Trial and Improvement.

To Find a Square Root.

- To find a square root of a number, you have to find a number which when multiplied by itself gives the number under the square root.
- Try to estimate the value of an unknown as closely as possible. For example, if you have to find $\sqrt{300}$, do not guess a value such as 5 or 100. Use mental estimation first. You know that $10^2 = 100$ and $20^2 = 400$
- Start off with a whole number.
- Once you have determined which two whole numbers the answer could lie, make your next estimation with a number to one decimal place.
- Substitute the value and calculate the result.
- By careful examination you will be able to make your next guess to get a closer result.
- Carry on improving your guess until the value of the unknown is found **to the degree of accuracy required**.
- Remember if you have to round off to 1 decimal place you have to calculate to 2 decimal places and then round to the 1 decimal place required.
- Be sure to write down all your calculations to show the examiner how you got the answer.

To Find a Cube Root.

- This is just as above, but remember you are looking for a number which when multiplied by itself twice will give the answer under the cube root. i.e. $\sqrt[3]{27} = 3$ because $3x3x3 = 27$

To solve an equation by trial and improvement.

If the unknown is on both sides of the equation, you have to substitute your estimate for the unknown into **both** sides of the equation **every time** you test your guess. You must try to get both sides of the equation as close to each other as possible.

Example

Solve for x (correct to 1 decimal place) by trial and improvement.

$2x + 7 = 23 - x$

Start off estimating a whole number. If you are not sure try a number and see how far you are out.

Try **x = 2**

2x + 7	=	23 – x
2(2) + 7	=	23 – 2
11	=	21 (difference =11)

You have to make the left hand side bigger and the right hand side smaller so we need to guess a bigger number for x

Try **x = 4**

2x + 7	=	23 – x
2(4) + 7	=	23 – 4
15	=	19 (difference = 4)

This is closer but still not close enough

Try **x = 5**

2x + 7	=	23 – x
2(5) – 7	=	23 – 5
17	=	18 (difference = 1)

Still not quite

Try **x = 6**

2x + 7	=	23 – x
2(6) – 7	=	23 – 6
19	=	17 (difference = 2)

We have now gone too far the value of x must lie **between 5 and 6.** Now our estimate must include one decimal place.

Try **x = 5.3**

2x + 7	=	23 – x
2(5.3) – 7	=	23 – 5.3
17.6	=	17.7 (difference=0.1)

Much closer lets

Try **x = 5.4**

2x + 7	=	23 – x
2(5.4) – 7	=	23 – 5.4
17.8	=	17.6 (difference=0.2)

x = 5.3 is looking very good, but just to double check

Try **x = 5.2**

2x + 7	=	23 – x
2(5.2) – 7	=	23 – 5.2
17.4	=	17.8 (difference=0.4)

Conclusion the solution to $2x + 7 = 23 - x$ is **x = 5.3**
(correct to one decimal place).