

## Ground Hog Day - 02/02/2021



February 2<sup>nd</sup> is **Groundhog Day** in the United States and Canada. According to folklore, if it is cloudy when a groundhog emerges from its burrow on this day, it will leave the burrow, signifying that winter-like weather will soon end. If it is sunny, the groundhog will supposedly see its shadow and retreat back into its burrow to sleep some more, and the winter weather will continue for six more weeks.<sup>1</sup>

First day of winter (Winter Solstice) was Tuesday, December 21, 2020

There are 31 days in December

There are 31 days in January

There are 28 days in February this year

There are 31 days in March

The first day of spring (Spring Equinox) will be Saturday, March 20<sup>th</sup>, 2021

1. How many days are there between the first day of winter and the first day of spring?
2. How many days are there between the first day of winter and Groundhog Day, February 2, 2021?
3. How many days are there between Groundhog Day and the first day of spring?
4. What position in the calendar do you think Groundhog Day is supposed to represent?

Groundhog Day has its origins in an ancient celebration of a point mid-way between the Winter Solstice and the Spring Equinox. Superstition has it that fair weather implied a stormy and cold second half of winter.

In the U.S. and Canada there are several famous groundhogs that are locally celebrated on February 2<sup>nd</sup>. The first groundhog, however, was recognized in the 1800's in Punxsutawney, Pennsylvania and he was given the name Punxsutawney Phil. Records have been kept on Punxsutawney Phil's predictions since 1887.

### Historical Track Record of Punxsutawney Phil 1887–2016

*Courtesy of [Punxsutawney Groundhog Club](#)*

Saw Shadow	No Shadow	No Record
105	20	11
More Winter	End of Winter	---

The **frequency** of an event happening is just the number of times that event occurs.

5. What is the frequency in the previous chart of Punxsutawney Phil seeing his shadow?
6. What is the frequency of Phil not seeing his shadow?

The **relative frequency** of an event happening is the frequency of the event divided by the total number of recorded events.

7. What is the relative frequency of Phil seeing his shadow?
8. What is the relative frequency of Phil not seeing his shadow?
9. What is the sum of Phil's relative frequencies of seeing and not seeing his shadow? What do you suppose that demonstrates?
10. Do you think that Phil will see his shadow this year?
11. How often should Phil see his shadow ...
  - a. In the next 5 years?
  - b. In the next 10 years?
  - c. Over the next 40 years
12. Is there some other number of years that you think makes sense to calculate based on your relative frequency calculations?

### **Punxsutawney Phil vs. the U.S. National Temperature 1988–2020**

The table below gives a snapshot by year since 1988 whether Phil saw his shadow or not along with the corresponding monthly national average temperature departures for both February and March.

<b>Year</b>	<b>Shadow</b>	<b>February Temperature Departure</b>	<b>March Temperature Departure</b>
2020	Yes	2.4°F above the average	4.6°F above the average
2019	No	-2.0 degrees F below average	-1.22 degrees F below average
2018	Yes	1.6 degrees F above average	1.1 degrees F above average
2017	Yes	Above Normal	Above Normal
2016	No	Above Normal	Above Normal
2015	Yes	Slightly Below	Above Normal
2014	Yes	Slightly Below	Slightly Below
2013	No	Slightly Below	About Normal
2012	Yes	Above	Above
2011	No	Slightly Below	Above
2010	Yes	Below	Above
2009	Yes	Above	Slightly Above

2008	Yes	Slightly Above	Slightly Below
2007	No	Below	Above
2006	Yes	Above	Above
2005	Yes	Above	Slightly Above
2004	Yes	Below	Above
2003	Yes	Below	Above
2002	Yes	Above	Below
2001	Yes	Slightly Above	Tied Average
2000	Yes	Above	Above
1999	No	Above	Above
1998	Yes	Above	Below
1997	No	Above	Above
1996	Yes	Above	Below
1995	No	Above	Above
1994	Yes	Below	Above
1993	Yes	Below	Above
1992	Yes	Above	Above
1991	Yes	Above	Above
1990	No	Above	Above
1989	Yes	Below	Above
1988	No	Below	Above

12. Compare Punxsutawney Phil's predictions to that February's temperature from the norm. Out of the 33 years shown, what is the relative frequency of Phil being correct?

13. Now compare his predictions with the average March temperature departures. What is his relative frequency of predicting correctly?

Let's consider how Phil's predictions compare to the predictions of a coin toss. Imagine that we simply flipped a coin to decide whether there will be more winter. If the coin lands heads, we have more winter. If it lands tails, we have the end of winter.

14. How might the coin have done in predicting the weather over last 33 years compared to Phil?



Source: <sup>1</sup>[http://en.wikipedia.org/wiki/Groundhog\\_Day](http://en.wikipedia.org/wiki/Groundhog_Day)  
<http://www.ncdc.noaa.gov/special-reports/groundhog-day.php>  
<https://www.ncdc.noaa.gov/sotc/national/202002>  
<http://www.groundhog.org/about/history/>