

ZETA MATHS

National 4 +

MATHEMATICS

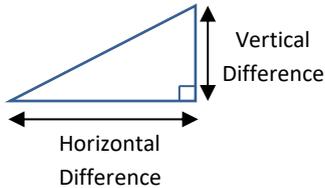
Learning Checklist

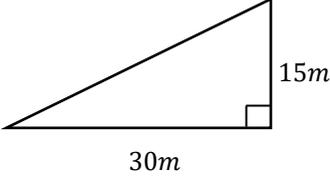
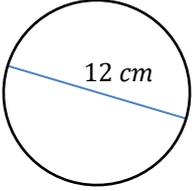
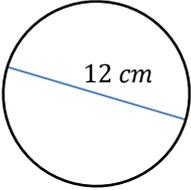
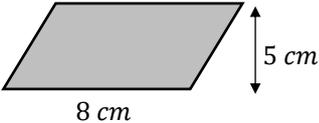
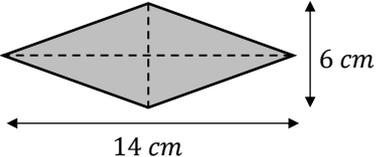
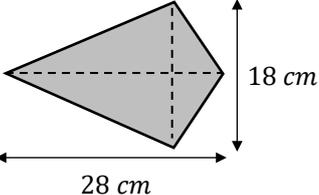
This checklist covers every skill that learners need for success at National 4 Mathematics. Each section of this checklist corresponds to the **Zeta Maths National 4+ Mathematics** textbook (available from www.zetamaths.com or on Amazon Kindle). *Only the skills required to cover the unit assessments and added value paper are included.* The topic names in this document are linked for easy navigation of the checklist and colour coded to correspond with skills: **numerical**, **algebraic**, **geometric**, **trigonometric** and **statistical**.

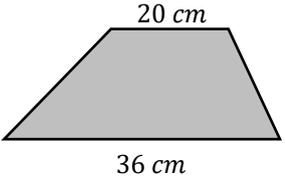
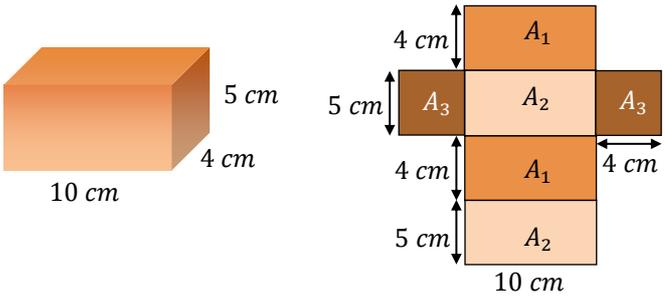
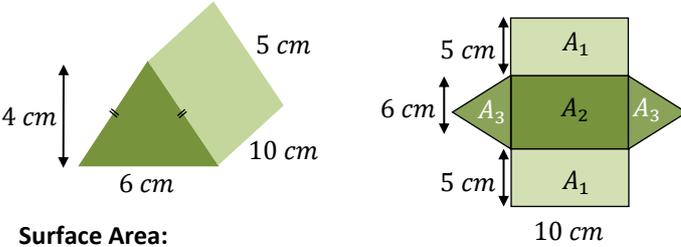
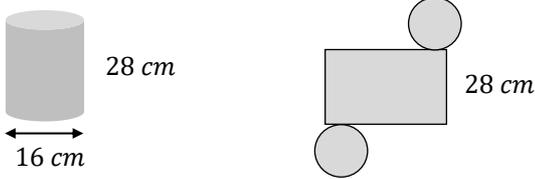
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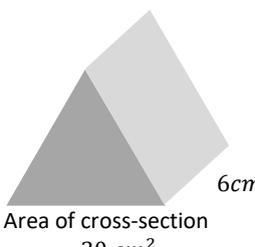
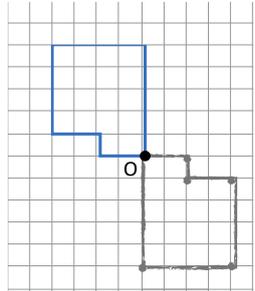
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| Section | Topic | Skills | | | |
|-----------------------------------|--|--|--|--|--|
| EXPRESSIONS & FORMULAE | | | | | |
| 1 Simplifying Expressions | | | | | |
| 1.1 | Basic addition and subtraction | When adding and subtracting terms within an algebraic expression, the terms that have the same variable go together. <i>a.</i> $x + x + x = 3x$ <i>b.</i> $x + y + x + y + x = 3x + 2y$ | | | |
| 1.2 | Further addition and subtraction | <i>a.</i> $3x + 4x = 7x$ <i>b.</i> $3x + 5y + x - 3y = 4x + 2y$ | | | |
| 1.3 | Multiplication of algebraic terms by numbers | When multiplying an algebraic term by a number, multiply the coefficient of the algebraic term by the number. <i>a.</i> $x \times 2 = 2x$ <i>b.</i> $6 \times 5y = 30y$ | | | |
| 1.4 | Multiplication of algebraic terms by letters | <i>a.</i> $a \times b = ab$ <i>b.</i> $x \times x = x^2$ <i>c.</i> $x \times y \times y = xyz$ | | | |
| 2 Expanding Brackets | | | | | |
| 2.1 | Expanding single brackets | To expand brackets, the term on the outside of the bracket multiplies each term inside the bracket: $x(y + z) = xy + xz$ <i>a.</i> $4(x + 1) = 4x + 4$ <i>b.</i> $5(x + 3y) = 5x + 15y$ | | | |
| 2.2 | Expanding single brackets with negatives | <i>a.</i> $2(x - 7) = 2x - 14$ <i>b.</i> $-6(x + y) = -6 \times x + (-6) \times y = -6x - 6y$ | | | |
| 2.3 | Expanding single brackets and simplifying | <i>a.</i> $4(x - 2) + 9 = 4x - 8 + 9 = 4x + 1$ When two or more brackets are being added or subtracted from one another, expand each bracket, then simplify: <i>b.</i> $4(y - 7) + 3(4y + 6) = 4y - 28 + 12y + 18 = 16y - 10$ <i>c.</i> $3(3z + 4) - 2(6z - 5) = 9z + 12 - 12z + 10 = -2z + 22$ | | | |
| 3 Factorising | | | | | |
| 3.1 | Common factor - numerical | When factorising any expression, the first thing to look for is a common factor . A factor is a number (or algebraic term) that divides into another term, e.g. factors of 4 are 1, 2 and 4. A common factor is a factor that each of the terms in an expression share. <i>a.</i> $3x + 12 = 3(x + 4)$ <i>b.</i> $12x + 16y = 4(3x + 4y)$ | | | |
| 4 Substitution | | | | | |
| 4.1 | Simple substitution | Substitution is the process of replacing algebraic terms with numerical or equivalent algebraic terms. If $w = 3$, $x = 5$, $y = -2$ and $z = -4$, find: <i>1.</i> $x + z = 5 + (-4) = 1$ <i>2.</i> $3w - 3y = 3(3) - 3(-2) = 9 + 6 = 15$ | | | |

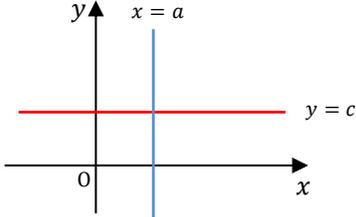
| Section | Topic | Skills | | | | | | | | | | | | | |
|-----------------------------------|--|---|----------|----|---|---|---|----------|---|----|----|----|--|--|--|
| 4.2 | Substitution into formulae | Using the formula $R = 2.3S + 0.7T$, calculate R when $S = 12$ and $T = 14$. $R = 2.3S + 0.7T$ $R = 2.3(12) + 0.7(14)$ $R = 37.4$ | | | | | | | | | | | | | |
| 5 Patterns & Sequences | | | | | | | | | | | | | | | |
| 5.1 | Finding the formula from a sequence of numbers | Find the formula for the following sequence of numbers: 3, 7, 11, 15, ... The formula is $an \pm b$. When n is 1, $a(1) \pm b = 3$, when n is 2, $a(2) \pm b = 7$, etc. We find a by looking at the change from each number to the next. The numbers go up by 4 each time which means the formula involves multiplication by 4 . So, the formula is $4n \pm b$. Next, we find b . When n is 1, $4(1) \pm b = 3$ so $4 \pm b = 3$, therefore $b = -1$. The formula is $4n - 1$ | | | | | | | | | | | | | |
| 5.2 | Using a formula to calculate terms in a sequence | Find the 7 th term in the sequence $3n + 6$. To find the 7 th term, substitute 7 for n into the formula. When n is 7, $3(7) + 6 = 21 + 6 = 27$. | | | | | | | | | | | | | |
| 5.4 | Finding a formula connecting two related terms | The table below shows two related variables. Find the formula relating the two variables. <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>G</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>H</td> <td>6</td> <td>14</td> <td>22</td> <td>30</td> </tr> </table> In the linear relationship $H = aG + b$, we find a by looking at the difference in each of the numbers. As G increases by 1, H increases by 8 each time. This means the sequence involves multiplication by 8. So $H = 8G \pm b$. When $G = 1$, $H = 6$, $6 = 8(1) \pm b$, so $b = -2$. \therefore The formula is $H = 8G - 2$ | G | 1 | 2 | 3 | 4 | H | 6 | 14 | 22 | 30 | | | |
| G | 1 | 2 | 3 | 4 | | | | | | | | | | | |
| H | 6 | 14 | 22 | 30 | | | | | | | | | | | |
| 6 Gradients | | | | | | | | | | | | | | | |
| 6.1 | Basic gradients | The gradient of a line is a measure of the slope of the line. A larger gradient means a steeper slope. The gradient can be calculated in several ways, as will be seen in this chapter. Each of the different ways follow the basic principle of the formula below: $\text{Gradient} = \frac{\text{Vertical Difference}}{\text{Horizontal Difference}}$ or $m = \frac{V}{H}$ where m is the gradient.  | | | | | | | | | | | | | |

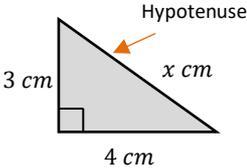
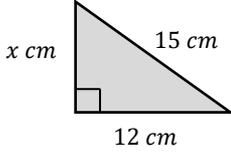
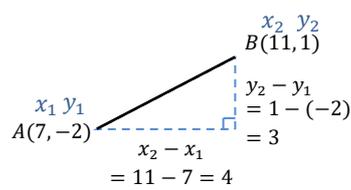
| Section | Topic | Skills | | | |
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| 6.1 | Basic gradients | Using the formula above, find the gradient of the following:  $m = \frac{V}{H}$ $m = \frac{15}{30}$ $m = \frac{1}{2}$ | | | |
| 7 The Circle – Area & Circumference | | | | | |
| 7.1 | The circumference of a circle | Circumference of a circle: $C = \pi D$ Find the circumference of the circle.  $C = \pi D$ $C = \pi \times 12$ $C = 37.7 \text{ cm (1 d.p.)}$ | | | |
| 7.2 | The area of a circle | Area of a circle: $A = \pi r^2$ Find the area of the circle.  $A = \pi r^2$ $A = \pi \times 6^2$ $A = 113.1 \text{ cm}^2 \text{ (1 d.p.)}$ <p>NB: The diameter is given; this needs to be halved to find the radius.</p> | | | |
| 8 Area of Quadrilaterals | | | | | |
| 8.3 | The area of a parallelogram | Area of a parallelogram: $A = b \times h$ Find the area of the parallelogram.  $A = b \times h$ $A = 8 \times 5$ $A = 40 \text{ cm}^2$ | | | |
| 8.4 | The area of a rhombus | Area of a rhombus: $A = \frac{1}{2} \times d_1 \times d_2$  $A = \frac{1}{2} \times d_1 \times d_2$ $A = \frac{1}{2} \times 14 \times 6$ $A = 42 \text{ cm}^2$ | | | |
| 8.5 | The area of a kite | Area of a kite: $A = \frac{1}{2} \times d_1 \times d_2$  $A = \frac{1}{2} \times d_1 \times d_2$ $A = \frac{1}{2} \times 28 \times 18$ $A = 252 \text{ cm}^2$ | | | |

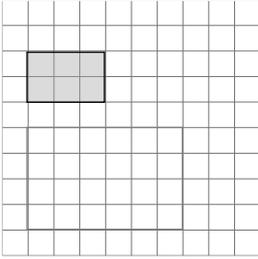
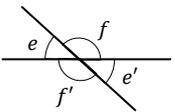
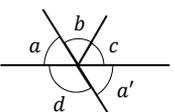
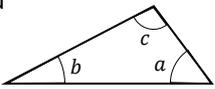
| Section | Topic | Skills | | | |
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| 8.6 | The area of a trapezium | <p>Area of a trapezium: $A = \frac{1}{2} \times (a + b) \times h$</p>  <p> $A = \frac{1}{2} \times (a + b) \times h$ $A = \frac{1}{2} \times (20 + 36) \times 24$ $A = 672 \text{ cm}^2$ </p> <p>NB: See alternative method in the textbook (P64-65).</p> | | | |
| 9 3D Solids 1 – Surface Area | | | | | |
| 9.1 | Surface area of cubes and cuboids | <p>By first sketching a net of the cuboid, calculate its surface area.</p>  <p>Surface Area:</p> $2(A_1) + 2(A_2) + 2(A_3)$ $= 2(4 \times 10) + 2(5 \times 10) + 2(4 \times 5)$ $= 2(40) + 2(50) + 2(20)$ $= 220 \text{ cm}^2$ | | | |
| 9.2 | Surface area of prisms | <p>A prism with a cross section in the shape of an isosceles triangle is shown in the diagram. By first sketching a net, calculate its surface area.</p>  <p>Surface Area:</p> $2(A_1) + A_2 + 2(A_3)$ $= 2(5 \times 10) + (6 \times 10) + 2\left(\frac{1}{2} \times 6 \times 4\right)$ $= 100 + 60 + 24$ $= 184 \text{ cm}^2$ | | | |
| 9.3 | Surface area of cylinders | <p>Calculate the surface area of the cylinder.</p>  <p>The length of the rectangle in the net is the same as the circumference of the circle.</p> | | | |

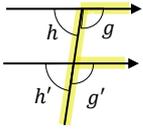
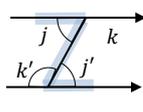
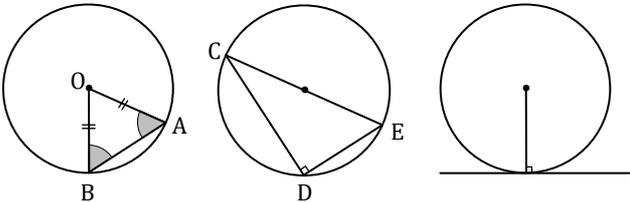
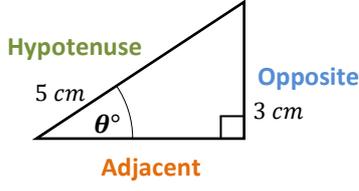
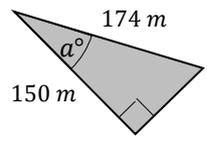
| Section | Topic | Skills | | | |
|--------------------------------|---|---|--|--|--|
| 9.3 | Surface area of cylinders | $2(\pi r^2) + l \times b$ $= 2(\pi r^2) + (\pi D \times b)$ $= 2(\pi(8)^2) + (\pi(16) \times 28)$ $= 1809.55 \dots = 1809.6 \text{ cm}^2 \text{ (1 d.p)}$ | | | |
| 10 3D Solids 2 – Volume | | | | | |
| 10.1 | Volume of a prism | <p>To calculate the volume of a prism, calculate the area of the base or cross-section and multiply this area by the height.</p> <p>Calculate the volume of the triangular prism.</p>  <p style="text-align: right;"> $V = Ah$ $V = 30 \times 6$ $V = 180 \text{ cm}^3$ </p> <p style="text-align: center;">Area of cross-section = 30 cm^2</p> | | | |
| 11 Rotational Symmetry | | | | | |
| 11.2 | The order of symmetry | The order of rotational symmetry of a shape is the number of times it fits exactly over itself when rotated. A rectangle has order 2 or half turn symmetry. An equilateral triangle has order 3 or one third turn symmetry. A square has order 4 or quarter turn symmetry. | | | |
| 11.3 | Sketching shapes with rotational symmetry | <p>Complete the shape below so that it has rotational symmetry of order 2 about O, the point of rotation.</p> <p>Step 1: Start at O and count how many boxes to the first vertex.</p> <p>Step 2: Count the same number of boxes in the opposite direction and mark the vertex.</p> <p>Step 3: Join the mark to O.</p> <p>Step 4: Complete the shape by counting boxes in the same way.</p>  | | | |
| 12 Statistics 1 | | | | | |
| 12.1 | Calculating the mean | <p>The mean is the sum of a set of data, divided by the number of terms in the data.</p> <p>Calculate the mean of the following set of data:</p> <p style="text-align: center;">3 6 7 7 9 10</p> $\text{mean} = \frac{3 + 6 + 7 + 7 + 9 + 10}{6} = \frac{42}{6} = 7$ | | | |
| 12.2 | Finding the median | <p>The median is the middle number in an ordered set of data.</p> <p>Step 1: Put the data in order starting with the lowest number.</p> <p>Step 2: identify the middle number.</p> | | | |
| 12.3 | Finding the mode | <p>The mode is the most common number in a set of data.</p> <p>NB: At National 4, if there is more than one modal value, state that there is no mode.</p> | | | |

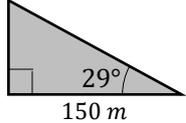
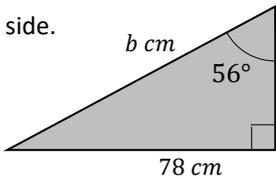
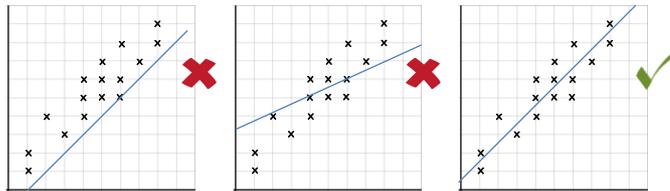
| Section | Topic | Skills | | | | | | | | | | | | | | | | | | | | | | | | |
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| 12.4 | Calculating the range | The range of a set of data is how large the spread of the data is. We find the range of the data by taking away the lowest value from the highest value in the data. | | | | | | | | | | | | | | | | | | | | | | | | |
| 12.5 | Comparing data using mean, median, mode and range | At National 4 level, the pieces of information we will compare from the data are the averages and the range. | | | | | | | | | | | | | | | | | | | | | | | | |
| 12.6 | Pie charts | <p>Step 1: Add an additional column to the table to calculate the angle.</p> <p>Step 2: Divide the frequency by the total frequency and multiply by 360°.</p> <p>Step 3: Add all angles to ensure they total to 360°.</p> <p>Step 4: Draw a circle, mark the centre and draw a line from the centre to the circumference.</p> <p>Step 5: Mark the first angle and draw a line.</p> <p>Step 6: Mark the rest of the angles and complete the pie chart with labels.</p> | | | | | | | | | | | | | | | | | | | | | | | | |
| 12.7 | Frequency tables using grouped data | <p>Step 1: Complete the first column by finding the lowest and highest values. Each group in the table should have the same range.</p> <p>Step 2: Work along the data from the first term, filling in the tally marks. This is especially important with large amounts of data, to avoid errors.</p> <p>Step 3: Count the tally marks and fill in the frequency column.</p> <p>Step 4: Total the frequency column and ensure that this figure is equal to the number of data in the data set.</p> <p>e.g.</p> <table border="1"> <thead> <tr> <th>Age</th> <th>Tally</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>16-25</td> <td> </td> <td>11</td> </tr> <tr> <td>26-35</td> <td></td> <td>1</td> </tr> <tr> <td>36-45</td> <td> </td> <td>4</td> </tr> <tr> <td>46-55</td> <td> </td> <td>1</td> </tr> <tr> <td>56-65</td> <td> </td> <td>3</td> </tr> <tr> <td>Total</td> <td></td> <td>20</td> </tr> </tbody> </table> | Age | Tally | Frequency | 16-25 | | 11 | 26-35 | | 1 | 36-45 | | 4 | 46-55 | | 1 | 56-65 | | 3 | Total | | 20 | | | |
| Age | Tally | Frequency | | | | | | | | | | | | | | | | | | | | | | | | |
| 16-25 | | 11 | | | | | | | | | | | | | | | | | | | | | | | | |
| 26-35 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 36-45 | | 4 | | | | | | | | | | | | | | | | | | | | | | | | |
| 46-55 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 56-65 | | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | | 20 | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Probability | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13.2 | Calculating simple probability | To calculate probability of an event, use the formula: $P(\text{event}) = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$ | | | | | | | | | | | | | | | | | | | | | | | | |
| RELATIONSHIPS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | The Straight Line | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15.1 | Sketch a line from its equation | <p>Step 1: Draw a table with three values of x, e.g. 0, 1, 2 or 0, 2, 4.</p> <p>Step 2: Substitute the values of x into the given equation and complete the table.</p> <p>Step 3: Write out the three coordinates from the value in the table and plot them on a coordinate diagram.</p> <p>Step 4: Draw a single, straight line through the points and beyond the points to the edge of the diagram and label it.</p> <p>Sketch the equation of the line $y = 2x - 1$.</p> | | | | | | | | | | | | | | | | | | | | | | | | |

| Section | Topic | Skills | | | |
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| 15.2 | The equation of horizontal and vertical lines | <p>Horizontal lines are lines with no gradient, i.e. $m = 0$, therefore these lines have the equation $y = c$. Where c is the value of the y-intercept.</p> <p>Vertical lines are lines with an undefined gradient, therefore these lines have the equation $x = a$, where a is the value of the x-intercept.</p>  | | | |
| 16 Solving Equations | | | | | |
| 16.1 | Solving equations: $x \pm a = b$ | <p>To solve equations; do the same thing to both sides of the equation.</p> <p>a. $x + 5 = 7$ $(-5) \quad (-5)$ $x = 2$</p> <p>b. $y - 4 = 9$ $(+4) \quad (+4)$ $y = 13$</p> | | | |
| 16.2 | Solving equations: $ax = b$ | <p>When solving equations of the form $ax = b$, always divide by the coefficient of the algebraic term. i.e. divide both sides by a.</p> <p>a. $2x = 10$ $(\div 2) \quad (\div 2)$ $x = 5$</p> <p>b. $3y = -12$ $(\div 3) \quad (\div 3)$ $y = -4$</p> | | | |
| 16.3 | Solving equations: $ax \pm b = c$ | <p>When solving equations of the form $ax + b = c$, add or subtract, then divide or multiply.</p> <p>a. $2w - 5 = 9$ $(+5) \quad (+5)$ $2w = 14$ $(\div 2) \quad (\div 2)$ $w = 7$</p> <p>b. $17 - 3y = 2$ $(-17) \quad (-17)$ $-3y = -15$ $(\div -3) \quad (\div -3)$ $y = 5$</p> | | | |
| 16.4 | Numbers and letters on both sides | <p>When solving equations of the form $ax + b = cx + d$, add or subtract the algebraic term first.</p> <p>1. $4x + 7 = 2x + 11$ $(-2x) \quad (-2x)$ $2x + 7 = 11$ $(-7) \quad (-7)$ $2x = 4$ $(\div 2) \quad (\div 2)$ $x = 2$</p> <p>2. $13 + 3y = 9y + 25$ $(-3y) \quad (-3y)$ $13 = 6y + 25$ $(-25) \quad (-25)$ $-12 = 6y$ $(\div 6) \quad (\div 6)$ $-2 = y$ $y = -2$</p> | | | |
| 16.5 | Equations with rational solutions | <p>A rational number is any number that can be expressed as a division of two integers, or more simply, a number that can be expressed as a fraction.</p> <p>NB: When solving equations in which the answers are not integers, leave the answers as simplified fractions.</p> | | | |

| Section | Topic | Skills | | | |
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| 17 Changing the Subject of a Formula | | | | | |
| 17.4 | Changing the subject of a formula involving two operations | <p>To change the subject of any formulae, perform the same method as solving equations, i.e. whatever operation is performed on one side of the equation, should also be performed on the other.</p> <p>Change the subject in each of the following questions to a.</p> <p>a. $y = mx + k$ $y - k = mx$ $x = \frac{y-k}{m}$</p> <p>b. $y = \frac{x+k}{z}$ $yz = x + k$ $x = yz - k$</p> | | | |
| 18 Pythagoras' Theorem | | | | | |
| 18.1 | Finding the hypotenuse | <p>The triangle in the diagram below is right-angled. Use Pythagoras' Theorem to calculate the length of x.</p>  <p>$x^2 = 3^2 + 4^2$ $x^2 = 9 + 16$ $x^2 = 25$ $x = \sqrt{25}$ $x = 5 \text{ cm}$</p> | | | |
| 18.2 | Finding a shorter side | <p>The triangle in the diagram below is right-angled. Calculate the length of x.</p>  <p>$15^2 = x^2 + 12^2$ $x^2 = 15^2 - 12^2$ $x^2 = 225 - 144$ $x^2 = 81$ $x = \sqrt{81}$ $x = 9 \text{ cm}$</p> | | | |
| 18.3 | Mixed questions | <p>When using Pythagoras' Theorem, always identify the hypotenuse and remember that if we are calculating a shorter side, we take the square of the shorter side away from the square of the hypotenuse.</p> | | | |
| 18.4 | Finding the distance between two points | <p>Find the distance between $A(9, 4)$ and $B(13, 7)$.</p> <p>Step 1: Sketch a right-angled triangle.</p> <p>Step 2: Label points and calculate difference.</p> <p>Step 3: Use Pythagoras' Theorem</p>  <p>$AB^2 = 4^2 + 3^2$ $AB^2 = 16 + 9$ $AB = \sqrt{25}$ $AB = 5 \text{ units}$</p> | | | |
| 19 Scale Factors & Similarity | | | | | |
| 19.1 | Finding scale factors | $LSF = \frac{\text{new length}}{\text{original length}}$ | | | |

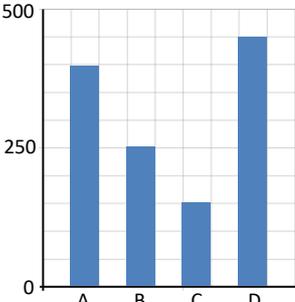
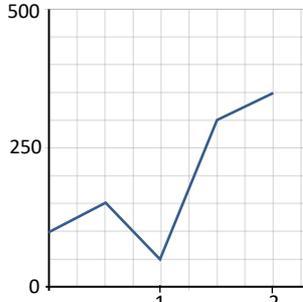
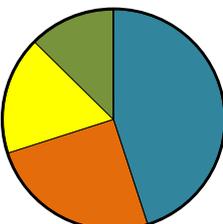
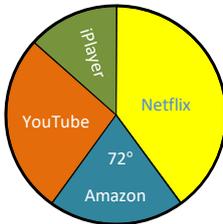
| Section | Topic | Skills | | | |
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| 19.2 | Using scale factors | <p>The two shapes below are mathematically similar. Calculate the value of x.</p>  <p>Step 1: Calculate the scale factor.</p> $\text{LSF} = \frac{\text{new length}}{\text{original length}} = \frac{14}{8} = \frac{7}{4}$ <p>Step 2: Use the scale factor.</p> $x = \frac{7}{4} \times 5 = 8\frac{3}{4} \text{ cm or } 8.75 \text{ cm}$ | | | |
| 19.3 | Using scale factors for drawing | <p>Draw an enlargement of the given shape using a scale factor of 2.</p> <p>Step 1: Start with any line and multiply the length by 2.</p> <p>Step 2: Move round the shape, one side at a time, calculating the new length.</p> <p>Step 3: Complete the shape.</p>  <p>Scale factor of 2.</p> | | | |
| 19.4 | Identifying similar shapes | <p>Step 1: Start with the first shape and multiply each dimension by the scale factor.</p> <p>Step 2: Check these dimensions against the dimensions in the other shape.</p> <p>If all the dimensions from the calculations in step 1, then the shapes are similar. If any dimension does not, then they are not.</p> | | | |
| 20 Angle Properties | | | | | |
| 20.1 | Complementary and supplementary angles | <p>Complementary Angles: Two angles that add together to make a right-angle, i.e. 90°.</p> <p>Supplementary Angles: Two angles that add together to make a straight-angle, i.e. 180°.</p> | | | |
| 20.2 | Vertically opposite angles | <p>Vertically Opposite Angles: When two straight lines cross, the opposite angles at the point of intersection are equal. In the diagram opposite, $e = e'$ and $f = f'$. These angles are sometimes called x-angles.</p>  | | | |
| 20.3 | Angles around a point | <p>Angles around a point: Angles around a point add up to 360°. In the diagram opposite, $a + b + c + a' + d = 360^\circ$. Also, $a = a'$ and $b + c = d$.</p>  | | | |
| 20.4 | Angles in a triangle | <p>Angles in a triangle: Angles in a triangle add up to 180°. In the diagram opposite, $a + b + c = 180^\circ$.</p>  | | | |

| Section | Topic | Skills | | | |
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| 20.5 | Angles and parallel lines | <p>Corresponding Angles: When two parallel lines are intersected by another line, corresponding angles are formed, these are commonly known as F-angles as the corresponding angles make an 'F' shape. In the diagram opposite, $g = g'$. We also have a backwards F, which gives us $h = h'$.</p>  <p>Alternate Angles: When two parallel lines are intersected by another line, alternate angles are also formed, these are commonly known as Z-angles as the alternate angles make a 'Z' shape. In the diagram opposite, $j = j'$. We also have a backwards Z, which gives us $k = k'$.</p>  | | | |
| 20.7 | Angles in circles |  | | | |
| 21 | Right-Angled Triangle Trigonometry | | | | |
| 21.2 | Determining the correct ratio | $\sin \theta = \frac{Opp}{Hyp}$ $\cos \theta = \frac{Adj}{Hyp}$ $\tan \theta = \frac{Opp}{Adj}$  <p>SOH CAH TOA</p> <p>Step 1: Write out the ratios.</p> <p>Step 2: Tick the sides that you have in the triangle (you may want to label the sides of your triangle).</p> <p>Step 3: The double tick is the ratio you should use; in this case that is SOH, so $\sin \theta = \frac{Opp}{Hyp}$.</p> | | | |
| 21.3 | Finding an angle | <p>Step 1: Identify the ratio to use; as in 21.2.</p> <p>Step 2: Substitute the values into the ratio.</p> <p>Step 3: Solve to calculate x°.</p> <p>SOH CAH TOA</p> $\cos a^\circ = \frac{Adj}{Hyp}$ $\cos a^\circ = \frac{150}{174}$ $a^\circ = \cos^{-1}\left(\frac{150}{174}\right)$ $a^\circ = 30.45 \dots$ $a^\circ = 30.5^\circ \text{ (1 d.p.)}$  <p>To find the value of x, when it lies within a trigonometric function, e.g. $\cos x$, we need to find the inverse of cosine on both sides of the equation. Write this as \cos^{-1}. On your calculator use "shift" or "2nd" key. This will give \cos^{-1}.</p> | | | |

| Section | Topic | Skills | | | |
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| 21.4 | Finding a side | <p>Step 1: Identify the ratio to use; as in 21.2. Step 2: Substitute the values into the ratio. Step 3: Solve to calculate unknown side.</p> <p>SOH CAH TOA</p> $\tan \theta^\circ = \frac{\text{Opp}}{\text{Adj}}$ $\tan 29^\circ = \frac{x}{150}$ $150 \tan 29^\circ = x$ $x = 83.14 \dots = 83.1 \text{ m (1 d.p.)}$ |  | | |
| 21.5 | Finding a harder side | <p>Step 1: Identify the ratio to use; as in 21.2. Step 2: Substitute the values into the ratio. Step 3: Solve to calculate unknown side.</p> <p>SOH CAH TOA</p> $\sin \theta^\circ = \frac{\text{Opp}}{\text{Hyp}}$ $\sin 56^\circ = \frac{78}{b}$ $b = \frac{78}{\sin 56^\circ}$ $b = 94.08 \dots = 94.1 \text{ cm (1 d.p.)}$ |  | | |
| 22 Statistics 2 – Scattergraphs | | | | | |
| 22.1 | Constructing a scattergraph | Scattergraphs display two pieces of information about one data entry. To construct a scattergraph, pick a suitable scale and plot each data entry on a graph with each axis representing each piece of information about the data. | | | |
| 22.2 | Drawing a line of best fit | To draw a line of best fit at National 4 level, we need to draw a line that is going in the same direction as the trend of the points and having roughly the same number of points above and below the line. |  | | |
| 22.3 | Using a line of best fit | Once we have a line of best fit in our scattergraph, we can use that line to make estimates of one of the variables, if we know the other. | | | |
| NUMERACY | | | | | |
| 24 Rounding | | | | | |
| At National 4, learners should develop non-calculator skills and calculators should complement these skills. Calculators may be used in all assessments, except Added Value Part 1. | | | | | |
| 24.1 | Round to decimal places | <p>Examples: 25.1241 → 25.1 (1 d.p.) 34.678 → 34.68 (2 d.p.)</p> | | | |

| Section | Topic | Skills | | | |
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| 24.2 | Round to significant figures | Examples: 1276 → 1300 (2 s.f.) 0.06356 → 0.064 (2 s.f.) 37,684 → 37,700 (3 s.f.) 0.005832 → 0.00583 (3 s.f.) | | | |
| 25 Whole Numbers & Integers | | | | | |
| 25.1 | Adding & subtracting whole numbers | | | | |
| 25.2 | Multiplying & dividing whole numbers | | | | |
| 25.3 | Multiplying & dividing by 10, 100 and 1000 | <p>To multiply whole numbers 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.</p> <p>a. 54×10 $\overset{10}{\curvearrowright} 54$ $= 540$</p> <p>b. 751×100 $\overset{100}{\curvearrowright} 751$ $= 75\,100$</p> <p>To divide whole numbers by 10, 100 or 1000, we move the numbers one, two or three places to the right. Instead of trying to move all the numbers, move one number and the rest will follow. Keep the digits in the same order.</p> <p>a. $80 \div 10$ $= 8$</p> <p>b. $1400 \div 100$ $= 14$</p> | | | |
| 25.4 | Adding & subtracting negative numbers | <p>In any calculation with two signs beside each other, before calculating, rewrite the calculation with only one sign. A negative and positive beside each other can be replaced with a negative. A negative and negative beside each other can be replaced with a positive.</p> <p>$9 + (-5) = 9 - 5 = 4$ $6 - (-12) = 6 + 12 = 18$</p> | | | |
| 26 Fractions, Decimals, Percentages & Ratio | | | | | |
| 26.1 | Simplifying fractions | <p>To simplify fractions, we divide the numerator and denominator by the same number. If you are not sure what number to use, try 2, 3, 4, 5, etc. Always check to see if you can simplify further.</p> <p>a. $\frac{10}{20} \div 10$ $\frac{10}{20} \div 10$ $= \frac{1}{2}$</p> <p>b. $\frac{24}{32} \div 8$ $\frac{24}{32} \div 8$ $= \frac{3}{4}$</p> | | | |

| | | | | | |
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| 26.2 | Equivalent fractions | Equivalent fractions are fractions that have the same value as one another. To find an equivalent fraction, multiply the numerator and denominator by the same number. | | | |
| Section | Topic | Skills | | | |
| 26.5 | Finding a fraction of a quantity | To find a fraction of a quantity, we multiply the quantity by the fraction. To do this, we divide by the denominator and multiply by the numerator . | | | |
| 26.8 | Finding a percentage of a quantity (non-calculator) | To calculate 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), 1% (divide 10% by 2), 20% (multiply 10% by 2), 30% (multiply 10% by 3), etc. Find the following percentages without using a calculator: <ol style="list-style-type: none"> 1. 30% of 28 $100\% = 28$ $10\% = 2.8$ $30\% = 8.4$ 2. 15% of 84 $100\% = 84$ $10\% = 8.4$ $5\% = 4.2$ $15\% = 12.6$ | | | |
| 26.10 | Percentage increase & decrease | Step 1: Calculate the increase. Step 2: Express as a fraction of original amount and multiply by 100. | | | |
| 26.11 | Using ratios | 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. $1 \text{ part} = 90 \div 5 = 18$ Step 3: Share in the given ratio. $3 \times 18 : 2 \times 18$ $54 : 36$ | | | |
| 27 | Time & Measurement | | | | |
| 27.3 | Time intervals | If we know the start time and end time of an event, we can calculate how long that event lasts. Likewise, if we know the start time of an event and how long it lasts, we can work out the end time. How long is the time interval between 9.35 am and 12.05 pm on the same day? Step 1: If the end minutes are less than the starting minutes; then add the number of minutes to take us to the next hour. Step 2: Add on hours to take us to the correct hour. Step 3: Add on the remaining minutes to take us to the correct time.  Duration 2 hours and 30 minutes. | | | |
| 27.4 | Reading scales | When reading scales, the first thing we need to do is to check the gradation of the scale, i.e. we need to check how many increments (spaces) there are from one number to the next. | | | |

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| | | 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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Section | Topic | Skills | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | Statistical Reasoning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29.1 | Reading values from graphical data | <p>There are many types of graphs and charts that illustrate data. Below are a few examples:</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Bar Graph</p> </div> <div style="text-align: center;">  <p>Line Graph</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p>Pie Chart</p> </div> <div style="text-align: center;"> <table style="border-collapse: collapse; margin: 0 auto;"> <tr><td style="border-right: 1px solid black; padding: 0 5px;">0</td><td style="padding: 0 5px;">1</td><td></td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 0 5px;">1</td><td style="padding: 0 5px;">2</td><td style="padding: 0 5px;">3</td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 0 5px;">2</td><td style="padding: 0 5px;">1</td><td style="padding: 0 5px;">6</td><td style="padding: 0 5px;">6</td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 0 5px;">3</td><td style="padding: 0 5px;">3</td><td style="padding: 0 5px;">5</td><td style="padding: 0 5px;">5</td><td style="padding: 0 5px;">6</td><td style="padding: 0 5px;">7</td></tr> <tr><td style="border-right: 1px solid black; padding: 0 5px;">4</td><td style="padding: 0 5px;">4</td><td style="padding: 0 5px;">4</td><td style="padding: 0 5px;">5</td><td style="padding: 0 5px;">8</td><td style="padding: 0 5px;">9</td></tr> <tr><td style="border-right: 1px solid black; padding: 0 5px;">5</td><td style="padding: 0 5px;">1</td><td style="padding: 0 5px;">2</td><td></td><td></td><td></td></tr> <tr><td style="border-right: 1px solid black; padding: 0 5px;">6</td><td style="padding: 0 5px;">0</td><td style="padding: 0 5px;">1</td><td></td><td></td><td></td></tr> </table> <p>$n = 20$ $1 \mid 2 = 12$</p> <p>Stem and Leaf</p> </div> </div> | 0 | 1 | | | | | 1 | 2 | 3 | | | | 2 | 1 | 6 | 6 | | | 3 | 3 | 5 | 5 | 6 | 7 | 4 | 4 | 4 | 5 | 8 | 9 | 5 | 1 | 2 | | | | 6 | 0 | 1 | | | | | | |
| 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 1 | 6 | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 3 | 5 | 5 | 6 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 4 | 4 | 5 | 8 | 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29.2 | Calculating values from a pie chart | <p>In a survey, 20 000 people were asked what their favourite streaming service was. The data is shown in the pie chart. How many people said Amazon?</p> <div style="text-align: right; margin-bottom: 10px;">  </div> <p>Step 1: Find the fraction: $\frac{72}{360}$</p> <p>Step 2: If this is non-calculator, simplify the fraction: $\frac{72}{360} = \frac{1}{5}$</p> <p>Step 3: Multiply by the total amount: $\frac{1}{5} \times 20\,000 = 20\,000 \div 5 = 4000$</p> <p>Answer: 4000 people said Amazon.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29.3 | Reasoning with comparative data | Comparative graphs show the graphs of more than one type of data on a single graph. We read these in the same way as normal graphs. They allow us to compare two or more types of data side by side on a graph. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29.4 | Reasoning with probability | When comparing probabilities, it is necessary for them to either both be decimal fractions, or both be fractions with the same denominator. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |