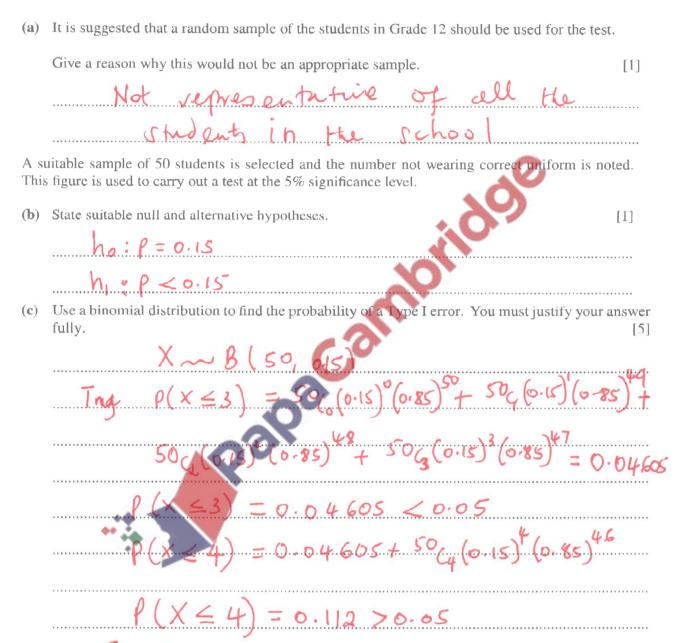
Hypothesis Tests – 2021 A2

1. June/2021/Paper 9709/61/No.8

At a certain large school it was found that the proportion of students not wearing correct uniform was 0.15. The school sent a letter to parents asking them to ensure that their children wear the correct uniform. The school now wishes to test whether the proportion not wearing correct uniform has been reduced.



Type I emor = 10.0460

(d)	In fact 4 students out of the 50 are not wearing correct uniform.
	State the conclusion of the test, explaining your answer. [2]
	4 6 outside the Critical
	(43) = 0.08460S < 0.08
	P(x = 1) = 0.112 > 0.05
	No endence that proportion not
	weening the correct uniform
	devease
	Accept Ho
(e)	State, with a reason, which of the errors, Type I or Type Π , may have been made. [2]
	Ho not rejected (Accept Ho)
	Ho not rejected (Accept Ho) type II error
	a Pacal
	.00
	Pak
	**

2. June/2021/Paper_9709/62/No.1

In a game, a ball is thrown and lands in one of 4 slots, labelled A, B, C and D. Raju wishes to test whether the probability that the ball will land in slot A is $\frac{1}{4}$.

(a)	State suitable null and alternative hypotheses for Raju's test.	[1]
/		F - 1



The ball is thrown 100 times and it lands in slot A 15 times.



$$1000 = 25 \times 3$$
 = 75

$$\rho\left(X \leq \frac{15.5 - 25}{\sqrt{75/4}}\right)$$

$$\rho(z \leq -2.194) = 1 - \phi(2.194)$$

$$= 0.0141 > 0.01$$

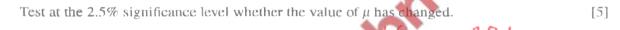
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3.	June	/2021	/Paper	9709	/62	/ NO.5

The time, in minutes, spent by customers at a particular gym has the distribution $N(\mu, 38.2)$. In the past the value of μ has been 42.4. Following the installation of some new equipment the management wishes to test whether the value of μ has changed.

(a) State	what is meant by a	Type I error in this context.	[1]
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(b) The mean time for a sample of 20 customers is found to be 45.6 minutes.









4.	lune	/2021	/Paper_	9709	/63	/No 2
→.	June	/ 2021/	rapei_	_5/05	/ US/	/ 140.2

In the past, the time, in hours, for a particular train journey has had mean 1.40 and standard deviation 0.12. Following the introduction of some new signals, it is required to test whether the mean journey time has decreased.

(a) State what is meant by a Type II error in this context. [1]

Lonclude that the mean Jouney Time has not decreased when in fact it has.

(b) The mean time for a random sample of 50 journeys is found to be 1.36 hours

Assuming that the standard deviation of journey times is still 0.12 hours, test at the 2.5% significance level whether the population mean journey time has decreased. [5]

Ho: µ=1.4

n=50 $\bar{x}=1.36$ $\bar{x}=0.12$

Z value = 1.36-1.4 \\ \(\sqrt{50} \)

0.60

z = -2.351 at 2.5% $z = \pm 1.96$

that the mean Journally has changed.

(c) State, with a reason, which of the errors, Type I or Type II, might have been made in the test in part (b).

Ho mas rejected

5. June/2021/Paper_9709/63/No.3

The local council claims that the average number of accidents per year on a particular road is 0.8. Jane claims that the true average is greater than 0.8. She looks at the records for a random sample of 3 recent years and finds that the total number of accidents during those 3 years was 5.

(a) Assume that the number of accidents per year follows a Poisson distribution.

(i) State null and alternative hypotheses for a test of Jane's claim.

[1]

 $H_0: \lambda = 2.4$ for 3 years $3 \times 0.8 = 2.4$ $H_1: \lambda > 2.4$

(ii) Test at the 5% significance level whether Jane's claim is justified.

P(X > 5) = 1 - P(X = 0, 0, 1)

[4]

 $1 - e^{2\cdot 4} \left(\frac{2\cdot 4^{\circ} + 2\cdot 4}{0! + \frac{2\cdot 4^{2}}{2!} + \frac{2\cdot 4^{3} + 2\cdot 4^{9}}{3! + \frac{2\cdot 4}{4!}} \right)$

 $1 - e^{-2.4} \left(1 + 2.4 + \frac{2.4^{2}}{2} + \frac{2.4^{3}}{31} + \frac{2.4^{9}}{4!} \right)$

at 5%

Tanels claim.

(b) Jane finds that the number of accidents per year has been gradually increasing over recent years.

State how this might affect the validity of the test carried out in part (a)(ii).

[1]

Mean not constant; so poisson model is

6.	N 4 - 4 - l-	/2021	/Daman	0700	100	// 2
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An architect wishes to investigate whether the buildings in a certain city are higher, on average, than buildings in other cities. He takes a large random sample of buildings from the city and finds the mean height of the buildings in the sample. He calculates the value of the test statistic, z, and finds that z = 2.41.

(a)	Explain briefly whether he should use a one-tail test or a two-tail test.	[1]
	One failed because and the architect	
	is investigation whether its'higher	•••••
(b)	Carry out the test at the 1% significance level.	[3]
	Ho: psp' me an (p) in city came as of	
	HI: pop mean in city is greather Ikain	other
	2.41 > 2.326	
	There is evidence that the brulds	ings
	are higher	

7. March/2021/Paper_9709/62/No.6

It is known that 8% of adults in a certain town own a Chantor car. After an advertising campaign, a car dealer wishes to investigate whether this proportion has increased. He chooses a random sample of 25 adults from the town and notes how many of them own a Chantor car.

(a) He finds that 4 of the 25 adults own a Chantor car.

Carry out a hypothesis test at the 5% significance level.	[5]
7 \$100	
Ho: Pop popotión - 0-08	
H. Pop Propostion >0.08	****

$I(X7,4)=1-P(X \in 3)$ + was browned	à (
X ~ β (25, 0.08) P=0.08 2=0.92	
2=0.92	
1- (0.9225 + 25c, x092 x0.08 + 25c, x0.	92 20.08
+ 25 22 3	******
$+2500.92^{22}\times0.08^{3}$ = 0.19	351
0.935 3 Significant figures	
** 0 VI35 > 0. 05	
There is no enderge that the	*******
propostion owning charter has	
In Company	

(b) Explain which of the errors, Type I or Type II, might have been made in carrying out the test in part (a).

Ho was not rejected

Hence type II might have been made in carrying out the test in [2]

Later, the car dealer takes another random sample of 25 adults from the town and carries out a similar hypothesis test at the 5% significance level.

(c) Find the probability of a Type I error.

[3]



 $(1-) P(x \leq 3) + P(x \equiv 4)$

1- (1-01351) + 25(4X0,9221 X0-084)

0.0451 which less than 0-5

P (Type 1 emor) = 0.0451