EXPERT TUITION

Maths Questions By Topic:

Statistical Hypothesis Testing

A-Level Edexcel

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1. A manufacturer of sweets knows that 8% of the bags of sugar delivered from supplier *A* will be damp.
A random sample of 35 bags of sugar is taken from supplier *A*.

Supplier *B* claims that when it supplies bags of sugar, the proportion of bags that are damp is less than 8%

The manufacturer takes a random sample of 70 bags of sugar from supplier *B* and finds that only 2 of the bags are damp.

Carry out a suitable test to assess supplier *B*'s claim.
You should state your hypotheses clearly and use a 10% level of significance.

(4)

Question 1 continued

(Total for Question 1 is 4 marks)

2 A nursery has a sack containing a large number of coloured beads of which 14% are coloured red.

Aliya takes a random sample of 18 beads from the sack to make a bracelet.

After several children have used beads from the sack, the nursery teacher decides to test whether or not the proportion of red beads in the sack has changed.
She takes a random sample of 75 beads and finds 4 red beads.

(a) Stating your hypotheses clearly, use a 5% significance level to carry out a suitable test for the teacher.

(4)

(b) Find the *p*-value in this case.

(1)

Question 2 continued

Question 2 continued

Question 2 continued

(Total for Question 2 is 5 marks)

3. Afrika works in a call centre.

She assumes that calls are independent and knows, from past experience, that on each sales call that she makes there is a probability of $\frac{1}{6}$ that it is successful.

Rowan works in the same call centre as Afrika and believes he is a more successful salesperson.

To check Rowan's belief, Afrika monitors the next 35 sales calls Rowan makes and finds that 11 of the sales calls are successful.

Stating your hypotheses clearly test, at the 5% level of significance, whether or not there is evidence to support Rowan's belief.

(4)

Question 3 continued

Question 3 continued

(Total for Question 3 is 4 marks)

4. Past records show that 15% of customers at a shop buy chocolate. The shopkeeper believes that moving the chocolate closer to the till will increase the proportion of customers buying chocolate.

After moving the chocolate closer to the till, a random sample of 30 customers is taken and 8 of them are found to have bought chocolate.

Julie carries out a hypothesis test, at the 5% level of significance, to test the shopkeeper's belief.

Julie's hypothesis test is shown below.

$H_0 : p = 0.15$

$H_1 : p \geqslant 0.15$

Let X = the number of customers who buy chocolate.

$X \sim B(30, 0.15)$

$P(X = 8) = 0.0420$

$0.0420 < 0.05$ so reject H_0

There is sufficient evidence to suggest that the proportion of customers buying chocolate has increased.

(a) Identify the first two errors that Julie has made in her hypothesis test.

(2)

(b) Explain whether or not these errors will affect the conclusion of her hypothesis test. Give a reason for your answer.

(1)

(c) Find, using a 5% level of significance, the critical region for a one-tailed test of the shopkeeper's belief. The probability in the tail should be less than 0.05

(2)

(d) Find the actual level of significance of this test.

(1)

Question 4 continued

Question 4 continued

(Total for Question 4 is 6 marks)

5. Naasir is playing a game with two friends. The game is designed to be a game of chance so that the probability of Naasir winning each game is $\frac{1}{3}$

Naasir and his friends play the game 15 times.

Naasir claims he has a method to help him win more than $\frac{1}{3}$ of the games. To test this claim, the three of them played the game again 32 times and Naasir won 16 of these games.

Stating your hypotheses clearly, test Naasir's claim at the 5% level of significance.

(4)

Question 5 continued

Question 5 continued

Question 5 continued

(Total for Question 5 is 4 marks)

6 Past records from a large supermarket show that 25% of people who buy eggs, buy organic eggs. On one particular day a random sample of 40 people is taken from those that had bought eggs and 16 people are found to have bought organic eggs.

(a) Test, at the 1% significance level, whether or not the proportion p of people who bought organic eggs that day had increased. State your hypotheses clearly.

(5)

(b) State the conclusion you would have reached if a 5% significance level had been used for this test.

(1)

(Total for Question 6 is 6 marks)

7. Past records suggest that 30% of customers who buy baked beans from a large supermarket buy them in single tins. A new manager suspects that there has been a change in the proportion of customers who buy baked beans in single tins. A random sample of 20 customers who had bought baked beans was taken.

(a) Write down the hypotheses that should be used to test the manager's suspicion.

(1)

(b) Using a 10% level of significance, find the critical region for a two-tailed test to answer the manager's suspicion. You should state the probability of rejection in each tail, which should be less than 0.05

(3)

(c) Find the actual significance level of a test based on your critical region from part (c).

(1)

One afternoon the manager observes that 12 of the 20 customers who bought baked beans, bought their beans in single tins.

(d) Comment on the manager's suspicion in the light of this observation.

(1)

Later it was discovered that the local scout group visited the supermarket that afternoon to buy food for their camping trip.

(e) Comment on the validity of the model used to obtain the answer to part (e), giving a reason for your answer.

(1)

Question 7 continued

(Total for Question 7 is 7 marks)

8. A dentist knows from past records that 10% of customers arrive late for their appointment.

A new manager believes that there has been a change in the proportion of customers who arrive late for their appointment.

A random sample of 50 of the dentist's customers is taken.

(a) Write down

- a null hypothesis corresponding to no change in the proportion of customers who arrive late
- an alternative hypothesis corresponding to the manager's belief

(1)

(b) Using a 5% level of significance, find the critical region for a two-tailed test of the null hypothesis in (a)
You should state the probability of rejection in each tail, which should be less than 0.025

(3)

(c) Find the actual level of significance of the test based on your critical region from part (b)

(1)

The manager observes that 15 of the 50 customers arrived late for their appointment.

(d) With reference to part (b), comment on the manager's belief.

(1)

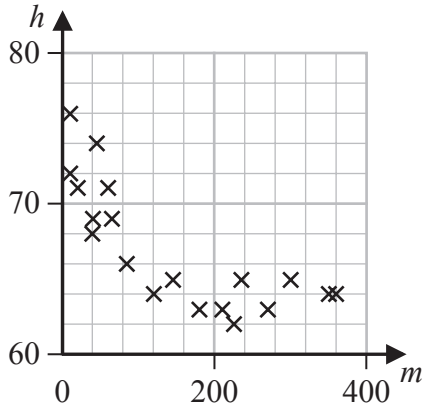
Question 8 continued

(Total for Question 8 is 6 marks)

9. Anna is investigating the relationship between exercise and resting heart rate. She takes a random sample of 19 people in her year at school and records for each person

- their resting heart rate, h beats per minute
- the number of minutes, m, spent exercising each week

Her results are shown on the scatter diagram.



Anna codes the data using the formulae

$$x = \log_{10} m$$
$$y = \log_{10} h$$

The product moment correlation coefficient between x and y is -0.897

Test whether or not there is significant evidence of a negative correlation between x and y
You should

- state your hypotheses clearly
- use a 5% level of significance
- state the critical value used

(3)

Question 9 continued

Question 9 continued

(Total for Question 9 is 3 marks)

10. Marc took a random sample of 16 students from a school and for each student recorded

- the number of letters, x, in their last name
- the number of letters, y, in their first name

The results from Marc's random sample of 16 observations are given in the table below.

x	3	6	8	7	5	3	11	3	4	5	4	9	7	10	6	6
y	7	7	4	4	6	8	5	5	8	4	7	4	5	5	6	3

(a) Use your calculator to find the product moment correlation coefficient between x and y for these data.

(1)

(b) Test whether or not there is evidence of a negative correlation between the number of letters in the last name and the number of letters in the first name.

You should

- state your hypotheses clearly
- use a 5% level of significance

(3)

Question 10 continued

Question 10 continued

(Total for Question 10 is 4 marks)

11. The heights of females from a different country are normally distributed with a standard deviation of 7.4 cm

Mia believes that the mean height of females from this country is less than 166.5 cm

Mia takes a random sample of 50 females from this country and finds the mean of her sample is 164.6 cm

Carry out a suitable test to assess Mia's belief.
You should

- state your hypotheses clearly
- use a 5% level of significance

(4)

Question 11 continued

Question 11 continued

Question 11 continued

(Total for Question 11 is 4 marks)

12. A random sample of 15 days is taken from the large data set for Perth in June and July 1987.

The scatter diagram in Figure 1 displays the values of two of the variables for these 15 days.

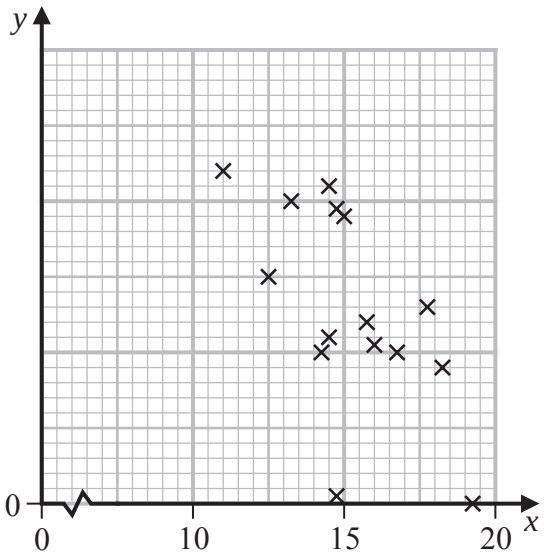


Figure 1

Stav believes that there is a correlation between Daily Total Sunshine and Daily Maximum Relative Humidity at Heathrow.

He calculates the product moment correlation coefficient between these two variables for a random sample of 30 days and obtains $r = -0.377$

Carry out a suitable test to investigate Stav's belief at a 5% level of significance.
State clearly

- your hypotheses
- your critical value

(3)

Question 12 continued

(Total for Question 12 is 3 marks)

13. A health centre claims that the time a doctor spends with a patient can be modelled by a normal distribution with a mean of 10 minutes and a standard deviation of 4 minutes.

Some patients complain that the mean time the doctor spends with a patient is more than 10 minutes.

The receptionist takes a random sample of 20 patients and finds that the mean time the doctor spends with a patient is 11.5 minutes.

Stating your hypotheses clearly and using a 5% significance level, test whether or not there is evidence to support the patients' complaint.

(4)

Question 13 continued

Question 13 continued

(Total for Question 13 is 4 marks)

14. Barbara is investigating the relationship between average income (GDP per capita), x US dollars, and average annual carbon dioxide (CO_2) emissions, y tonnes, for different countries.

She takes a random sample of 24 countries and finds the product moment correlation coefficient between average annual CO_2 emissions and average income to be 0.446

(a) Stating your hypotheses clearly, test, at the 5% level of significance, whether or not the product moment correlation coefficient for all countries is greater than zero.

(3)

Barbara believes that a non-linear model would be a better fit to the data.
She codes the data using the coding $m = \log_{10} x$ and $c = \log_{10} y$ and obtains the model $c = -1.82 + 0.89m$

The product moment correlation coefficient between c and m is found to be 0.882

(b) Explain how this value supports Barbara's belief.

(1)

(c) Show that the relationship between y and x can be written in the form $y = ax^n$ where a and n are constants to be found.

(5)

Question 14 continued

Question 14 continued

Question 14 continued

(Total for Question 14 is 9 marks)

15. A machine puts liquid into bottles of perfume. The amount of liquid put into each bottle, D ml, follows a normal distribution with mean 25 ml

The machine is adjusted so that the standard deviation of the liquid put in the bottles is now 0.16 ml

Following the adjustments, Hannah believes that the mean amount of liquid put in each bottle is less than 25 ml

She takes a random sample of 20 bottles and finds the mean amount of liquid to be 24.94 ml

Test Hannah's belief at the 5% level of significance.
You should state your hypotheses clearly.

(5)

Question 15 continued

Question 15 continued

(Total for Question 15 is 5 marks)

16. Tessa owns a small clothes shop in a seaside town. She records the weekly sales figures, £w, and the average weekly temperature, t °C, for 8 weeks during the summer.
The product moment correlation coefficient for these data is −0.915

(a) Stating your hypotheses clearly and using a 5% level of significance, test whether or not the correlation between sales figures and average weekly temperature is negative.

(3)

(b) Suggest a possible reason for this correlation.

(1)

Tessa suggests that a linear regression model could be used to model these data.

(c) State, giving a reason, whether or not the correlation coefficient is consistent with Tessa's suggestion.

(1)

(d) State, giving a reason, which variable would be the explanatory variable.

(1)

Tessa calculated the linear regression equation as $w = 10\,755 - 171t$

(e) Give an interpretation of the gradient of this regression equation.

(1)

Question 16 continued

(Total for Question 16 is 7 marks)

17. The lifetime, L hours, of a battery has a normal distribution with mean 18 hours and standard deviation 4 hours.

Alice's calculator requires 4 batteries and will stop working when any one battery reaches the end of its lifetime.

After her exams, Alice believed that the lifetime of the batteries was more than 18 hours. She took a random sample of 20 of these batteries and found that their mean lifetime was 19.2 hours.

Stating your hypotheses clearly and using a 5% level of significance, test Alice's belief.

(5)

Question 17 continued

Question 17 continued

Question 17 continued

(Total for Question 17 is 5 marks)

18. *Kaff* coffee is sold in packets. A seller measures the masses of the contents of a random sample of 90 packets of *Kaff* coffee from her stock. The results are shown in the table below.

Mass w (g)	Midpoint y (g)	Frequency f
$240 \leq w < 245$	242.5	8
$245 \leq w < 248$	246.5	15
$248 \leq w < 252$	250.0	35
$252 \leq w < 255$	253.5	23
$255 \leq w < 260$	257.5	9

(You may use $\sum fy^2 = 5\ 644\ 171.75$)

A histogram is drawn and the class $245 \leq w < 248$ is represented by a rectangle of width 1.2 cm and height 10 cm.

(a) Calculate the width and the height of the rectangle representing the class $255 \leq w < 260$.

(3)

(b) Use linear interpolation to estimate the median mass of the contents of a packet of *Kaff* coffee to 1 decimal place.

(2)

(c) Estimate the mean and the standard deviation of the mass of the contents of a packet of *Kaff* coffee to 1 decimal place.

(3)

The seller claims that the mean mass of the contents of the packets is more than the stated mass. Given that the stated mass of the contents of a packet of *Kaff* coffee is 250 g and the actual standard deviation of the contents of a packet of *Kaff* coffee is 4 g,

(d) test, using a 5% level of significance, whether or not the seller's claim is justified. State your hypotheses clearly.

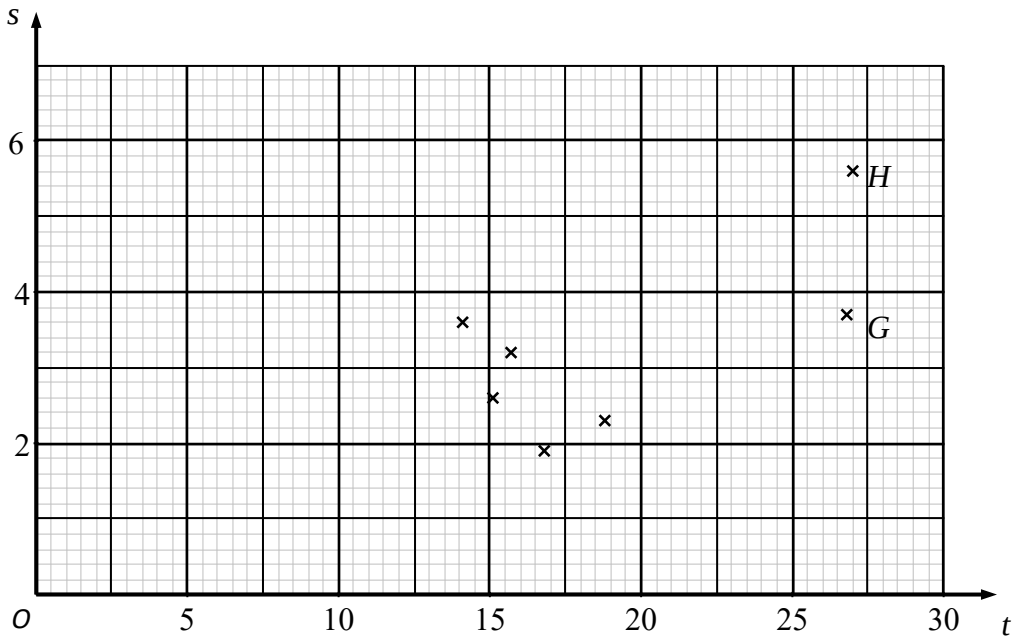
(You may assume that the mass of the contents of a packet is normally distributed.)

(5)

Question 18 continued

(Total for Question 18 is 13 marks)

19. A researcher believes that there is a linear relationship between daily mean temperature and daily total rainfall. The 7 places in the northern hemisphere from the large data set are used. The mean of the daily mean temperatures, t °C, and the mean of the daily total rainfall, s mm, for the month of July in 2015 are shown on the scatter diagram below.



The researcher calculated the product moment correlation coefficient for the 7 places and obtained $r = 0.658$.

Stating your hypotheses clearly, test at the 10% level of significance, whether or not the product moment correlation coefficient for the population is greater than zero.

(3)

Question 19 continued

(Total for Question 19 is 3 marks)

20. A meteorologist believes that there is a relationship between the daily mean windspeed, w kn, and the daily mean temperature, t °C. A random sample of 9 consecutive days is taken from past records from a town in the UK in July and the relevant data is given in the table below.

t	13.3	16.2	15.7	16.6	16.3	16.4	19.3	17.1	13.2
w	7	11	8	11	13	8	15	10	11

The meteorologist calculated the product moment correlation coefficient for the 9 days and obtained $r = 0.609$

(a) State what is measured by the product moment correlation coefficient.

(1)

(b) Stating your hypotheses clearly test, at the 5% significance level, whether or not the product moment correlation coefficient for the population is greater than zero.

(3)

Question 20 continued

(Total for Question 20 is 4 marks)

21. A machine cuts strips of metal to length L cm, where L is normally distributed with standard deviation 0.5 cm.

Strips with length either less than 49 cm or greater than 50.75 cm **cannot** be used.

A second machine cuts strips of metal of length X cm, where X is normally distributed with standard deviation 0.6 cm

A random sample of 15 strips cut by this second machine was found to have a mean length of 50.4 cm

Stating your hypotheses clearly and using a 1% level of significance, test whether or not the mean length of all the strips, cut by the second machine, is greater than 50.1 cm

(5)

Question 21 continued

(Total for Question 21 is 5 marks)

Leave blank

22. Past records show that the proportion of customers buying organic vegetables from *Tesson* supermarket is 0.35

During a particular day, a random sample of 40 customers from *Tesson* supermarket was taken and 18 of them bought organic vegetables.

(a) Test, at the 5% level of significance, whether or not this provides evidence that the proportion of customers who bought organic vegetables has increased. State your hypotheses clearly.

(5)

The manager of *Tesson* supermarket claims that the proportion of customers buying organic eggs is different from the proportion of those buying organic vegetables. To test this claim the manager decides to take a random sample of 50 customers.

(b) Using a 5% level of significance, find the critical region to enable the *Tesson* supermarket manager to test her claim. The probability for each tail of the region should be as close as possible to 2.5%

(3)

During a particular day, a random sample of 50 customers from *Tesson* supermarket is taken and 8 of them bought organic eggs.

(c) Using your answer to part (b), state whether or not this sample supports the manager's claim. Use a 5% level of significance.

(1)

(d) State the actual significance level of this test.

(1)

The proportion of customers who buy organic fruit from *Tesson* supermarket is 0.2
During a particular day, a random sample of 200 customers from *Tesson* supermarket is taken. Using a suitable approximation, the probability that fewer than n of these customers bought organic fruit is 0.0465 correct to 4 decimal places.

(e) Find the value of n.

(6)

Leave blank

Question 22 continued

Leave blank

Question 22 continued

Leave blank

Question 22 continued

(Total 16 marks)

Leave blank

23. A potter believes that 20% of pots break whilst being fired in a kiln. Pots are fired in batches of 25.

(a) Let X denote the number of broken pots in a batch. A batch is selected at random. Using a 10% significance level, find the critical region for a two tailed test of the potter's belief. You should state the probability in each tail of your critical region.

(4)

The potter aims to reduce the proportion of pots which break in the kiln by increasing the size of the batch fired. He now fires pots in batches of 50. He then chooses a batch at random and discovers there are 6 pots which broke whilst being fired in the kiln.

(b) Test, at the 5% level of significance, whether or not there is evidence that increasing the number of pots in a batch has reduced the percentage of pots that break whilst being fired in the kiln. State your hypotheses clearly.

(5)

Leave blank

Question 23 continued

(Total 9 marks)

Leave blank

24. In a region of the UK, 5% of people have red hair. In a random sample of size n, taken from this region, the expected number of people with red hair is 3

Patrick claims that *Reddman* people have a probability greater than 5% of having red hair. In a random sample of 50 *Reddman* people, 4 of them have red hair.

Stating your hypotheses clearly, test Patrick's claim. Use a 1% level of significance.

(5)

Leave blank

Question 24 continued

Leave blank

Question 24 continued

Leave blank

Question 24 continued

(Total 5 marks)

Leave blank

25. The proportion of houses in Radville which are unable to receive digital radio is 25%. In a survey of a random sample of 30 houses taken from Radville, the number, X, of houses which are unable to receive digital radio is recorded.

A radio company claims that a new transmitter set up in Radville will reduce the proportion of houses which are unable to receive digital radio. After the new transmitter has been set up, a random sample of 15 houses is taken, of which 1 house is unable to receive digital radio.

Test, at the 10% level of significance, the radio company's claim. State your hypotheses clearly.

(5)

Leave blank

Question 25 continued

(Total 5 marks)

Leave blank

26. Before Roger will use a tennis ball he checks it using a "bounce" test. The probability that a ball from Roger's usual supplier fails the bounce test is 0.2. A new supplier claims that the probability of one of their balls failing the bounce test is less than 0.2. Roger checks a random sample of 40 balls from the new supplier and finds that 3 balls fail the bounce test.

Stating your hypotheses clearly, use a 5% level of significance to test the new supplier's claim.

(5)

Leave blank

Question 26 continued

(Total 5 marks)

Leave blank

27. In a manufacturing process 25% of articles are thought to be defective. Articles are produced in batches of 20

(a) A batch is selected at random. Using a 5% significance level, find the critical region for a two tailed test that the probability of an article chosen at random being defective is 0.25
You should state the probability in each tail which should be as close as possible to 0.025

(5)

The manufacturer changes the production process to try to reduce the number of defective articles. She then chooses a batch at random and discovers there are 3 defective articles.

(b) Test at the 5% level of significance whether or not there is evidence that the changes to the process have reduced the percentage of defective articles. State your hypotheses clearly.

(5)

Leave blank

Question 27 continued

(Total 10 marks)

Leave blank

28. (a) Explain what you understand by a hypothesis.

(1)

(b) Explain what you understand by a critical region.

(2)

Mrs George claims that 45% of voters would vote for her.

In an opinion poll of 20 randomly selected voters it was found that 5 would vote for her.

(c) Test at the 5% level of significance whether or not the opinion poll provides evidence to support Mrs George's claim.

(4)

In a second opinion poll of n randomly selected people it was found that no one would vote for Mrs George.

(d) Using a 1% level of significance, find the smallest value of n for which the hypothesis $H_0 : p = 0.45$ will be rejected in favour of $H_1 : p < 0.45$

(3)

Leave blank

Question 28 continued

(Total 10 marks)

Leave blank

29. A test statistic has a distribution B(25, p).

Given that

$$H_0 : p = 0.5 \qquad H_1 : p \neq 0.5$$

(a) find the critical region for the test statistic such that the probability in each tail is as close as possible to 2.5%.

(3)

(b) State the probability of incorrectly rejecting H_0 using this critical region.

(2)

Leave blank

Question 29 continued

(Total 5 marks)

Leave blank

30. David claims that the weather forecasts produced by local radio are no better than those achieved by tossing a fair coin and predicting rain if a head is obtained or no rain if a tail is obtained. He records the weather for 30 randomly selected days. The local radio forecast is correct on 21 of these days.

Test David's claim at the 5% level of significance.

State your hypotheses clearly.

(7)

(Total 7 marks)

Leave blank

31. A shopkeeper knows, from past records, that 15% of customers buy an item from the display next to the till. After a refurbishment of the shop, he takes a random sample of 30 customers and finds that only 1 customer has bought an item from the display next to the till.

(a) Stating your hypotheses clearly, and using a 5% level of significance, test whether or not there has been a change in the proportion of customers buying an item from the display next to the till.

(6)

During the refurbishment a new sandwich display was installed. Before the refurbishment 20% of customers bought sandwiches. The shopkeeper claims that the proportion of customers buying sandwiches has now increased. He selects a random sample of 120 customers and finds that 31 of them have bought sandwiches.

(b) Using a suitable approximation and stating your hypotheses clearly, test the shopkeeper's claim. Use a 10% level of significance.

(8)

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Question 31 continued

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Question 31 continued

Leave blank

Question 31 continued

(Total 14 marks)

Leave blank

32. A student takes a multiple choice test. The test is made up of 10 questions each with 5 possible answers. The student gets 4 questions correct. Her teacher claims she was guessing the answers. Using a one tailed test, at the 5% level of significance, test whether or not there is evidence to reject the teacher's claim.
State your hypotheses clearly.

(6)

(Total 6 marks)

Leave blank

33. A company claims that a quarter of the bolts sent to them are faulty. To test this claim the number of faulty bolts in a random sample of 50 is recorded.

(a) Give two reasons why a binomial distribution may be a suitable model for the number of faulty bolts in the sample.

(2)

(b) Using a 5% significance level, find the critical region for a two-tailed test of the hypothesis that the probability of a bolt being faulty is $\frac{1}{4}$. The probability of rejection in either tail should be as close as possible to 0.025

(3)

(c) Find the actual significance level of this test.

(2)

In the sample of 50 the actual number of faulty bolts was 8.

(d) Comment on the company's claim in the light of this value. Justify your answer.

(2)

The machine making the bolts was reset and another sample of 50 bolts was taken. Only 5 were found to be faulty.

(e) Test at the 1% level of significance whether or not the probability of a faulty bolt has decreased. State your hypotheses clearly.

(6)

Leave blank

Question 33 continued

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Question 33 continued

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Question 33 continued

(Total 15 marks)

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34. (a) Define the critical region of a test statistic.

(2)

A discrete random variable X has a Binomial distribution B(30, p). A single observation is used to test $H_0 : p = 0.3$ against $H_1 : p \neq 0.3$

(b) Using a 1% level of significance find the critical region of this test. You should state the probability of rejection in each tail which should be as close as possible to 0.005

(5)

(c) Write down the actual significance level of the test.

(1)

The value of the observation was found to be 15.

(d) Comment on this finding in light of your critical region.

(2)

Leave blank

Question 34 continued

(Total 10 marks)

Leave blank

35. Past records suggest that 30% of customers who buy baked beans from a large supermarket buy them in single tins. A new manager questions whether or not there has been a change in the proportion of customers who buy baked beans in single tins. A random sample of 20 customers who had bought baked beans was taken.

(a) Using a 10% level of significance, find the critical region for a two-tailed test to answer the manager's question. You should state the probability of rejection in each tail which should be less than 0.05.

(5)

(b) Write down the actual significance level of a test based on your critical region from part (a).

(1)

The manager found that 11 customers from the sample of 20 had bought baked beans in single tins.

(c) Comment on this finding in the light of your critical region found in part (a).

(2)

Leave blank

Question 35 continued

(Total 8 marks)

Leave blank

36. A single observation x is to be taken from a Binomial distribution B(20, p).

This observation is used to test $H_0 : p = 0.3$ against $H_1 : p \neq 0.3$

(a) Using a 5% level of significance, find the critical region for this test.
The probability of rejecting either tail should be as close as possible to 2.5%.

(3)

(b) State the actual significance level of this test.

(2)

The actual value of x obtained is 3.

(c) State a conclusion that can be drawn based on this value giving a reason for your answer.

(2)

(Total 7 marks)

Leave blank

37. Sue throws a fair coin 15 times and records the number of times it shows a head.

(a) State the distribution to model the number of times the coin shows a head.

(2)

Find the probability that Sue records

(b) exactly 8 heads,

(2)

(c) at least 4 heads.

(2)

Sue has a different coin which she believes is biased in favour of heads. She throws the coin 15 times and obtains 13 heads.

(d) Test Sue's belief at the 1% level of significance. State your hypotheses clearly.

(6)

Leave blank

Question 37 continued

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Question 37 continued

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Question 37 continued

(Total 12 marks)

Leave blank

38. Dhriti grows tomatoes. Over a period of time, she has found that there is a probability 0.3 of a ripe tomato having a diameter greater than 4 cm. She decides to try a new fertiliser. In a random sample of 40 ripe tomatoes, 18 have a diameter greater than 4 cm. Dhriti claims that the new fertiliser has increased the probability of a ripe tomato being greater than 4 cm in diameter.

Test Dhriti's claim at the 5% level of significance. State your hypotheses clearly.

(7)

(Total 7 marks)