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# National 4 Mathematics

## Q&A Booklet: Key Facts to Memorise

### Ways of using this booklet:

- 1) Write the questions on cards with the answers on the back and **test yourself**.
- 2) **Work with a friend** who is also doing National 4 Maths to take turns reading a random question and answering.
- 3) **Ask a friend or family member\*\*** to test you by reading questions (on the left-hand side) to you.

The questions are on the left-hand side of each page and the answers are on the right.

\*\*If the person who is testing you has not done National 4 level maths topics recently (or ever!), they may need some help reading the maths symbols, so some mathematical symbols have been written out phonetically (in a smaller bold underlined font) to help them.

Questions with a grey background are also repeated on the formula sheet, but it is still a good idea to memorise them ahead of tests.

## General Skills

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| 1) What two things do you need to include when a question asks you to ' <b>explain your answer</b> ' (or ' <b>justify your answer</b> ' or ' <b>give a reason</b> ')? | Two numbers and a comparing word.                      |
| 2) When a question asks you to round your answer, what do you have to remember?   | Write the unrounded answer as well as the rounded one. |

## Numeracy Outcome 1: Measurement

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|--|------|
| 3) How many <b>centimetres</b> are in a <b>metre</b> ?       | 100  |
| 4) How many <b>metres</b> are in a <b>kilometre</b> ?        | 1000 |
| 5) How many <b>millimetres</b> are in a <b>centimetre</b> ?  | 10   |
| 6) How many <b>grams</b> are in a <b>kilogram</b> ?          | 1000 |
| 7) How many <b>millilitres</b> are in a <b>litre</b> ?       | 1000 |
| 8) How many <b>centimetres cubed</b> are in a <b>litre</b> ? | 1000 |

## Numeracy Outcome 1: Speed, Distance and Time

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| 9) What is the formula for <b>speed</b> ?                              | Speed = $\frac{\text{Distance}}{\text{Time}}$ (or $S = \frac{D}{T}$ ) |
| 10) What is the formula for <b>distance</b> ?                          | Distance = Speed $\times$ Time (or $D = ST$ )                         |
| 11) What is the formula for <b>time taken</b> ?                        | Time = $\frac{\text{Distance}}{\text{Speed}}$ (or $T = \frac{D}{S}$ ) |
| 12) How do you write <b>15 minutes</b> in hours using a decimal point? | 0.25  |
| 13) How do you write <b>45 minutes</b> in hours using a decimal point? | 0.75  |
| 14) What is <b>0.1 hours</b> in minutes?                               | 6 minutes   |
| 15) How do you write <b>6 minutes</b> in hours using a decimal point?  | 0.1   |
| 16) How do you change minutes into hours using a decimal point?        | Divide by six and write the answer after the point                    |
| 17) How do you change hours (with a decimal point) into minutes?       | Multiply the number after the point by six                            |

## Numeracy Outcome 1: Fractions and Percentages

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| 18) How do you calculate a <b>fraction</b> ?                               | Divide by the bottom and times (multiply) by the top   |
| 19) What do you divide by to work out <b>25%</b> ?                         | 4  |
| 20) What do you divide by to work out <b>10%</b> ?                         | 10   |
| 21) What sum do you do to work out <b>75%</b> ?                            | Divide by 4 and times by 3<br><b>Alternative answer:</b> find three-quarters   |
| 22) What do you do to work out <b>30%</b> <u>without</u> a calculator?     | Divide by 10 and times by 3<br><b>Alternative answer:</b> find 10% and times by 3  |
| 23) What sum do you do to work out <b>70%</b> <u>without</u> a calculator? | Divide by 10 and times by 7<br><b>Alternative answer:</b> find 10% and times by 7  |
| 24) What sum do you do to work out <b>3%</b> <u>without</u> a calculator?  | Divide by 100 and times by 3<br><b>Alternative answer:</b> find 1% and times by 3  |
| 25) What sum do you do to work out <b>5%</b> <u>without</u> a calculator?  | Divide by 100 and times by 5<br><b>Alternative answer:</b> find 1% and times by 5<br><b>Alternative answer:</b> find 10% and half it |
| 26) How do you work out a percentage <u>with</u> a calculator?             | <b>either</b> change to a decimal and multiply<br><b>or</b> divide by 100 and multiply   |

## Numeracy Outcome 2: Graphs and Probability

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| 27) What is the probability of something <b>impossible</b> ?         | Zero   |
| 28) What is the probability of something <b>certain</b> ?            | One<br><b>Alternative answer:</b> 100%                               |
| 29) How can you decide which probability is most likely?             | Change all probabilities to a percentage and choose the largest one. |
| 30) How do you change a probability from a fraction to a percentage? | Top number divided by bottom number multiplied by 100.               |

## Expressions and Formulae 1.1: Algebra

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| 31) What does <b>evaluate</b> mean?  | Do the sum  |
| 32) What does <b>factorise</b> mean?   | Put the brackets back in  |
| 33) When writing a formula from a table of values, how do you find the number you multiply by? | Look at the bottom row of the table and identify the number you are 'going up' in |
| 34) How do you calculate a <b>gradient</b> ?   | Vertical distance divided by horizontal distance                                  |

## Expressions and Formulae 1.3: Graphs, Charts, Tables and Statistics

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| 35) If you are asked to draw a <b>frequency table</b> , what does this mean?       | A tally chart.   |
| 36) What two things do you need to remember when drawing a frequency table?        | 1) Three columns: description, tally, frequency<br>2) Headings for columns |
| 37) How do you calculate the angles needed for a pie chart?                        | 360 divided by the 'total' multiplied by the frequency for that 'slice'    |
| 38) How do you find the <b>range</b> ?   | Highest take away Lowest   |
| 39) How do you find the <b>mode</b> ?  | The most frequent number   |
| 40) How do you find the <b>median</b> ?  | The middle number  |
| 41) What do you have to do <u>before</u> you can find the median?                  | Put the numbers in order   |
| 42) How do you find the <b>mean</b> ?  | a) Add all the numbers together<br>b) Divide by how many numbers there are |
| 43) If a <u>mean, median or mode</u> is <b>higher</b> , what comment can you make? | On average the numbers are higher  |
| 44) If a <u>mean, median or mode</u> is <b>lower</b> , what comment can you make?  | On average the numbers are lower   |
| 45) If a <u>range</u> is <b>higher</b> , what comment can you make?                | The numbers are more <b>varied</b>   |
| 46) If a <u>range</u> is <b>lower</b> , what comment can you make?                 | The numbers are more <b>consistent</b>                                     |

## Numeracy/Expressions and Formulae 1.2: Areas and Volumes

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|---|---|
| 47) When do you use <b>squared units</b> e.g. centimetres squared ( $\text{cm}^2$ ) or metres squared ( $\text{m}^2$ )? | When you are working out an area<br><b>Alternative answer:</b> when the formula begins "A ="  |
| 48) When do you use <b>cubed units</b> e.g. metres cubed ( $\text{m}^3$ ) or centimetres cubed ( $\text{cm}^3$ )?       | When you are working out a volume<br><b>Alternative answer:</b> when the formula begins "V ="   |
| 49) How do you find the area of a <b>rectangle</b> ?  | "Length times Breadth"<br><b>Alternative answer:</b> $A = LB$   |
| 50) How do you find the area of a <b>triangle</b> ?   | "Half Base times Height"<br><b>Alternative answer:</b> $A = \frac{BH}{2}$ ( <u>A equals BH over 2</u> )                                     |
| 51) How do you find the volume of a <b>cuboid</b> ?   | "Length times Breadth times Height"<br><b>Alternative answer:</b> $V = LBH$   |
| 52) What is the formula for the <b>area</b> of a circle?  | $A = \pi r^2$ ( <u>A equals pi r squared</u> )  |
| 53) What is the formula for the <b>circumference</b> of a circle?   | $C = \pi d$ ( <u>C equals pi d</u> )  |
| 54) What are the three steps to find the <b>surface area</b> of a cuboid?   | 1) Find the area of the three rectangles<br>2) Add them together<br>3) Double your answer   |
| 55) How do you find the <b>perimeter</b> of a shape with curved sides?  | Use $C = \pi d$ for the curved length and then add on any straight lengths  |
| 56) If you are told the radius, how do you find the <b>diameter</b> of a circle?  | Double it   |
| 57) If you are told the diameter, how do you find the <b>radius</b> of a circle?  | Half it   |
| 58) How do you find the area of a <b>semicircle</b> ?   | Find the area of a circle and then half it<br><b>Alternative answer:</b> $A = \frac{\pi r^2}{2}$<br>( <u>A equals pi r squared over 2</u> ) |
| 59) How do you find the volume of a <b>prism</b> ?  | a) Find the area of the end (cross-section)<br>b) Multiply by the height  |
| 60) What is the formula for the volume of a <b>cylinder</b> ?   | $V = \pi r^2 h$ ( <u>V equals pi r squared h</u> )  |

## Relationships 1.1: Equations and Straight Line Graphs

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| 61) What is the key rule for solving <b>equations</b> ?   | Move to the other side and do the opposite |
| 62) If a straight line is <b>horizontal</b> through the number $a$ , how do you write its equation? | $y = a$                                    |
| 63) If a straight line is <b>vertical</b> through the number $b$ , how do you write its equation?   | $x = b$                                    |

## Relationships 1.2: Pythagoras and Angles

|  |   |
|--|---|
| 64) What are the three steps involved in a <b>Pythagoras</b> question?                 | <ol style="list-style-type: none"> <li>1) Square</li> <li>2) Add or take away</li> <li>3) Square root</li> </ol>    |
| 65) When do you choose to <b>add</b> in a Pythagoras question?                         | If the side you are finding is the longest one  |
| 66) When do you choose to <b>take away</b> in a Pythagoras question?                   | If the side you are finding is a shorter one  |
| 67) On a test paper, what phrase might be a clue to use Pythagoras?                    | "Do not use a scale drawing"  |
| 68) What do the three angles in a <b>triangle</b> always add up to?                    | 180 degrees   |
| 69) What do the four angles in a <b>quadrilateral</b> always add up to?                | 360 degrees   |
| 70) What is a tangent to a circle?   | A line that just touches the edge of the circle at one point  |
| 71) When you have a circle diagram including a tangent, what can you say about angles? | The angle between the tangent and the radius is a right angle   |
| 72) What do you know about the angle in a semicircle?                                  | It is a right angle   |
| 73) In which two places can you find right angles in circle diagrams?                  | <ol style="list-style-type: none"> <li>1) Between a tangent and radius</li> <li>2) Angle in a semicircle</li> </ol> |

| <b>Relationships 1.3: Trigonometry (SOH CAH TOA)</b>   |  |
|--|--|
| 74) On a test paper, what phrase might be a clue that you have to use either Pythagoras or SOH CAH TOA?                  | “Do not use a scale drawing.”  |
| 75) If a question has the <b>opposite</b> and <b>hypotenuse</b> , do you use sin ( <u>pronounced sine</u> ), cos or tan? | sin  |
| 76) If a question has the <b>adjacent</b> and <b>opposite</b> , do you use sin ( <u>pronounced sine</u> ), cos or tan?   | tan  |
| 77) If a question has the <b>hypotenuse</b> and <b>adjacent</b> , do you use sin ( <u>pronounced sine</u> ), cos or tan? | cos  |
| 78) What is the formula for <b>tan</b> ?   | $\tan x = \frac{\text{opposite}}{\text{adjacent}}$ <p style="text-align: center; margin: 0;"><small>(tan x equals opposite over adjacent)</small></p>      |
| 79) What is the formula for <b>sin</b> ? ( <u>pronounced sine</u> )  | $\sin x = \frac{\text{opposite}}{\text{hypotenuse}}$ <p style="text-align: center; margin: 0;"><small>(sine x equals opposite over hypotenuse)</small></p> |
| 80) What is the formula for <b>cos</b> ?   | $\cos x = \frac{\text{adjacent}}{\text{hypotenuse}}$ <p style="text-align: center; margin: 0;"><small>(cos x equals adjacent over hypotenuse)</small></p>  |
| 81) When do you use the SHIFT button on the calculator in a SOH CAH TOA question?  | To calculate an angle  |
| 82) A SOH CAH TOA question asks you to find the angle: what are the two main steps?                                      | 1) Divide<br>2) Use shift (or inverse) sin/cos/tan   |
| 83) A SOH CAH TOA question asks you to find a length: what are the two main steps?                                       | 1) Multiply by the number on the bottom<br>2) Use normal sin/cos/tan   |
| 84) How do you know whether to use SOH CAH TOA or Pythagoras?  | If there is an angle in the question, you use SOH CAH TOA. If its only lengths, you use Pythagoras.  |

## Relationships 1.4: Scatter Graphs

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| 85) Does a line of best fit need to go through the origin? | No  |
| 86) If a question asks you to 'estimate' what do you do?   | Use your line of best fit to read off the graph |

## Whole Course: Choosing the correct Method

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| 87) If a question has a <b>circle</b> in, and isn't about angles, what do you need to do to get most of the marks? | Use either $A = \pi r^2$ or $C = \pi d$<br><b>(A equals pi r squared or C equals pi d)</b>  |
| 88) If a question contains the phrase " <b>do not use a scale drawing</b> ", which two topics might it be?         | 1) Pythagoras<br>2) SOH CAH TOA   |
| 89) If a question asks you to <b>solve algebraically</b> , what do you have to do?                                 | Move things from one side to the other and <b>do the opposite</b> (and if you don't, you'll get zero marks even if you have the right answer) |
| 90) If a question asks you to calculate a (straight) distance or length, which two topics might it be?             | 1) Pythagoras<br>2) SOH CAH TOA   |