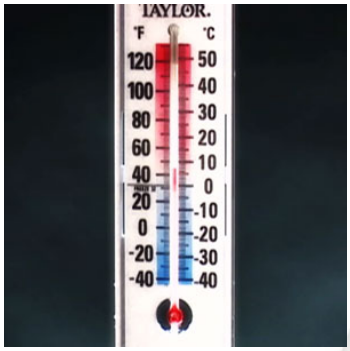
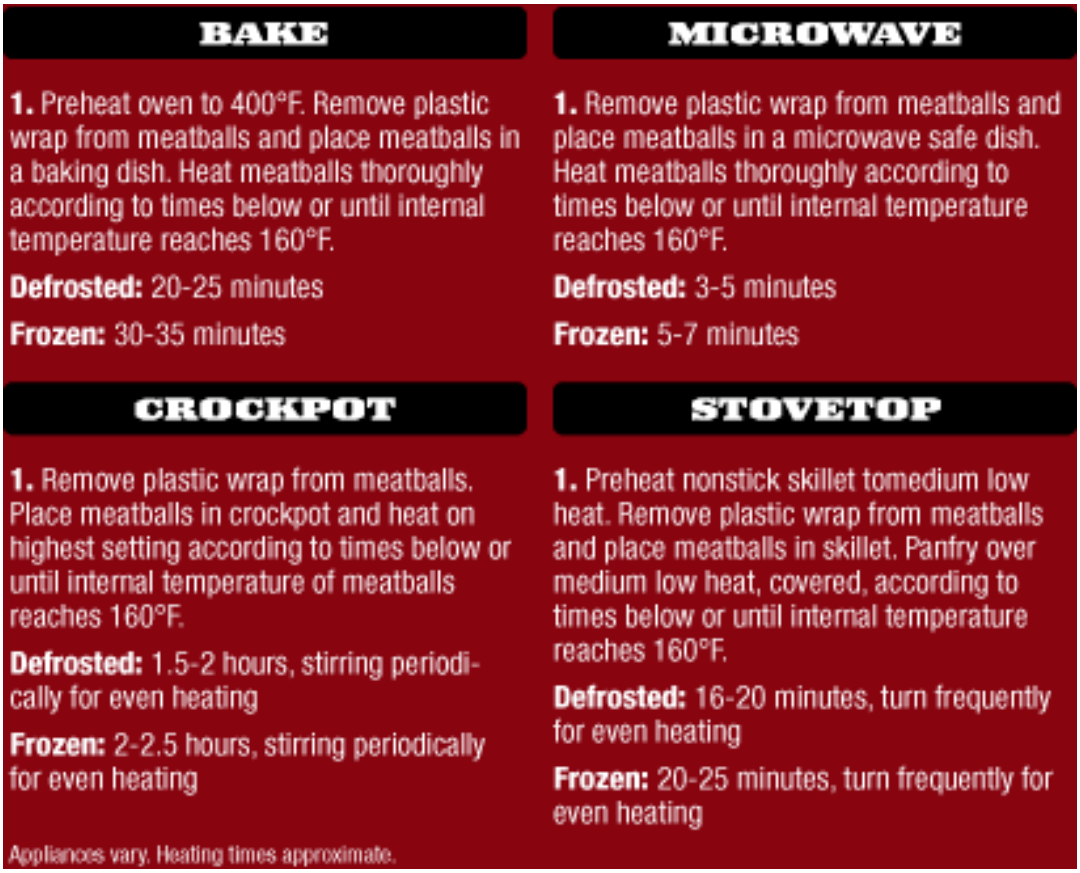
Chapter 5: Mass, Temperature, and Volume

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

- Read Math on the Job p. 188

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.

$185^{\circ}C$

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

$= \frac{9}{5}(185) + 32$

$= 333 + 32$

$= 365^{\circ}F$

COMPARISONS...

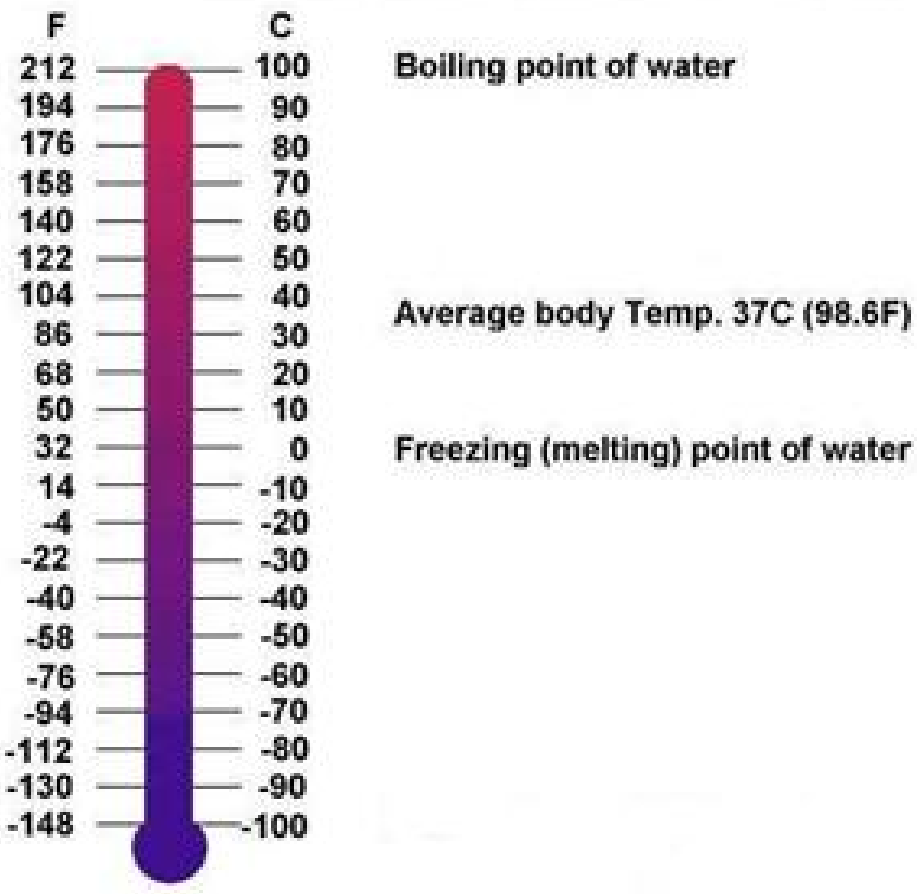
- 100° Celsius is the same temperature as 212° Fahrenheit, and 0° Celsius is the same temperature as 32° Fahrenheit.
- Thus, there is a 100-degree difference between the freezing and boiling points on the Celsius scale, while on the Fahrenheit scale there is a 180-degree difference.
- Therefore, the 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:

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

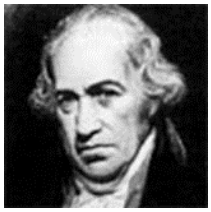


Roots of Temperature

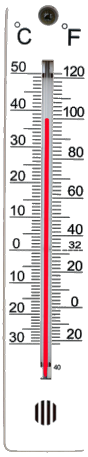
Galileo Thermoscope 1592

Galileo Galilei
(1564- 1642)

Fahrenheit Scale 1714



Daniel Gabriel Fahrenheit
(1686 - 1736)



Celsius Scale 1742

Anders Celsius
(1701 - 1744)

Conversions

Convert from °F into °C...

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

Convert from °C into °F...

Let's rearrange to get the formula!

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

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

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

Formula???

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

Temperature Conversion Worksheet

Fahrenheit		Celsius	Comments
350°F	=		Standard cooking temperature
	=	100°C	Water boils
170°F	=		Well done steak
98.6°F	=		Normal body temperature
	=	20°C	Room temperature
	=	0°C	Water freezes
	=	-40°C	School closures
	=	-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 = _____

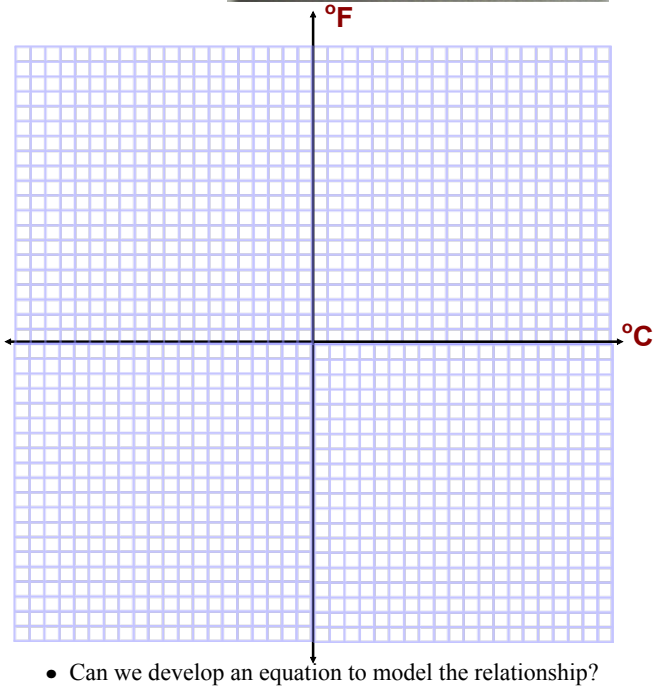
Activity 5.1 on Page 189

Working in partners you will complete questions 1, 3, 5, and 6 on page 189. You will have 30 minutes to complete this and pass it in. Use the graph to answer the questions.

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?

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:

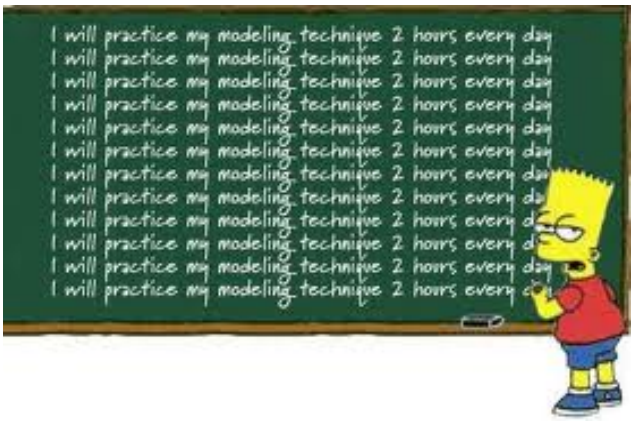
°F = 9/5 * °C + 32

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

HOMEWORK...

TEXT p. 193 # 1 - 6

5.1 Worksheet - Temperature Conversions.docx



NEED ANSWERS???

Section 5.1 Detailed Solutions.pdf

Converting Fahrenheit and Celsius (B)

10 °C = ____ °F	78 °F = ____ °C	-128 °F = ____ °C
-31 °F = ____ °C	208 °F = ____ °C	5 °F = ____ °C
21 °F = ____ °C	61 °F = ____ °C	-89 °C = ____ °F
98 °C = ____ °F	-143 °F = ____ °C	-133 °F = ____ °C
-30 °F = ____ °C	141 °F = ____ °C	-46 °C = ____ °F
-31 °C = ____ °F	62 °C = ____ °F	5 °C = ____ °F
12 °C = ____ °F	-102 °F = ____ °C	44 °C = ____ °F
-91 °C = ____ °F	51 °F = ____ °C	-21 °C = ____ °F
185 °F = ____ °C	-83 °F = ____ °C	-2 °C = ____ °F
6 °C = ____ °F	88 °C = ____ °F	206 °F = ____ °C
-96 °C = ____ °F	86 °C = ____ °F	75 °F = ____ °C

Converting Fahrenheit and Celsius (B) Answers

10 °C = 50 °F	78 °F = 25.55 °C	-128 °F = -88.88 °C
-31 °F = -35 °C	208 °F = 97.77 °C	5 °F = -15 °C
21 °F = -6.11 °C	61 °F = 16.11 °C	-89 °C = -128.2 °F
98 °C = 208.4 °F	-143 °F = -97.22 °C	-133 °F = -91.66 °C
-30 °F = -34.44 °C	141 °F = 60.55 °C	-46 °C = -50.8 °F
-31 °C = -23.8 °F	62 °C = 143.6 °F	5 °C = 41 °F
12 °C = 53.6 °F	-102 °F = -74.44 °C	44 °C = 111.2 °F
-91 °C = -131.8 °F	51 °F = 10.55 °C	-21 °C = -5.8 °F
185 °F = 85 °C	-83 °F = -63.88 °C	-2 °C = 28.4 °F
6 °C = 42.8 °F	88 °C = 190.4 °F	206 °F = 96.66 °C
-96 °C = -140.8 °F	86 °C = 186.8 °F	75 °F = 23.88 °C

EXTRA PRACTICE???

Worksheet - Converting Temperatures.docx

Worksheet - Converting Temperatures.pdf

WARM-UP...

Chinook winds are known to cause great changes in temperature over a short period of time. The most extreme temperature change in a 24-hour period occurred in Loma, Montana, on January 17, 1972. The temperature rose from -54 °F to 49 °F.

a) What was the change in temperature in degrees Fahrenheit?

Solution?

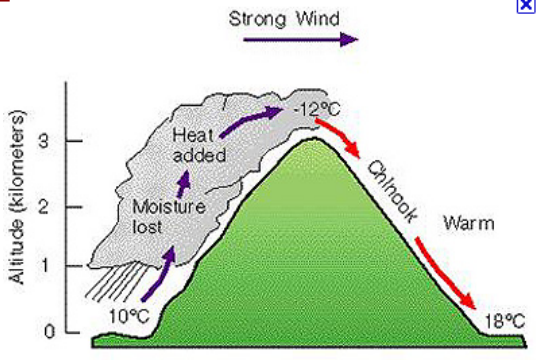
b) What was the maximum/minimum temperatures in degrees Celsius?

Solution?

A Chinook wind ia a warm, dry wind that blows east of the Rocky Moutains, often causing significant temperature increases in a short time in winter.

c) What was the change in temperature in degrees Celsius?

Solution?



Attachments

Geo_Mea_Fin 10 - Chp. 5 Conversion Table.docx

Geo_Mea_Fin 10 - Chp. 5 Group Assessment.docx

Geo_Mea_Fin 10 - Chp. 5 Judging Criteria.docx

Geo_Mea_Fin 10 - Chp. 5 Project Checklist.docx

Geo_Mea_Fin 10 - Chp. 5 Shopping List.docx

Worksheet - Converting Temperatures.docx

Worksheet - EXTRA Practice Converting Temperatures.docx

5.1 Worksheet - Temperature Conversions.docx

Worksheet - Converting Temperatures.pdf

Section 5.1 Detailed Solutions.pdf