```cpp
// Author: M. Merculio
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// Description: Conversion Program

#include <iostream>  // for cin, cout
#include <string>
#include <cmath>

using namespace std;

int main()
{
string init_unit, sec_unit;  //declaration of the conversion units
double conv_val;     //declaration of the number to be converted

// Welcome message
cout<< "---------------------\n"
<< "| length Convertion |\n"
<<     "---------------------\n\n";

//request conversion unit
cout<<"Enter initial conversion unit (mm, cm, m, km): \n";  //user enters units
cin>>init_unit;

if (init_unit != "mm" && init_unit != "cm" && init_unit != "km" )
{
cerr<<"--> Sorry, unit to convert from is invalid\n"
<<"Thank you for using Metric Unit converter Program\n";
}
else
{
cout<<"Enter unit to convert to (mm, cm, m, km): \n";   //user enters units
cin>>sec_unit;

}
if (sec_unit != "mm" && sec_unit != "cm" && sec_unit != "m" && sec_unit != "km")
{
cout<<"--> Sorry, unit to convert TO is invalid\n"
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "mm" && sec_unit == "cm")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val*10<<" "<<sec_unit<<endl //cm=mm*10
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "mm" && sec_unit == "m")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val*100<<" "<<sec_unit<<endl //m=mm*100
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "mm" && sec_unit == "km")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val*100000<<" "<<sec_unit<<endl //km=100000*mm
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "cm" && sec_unit == "mm")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val/10<<" "<<sec_unit<<endl //cm=mm*10
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "cm" && sec_unit == "m")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
```

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<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "cm" && sec_unit == "m")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val*10<<" "<<sec_unit<<endl //cm=m*10
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "cm" && sec_unit == "mm")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val/10<<" "<<sec_unit<<endl //cm=mm*10
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "cm" && sec_unit == "m")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val*10<<" "<<sec_unit<<endl //m=cm*10
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "cm" && sec_unit == "km")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val*10000<<" "<<sec_unit<<endl //km=10000*cm
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "m" && sec_unit == "mm")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val/100<<" "<<sec_unit<<endl //m=mm*100
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "m" && sec_unit == "km")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val/1000<<" "<<sec_unit<<endl //km=1000*m
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "km" && sec_unit == "mm")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val/100000<<" "<<sec_unit<<endl //km=100000*mm
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "km" && sec_unit == "cm")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val/10000<<" "<<sec_unit<<endl //km=10000*cm
<<"Thank you for using Metric Unit converter Program\n";
}
else if (init_unit == "km" && sec_unit == "m")
{
cout<<"Enter numerical value to convert: \n";
cin>>conv_val;
cout<<"Result of conversion: "<<conv_val<<" is equivalent to "<<conv_val/1000<<" "<<sec_unit<<endl //km=1000*m
<<"Thank you for using Metric Unit converter Program\n";
}
system("Pause");
}
```

Output

```
--------------------
| length Convertion |
--------------------

Enter initial conversion unit (mm, cm, m, km):
mm
Enter unit to convert to (mm, cm, m, km):
cm
Enter numerical value to convert:
300
Result of conversion: 300 is equivalent to 3000 cm
Enter initial conversion unit (mm, cm, m, km):
cm
Enter unit to convert to (mm, cm, m, km):
m
Enter numerical value to convert:
300
Result of conversion: 300 is equivalent to 3000 m
Enter initial conversion unit (mm, cm, m, km):
km
Enter unit to convert to (mm, cm, m, km):
m
Enter numerical value to convert:
320
Result of conversion: 320 is equivalent to 0.32 m
Enter initial conversion unit (mm, cm, m, km):
km
Enter unit to convert to (mm, cm, m, km):
cm
Enter numerical value to convert:
342
Result of conversion: 342 is equivalent to 0.0342 cm

...Program finished with exit code 0
Press ENTER to exit console.
```