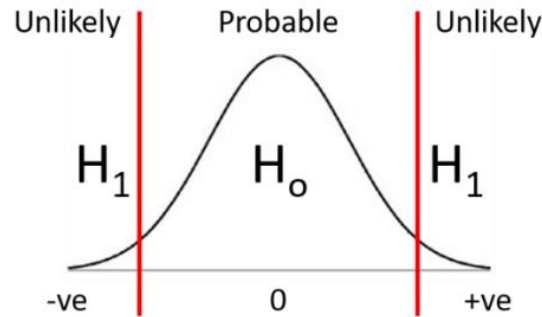# Hypothesis Testing Exam Questions
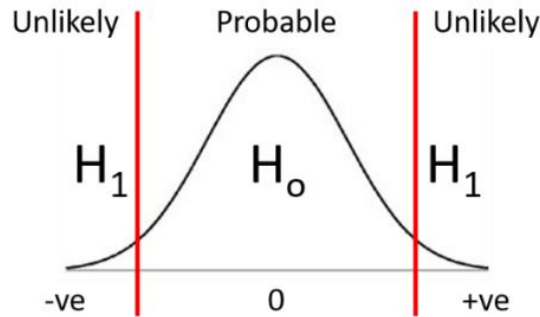

With the Binomial Distribution	With the Normal Distribution	With the Product Moment Correlation Coefficient
It is known that under the standard treatment for a disease, 9.7% of patients experience side effects. In a trial of a new treatment, 450 patients with this disease were selected and it was found that 51 of the 450 patients experienced side effects within one year. Test at the 10% significance level whether the proportion of patients experiencing side effects within one year is greater under the new treatment than under the standard treatment.	The time spent by customers in a shop had mean 10.5 minutes and standard deviation 4.2 minutes. Following a change of layout in the shop, the mean time spent in the shop by 50 customers is found to be 12.0 minutes. Assuming that the standard deviation is unchanged, test at the 1% significance level whether the mean time spent by customers in the shop has changed.	Maria wished to test whether there is positive linear correlation between the height of a tree and the circumference of its trunk. Maria recorded the height and circumference of a random sample of 10 trees of this variety. She calculated the product-moment correlation coefficient for her sample to be 0.642. Carry out a hypothesis test at the 2.5% significance level to determine whether there is positive correlation between height and circumference of trunk.

Writing Frame

		Disease	Shop	Trees
1	Define the variable	$p =$	$\mu =$	$\rho =$
2	Write down the null and alternate hypotheses			
3	What is the significance level?			
4	Is it one or two tailed?			
5	What is the probability of this sample occurring randomly?			
6	Is this probability less than or greater than the significance level?			
7	Accept or reject the null hypothesis?			
8	Conclude and clarify in context			

Hypothesis Testing Exam Questions – Now Try These

With the Binomial Distribution	With the Normal Distribution	With the Product Moment Correlation Coefficient
In Norwich, the proportion of inhabitants from the suburb of Sprowston is known to be 0.4. A sample of 12 employees of Aviva (a large company based in the city) is obtained and it is found that 2 of them are from Sprowston. Carry out a test at the 5% significance level to determine whether the proportion of employees at Aviva from Sprowston is less than in the city as a whole.	A machine fills packets with X grams of powder where X is normally distributed with mean μ. Each packet is supposed to contain 1 kg of powder with standard deviation 9.117g. A sample of 10 packets has weight, in grams, of powder in each packet is as follows: (see table below) Assuming that the standard deviation of the population is 9.117g, test at the 1% significance level, whether or not the machine is delivering packets with mean weight of less than 1 kg.	Sam Jackson wishes to test whether there is linear correlation between the mass and the height of adult donkeys. Sam chooses a random sample of 12 adult donkeys and calculates Pearson's product-moment correlation coefficient, r. He finds that r = 0.4760. Carry out the test at the 5% significance level stating your hypotheses and conclusion clearly.

999	1000	1002	996	1004
991	1000	1001	992	993

Writing Frame

		Aviva	Powder	Donkeys
1	Define the variable	$p =$	$\mu =$	$\rho =$
2	Write down the null and alternate hypotheses			
3	What is the significance level?			
4	Is it one or two tailed?			
5	What is the probability of this sample occurring randomly?			
6	Is this probability less than or greater than the significance level?			
7	Accept or reject the null hypothesis?			
8	Conclude and clarify in context			

Critical values of Pearson's product-moment correlation coefficient

	1-tail test	5%	2.5%	1%	0.5%
	2-tail test	10%	5%	2.5%	1%
n	9	0.5822	0.6664	0.7498	0.7977
	10	0.5494	0.6319	0.7155	0.7646
	11	0.5214	0.6021	0.6851	0.7348
	12	0.4973	0.5760	0.6581	0.7079

Answers Page 1

		Disease	Shop	Trees
1	Define the variable	$p = $ probability of experience side effects	$\mu = $ mean time spent in shop	$\rho = $ PMCC between height and circumference of tree
2	Write down the null and alternate hypotheses	H$_0$: $p = 0.097$ H$_1$: $p > 0.097$	H$_0$: $\mu = 10.5$ H$_1$: $\mu \neq 10.5$	H$_0$: $\rho = 0$ H$_1$: $\rho > 0$
3	What is the significance level?	10%	1%	2.5%
4	Is it one or two tailed?	One tailed	Two tailed (so 0.5% in each tail)	One tailed
5	What is the probability of this sample occurring randomly?	13.8%	0.577%	Value from table is 0.6319
6	Is this probability less than or greater than the significance level?	Greater than	Greater than	Given value is bigger than value from table
7	Accept or reject the null hypothesis?	Accept null hypothesis	Accept null hypothesis	Reject null hypothesis
8	Conclude and clarify in context	There is evidence to suggest that the probability of side effects remains at 0.97%	There is evidence to suggest that the mean time spent in the shop remains at 10.5 minutes	There is evidence to suggest that there is a positive linear correlation between height of tree and circumference of trunk

Answers Page 2

		Aviva	Powder	Donkeys
1	Define the variable	$p =$ probability of someone being from Sprowston	$\mu =$ mean weight of powder in packet	$\rho =$ PMCC between height and weight of donkeys
2	Write down the null and alternate hypotheses	$H_0: p = 0.4$ $H_1: p < 0.4$	$H_0: \mu = 1000$ $H_1: \mu < 1000$	$H_0: \rho = 0$ $H_1: \rho \neq 0$
3	What is the significance level?	5%	1%	5%
4	Is it one or two tailed?	One tailed	One tailed	Two tailed
5	What is the probability of this sample occurring randomly?	8.3%	22%	Value from table is 0.5760
6	Is this probability less than or greater than the significance level?	Greater than	Less than	Given value is less than value from table
7	Accept or reject the null hypothesis?	Accept null hypothesis	Accept null hypothesis	Accept null hypothesis
8	Conclude and clarify in context	There is evidence to suggest that the probability of proportion of employees from Sprowston is 0.4	There is no evidence to suggest that the mean amount of powder in each packet is less than 1000g	There is not enough evidence to suggest that there is correlation between height and weight of donkeys