

STAT220: QUIZ 2: FEB 21, 2008

Student name _____

Section _____

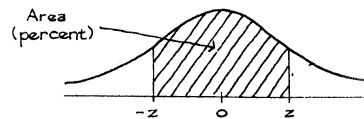
Please fill in your name and section.

Answer the questions, on the question paper.

It should take at most 20 minutes to complete this quiz.

The small table at the top of the page gives you all the normal distribution area numbers you need to answer the questions in this quiz.

z	Area (percent)
0.0	0.0
0.5	38
1.0	68
1.2	76
1.5	86
2.0	95

**Show your work.**

Typically, 10 inches of snow is equivalent to about one inch of rain. The *water equivalent* (WEq) of a given depth of snow precipitation is related to the surface air temperature, but varies due to wind and other weather factors. The WEq of snow is important in assessing avalanche danger. Units of WEq are such that the average is typically 100, and a value of 130 or more leads to announcement of avalanche warnings.

At a particular weather station measurements are made over many years of the temperature and of the WEq of the snow on days when there is measurable snow accumulation. In this question “days” means days on which these measurements are taken, and temperature means “surface air temperature”.

At this weather station, on the days measured, the average temperature is 26°F, and the standard deviation (SD) is 3°F, the average WEq is 100, and the standard deviation (SD) is 25. The correlation coefficient is $r = 0.6$.

Both the temperature and the WEq measurements have normal-shaped histograms, and the scatterplot of WEq (y -axis) against temperature (x -axis) is football-shaped.

The r.m.s.error for the regression of y on x is $\sqrt{1 - r^2} \times SD(y)$.

(a) (2 points) What is the average WEq on days when the temperature is 32°F?

z for temp = (32-26)/3 = 2; predicted z-score for WEq = 2×0.6=1.2 (1 point)

Predicted WEq = 100 + 1.2×25 = 130 (1 point)

(b) (3 points) What is the average temperature on days when the WEq is 130?

z for WEq = 1.2, from (a) (1 point). predicted z-score for temp = 0.6×1.2 = 0.72 (1 point)

predicted temperature = 26+ 0.72× 3 = 28.16°F (1 point)

(c) (3 points) Overall, on what percentage of days is WEq 130 or greater?

z for WEq = 1.2, from (a) (1 point) Middle area = 76% (1 point)

So on (100-76)/2= 12% of days. (1 point)

(d) (2 points) On days when the temperature is 30°F, what is the average WEq?

z for temp = (30-26)/3 = 4/3; predicted z-score for WEq = (4/3)×0.6=0.8 (1 point)

Predicted WEq = 100 + 0.8×25 = 120 (1 point)

(e) (3 points) On days on which the temperature is 30°F, what is the SD of WEq?

This is the r.m.s. error (1 point, do not need to say explicitly)

So required SD is $\sqrt{(1 - 0.36)} \times 25 = 0.8 \times 25 = 20$. (2 points)

(f) (3 points) Of the days on which the temperature is 30°F, what percentage have WEq 130 or greater?

z-score = (130 - 120)/20 = 0.5 (from (d), (e)) (1 point) Middle area = 38% (1 point)

So on (100-38)/2 = 31% of days. (1 point)