

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. Please write down all relevant mathematics. You have 20 minutes.

1. PROBLEM ONE

The box weight of a brand of dry cereal is a normally distributed random variable with mean 16 oz. and standard deviation .5 oz. Use your TI-83 to determine what percentage of the cereal boxes will weigh between 14.8 oz. and 17.2 oz? [Equivalently, what is the probability that a randomly selected box will weigh between 14.8 and 17.2 oz.?

$$\text{Normalcdf}(14.8, 17.2, 16, .5) = .9836049423$$

2. PROBLEM TWO

For the cereal weight random variable in Problem 1, what is the median box weight? What is the 90th percentile weight, i.e., the weight  $x_{.90}$  for which  $P(X \leq x_{.90}) = .90$ ?

$$x_{.9} = \text{invNorm}(.9, 16, .5) = 16.64077578$$

$$M = \text{invNorm}(.5, 16, .5) = 16$$

median      OR       $m = \mu = 16$

3. PROBLEM THREE

If a random variable  $X$  has mean 5 and standard deviation 2, what are the mean and standard deviation for the rescaled random variable  $Y = 4X + 3$ ?

$$\mu_Y = 4\mu_X + 3 = 23$$

$$\sigma_Y = 4\sigma_X = 8.$$

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1. PROBLEM ONE

The box weight of a brand of dry cereal is a normally distributed random variable with mean 20 oz. and standard deviation .75 oz. Use your TI-83 to determine what percentage of the cereal boxes will weigh between 18.6 oz. and 21.4 oz? [Equivalently, what is the probability that a randomly selected box will weigh between 18.6 and 21.4 oz.?

$$\text{Normalcdf}(18.6, 21.4, 20, .75) = .93805$$

2. PROBLEM TWO

For the cereal weight random variable in Problem 1, what is the median box weight? What is the 90th percentile weight, i.e., the weight  $x_{.90}$  for which  $P(X \leq x_{.90}) = .90$ ?

$$m = \mu = 20$$

$$x_{.90} = \text{invNorm}(.9, 20, .75) = 20.96116367$$

3. PROBLEM THREE

If a random variable  $X$  has mean 3 and standard deviation 1, what are the mean and standard deviation for the rescaled random variable  $Y = 5X + 4$ ?

$$\mu_Y = 5(\mu_X) + 4 = 15 + 4 = 19$$

$$\sigma_Y = 5\sigma_X = 5 \cdot 1 = 5$$

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. Please write down all relevant mathematics. You have 20 minutes.

1. PROBLEM ONE

The box weight of a brand of dry cereal is a normally distributed random variable with mean 14 oz. and standard deviation .4 oz. Use your TI-83 to determine what percentage of the cereal boxes will weigh between 13.0 oz. and 15.0 oz? [Equivalently, what is the probability that a randomly selected box will weigh between ~~13.0 and 15.0 oz.?~~

13.0 and 15.0.

$$\text{normalcdf}(13, 15, 14, .4) = .98758$$

2. PROBLEM TWO

For the cereal weight random variable in Problem 1, what is the median box weight? What is the 95th percentile weight, i.e., the weight  $x_{.95}$  for which  $P(X \leq x_{.95}) = .95$ ?

$$x_{.95} = \text{invNorm}(.95, 14, .4) = 14.65794$$

$$m = \text{invNorm}(.5, 14, .4) = 14$$

↑  
median

OR.  $m = \mu = 14$

3. PROBLEM THREE

$\mu_X$

$\sigma_X$

If a random variable  $X$  has mean 7 and standard deviation 3, what are the mean and standard deviation for the rescaled random variable  $Y = 2X + 5$ ?

$$\mu_Y = 2(\mu_X) + 5 = 2 \cdot 7 + 5 = 19$$

$$\sigma_Y = 2\sigma_X = 2 \cdot 3 = 6$$