

Calculating Scale 计算比例

English Name 英文名字: _____ Grade and Class 年级班级: ____ - ____

Scale is an important part of Architectural Drawings. The definition of scale according to the dictionary is:

比例是建筑绘图非常重要的一部分，在字典里比例的定义如下：

Scale:

With a uniform reduction or enlargement.

In proportion to the surroundings (of a drawing or model):
Example: *It is hard to build models to scale from a drawing.*

比例:

统一的缩小或放大

跟周围环境的比例（如图或模型）

例：很难根据图片按比例制作模型。

When making Architectural Drawings it is very important that the proportions of object remain the same. It is also important to understand how sizes relate when enlarged or reduced.

在制作建筑绘图时一定要注意物体的比例是保持不变的，还有当放大或缩小时比例之间联系。

Reduction in scale is common in Architecture, as it would not be possible to draw a building on paper at the size it will be built. Therefore all the measurements are reduced.

在建筑中缩小比例是非常常见的，因为想按照建筑原来的大小在纸上画下了是不太可能的，所以要所有的数据都同时缩小。

Scale is easy to calculate using the metric measuring system. Metric measurements are used by most countries around the world. The Metric System is very easy to use. As you move up and down the scale you simply move the decimal place.

用公制测量单位来计算比例是非常简单的.很多国家都是有公制测量。公制测量单位很好使用，当你想增大或减小比例只要变动一下小数位就行了。

Imperial Measurements are used in America. Canada Uses both Metric and Imperial Measurements because of the close relationship with America. Imperial measurements are much more difficult to calculate because fractions and irregular intervals are used when converting between the various measurements in the scale.

在美国使用的是英制测量单位，加拿大由于跟美国关系较密切所以两种测量系统都使用。英制单位要更为复杂一些，因为在换算比例时小数和不规则的间隔很多。

Calculating Scale 计算比例

Look at the Measurement scales for both the Imperial and Metric measuring systems. There are many units of measurements. The 4 most commonly used measurements are shown in **RED**.

请看下列两种测量单位，每一种都包括很多种小的单位，其中最常用的四种已用**红色**字体标注出来。

Metric Measurement Scale | 公制计量单位

Kilometer	千米	1,000
Hectometer	百米	100
Decameter	十米	10
Meter	米	1
Decimeter	分米	0.1
Centimeter	厘米	0.01
Millimeter	毫米	0.001
Micrometer	微米	0.000,001
Nanometer	纳米	0.000,000,001

Imperial Measurement Scale (America) | 英制测量单位 (美国)

Mile (8 Furlongs)	英里 (8弗隆)	63,360
Furlong (10 Chains)	弗隆 (10链)	7920
Chain (22 Yards)	链 (22码)	792
Yard (3 Feet)	码 (3英尺)	36
Foot (12 Inch)	英尺 (12寸)	12
Inch	英寸	1
1/2 Inch	1/2 英寸	0.5
1/4 Inch	1/4 英寸	0.25
1/8 Inch	1/8 英寸	0.125
1/16 Inch	1/16 英寸	0.0625
1/32 Inch	1/32 英寸	0.03125

Calculating Scale 计算比例

Determining Scale | 确定比例

Determining scale is very important for Architectural Drawing and model building. Scale is shown as a ratio between two different sets of dimensions. (The dimensions of the actual object, and the reduced or enlarged dimensions of the drawing or model)

在绘图时确定比例是非常重要的一步，比例是指两个不同维度之间的关系。（物体原本维度及被放大或缩小之后的吐血或模型）

The formula for determining scale is simple. However remember that you might need to convert numbers to the same unit of measurement. Converting Metric Units of measurements only requires moving the decimal place, where converting Imperial units will be more complicated.

确定比例的公式非常的简单，但是要注意单位的统一。公制测量单位只需移动小数点位置就可以了，而英制测量单位则要复杂多了。

to calculate scale you must know the following:
在计算比例时需了解以下：

S	=	Scale 比例
AS	=	Actual Size 实际大小
MS	=	Model Size 模型大小

Scale = Actual Size / Model Size
比例 = 实际大小 / 模型大小

Calculating Scale 计算比例

Example 1 | 例1

A model car that you bought is 20cm long. The car is 3 meters long in real life. What is the correct scale of the car model?

你购买的模型车长20cm，而该车的实际长度是3m,那么该模型车的比例是多少？

Step 1: Covert meters to centimeters

第一步：把米转化成厘米

3 meters = 300 centimeters

3米 = 300厘米

Step 2: Calculate scale

第二步：计算比例

Scale 比例 = $300 / 20$

Scale 比例 = 15

Therefore 1 centimetre on the model is equivalent to 15 centimetres on the real car. This is also written as a scale of 1/15

所以该模型的1厘米相当于实际的15厘米，该比例写为1/15。

Example 2 | 例2

The Eiffel Tower in Paris France is a cultural land mark. The Eiffel tower is 300 meters tall. At the gift shop you can buy model replicas of the tower that are 20 centimetres tall. Determine the scale of the model. Show all steps of your calculations.

法国的埃菲尔铁塔是一个著名的地标。该塔高达300米，而在礼品店你可以买到20厘米高的模型。请你计算该比例是多少，并写出步骤。

Calculating Scale 计算比例

Calculating Scale Vocabulary | 计算比例词汇

Area	面积
Beam (width of a ship)	船宽 (船的宽度)
Centimeter (cm)	厘米 (cm)
Conversion	转换
Feet (Plural form of foot)	英尺 (复数形式)
Foot (Singular form)	英尺 (单数形式)
Height	高度
Imperial Measurement	英制测量
Inch	英寸
Meter (m)	米 (m)
Metric Measurement	公制测量
Model	模型
Scale	比例
Size (Actual Size or Model Size)	大小 (实际大小或模型大小)
Width	宽度

Calculating Scale 计算比例

Activity 1 | 活动 1

The F-16 Fighter jet also known as the Falcon was a lightweight fighter jet developed in 1976 for the United States Air Force (USAF). It quickly evolved into a successful multipurpose aircraft. This aircraft had numerous innovations such as a frameless bubble canopy for better visibility.

F-16战斗机又称为Falcon（猎鹰战斗机）是1976年美国空军（USAF）研制出的一种轻型战斗机。随后演变为一架多功能的飞机。该飞机融进了多种新科技，如为了更好地能见度使用了无骨架舱盖。

The plane weighs 8,570 kg (Kilograms) and is 15.06 meters long. The plane has a wingspan of 9.96 meters and the total area of the wings covers 27.87 m². The F-16 is capable of speeds of 2,410 km/h. If traveling at the plane's top speed an F-16 could take off in Beijing and land in Shanghai 1,069 km away in under 30 minutes. This is an impressive plane which has been a very important part of American Aviation.

该飞机重达8,570千克，长达15.06米，机翼长达9.96米，且机翼面积达到27.87平方米。F-16失速可达2,410千米/时，如果从北京出发到上海只需30分钟。在美国航空史上这架飞机起了至关重要的作用。

A scaled model is 20.1 cm in length and want to know the scale. Calculate the following questions about this model airplane and determine the scale ratio.

现在已知模型长度是20.1厘米，那么该比例是多少。计算下列关于该飞机模型的问题和比例。



F-16 Fighter Jet (Falcon)
F-16战斗机 (Falcon)

Calculating Scale 计算比例

1. How long is the F-16 Fighter Jet? (Meters)
该 F-16 战斗机多长? (米)
2. Convert the length of the F-16 from meters to centimetres
把 F-16 战斗机的长度从米换算成厘米。
3. What is the length of the F-16 Model
F-16 战斗机模型的长度是多少?
4. Calculate scale. (Show all steps in your math)
计算该比例。(写出具体的步骤)

Scale = Actual Size / Model Size
比例 = 实际大小 / 模型大小

5. Now that you know the scale calculate the following dimensions of the model. Convert the scale of the model from centimetres to the "American Imperial Measurements". 1 centimetre is equal to 0.3937 Inch. Round your answer to 1 decimal place.
根据你所得出的比例来计算该模型的其他规格。最后把比例从厘米换算成“英制测量单位”，1厘米等于 0.3937 英寸，且答案保留 1 位小数。

Dimensions 规格	Meters 米	Centimeters 厘米	At Scale 模型大小	Conversion 换算
Length 长度	15.06 m	1,506 cm	20.1 cm	7.9 Inch
Width 宽度	4.88 m			
Hight 高度				
Wing Area 机翼面积				

Activity 2 | 活动 2

Calculating Scale 计算比例

The RMS Titanic was one of 3 Ships built by “White Star Line” as part of their “Olympic Class Ocean Liners”. These three ships were the most luxurious ships ever built until that point in history. The “Titanic” was the most impressive of all the ships. It was larger, more luxurious and was thought to be **“UNSINKABLE”** since it was designed with water tight doors dividing the ship. If the hull was damaged the water tight doors would contain the leak in that area of the ship which would prevent the ship from sinking.

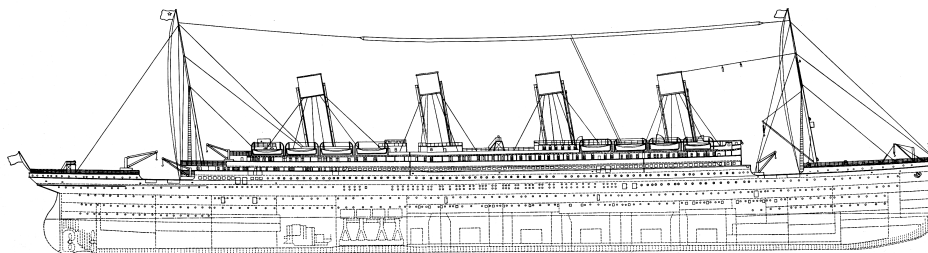
RMS泰坦尼克号是“白色航运公司”建造的“奥运类远洋航班”中的3艘豪艇中的一个，这3艘船是在那时最为豪华的，而泰塔尼克号是其中最令人叹为观止的。她庞大、豪华，被认为是“永不沉没的”，因为整艘船被水密门隔开。如果船体被损坏，水密门会保存船上进入的水而阻止船下沉。

The Titanic was famous for its innovation, but the Titanic is not remembered today for its Engineering marvels but the devastating maiden voyage. The Titanic, the **“UNSINKABLE”** ship, sank on April 15th 1912 on its first crossing from Southampton in the United Kingdom to New York City in America.

泰塔尼克号因其设计新颖而出名，但是现今并不是因为其工程浩远被人铭记，而是其一次毁灭性的海上航行。1912年4月15日，这艘号称“永不沉没的”船在其从英国的南安普敦到美国纽约的处女之行中沉入了海底。

There were 2,224 people aboard the Titanic when it set sail for America. Only 710 passengers were saved the night the Titanic sank. 1514 passengers lost their lives. There were only enough life boats for half of the passengers aboard. Even with the limited amount of lifeboats many of the life boats were only half full when they were lowered into the ocean. Many lives could have been saved, however many people thought that the boat could not sink. After the Titanic disaster, recommendations and changes were made to improve passenger safety. Mandatory life boat drills were implemented and the amount of life boats aboard a ship was increased to accommodate every passenger aboard.

在这艘开往美国的泰塔尼克号上有 2,224乘客，在其沉没的那晚只有710个幸存者，其他1514个乘客全都丧身海底。当时仅有能救一半乘客的救生艇，更糟糕的是这些救生艇并没有坐满，因为他们都相信这是一艘“永不沉没的船”。在这次灾难之后，海上航线考虑到乘客的安全做了很多改善，并进行了多次的强制性救生演习，同时也增加了救生艇的数量。



Calculating Scale 计算比例

The Titanic was 269.0 meters long, and weighted a total of 52,310 tons. The Titanic was propelled by two 3-blade propellers and could travel at speeds of 44km/h. A scale model of the Titanic is available which is 67.25 centimetres long.

泰坦尼克号船长 269.0米，重达 52,310吨，并使用了3叶的螺旋桨，其航行时速可达 44千米/时。现由泰坦尼克号模型一个，其长度是 67.25厘米。

Calculate the model scale: (Show all your calculations)
计算该模型比例。（写出具体计算步骤）

Using the Scale Ratio you calculated determine the Height of the actual Titanic by using the measurements of the model. If we use division to calculate the size of a reduced model what formula would we use to calculate the size of the original from measurements from a model?

已知模型的高度，根据你所得到的比例，计算泰坦尼克号的实际高度。如果我们使用除法来计算模型的大小，那么现在知道模型的大小来计算实际大小应该使用什么公式？

Dimensions 规格	The Titanic 泰坦尼克号	Scale Model 模型大小
Length 长度	269.0 m or 26,900 cm	
Height 高度		13.235 cm
Beam 船宽		7 cm

**Beam is the term used to describe the width of a ship at its widest point.*

*船宽指船的宽度，在英语中用*beam*这个单词来表示。

Calculating Scale 计算比例

Now that you have calculated the dimensions of the Titanic in Metric convert the units to Imperial Measurements.

现在你已计算出泰坦尼克号规格了，下面把公制计量单位换算成英制计量单位。

Dimensions 规格	The Titanic (cm) 泰坦尼克号 (厘米)	Convert to Feet and Inches 转换成英尺和英寸
Length 长度	26,900 cm	$26,900 \text{ cm} \times 0.3937 \text{ cm/inch}$ 10590 inch 12 inch/foot $10590 \text{ inch} \div 12 \text{ inch/foot}$ 882.5 feet $.5 \text{ feet} \times 12 \text{ inch/foot}$ 6 Inch 882 Feet 6 Inches
Height 高度		
Beam 船宽		