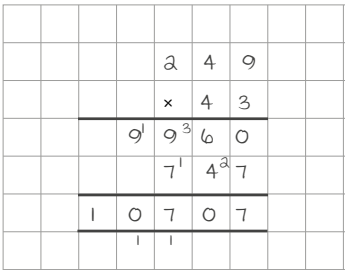
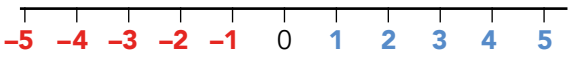
Section	Topic	Skills			
4.12	Long multiplication	Calculate 249 × 43 **Step 1:** Write out the calculation. **Step 2:** Multiply 249 by 40, write the answer in line 3. (To do this, first multiply 249 by 10 by putting a zero in the first column on the right, then multiply by 4.)  **Step 3:** Multiply 249 by 3, write the answer in line 4. **Step 4:** Add the answers on line 3 and 4 together in line 5.			
Learners should be able to use negative number skills to solve problems (see **Maths in Context 1**)					
5	**Multiples & Factors**				
5.1	Multiples	A **multiple** of a number is the result of a multiplication of the number by any whole number. The first 6 multiples of 4 are: 4, 8, 12, 16, 20, 24			
5.3	Factors	A **factor** of a number is a whole number that divides into the number without leaving a remainder. **24:** 1 × 24, 2 × 12, 3 × 8, 4 × 6. The factors of 24: 1, 2, 3, 4, 6, 8, 12, 24			
Learners should be able to solve problems with multiples and factors (see **Maths in Context 1**)					
6	**Negative Numbers**				
6.1	Ordering positive and negative numbers	One of the simplest ways to visualise negative numbers is to use a number line. A number line can either be drawn across a page or vertically on the page.  Negative numbers are numbers to the left of zero. Negative numbers are always preceded by a negative sign, for example –2, –3, etc.			
6.2	Calculations involving negative numbers	**Examples:** **1.** 4 – 10 = –6 **2.** –2 – 5 = –7 **3.** –9 + 5 = –4 **4.** –10 + 15 = 5			
7	**Decimals**				
7.1	Decimal place value	Numbers that are not whole numbers, **i.e.** they have a fractional part, can be written as **decimal numbers** by using a decimal point, **e.g.** 0·5, 1·4, etc. **Worked Examples:** Express the following numbers in figures: **1.** Five tenths. 0·5 **2.** Four thousandths. 0·004			

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Section	Topic	Skills			
7.2	Partitioning decimal numbers	**Worked Examples:** Partition the following numbers: **1.** 0·578 **0·5** **Five tenths**, **0·07** **seven hundredths** and **0·008** **eight thousandths**. This time, write your answer as a sum in figures: **2.** 0·578 **0·578** = **0·5** + **0·07** + **0·008**			
7.3	Addition of decimal numbers	**Worked Examples:** **1.** 3·8 + 4·5 3.8 + 4.5 = 8.3 **2.** 1·087 + 0·934 1.087 + 0.934 = 2.021			
7.4	Subtraction of decimal numbers	**Worked Examples:** **1.** 5·3 – 1·8 5.3 – 1.8 = 3.5 **2.** 0·97 – 0·885 0.970 – 0.885 = 0.085			
7.5	Mental addition and subtraction of decimal numbers	**Strategy 1 – Partitioning:** **1.** **2·4** + **1·5** = **2** + **1** + **0·4** + **0·5** = 3 + 0·9 = 3·9 **2.** **8·2** – **3·4** = **8·2** – **3** – **0·4** = 5·2 – 0·4 = 4·8 **Strategy 2 – Compensation:** **3.** **3·9** + **2·5** = **4·0** + **2·4** = 6·4 **4.** **5·9** – **2·5** = **6·0** – **2·6** = **6·0** – **2·0** – **0·6** = 3·4			
7.6	Multiplication of a decimal number by a whole number	**Worked Examples:** **2.** 5·23 × 7 5.23 × 7 = 36.61 **2.** 1·75 × 8 1.75 × 8 = 14.00			
7.7	Division by a whole number	**Worked Examples:** **1.** 33·4 ÷ 2 33.4 ÷ 2 = 16.7 **2.** 16 ÷ 5 16 ÷ 5 = 3.2			
7.8	Multiplication by 10, 100 and 1000	To **multiply** a decimal number by **10**, **100** or **1000**, we move the numbers **one**, **two** or **three places** to the **left**. Instead of trying to move all the numbers, move one number and the rest will follow. Keep the digits in the same order. **Worked Examples:** **1.** 7·2 × 10 = 72 **2.** 4·53 × 100 = 453 **3.** 0.21 × 1000 = 210			

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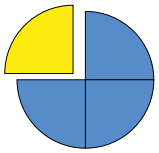
Section	Topic	Skills			
7.9	Division by 10, 100 and 1000	To **divide** a decimal number by **10**, **100** or **1000**, we move the numbers **one**, **two** or **three places** to the **right**. **Worked Examples:** **1.** 1·6 ÷ 10 = 0·16 **2.** 48 ÷ 100 =0·48 **3.** 506 ÷ 1000 = 0·506			
7.10	Decimal calculations involving money	When performing calculations involving money, we need to have two numbers after the point. We do not need to include the units in the calculation, but we should have them included in the answer.			
8	**The Order of Operations**				
8.1	Simple operations	**Worked Examples:** **1.** 7 + 5 – 9 = **7 + 5** – 9 = **12** – 9 = 3 **2.** 8 – 6 + 7 = **8 – 6** + 7 = **2** + 7 = 9 **3.** 11 – 13 + 5 – 3 = **11 – 13** + 5 – 3 = **–2** + 5 – 3 = 3 – 3 = 0 Alternative method: **1.** 7 + 5 – 9 = 7 + **5 – 9** = 7 **– 4** = 3 **2.** 8 – 6 + 7 = 8 **– 6 + 7** = 8 + **1** = 9 **3.** 11 – 13 + 5 – 3 = 11 **– 13 + 5** – 3 = 11 **– 8** – 3 = 3 – 3 = 0			
8.2	More complex operations	When a calculation involves multiplication or division *and* addition or subtraction, always **divide** or **multiply** *before* we **add** or **subtract**. The acronym **BIDMAS**, which means **B**rackets, **I**ndices (powers), **D**ivide, **M**ultiply, **A**dd, **S**ubtract, helps us to remember this order. **Worked Examples:** Evaluate each of the following: **1.** 7 × 3 + 9 **2.** 6 + 4 × 3 **3.** 15 – 8 ÷ 2 **Solutions:** **1.** **7 × 3** + 9 = **21** + 9 = 30 **2.** 6 + **4 × 3** = 6 + **12** = 18 **3.** 15 – **8 ÷ 2** = 15 – **4** = 11			
9	**Fractions**				
9.1	Identifying fractions	Fractions are numbers that represent part of something, **e.g.** part of a whole number, part of an object, etc.  Fractions are numbers made up of a **numerator** (top number) and a **denominator** (bottom number). The numerator represents the number of parts of the whole that we have and the denominator represents how many equal parts the whole has been divided into. If we consider the circle above, one part out of four is yellow, so the fraction is $\frac{1}{4}$.			

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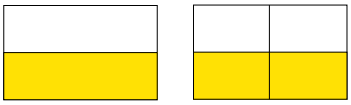
Section	Topic	Skills			
9.2	Equivalent fractions	**Equivalent fractions** are fractions that have the same value as one another. We can see in the shapes below that the same amount of each shape is shaded, but each shape is divided into different numbers of parts.  $\frac{1}{2}$ $\frac{2}{4}$ To form equivalent fractions, pick any number and multiply the numerator and denominator by that number. $\frac{2}{5} \overset{(\times 2)}{=} \frac{4}{10} \overset{(\times 5)}{=} \frac{10}{25} \overset{(\times 10)}{=} \frac{20}{50}$			
9.3	Simplifying fractions	To **simplify** fractions we divide the **numerator** and **denominator** by the **same** number. **Worked Examples:** Simplify each of the following: **1.** $\frac{2}{4} \overset{\div 2}{\underset{\div 2}{}} = \frac{1}{2}$ **2.** $\frac{10}{30} \overset{\div 10}{\underset{\div 10}{}} = \frac{1}{3}$ **3.** $\frac{8}{12} \overset{\div 4}{\underset{\div 4}{}} = \frac{2}{3}$			
9.4	Ordering fractions	When ordering fractions, the larger the denominator – the more parts we have – the smaller each part becomes. **i.e.** $\frac{1}{2}$ is larger than $\frac{1}{3}$, and $\frac{1}{3}$ is larger than $\frac{1}{4}$, etc. However, it is not always clear whether one fraction is larger or smaller than another. One way to do so is to form **equivalent fractions** with the **same denominator**.			
9.5	Finding a fraction of a whole number or quantity	**Worked Examples:** **(a)** Find $\frac{1}{3}$ of 12. $\frac{1}{3} \times 12$ $= 12 \div 3$ $= 4$ **(b)** Find $\frac{3}{4}$ of 36. $\frac{3}{4} \times 36$ $= 36 \div 4 \times 3$ $= 9 \times 3$ $= 27$			
9.7	Expressing fractions as decimals	To express a fraction as a decimal without a calculator, it is best to form an equivalent fraction with the denominator 10, 100, 1000, etc. We can then use our knowledge of place value to write the fraction in decimal form. **Worked Examples:** **1.** $\frac{3}{5} \overset{(\times 2)}{\underset{(\times 2)}{}} = \frac{6}{10} = 0.6$ **2.** $\frac{3}{20} \overset{(\times 5)}{\underset{(\times 5)}{}} = \frac{15}{100} = 0.15$			

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Section	Topic	Skills			
10	**Percentages**				
10	Percentages	A **percentage** is a special fraction that is always out of 100. We have already seen many common fractions: out of two (halves), out of three (thirds), out of four (quarters), out of five (fifths), etc. **Common Fractions and Percentages:** $\frac{1}{2}$ = **50%** $\quad$ $\frac{1}{4}$ = **25%** $\quad$ $\frac{3}{4}$ = **75%** $\frac{1}{10}$ = **10%** $\quad$ $\frac{1}{20}$ = **5%** $\quad$ $\frac{1}{100}$ = **1%** $\frac{1}{5}$ = **20%** $\quad$ $\frac{2}{5}$ = **40%** $\quad$ $\frac{3}{5}$ = **60%** $\frac{4}{5}$ = **80%** $\quad$ $\frac{1}{3}$ = **33 $\frac{1}{3}$ %** $\quad$ $\frac{2}{3}$ = **66 $\frac{2}{3}$ %**			
10.1	Expressing a percentage as a fraction	To express a percentage as a fraction, write the percentage as a number with a denominator of 100, then simplify. **Worked Examples:** Express each percentage as a fraction: **1.** $20\% = \frac{20}{100} = \frac{1}{5}$ $\quad$ **2.** $54\% = \frac{54}{100} = \frac{27}{50}$			
10.2	Expressing a fraction as a percentage	To express a fraction as a percentage *without* a calculator, make the denominator 100 using equivalent fractions. We can then write the number as a percentage. **Worked Examples:** **(a)** $\frac{3}{5}$ multiply by $\frac{20}{20}$ $\quad$ **(b)** $\frac{5}{40}$ multiply by $\frac{10}{10}$ $= \frac{60}{100}$ $\quad$ $= \frac{50}{400}$ divide by $\frac{4}{4}$ $= 60\%$ $\quad$ $= 12.5\%$			
10.3	Expressing a percentage as a decimal	To express a percentage as a decimal, divide it by 100. **Worked Examples:** **(a)** $15\% = 15 \div 100 = 0{\cdot}15$ $\quad$ **(b)** $3\% = 3 \div 100 = 0{\cdot}03$			
10.4	Expressing a decimal as a percentage	To express a decimal as a percentage, multiply it by 100%. **Worked Examples:** **(a)** $0{\cdot}3 = 0{\cdot}3 \times 100(\%) = 30\%$ $\quad$ **(b)** $0{\cdot}04 = 0{\cdot}04 \times 100(\%) = 4\%$			
10.5	Finding a percentage of a quantity (complex)	**Worked Examples:** Find the following percentages *without* using a calculator: **1.** Find 10% of 450. $\frac{1}{10}$ of 450 $= 450 \div 10$ $= 45$ **2.** Find 50% of 64. $\frac{1}{2}$ of 64 $= 64 \div 2$ $= 32$			
10.6	Finding a percentage of a quantity (complex)	To calculate more complicated percentages of any value *without* using a calculator, we can calculate simple percentages and add them together. The most useful percentage is 10%. From this, we can calculate 1% (divide 10% by 10), 5% (divide 10% by 2), 20% (multiply 10% by 2), 30% (multiply 10% by 3), etc. **Worked Examples:** Find the following percentages without using a calculator: **(a)** 40% of 56 100% = 56 10% = 5·6 **40% = 22·4** **(b)** 15% of 68 100% = 68 **10% = 6·8** **5% = 3·4** **15% = 10·2**			

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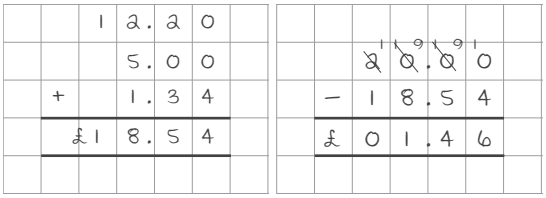
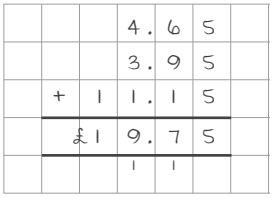
Section	Topic	Skills			
10.1	Simplifying ratios	Ratios can be simplified in the same way as fractions, by dividing each number by the *same* number, ideally, the **highest common factor** (see **section 5.4**). We should always simplify ratios before sharing. **Worked Examples:** Simplify the following ratios: **(a)** 18 : 30 divide by 6 3 : 5 **(b)** 75 : 120 divide by 15 5 : 8			
10.1	Sharing ratios	A ratio divides a quantity into a certain number of parts that are then shared in the given ratio. If the ratio can be simplified, simplify before sharing. **Worked Example:** Share 90 in the ratio 3 : 2. **Step 1:** Determine the number of parts. 3 + 2 = 5 parts **Step 2:** Calculate the value of one part. 1 part = 90 ÷ 5 = 18 **Step 3:** Share in the given ratio. 3 ×18 : 2 ×18 **54 : 36**			
10.3	Using a ratio to find unknown values	**Worked Example:** A and B are in the ratio **3** : **4**. If A is 420, what is the value of B? **Step 1:** Calculate the value of one part. 1 part = 420 ÷ **3** = 140 **Step 2:** Multiply by 4 to find value of B. 140 × **4** = 560			
11	**Money**				
11.1	Money calculations	**Worked Example:** Peter buys items costing £12·20, £5 and £1·34. How much change will he receive from £20? **Step 1:** Add up the expenses. **Step 2:** Take away the answer from £20.  			
11.2	Comparing costs	In this section, we focus on comparing like-for-like costs. In other words, we need to find the cost for the **same number of items**. The best way to do this calculation is to find the cost of one item in each comparison, or the total cost in each comparison.			
11.3	Budgeting	**Budgeting** is planning how much money we have and how much we plan to spend and on what. **Worked Example:** Molly has £20 and she wants to buy items costing £4·65, £3·95, £11·15. Does she have enough money to buy the items? Justify your answer by calculation. **Solution:** **Step 1:** Add up all the items. **Step 2:** Compare prices and answer question.  Molly has enough money as £20 > £19·75.			

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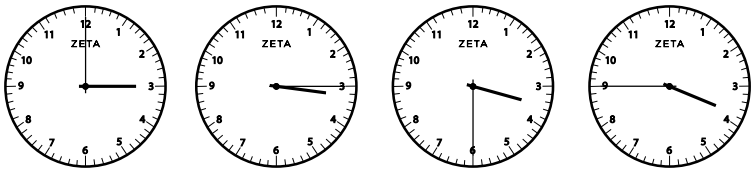
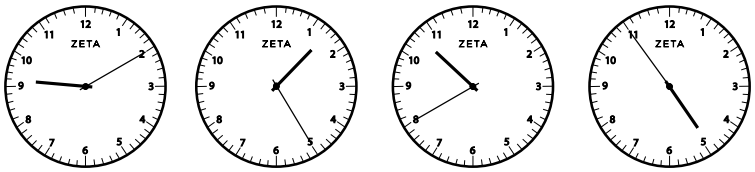
Section	Topic	Skills			
11.4	Profit and loss	The terms **profit** and **loss** apply to running a business. When running any kind of business there are two main financial things to consider: **income** and **expenditure** (spending). Income is the money that comes into a business from sales, or services that are provided, and expenditure is the money that goes out from expenses, paying staff, rent, etc. When income is more than spending we earn a **profit**. When spending is more than income we make a **loss**. For a project on profit and loss see the website.			
12	**Time**				
12.1	Reading analogue time	The **shorter hand** represents the **hours**, and this can simply be read from the clock. The **longer hand** represents the **minutes**. To know how many are past, we need to multiply the number the hand is pointing to by five. When the minute hand is less than 30 (**i.e.** not yet pointing to the six), we describe the minutes as past the hour. When the minute hand is more than 30 (**i.e.** past the six), we describe the minutes until the next hour. There are certain common times like the first four below.  Three o'clock — Quarter past three — Half past three — Quarter to fou  Ten past nine — Twenty-five past one — Twenty to eleven — Five to five			
12.2	Changing between 12 and 24–hour time	If a time is **am**, we can change it to 24-hour time by simply writing it with four digits. **Examples:** ***1.*** 6 am → 0600 ***2.*** 8.30 am → 0830 ***3.*** Midnight → 0000 If a time is **pm**, we can change it to 24-hour by *adding 12 to the hours* and writing it with four digits. **Examples:** ***1.*** 9 pm → 2100 ***2.*** 7.30 pm → 1930 ***3.*** Noon → 1200			
12.3	Time unit conversions	**Examples:** Change the following times to minutes ***1.*** $1\frac{1}{4}$ hours ***2.*** 5·75 hours **Solution:** multiply the hours by 60 and add on the fraction. ***1.*** $1\frac{1}{4}$ hours = **60** + **15** mins = 75 mins ***2.*** **5·75** hours = **5 × 60** + **45** = **300** + **45** mins = 345 mins $0{\cdot}75 = \frac{3}{4}$ = 45 minutes			

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Section	Topic	Skills			
12.4	Recording time	There are many ways to record or keep track of time. The instrument we use to record time depends on the type of event we are trying to record or to keep track of.			
12.5	Time intervals	**Worked Example:** How long is the time interval between 11.30 am and 3.10 pm on the same day? +30 mins +3 hours +10 mins 11.30am 12.00am 3pm 3.10pm Duration 3 hours and 40 minutes.			
12.6	Length of a journey from a speed and a distance	Speed, distance and time of any journey are all related. If we know two of these, we can calculate the third. **Worked Example:** John walks 2·5 km to school at an average speed of 5 km/h. Calculate the time taken. 5 km in 1 hour 2·5 km in $\frac{1}{2}$ hour or 30 minutes. John takes 30 minutes to walk to school.			
12.7	Reading timetables	Plan events and solve problems using timetables.			
13	**Measurement**				
13.1	Reading scales	Most scales will have two, four or ten increments between one number and the next. Some may have five. To work out how much each increment is worth, divide the difference between successive numbers by the number of increments. **Example:** 10 20 30 40 50 60 The difference between successive numbers is **10** and there are **2** increments, so each is worth **5**, as **10** ÷ **2** = **5**.			
13.2	Measuring lengths	To measure the length of an object, place the ruler on the object, ensuring that the zero of the ruler is at the starting point of the measurement – as in the diagram on the next page. Then read the value at the other end of the object.			
13.3	Estimating lengths	An estimation is an approximation. When estimating lengths, it is helpful to think of something familiar which we already know the length of. For example, for short lengths, we can compare them to a 15 cm or 30 cm ruler. For longer lengths, we can compare them to a metre stick.			
13.4	Converting units	**Larger to Smaller Unit (Multiply)** / **Smaller to Larger Unit (Divide)** Kilometres to metres (×1000) / Metres to kilometres (÷1000) Metres to centimetres (×100) / Centimetres to metres (÷100) Centimetres to millimetres (×10) / Millimetres to centimetres (÷10) Metres to millimetres (×1000) / Millimetres to metres (÷1000) Kilograms to grams (×1000) / Grams to kilograms (÷1000) Litres to millilitres (×1000) / Millilitres to litres (÷1000)			

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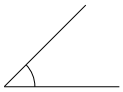
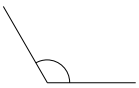
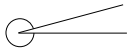
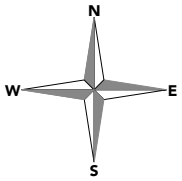
Section	Topic	Skills			
14	**Angle Properties**				
14.1	Types of angle	 **Acute angle:** Less than 90° **Right-angle:** 90°  **Obtuse angle:** Greater than 90° Less than 180° **Straight angle:** 180°  **Reflex angle:** Greater than 180° Less than 360°			
14.2	Measuring angles	**Step 1:** Place the protractor on the angle with the cross-hairs on the vertex. **Step 2:** Ensure the zero line is along one of the lines that form the angle. **Step 3:** Read from zero to the marked angle. Notice the numbers on the outside go in a clockwise direction and on the inside, in an anticlockwise direction. **Step 4:** Write down your answer.			
14.3	Drawing angles	**Step 1:** Draw a horizontal line. **Step 2:** Put the cross-hairs of the protractor on the end of the line. **Step 3:** Mark the angle. **Step 4:** Draw a line through the point and mark the angle.			
14.4	Complementary angles	**Complemetary angles** are angles that add up to 90°. To find the **complement** of an angle, we take the angle away from 90°. **Worked Example:** Find the complement of 63°. 90 – 63 = 27°			
14.4	Complementary angles	**Supplementary angles** are angles that add up to 180°. To find the **supplement** of an angle, we take the angle away from 180°. **Worked Example:** Find the supplement of 46°. 180 – 46 = 134°			
14.5	Compass points	On a compass, there are four main directions: **north**, **east**, **south** and **west**. These can be seen on the compass star on the right. Each direction is a quarter turn or 90° apart in a clockwise direction. The compass points can be remembered using a simple mnemonic such as **n**ever **e**at **s**oggy **w**affles. 			
15	**Reflection Symmetry**				
15.1	Identifying reflection symmetry	Reflection symmetry is often easy to determine as it produces a mirror image along the **line** or **axis of symmetry**. In a rectangle, we can see that there are only two lines of symmetry as the line on the diagonal does not produce a mirror image.			

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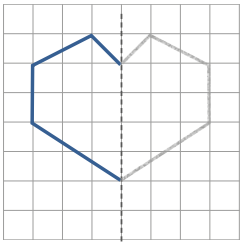
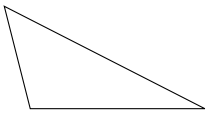
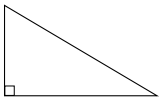
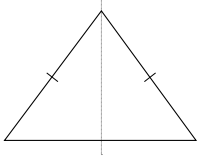
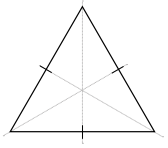
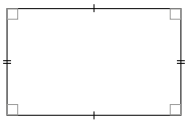
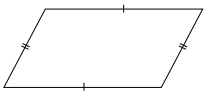
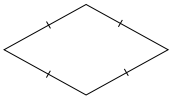
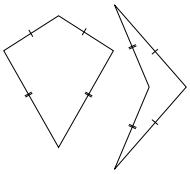
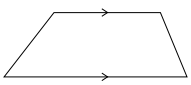
Section	Topic	Skills
15.2	Using reflection symmetry	**Step 1:** Start at one end of the design. **Step 2:** For each vertex, count the number of boxes from the symmetry line and count the **same number** of boxes in the **opposite direction**, then mark the new vertex. **Step 3:** Draw a line joining each of the vertices. 
16	**Properties of Shapes**	
16.1	Triangles	**Scalene Triangle**  **Sides:** all different lengths. **Angles:** all different sizes. **Symmetry:** no lines of symmetry. **Right-Angled Triangle**  **Sides:** all different lengths (unless isosceles). **Angles:** one angle is right-angled (90°). **Symmetry:** no lines of symmetry (unless isosceles). **Isosceles Triangle**  **Sides:** two sides the same length. **Angles:** two angles the same size. **Symmetry:** one line of symmetry. **Equilateral Triangle**  **Sides:** all sides the same length. **Angles:** all angles the same size. **Symmetry:** three lines of symmetry.
16.2	Quadrilaterals	**Rectangle**  **Sides:** Opposite sides are equal and parallel. **Angles:** All angles are right-angles. **Symmetry:** Two lines of symmetry. **Parallelogram**  **Sides:** Opposite sides are equal and parallel. **Angles:** Opposite angles are equal. **Symmetry:** No lines of symmetry. **Rhombus**  **Sides:** All sides equal. Opposite sides parallel. **Angles:** Opposite angles are equal. **Symmetry:** Two lines of symmetry. **Kite**  **Sides:** Adjacent sides equal. No sides parallel. **Angles:** One pair of opposite angles are equal. **Symmetry:** One line of symmetry. **Trapezium**  **Sides:** One pair of opposite sides are parallel. **Angles:** Angles may all be different sizes. **Symmetry:** One or no lines of symmetry.

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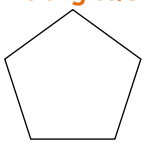
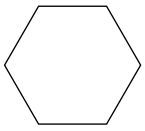
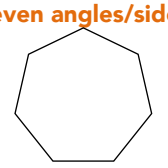
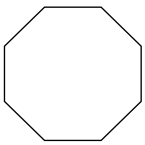
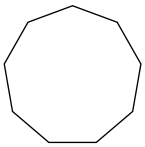
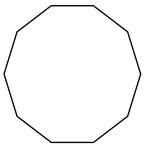
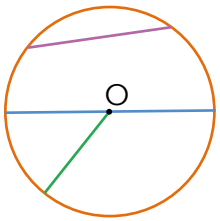
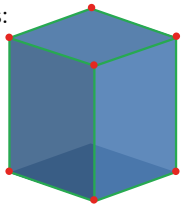
Section	Topic	Skills			
16.3	Polygons	The name polygon is used for any two dimensional shape with straight line sides and angles, but we use more specific names for shapes given the number of their sides and angles. **Pentagon** – **Five angles/sides**  **Hexagon** – **Six angles/sides**  **Heptagon (Septagon)** – **Seven angles/sides**  **Octagon** – **Eight angles/sides**  **Nonagon** – **Nine angles/sides**  **Decagon** – **Ten angles/sides** 			
16.4	Cicles	**Circumference** – a measure of distance around the outside of the circle. **Diameter** – a straight line from one side of the circle to the other, passing through the centre. **Radius** – the radius is a line from the centre O, to the circumference of the circle. **Chord** – a straight line connecting two points on the circumference. 			
17	**Area & Perimeter**				
17.2	The area of a square or rectangle	To calculate the area of a square or rectangle, we can use the formula $A = l \times b$, where l is the length and b is the breadth. In a square, the length and breadth are the same.			
17.3	The area of a right-angled triangle	To calculate the area of a right–angled triangle, we can use the formula $A = \frac{1}{2} \times l \times b$, where l is the length and b is the breadth.			
17.4	Finding the perimeter of shapes	The **perimeter** of a two-dimensional shape is the distance around the boundary of the shape. To find the perimeter of a shape, we need to add up the lengths of all the sides.			
17.5	Equivalent area and perimeter	It is possible for squares and rectangles to look different but have the same area or perimeter. For **equal area**: find pairs of numbers which multiply together to give the same area. For **equal perimeter**: choose the length of one side. Double the length and take it away from the perimeter. Then halve what is left.			
18	**3D Shapes**				
18.1	Properties of 3D shapes	3D shapes may have each of the following properties: **Faces** – these are the polygons (2D shapes) that make up the Objects. **Edges** – these are the lines where two faces meet. **Vertices** – these are the points where the edges meet.  The cylinder, cone and sphere are slightly different as they have curved faces and curved edges, apart from the sphere which has no edges.			

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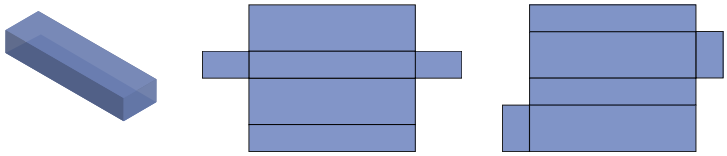
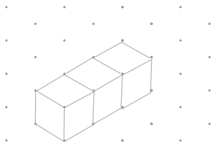
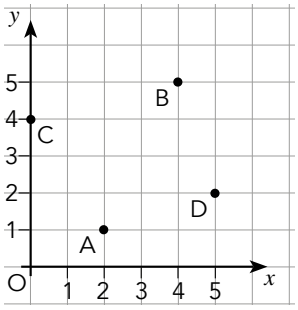
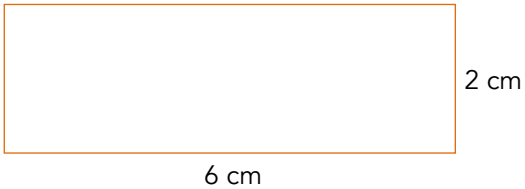
Section	Topic	Skills			
18.2	Nets of 3D shapes	A net of a three-dimensional object is a two-dimensional presentation of each of the faces of the object. To draw the net of a prism, consider unfolding it, as though it were a cardboard box. Each face needs to be connected to the net, but there are many ways to do this. 			
18.3	Finding the volume of cubes/cuboids	To find the volume of a cube or cuboid, we can use the formula $V = l \times b \times h$, where l is the length, b is the breadth and h is the height. In a cube, all of these dimensions are equal, so we could also use the formula $V = l^3$.			
18.4	Drawing 3D shapes	Use technology or isometric paper to draw 3D shapes. 			
19	**Coordinates**				
19.1	Reading coordinates	Coordinate diagrams are for plotting points in two directions or two dimensions. These two directions are identified by their axes. The x–axis is for the horizontal direction (right and left) and the y–axis is for the vertical direction (up and down). When reading coordinates, read along to the right, from the origin, (0, 0), to find the x–coordinate, then up to find the y–coordinate. The x– and y–coordinates are **separated by a comma and always written in brackets**.			
19.2	Plotting coordinates	When plotting coordinates (x, y) on a coordinate diagram, remember the x–coordinate comes first then the y–coordinate. **Examples:** Plot A(2, 1), B(4, 5), C(0, 4) and D (5, 2). 			
20	**Scale and Scale Factors**				
20.1	Using scale factors	When shapes or objects are **mathematically similar** – in other words, one is an **enlargement** or **reduction** of the other – all angles will be the same and lengths will change in the same ratio, so we can use the **scale factor** to calculate unknown lengths if we know the corresponding length. **Worked Example:** The rectangle is a scale plan of a building with a scale of 1 cm : 5 m. Calculate the actual length of the room.  Multiply the length by 5, as 1 cm is 5 m in real life. 6 × 5 = 30 m.			

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Section	Topic	Skills			
20.2	Describing directions	Sometimes we need to work out the directions from the map.			
21	**Patterns & Sequences**				
21.1	Extending number patterns and describing the rule	A sequence of numbers could be any ordered list of numbers. We can use the pattern in a number sequence to generate further numbers in the sequence. **Worked Example:** **(a)** Find the next three numbers for the following sequence of numbers: 7, 11, 15, 19,… 23, 27, 31. **(b)** Describe the rule relating the numbers. From one number to the next we are adding four.			
22	**Solving Equations**				
22.2	Solving equations: $x \pm a = b$	To sovle an equation, it is necessary to add or subtract **the same amount to or from both sides of the equation**. **Worked Examples:** **1.** $x + 5 = 9$ $(-5)\quad(-5)$ $x = 4$ **2.** $y - 3 = 12$ $(+3)\quad(+3)$ $y = 15$			
22.3	Solving equations: $ax = b$	When solving equations of the form $ax = b$, always divide by the coefficient of the algebraic term. The coefficient of an algebraic term is the number multiplying the letter. **Worked Examples:** **1.** $2w = 6$ $(\div 2)\quad(\div 2)$ $\frac{2w}{2} = \frac{6}{2}$ $w = 3$ **2.** $3x = 18$ $(\div 3)\quad(\div 3)$ $\frac{3x}{3} = \frac{18}{3}$ $x = 6$			
23	**Information Handling**				
23.1	Data interpretation	Three areas of information handling that can produce inaccurate or misleading information: **the sample**, **the survey** and **the graph**.			
24.2	Frequency tables	**Frequency tables** are tables that display how many or how frequent each piece of data or information is from a data set. Colour / Tally / Frequency Red / 𝍸 I / 6 Blue / II / 3 Black / IIII / 4 Grey / II / 2 White / 𝍸 I / 5			
24.3	Bar graphs	**Bar graphs**, also called bar charts display sets of data in bars. Bar graphs provide an easy visual representation of data. In bar graphs, the bars should always be the same distance apart and the bars are usually separated by a space.			
24.3	Line graphs	**Line graphs** should only be used for certain types of data. This is normally data that is a measurement that can change continuously with time, such as temperature.			
24.4	Pie charts	Pie charts are a method of displaying information graphically, represented by pieces of a pie. Pie charts give a very clear indication of the proportions of the data belonging to each category, but they do not necessarily provide any other specific numerical information relating to the data.			

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Section	Topic	Skills			
25	**Probability**				
25.1	Stating probability using words	In describing probability, we will limit ourselves to seven descriptions: **impossible**, **highly unlikely**, **unlikely**, **even chance**, **likely**, **highly likely** and **certainty**. These descriptions may vary.			
25.2	Stating probability using numbers	We often use words to describe probability, but probability is also measurable and can be expressed as a **fraction** a **decimal** or a **percentage**. If we consider the coin toss and the probability of it landing on heads, we have an even chance, which can also be described as fifty-fifty. This can also be described as 1 out of 2, as there is one head and two possibilities. We can say this probability is $\frac{1}{2}$, 0·5 or 50%.			

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