Chapter 5: Mass, Temperature, and Volume

We will look at further conversions between the metric and imperial systems in this chapter and learn how to apply them to real life situations.

Temperature

Have you ever noticed how cooking temperatures for most frozen meals are given in °F yet we measure the outside temperature in °C? How do we compare the temperatures in these two systems of measurement?

BAKE

1. Preheat oven to 400°F. Remove plastic wrap from meatballs and place meatballs in a baking dish. Heat meatballs thoroughly according to times below or until internal temperature reaches 160°F.

Defrosted: 20-25 minutes

Frozen: 30-35 minutes

MICROWAVE

1. Remove plastic wrap from meatballs and place meatballs in a microwave safe dish. Heat meatballs thoroughly according to times below or until internal temperature reaches 160°F.

Defrosted: 3-5 minutes

Frozen: 5-7 minutes

CROCKPOT

1. Remove plastic wrap from meatballs. Place meatballs in crockpot and heat on highest setting according to times below or until internal temperature of meatballs reaches 160°F.

Defrosted: 1.5-2 hours, stirring periodically for even heating

Frozen: 2-2.5 hours, stirring periodically for even heating

STOVETOP

1. Preheat nonstick skillet tomedium low heat. Remove plastic wrap from meatballs and place meatballs in skillet. Panfry over medium low heat, covered, according to times below or until internal temperature reaches 160°F.

Defrosted: 16-20 minutes, turn frequently for even heating

Frozen: 20-25 minutes, turn frequently for even heating

Appliances vary. Heating times approximate.

5.1 - Temperature Conversions

FACTS...

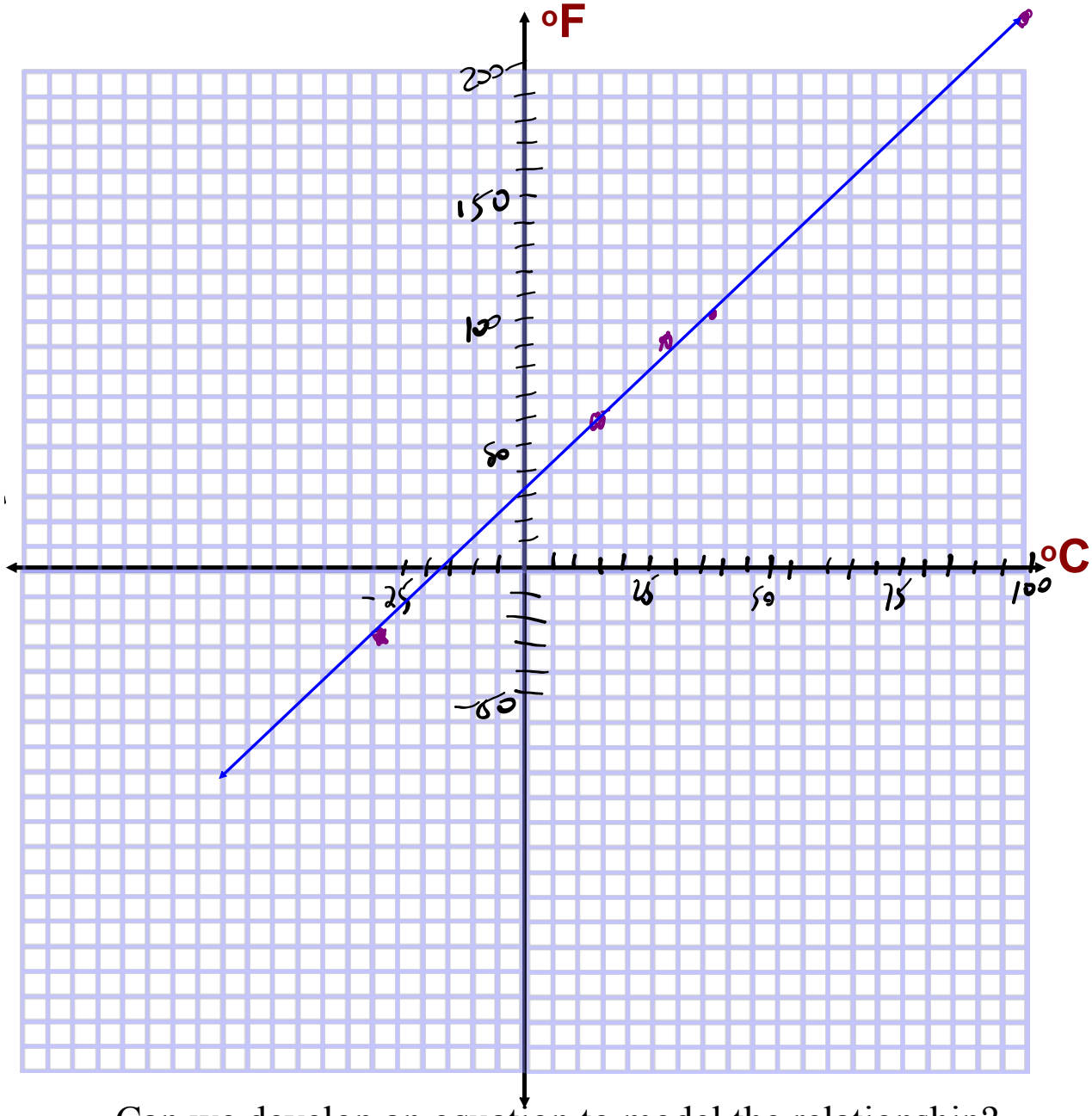
- most North Americans use cooking temperatures in Fahrenheit.
- stoves and recipes are usually in ^{o}F.
- SI system came into play in 1970's...before that was Fahrenheit only.

Degrees in Fahrenheit versus Degrees in Celsius

ACTIVITY 5.1 p. 189

EQUIVALENCIES IN FAHRENHEIT AND CELSIUS UNITS

Example	°F	°C
Bitterly cold day	-22	-30
Mild day	59	15
Hot day	81	27
Normal body temperature	98.6	37
Boiling water	212	100



- Can we develop an equation to model the relationship?

COMPARISONS... Temperatures

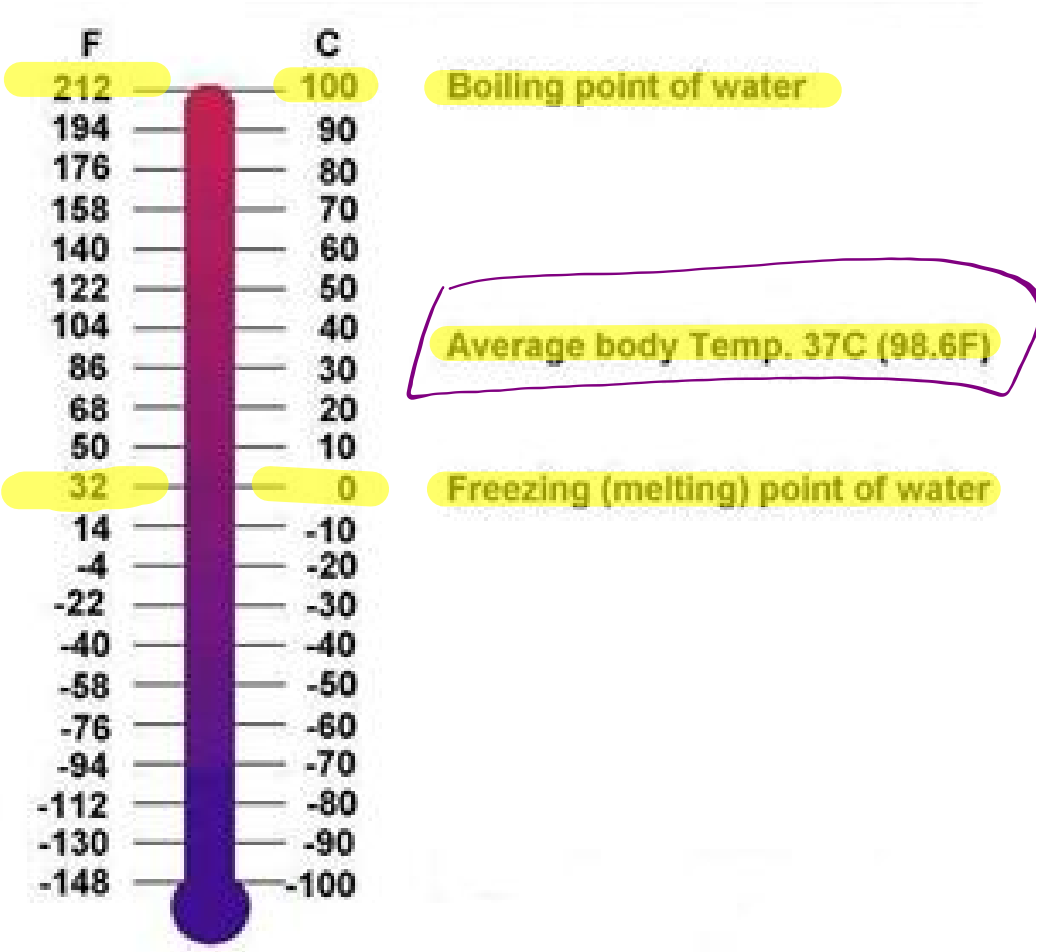
- 100° Celsius is the same temperature as 212° Fahrenheit, and 0° Celsius is the same temperature as 32° Fahrenheit.
- Thus, there is a 100-degree difference between the freezing and boiling points on the Celsius scale, while on the Fahrenheit scale there is a 180-degree difference.
- Therefore, the relationship between the size of the degrees can be expressed as

$$\frac{C}{F} = \frac{100}{180} = \frac{5}{9}$$

This means that each degree Fahrenheit is $\frac{5}{9}$ of a degree Celsius.

- Since 0°C is equivalent to 32°F, we must subtract 32 from the Fahrenheit temperature before we multiply by $\frac{5}{9}$.
- Thus, the formula for converting degrees Fahrenheit to degrees Celsius is:

$$C = \frac{5}{9}(F - 32)$$


F
C
212
100
Boiling point of water
194
90
176
80
158
70
140
60
122
50
104
40
Average body Temp. 37C (98.6F)
86
30
68
20
50
10
32
0
Freezing (melting) point of water
14
-10
-4
-20
-22
-30
-40
-40
-58
-50
-76
-60
-94
-70
-112
-80
-130
-90
-148
-100

Conversions

Convert from °F into °C...

$$C = \frac{5}{9}(F - 32)$$

ex: 71°F

Convert from °C into °F...

Let's rearrange to get the formula!

SAMOEB

$$\frac{9}{5}C = \frac{\cancel{5}}{\cancel{9}}\frac{\cancel{9}}{\cancel{5}}(F - 32)$$

$$\frac{9}{5}C + 32 = F - \cancel{32} \cancel{+ 32}$$

$$\frac{9}{5}C + 32 = F$$

Formula???

$$F = \frac{9}{5}C + 32$$

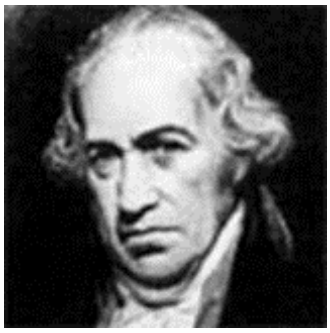
ex: 10°C

Roots of Temperature

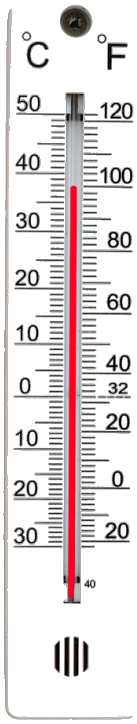
Galileo Thermoscope 1592

Galileo Galilei
(1564- 1642)

Fahrenheit Scale 1714



Daniel Gabriel Fahrenheit
(1686 - 1736)



Celsius Scale 1742

Anders Celsius
(1701 - 1744)

Temperature Conversion Worksheet

Fahrenheit		Celsius	Comments
350°F	=	177°C	Standard cooking temperature
212°F	=	100°C	Water boils
170°F	=	77°C	Well done steak
98.6°F	=	37°C	Normal body temperature
68°F	=	20°C	Room temperature
32°F	=	0°C	Water freezes
-40°F	=	-40°C	School closures
-321°F	=	-196°C	Boiling point of nitrogen

To convert from Celsius to Fahrenheit:

$$T_F = \frac{9}{5}T_C + 32$$

You can convert a temperature from **Celsius to Fahrenheit** in 3 steps:

1. Take your Celsius temperature _____ and multiply it by 9.

   _____ x 9 = _____

2. Take the answer from step one and divide it by 5.

   _____ ÷ 5 = _____

3. Take the answer from step two and add 32 to it.

   _____ + 32 = _____

To convert from Fahrenheit to Celsius:

$$T_C = \frac{5}{9}(T_F - 32)$$

You can convert a temperature from **Fahrenheit to Celsius** in 3 steps:

1. Take your Fahrenheit temperature _____ and subtract 32 from it.

   _____ - 32 = _____

2. Take the answer from step one and multiply it by 5.

   _____ x 5 = _____

Take the answer from step two and divide it by 9.

_____ ÷ 9 = _____

Worksheet - EXTRA Practice Converting Temperatures.docx

Converting Temperatures in °Celsius to °Fahrenheit and vice versa!

Formula for converting °C to °F:

°C = 5/9 * (°F - 32)

$$C = \frac{5}{9}(F - 32)$$

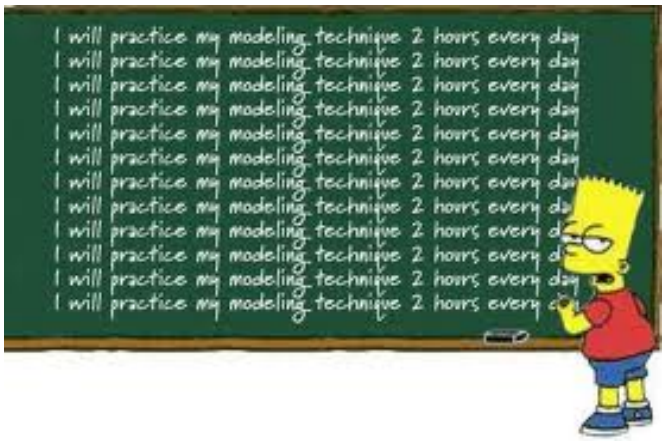
Formula for converting °F to °C:

°F = 9/5 * °C + 32

$$F = \frac{9}{5}C + 32$$

HOMEWORK...

Worksheet - Converting Temperatures.docx



Attachments

Worksheet - EXTRA Practice Converting Temperatures.docx

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