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Maths Formula Sheet

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| **Topic** | What it is: | **Formula:** | **What it means and when to use it:** |
| **Surds** | Simplification of Surds |  | If two numbers are underneath a radical sign, they can be rewritten. This is used to simplify surds. |
| Squaring Surds |  | If the index of the radical sign and the index of the radicand (or the entire surd) are equal, then it can be simplified into just the radicand. |
| Dividing Surds |  | This formula is used to divide surds. Square root a over square root b becomes square root a over b. |
| Rationalising the Denominator (Surd only) |  | To rationalise the denominator, you need to multiply the fraction by the denominator over itself. It is used when making the denominator a rational number, instead of a surd. |
| Rationalising the Denominator (Integer and Surd) |  | When the fraction’s denominator has an integer and a surd, you use the conjugate of the denominator (the same equation with the sign flipped from + to – and vice versa) instead of just the surd.  This only applies to denominators which have integers adding or subtracting a surd, not multiplying. To multiply, use the method above, but exclude the integer when multiplying with the denominator over itself. |
| Multiplying, adding, and subtracting Surds |  | Multiplying, adding, and subtracting surds is the same as that with algebraic terms. |
| **Indices** | 1st Index Law |  | When multiplying like terms with indexes, the indexes add up. |
| 2nd Index Law |  | When multiplying like terms with indexes, the indexes subtract. |
| 3rd Index Law |  | Any number to the power of 0 is one. |
| Indices and Brackets |  | When both the term inside the brackets and the brackets itself have indexes, they are multiplied. |
| Negative Indices |  | When the index is negative, the result is 1 over the number that comes from the same number with a positive index. If the index is negative on the denominator, it can be flipped to become the numerator, which makes the index positive. Naturally, the opposite is true for the numerator. |
| Indices and Surds |  | An index can be rewritten into a surd if it is a fraction. The denominator is the index of the surd, and the numerator is the index of the radicand, which would be the base. |
| **Logs** | Log to Index Formula |  | You can rewrite an index term like this. |
| 1st Log Law |  | Two logs with the same base can multiply bases when adding. |
| 2nd Log Law |  | Two logs with the same base can divide bases when subtracting. |
| 3rd Log Law |  | If a log has an exterior index (an index applying to the log), the log can be multiplied by that index. |
| 4th Log Law |  | Any log with a product of 1 is equal to 0. This is because anything to the power of 0 is equal to 1. |
| 5th Log Law |  | If the base and the product are the same, the result is 1. |
| 6th Log Law |  | If the product of a log is a number over 1, the log changes to separate the two logs. |
| 7th Log Law |  | If the product has an index, the result is the value of that index. This assumes the base of the log and the base of the index are the same. |
| **Pythag**  **Trig I** | Pythagoras’ Theorem |  | Pythagoras’ Theorem states a squared plus b squared is equal to c square, assuming a and b represent the two smaller sides, and c represents the biggest side (the hypotenuse). |
| SOH, CAH, TOA |  | The equalities between the trigonometric functions (sine, cosine, and tangent) and the corresponding sides. |
| Finding Angles |  | How to find angles. Simply switch out sin^-1 with the trigonometric function and its corresponding sides. |
| **Circle Geom’** | Triangle Angle Theorem |  | A + B + C = 180, where A, B, and C, are different angles on a triangle. |
| *Circle Theorems are not included due to their length. Copy down the Circle Theorems from Jacplus* | | | |
| **Trig II** | Sine Rule |  | The sine rule states that the side a over the sine of angle A (where a and A are on opposite sides of a triangle; side a is not adjacent to angle A) are equal to b over sin B and c over sin C, where the same properties apply.  This can be used to find the sides and angles of a triangle if you only have three values, which includes both a side and an angle which are opposite to each other (a and A, b and B, c and C) |
| Area Formula |  | The formula to find the area of a triangle, where b and c are sides adjacent to A, and A is an angle. |
| Cosine Rule |  | The rule to find the length of a side squared. Simply square root both sides to find the missing side.  This formula assumes you have the value of an angle (A) and the two sides adjacent to it (b and c) |
| Modified Cosine Rule to find the Angle |  | A modified version of the cosine rule that allows you to find an angle using the three sides of the triangle. |
| Unit Circle Triangle, where y = r |  | In a triangle on the unit circle, where the hypotenuse is equal to the radius of the circle, which is 1, and one point of the triangle lies on the circumference, and another point of the triangle lies on the centre of the circle (0,0). |
| Radians to Degrees: |  | Used when converting radians to degrees. |
|  | Degrees to Radians: |  | Used when converting degrees to radians. |
|  | X-intercept: | c = y-intercept  m = gradient | Used when wanting to find the x intercept in the form y=mx+c |
|  | Y-intercept: | Say your equation is y=2x+c and you know this line passes through the point (-1,2). Substitute that point in the equation for its respective x and y values, eg: 2=2(-1)+c and solve for c which = 4 in this case. | Used when trying to find the y-intercept when you only have a gradient and a point the line passes through. |
|  | Point Line (Finding a Line using the Gradient and a point) |  | If you are only given a gradient and a point that the line passes, you can find the equation for that line using the below formula.  In this case, y1 and x1 are the y and x coordinates of the point.  Say we have a gradient of 0.5 and the point (4,5). We know what y1 is, so we can move it to the right. Our equation is now: |
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|  | Gradient of perpendicular line: |  | Used to find the gradient of a line to a line perpendicular when only two points of one line are shown. |
|  | Ways to sketch Graph: | Intercept method – solve for both x and y- intercepts and then sketch a line between the two.  Gradient and y-intercept method – Plot a dot/point on the y-intercept and then go across right by one on the x-axis and then up or down by your gradient. | Different ways to sketch a graph. |