Math Notes

Significant Figures, Indices and Standard Form

PART 1 - Decimal Places and Significant Figures

RECAP

Estimation

- If 378 is to be rounded to nearest 10, 380 is the correct answer as it is nearer to 378.
- Similarly, if 42449 is to be rounded to nearest 100, 42400 is the correct answer.
- When given questions like this: 1999 rounded to nearest 10, 2000 is the correct answer.

Rounding off to Decimal Places

- When asked to round off to decimal places, it is similar to the above examples, except instead of nearest 10, it would be 0.1, 0.01 and so on.
- Firstly, you consider the digit on the right of the desired decimal place.
- Next, if the digit on the right is less than 5, write the answer to required amount of decimal places without changing any digits in front.
- Else, if the digit on the right is 5 or more, write the answer to the required amount of decimal places, but add one to the final digit.
- EG. Round off 84.66666666 to 3 decimal places.
  Answer would be 84.667.
- EG2. Round off 13.111 to 1 decimal place.
  Answer would be 13.1.

Accuracy

- If a value is so small, such as 0.0000000999, correcting it to 3 decimal places would get you 0.000, which is pointless.
- With Significant figures, you can correct it such that you would still get a value of some use.

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Significant Figures

- All non-zero figures are significant
- Zero at the end of a decimal are significant
- Zeroes at the end of a whole number may be significant depending on how the estimation is made
- Zeroes that lie between significant figures are significant
- Space holding zeroes in numbers less than 1 are insignificant.
- The first significant figure is the first non-zero digit from the left.
- EG. 0.00405
  4 is the first significant figure, followed by 0, then 5.
  The zeroes before 4 is not significant.

Application

- All irrational numbers should be rounded off to 3 significant figures unless told otherwise or is already accurate (In other forms such as fractions).
- All currencies should be rounded off to 2 decimal places.
- All angles should be rounded to 1 decimal place.
- Label every round off/estimation after doing so
  EG. 13.111 = 13.1 (1 d.p)
  EG2. 13.111 = 13.1 (3 s.f.)

Math Notes

PART 2 - Indices

Index Notation

- A number in index notation is written as where a is the base and n is the power/index
- It is the same as writing a x a x a x a .... a x a x a, where a appears n times

Laws of Indices (^ is power, / is divide)

- (a^m) x (a^n) = a^(m+n)
- (a^m) / (a^n) = a^(m-n)
- (a^m)^n = a^(mn)
- a^0 = 1, where a is not 0.
- a^(-n) = 1/(a^n), where a is not 0.
- b/(a^(-n)) = b(a^n)
- (a/b)^(-n) = (b/a)^n
- a^(m/n) = (n√a)^m, where n√ is n root, not n times square root a.
- (a/b)^(m/n) = (n√(a/b))^m)
- a^-(m/n) = 1/((n√a)^m)
- (a/b)^-(m/n) = 1/(n√(a/b))^m)
- (a^n)/(b^n) = (a/b)^n
- (a^n) x (b^n) = (ab)^n

Raw Notes Form ->

Exponential Equations

- When the unknown value, x is now the index/power in an equation, we call it an exponential equation.
- If a^x = a^n, x = n, where a is not 0, 1 or -1.
- Always make the base equal before solving the equation.

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Part 3 - Standard Form

Standard Form

- It takes the form of $A \times 10^b$
- A must be less than 10, but more than or equal to 1.
- When A is smaller than 1, move the decimal place from left to right. For every movement to the right, b decreases by 1.
- When A is 10 or larger, move the decimal place from right to left. For every movement to the left, b increases by 1.

Plus and Minus Logic

- $an + bn = (a+b)n$
  EG. $(2\times10^3) + (3.6\times10^4) = (0.2\times10^4) + (3.6\times10^4) = 3.8\times10^4$
- $an - bn = (a-b)n$
  EG. $(7\times10^5) - (5.2\times10^4) = (7\times10^5) - (0.52\times10^5) = 6.48\times10^5$
- Always have the power of 10 be equal before continuing with the addition or subtraction

Multiplication and Division Logic

- $an \times bm = anbm$
  EG. $(3\times10^{-7})(3\times10^{-8}) = 9\times10^{-15}$
- $an / bm = an/bm$
  EG. $(2\times10^5) / (4\times10^{-2}) = 0.5\times10^7 = 5\times10^6$
- Does not have to have equal power to continue with multiplication or division

Conversion

- $0.56 = 5.6 \times 10^{-1}$
- $0.0564 = 5.64 \times 10^{-2}$
- $0.005648 = 5.648 \times 10^{-3}$
- $560000 = 5.6 \times 10^5$