Statistics Unit 1 quiz 5: The normal distribution, Normal calculations: areas and percentiles

Name _____ Date _____ Period _____

8 questions, 21 points

1. Curve A is the normal curve $N(28, 3)$. Curve B is a normal curve with the same shape as A, and its left inflection point is directly above A's right inflection point. Write the model for B, and give the position of B's other inflection point. (2 points)

2. The masses of the watermelons from one farm are modeled by $N(6{,}800, 1{,}200)$, in grams. Use the standard normal table or a calculator's normal function. What share of the watermelons weigh between 5,900 g and 7,100 g? Give it to four decimal places. (2 points)

3. The times of the members of a running club in a 5 km race are modeled by $N(25, 2)$, in minutes. Elena ran it in 22.2 minutes. Use the standard normal table or a calculator's normal function. (2 points)

(a) What share of the club's runners finish faster than Elena? Give it to four decimal places.

(b) At about which percentile of the club's times is Elena's time, and about what percent of the club's runners are slower than she is?

4. A delivery driver can take the ring road or the town route to a warehouse. Trip times, in minutes, are modeled by $N(44, 2)$ on the ring road and $N(38, 10)$ on the town route. (3 points)

(a) Which route's curve has the taller peak, and how many times as tall is it?

(b) Give the inflection points of each curve.

(c) Another driver says, "The town route's curve is much wider, so its peak must be taller too, to hold all those extra times." Explain what is wrong.

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5. A library's self-checkout machine records how long each customer takes, in minutes. The times have mean 2.0 and standard deviation 1.5. A librarian models them by $N(2.0, 1.5)$. (3 points)

(a) Where are the inflection points of the model's curve, and over what range would the curve be drawn, running three standard deviations either side of the mean?

(b) Which part of that range is impossible for a checkout time? Explain why this makes the normal model a poor choice.

(c) The median time is 1.4 minutes. What does this, together with the mean, suggest about the shape of the distribution?

6. The masses of the loaves from one bakery's oven, in grams, are modeled by a normal curve. The model gives a share of about 0.106 of loaves lighter than 390 g and the same share heavier than 410 g, and the curve's two inflection points are 16 g apart. (3 points)

(a) Find μ and σ.

(b) What share of loaves does the model give between 390 and 410 g?

(c) What share does it give between 400 and 410 g?

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7. A video game tests players' reaction times, which are modeled by $N(310, 25)$, in milliseconds. Use z-scores from the standard normal table (the nearest entry) and round times to the nearest whole millisecond. (3 points)

(a) Find the range that holds the middle 60% of reaction times.

(b) Find the 40th percentile of the reaction times, and say what it means for a player whose time is exactly that.

8. The time a rechargeable flashlight runs on one full charge is modeled as normal with mean 20 hours. Tests show that 10% of charges last less than 16.8 hours. Use z-scores from the standard normal table (the nearest entry). (3 points)

(a) Find the standard deviation of the run times.

(b) What share of charges last more than 24 hours? Give it to four decimal places.

(c) Without any more table work, what share of charges last more than 23.2 hours? Explain.

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