Statistics Unit 1 worksheet: z-scores and the empirical rule

Name _____ Date _____ Period _____

1. Find the z-score z or the value x, as each part asks.

(a) z when $x = 74,\ \mu = 60,\ \sigma = 8$

(b) x when $z = -1.4,\ \mu = 80,\ \sigma = 5$

(c) z when $x = 6.7,\ \bar{x} = 4.7,\ s = 0.8$

(d) x when $z = 2.6,\ \mu = 6.2,\ \sigma = 0.5$

(e) z when $x = 0.88,\ \mu = 1,\ \sigma = 0.06$

(f) x when $z = 0.6,\ \mu = 2{,}400,\ \sigma = 350$

2. Priya and Diego sat the same chemistry and history tests as the rest of their class. The chemistry scores had mean 68 and standard deviation 8; the history scores had mean 74 and standard deviation 5.

	Chemistry	History
Priya	80	83
Diego	62	70

(a) Find all four z-scores.

(b) For each student, on which test did they do better compared with the class?

(c) What chemistry score would have put Diego in the same place among the class as his history score did?

3. A public library counted its visitors on a sample of days. The daily counts have mean $\bar{x} = 420$ and standard deviation $s = 35$. Call a day unusual when its z-score is greater than 2 or less than -2.

Day	Monday	Tuesday	Thursday	Saturday
Visitors	352	498	430	345

(a) Find the z-score of each day, to two decimal places, and say whether the day is unusual.

(b) From what count to what count is a day's number of visitors not unusual?

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4. A sheep farm weighs every lamb at birth. The birth masses are modeled by $N(4.6, 0.5)$, in kilograms. Use the empirical rule: for a normal model, about 68%, 95% and 99.7% of values lie within one, two and three standard deviations of the mean.

(a) Find the z-scores of birth masses of 3.6, 4.1, 5.6 and 6.1 kg.

(b) Estimate the share of lambs born between 3.6 and 6.1 kg.

(c) Estimate the share of lambs born between 4.6 and 5.6 kg.

(d) The farm expects 500 lambs this spring. About how many will weigh more than 4.1 kg at birth?

5. A pizza shop times its deliveries, from the order to the door. A delivery of 18 minutes is one and a half standard deviations shorter than the mean delivery time, and a delivery of 50 minutes is two and a half standard deviations longer than the mean.

(a) Write the z-score of each of the two deliveries.

(b) Find the mean and the standard deviation of the delivery times.

(c) How long is a delivery that is three standard deviations longer than the mean?

6. Leah's class flew paper airplanes. The flight distances had mean 180 cm and standard deviation 12 cm, and the longest flight was 201 cm.

(a) Find the z-score of the longest flight and say what it means.

(b) Three classmates made the claims below. Explain what is wrong with each, and give the correct statement.

Andre: "The z-score is 21 cm, because the flight is 21 cm longer than the mean."

Mei: "The variance is 144, so the z-score is $\frac{21}{144} \approx 0.15$."

Ryan: "A flight with z-score -0.5 is 0.5 cm shorter than the mean."

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