

Normal Distributions

Name : _____

KEY

1. The distances driven by all employees at Brand A Courier Service are normally distributed with an average of 2500 km per month and a standard deviation of 400 km.

a) Find the z-score for a driver who drives 3200 km in a month.

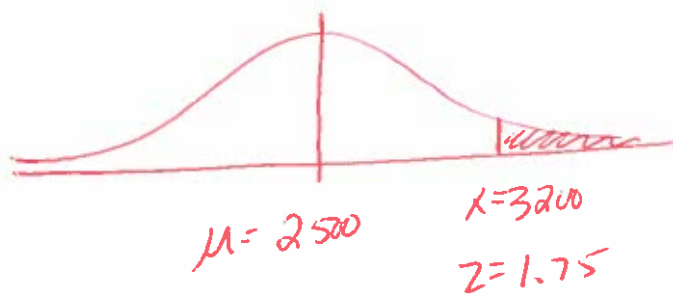
$$Z = \frac{x - \mu}{\sigma}$$

$$Z = \frac{3200 - 2500}{400}$$

$$Z = \frac{700}{400}$$

$$Z = 1.75$$

b) Find the probability that a courier drives at least 3200 km in a month.



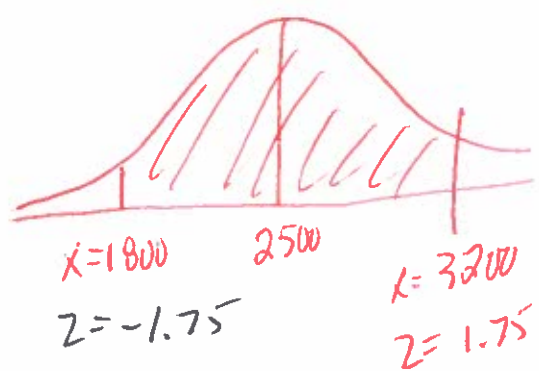
$$\text{normalcdf}(1.75, 5)$$

$$= 0.0401$$

OR

$$4.0\%$$

c) Find the probability that a courier drives between 1800 km and 3200 km in a month.



$$x = 1800$$

$$Z = \frac{1800 - 2500}{400}$$

$$Z = -1.75$$

$$\text{normalcdf}(-1.75, 1.75)$$

$$= 0.9199 \quad \text{OR} \quad 92\%$$

2. Given the formula $z = \frac{x - \mu}{\sigma}$.

- a) A math student has a z-score ranking of 1.07 for an exam in which the class average was 63.0 and the standard deviation was 14.5. Find the student's actual score, rounded to the nearest tenth.

$$1.07 = \frac{x - 63.0}{14.5}$$

$$15.5 = x - 63.0$$

$$x = 78.5 \text{ actual score}$$

- b) The mean life for Energizer batteries is 306 hours. A battery that lasts 274 hours has a standard z-score of -1.16. Determine the standard deviation for the life of Brand X batteries, rounded to the nearest tenth of an hour.

$$-1.16 = \frac{274 - 306}{\sigma}$$

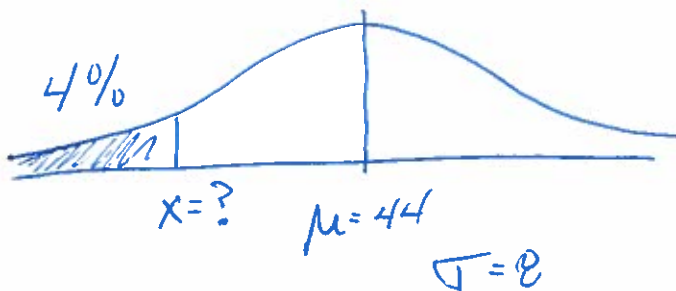
cross multiply

$$-1.16\sigma = -32$$

$$\div -1.16$$

$$\sigma = 27.6$$

3. An electronics manufacturer only wants to replace 4% of their personal CD players. If their personal CD players have an average life of 44 months and a standard deviation of 8.0 months, what guarantee should they offer?



$Z = \text{inverse normal}(0.04)$

$$Z = -1.75$$

$$-1.75 = \frac{x - 44}{8}$$

$$14 = x - 44$$

$$x = 30 \text{ month guarantee}$$

4. Holly was discussing her ranking in English class and Physics class with her parents. Holly's parents believe her English ranking is better than her Physics ranking, while Holly believes the opposite is true.

	Mark	Class Average	Standard Deviation
English	75	67	2.5
Physics	80	71	4.0

- a) Find Holly's z-score in each class.

ENGL

$$z = \frac{75 - 67}{2.5} = \frac{8}{2.5} = 3.2$$

PHY

$$z = \frac{80 - 71}{4.0} = \frac{9}{4.0} = 2.25$$

- b) Who is correct about the class ranking? Justify.

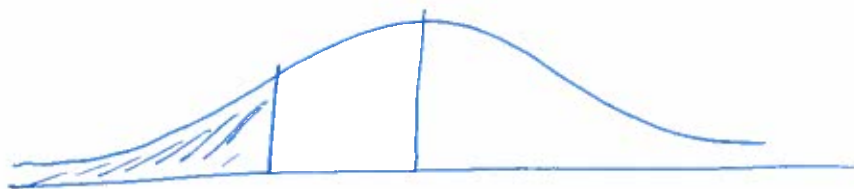
ENGLISH is better - Holly has a better z-score in English.

5. A sample of Old Dutch chips has a mean mass of 50.5 g with a standard deviation of 1.2 g.

- a) Find the z-score for 49.0 g.

$$z = \frac{49.0 - 50.5}{1.2} = \frac{-1.5}{1.2} = -1.25$$

- b) What is the probability that a randomly selected bag will have a mass less than 49.0 g?



$$x = 49.0 \quad 50.5$$

$$z = -1.25$$

$$\text{normalcdf}(-5, -1.25) = 0.1056$$

OR 10.56%