

Probability test

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# 1 Tasks

## 1.1 Task 1

1. Suppose that body temperatures for healthy adults are normally distributed with a mean of 98.2 °F and standard deviation 0.62 °F. If we consider 100.1 °F as the lowest temperature considered to be a fever, what percentage of healthy adults would be considered to have a fever?

**Answer:** normally distribution  $\xi \sim N(98.2, 0.62)$ .  $X_1 = 100.1$ ,  $\xi = 0.62\nu + 98.2$ ,  $\nu \sim N(0, 1) = \frac{\xi - 98.2}{0.62}$

$$P(\xi \leq X_1) = P\left(\frac{\xi - 98.2}{0.62} \leq \frac{100.1 - 98.2}{0.62}\right) = \Phi_\nu(3.06) = 0.9989$$

So the answer of percentage of healthy adults would be considered to have a fever is  $1 - 0.9989 = 0.001$  or 0.1 percent

## 1.2 Task 2

2. A pollster contacts 84 people in the 18-21 age bracket and finds that 73 of them respond and 11 refuse to respond. When 275 people in the 22-29 age bracket are contacted, 225 respond and 50 refuse to respond. If one of the above 359 people is randomly selected, find the probability of getting someone who is in the 18-21 age bracket or someone who refused to respond.

**Answer:**

We can select one of people from 18 – 21 (first probability) or one from people who refuse to respond (20 from second group):

$$\frac{84}{359} + \frac{50 + 11}{359} - \frac{11}{359} = \frac{134}{359}$$

### 1.3 Task 3

3. The following table summarizes blood groups and Rh types for a group of typical people.

		Group			
		O	A	B	AB
Rh Type	Positive	21	18	4	2
	Negative	3	2	1	1

If two people are randomly selected (without replacement), find the probability that exactly one of them has group A blood.

- (a) .1616 (b) .2413 (c) .4827 (d) .2367 (e) .4734

**Answer:** the multiplication of probabilities with A group and not A:

$$C_2^1 \cdot \frac{20}{52} \cdot \frac{32}{52} = 0.4734$$

Answer E

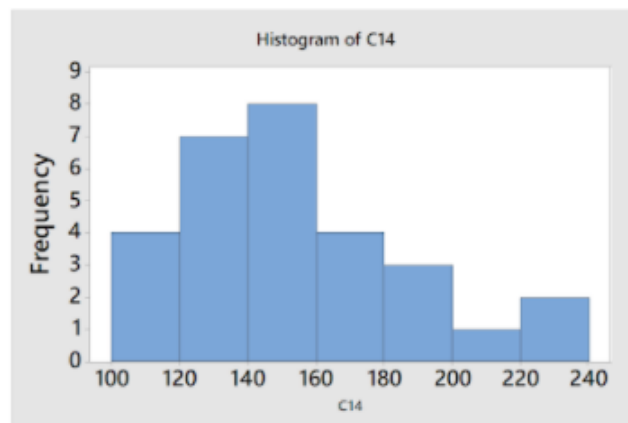
### 1.4 Task 4

4. Consider the data set summarized in the Minitab output below.

Descriptive Statistics: C14

Variable	N	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3
C14	29	153.21	6.65	35.82	106.00	125.00	143.00	163.00

Here is a histogram for that data set.



How many outliers are there?

**Answer:** data is not in normal distribution so for outliers we will use interquartile method to find outliers:

$$IQR = Q_3 - Q_1 = 163 - 125 = 38$$

$$(Q_1 - 1.5IQR, Q_3 + 1.5IQR) = (68, 220)$$

So the outliers are more than 220 and less than 68. For less than 68 there is no data, but for 220 there are two values. Answer: **2** outliers.

## 1.5 Task 5

5. Suppose that 521 students in this class each use their personalized class data set to produce a 95% confidence interval for the average height  $\mu$  of a person in this class. Which of the following statements is true? (Assume that all of the students correctly produce the confidence interval.)

- (a) Approximately 26 students will obtain a confidence interval that contains the average height  $\mu$ .
- (b) Approximately 5 students will obtain a confidence interval that does not contain the average height  $\mu$ .
- (c) Approximately 495 students will obtain a confidence interval that contains the average height  $\mu$ .
- (d) All of the students will obtain a confidence interval that contains the average height  $\mu$  (since they all produce the interval correctly).
- (e) The margin of error of each confidence interval will be 5%.

Answer *d* looks right.