# Statistics Unit 1 worksheet: Normal calculations: areas and percentiles

Name _____ Date _____ Period _____

**1.** A bakery's sourdough loaves have masses modeled by $N(820, 8)$, in grams. Use the standard normal table or a calculator's normal function, and give the share to four decimal places.

(a) What share of the loaves weigh less than 814 g?

(b) The bakery bakes 500 of these loaves in a month. About how many does the model expect to weigh less than 814 g? Round to the nearest whole loaf.

**2.** The times a ferry takes to cross a lake are modeled by $N(38, 2.5)$, in minutes. The figure shows the curve with one region shaded. Use a calculator's normal function and give shares to four decimal places.




(a) Write the shaded area as a probability about $X$, the time of one crossing.

(b) Find the shaded area.

(c) What share of crossings take longer than 42 minutes?


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**3.** A lathe turns wooden dowels whose diameters are modeled by $N(12.0, 0.2)$, in millimeters. A dowel is accepted only if its diameter is between 11.7 and 12.3 mm. Use a calculator's normal function and give shares to four decimal places.

(a) What share of dowels are rejected?

(b) About how many of a batch of 2,500 dowels does the model expect to be rejected?

(c) The lathe drifts so that its mean becomes 12.05 mm, with the same standard deviation. What share of dowels are rejected now? Did a drift of only 0.05 mm make a real difference?

**4.** A puzzle app times how long players take to finish its daily crossword. The times are modeled by $N(22, 3)$, in minutes. Use the z-score from the standard normal table (the nearest entry), and give times to two decimal places.

(a) The app gives a gold badge to the fastest 1% of players. What time must a player beat to earn the badge?

(b) What time do only the slowest 1% of players take longer than?


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**5.** A bus company models the times its buses take to run one route by $N(46, 4)$, in minutes. Use the standard normal table or a calculator, and give times to one decimal place.

(a) The company wants to print a scheduled time that 90% of trips meet (take at most that long). What time should it print?

(b) The printed schedule says 50 minutes, and the company wants 95% of trips to meet it. If the standard deviation stays 4 minutes, what mean trip time is needed, and by how many minutes must the mean come down?

**6.** A factory cuts floor tiles whose lengths are normal with mean 299 mm. A customer asks that 99% of tiles be at least 300 mm long.

(a) The manager says, "We will keep the mean at 299 mm and make the machine more precise." Use $z \approx -2.33$ for the 1st percentile to show that no standard deviation can meet the target, and explain why in words.

(b) The factory instead raises the mean to 300.6 mm and gets the standard deviation down to 0.25 mm. Use a calculator's normal function to find the share of tiles shorter than 300 mm, to four decimal places. Is the customer's target met?


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