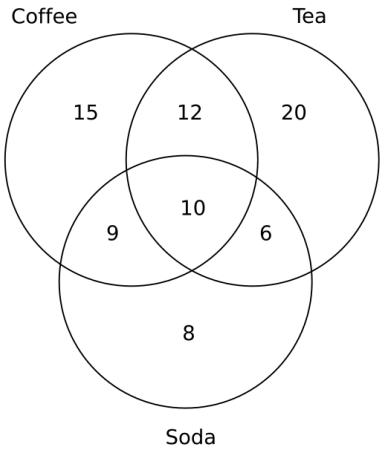
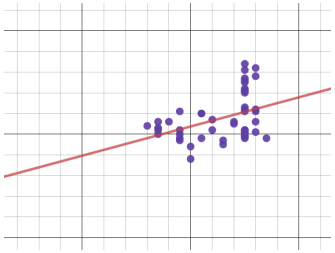
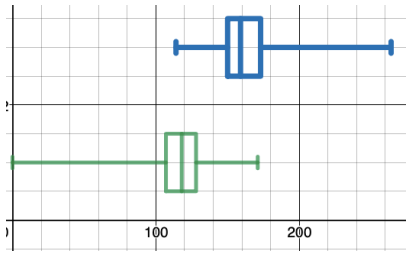
AQA A-Level Mathematics Warmup - Paper 3 2022

What is quota sampling? When is it useful?	Let $x = 3t^2 + t, y = t^2$. Find $\frac{dy}{dx}$ for this curve.	Let $X \sim B(15,0.3)$, calculate a) $P(X = 4)$ b) $P(X \leq 11)$ c) $P(X > 5)$	A cube of side length $2x$ is expanding . Let A be the surface area and V be the volume. By finding $\frac{dA}{dx}$ and $\frac{dV}{dx}$ show that $\frac{dA}{dt} = \frac{4}{x}$ if $\frac{dV}{dt} = 2$.	Two events A and B are independent if
	Using the Venn diagram to the left, What is the probability a randomly chosen person: a) Likes coffee? b) Likes tea and soda? c) Likes coffee or tea but not both? d) Likes soda given they like coffee?		If $X \sim B(n,p)$ then when can this distribution be approximated by a normal distribution? And what are the mean and variance of this approximation?	Find the area between the curves of $y = \cos(x)$ and $y = \sin(x)$ over the interval $\left[0, \frac{\pi}{2}\right]$.
	Sketch $y = 2\sin\left(x - \frac{\pi}{3}\right)$	How would you describe the correlation in the above scatter plot?	Prove $\sin(2x) = 2\sin(x)\cos(x)$	Fred wants to test at the 5% level whether a coin is biased towards heads. He tosses the coin 10 times and records the number of tails, X. Define suitable null and alternative hypotheses. Which values would cause him to reject the the null hypothesis?
What is the range of $f(x) = \sqrt{x-3}$? Find $f^{-1}(x)$ and state its domain and range.	For what values of $\lvert x \rvert$ is the binomial expansion of $(3+4x)^{\frac{1}{2}}$ valid.	For a normal distribution X, complete the following statements: 1) The points of inflection are ..... standard deviation away from the mean. 2) Total area under the curve is ..... 3) ~..... % of values lie within σ of the mean. 4) ~ ..... of values lie within 3σ of the mean. 5) $P(X > \mu + a) = P(X < \ldots\ldots)$ for any constant a.	Find the Cartesian form of the parametric equation given by $x = 2 + \sin(\theta)$ and $y = 3 + \cos(\theta)$.	Let $X \sim N(65,4^2)$, calculate $P(54 \leq X \leq 72)$.
What is the median? Name some advantages and disadvantages to using the median as a statistic.	Solve the simultaneous equations $y = x^2 + 6x + 6$ and $y = -x$			The box plots to the left display data concerning CO_2 emissions of cars registered in 2002 (top) and registered in 2016 (bottom). Compare these emissions.

AQA A-Level Mathematics Warmup - Paper 3 2022

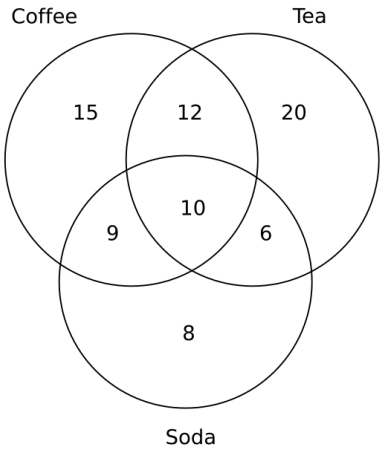
Quota sampling divides a population into categories. Each category is given a quota (number of members to sample). Collect data until the quotas are met in all categories.

$$\frac{dx}{dt} = 6t + 1$$
$$\frac{dy}{dt} = 2t$$
Then $$\frac{dy}{dx} = \frac{2t}{6t+1}$$

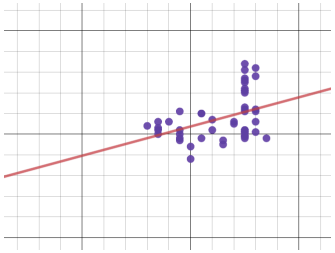
a) 0.2186
b) 0.9999
c) 0.2784

$$A = 24x^2 \Rightarrow \frac{dA}{dx} = 48x$$
$$V = 8x^3 \Rightarrow \frac{dV}{dx} = 24x^2$$
$$\frac{dA}{dt} = 48x\frac{dx}{dt}$$
$$\frac{dx}{dt} = \frac{dx}{dV} \times \frac{dV}{dt} = \frac{1}{12x}$$
$$\frac{dA}{dt} = \frac{4}{x}$$

$$P(A \mid B) = P(A)$$



a) $\frac{46}{80}$
b) $\frac{16}{80}$
c) $\frac{50}{80}$
d) $\frac{19}{46}$

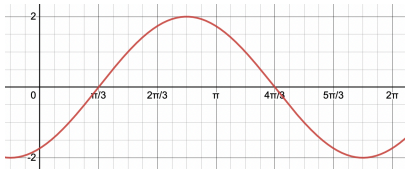


n is large.

Mean: np

Variance: $np(1-p)$

$$\int_0^{\pi/4} \cos(x) - \sin(x)\ dx + \int_{\pi/4}^{\pi} \sin(x) - \cos(x)\ dx$$
$$= 2\sqrt{2}$$



Weak positive correlation.

Consider the LHS
$$\sin(2x) = \sin(x+x)$$
$$= \sin(x)\cos(x) + \cos(x)\sin(x)$$
$$= 2\sin(x)\cos(x)$$

Let $X \sim N(10,0.5)$
Null hypothesis: $H_0 : p = 0.5$
Alternative hypotheses:
$H_0 : p > 0.5$.
Will reject the null hypotheses if 9 or more heads are thrown out of 10 tosses.

Range of $f(x)$: $y \in \mathbb{R}, y \geq 0$
$f^{-1}(x) = x^2 + 3$
Domain of $f^{-1}(x)$: $x \in \mathbb{R},\ x \geq 0$
Range of $f^{-1}(x)$: $y \in \mathbb{R}\ y \geq 3$

$$|x| < \frac{3}{4}$$

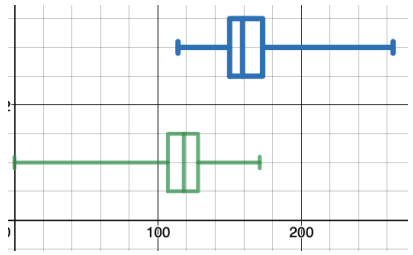
1) The points of inflection are 1 standard deviation away from the mean.
2) Total area under the curve is 1.
3) ~.68 % of values lie within σ of the mean.
4) ~ .99.8 of values lie within 3σ of the mean.
5) $P(X > \mu + a) = P(X < \mu - a)$ for any constant a.

$$(x-2)^2 + (y-3)^2 = 1$$

0.9569

The median is a measure of central tendency. It is the middle value when data is listed in size order.

$(-6,6)$ and $(-1,1)$



Emissions are in general significantly less in 2016 than they were in 2002 as the median is lower. The spread of emissions is also slightly less as evidenced in the IQR. In 2016 there were also cars with zero emissions.