

Summer Assignment Test 1 Version O

1. A boy of mass 30 kg slides from rest down a straight slide of length 6m. The slide is inclined to the horizontal at angle of 30° . The coefficient of friction between the boy and the slide is 0.2

By modelling the boy as a particle, find

- the acceleration of the boy
- the speed of the boy at the bottom of the slide

Give your answer to 2 d.p.

2. Solve the equation $\sec^2 x = 4 \tan x$ for $-\pi \leq x \leq \pi$ giving an exact answer in terms of π

3. It is claimed that 50% of people use Oriels washing powder. In a random survey of 20 people, 12 said they did not use Oriels powder.

Test at the 5% significance level, whether there is evidence that the proportion of people using Oriels powder is 50%. State your hypothesis carefully.

Summer Assignment Test 1 Version P

1. A boy of mass 20 kg slides from rest down a straight slide of length 4m. The slide is inclined to the horizontal at angle of 25° . The coefficient of friction between the boy and the slide is 0.15

By modelling the boy as a particle, find

- the acceleration of the boy
- the speed of the boy at the bottom of the slide

Give your answer to 2 d.p.

2. Solve the equation $\sec^2 x = -2 \tan x$ for $-\pi \leq x \leq \pi$ giving an exact answer in terms of π

3. It is claimed that 40% of people use Oriels washing powder. In a random survey of 25 people, 15 said they did not use Oriels powder.

Test at the 5% significance level, whether there is evidence that the proportion of people using Oriels powder is 40%. State your hypothesis carefully.

Summer Assignment Test 1 Version Q

1. A boy of mass 70 kg slides from rest down a straight slide of length 20m. The slide is inclined to the horizontal at angle of 40° . The coefficient of friction between the boy and the slide is 0.05

By modelling the boy as a particle, find

- the acceleration of the boy
- the speed of the boy at the bottom of the slide

Give your answer to 2 d.p.

2. Solve the equation $\sec^2 x = -4 \tan x$ for $-\pi \leq x \leq \pi$ giving an exact answer in terms of π

3. It is claimed that 20% of people use Oriels washing powder. In a random survey of 20 people, 9 said they did not use Oriels powder.

Test at the 5% significance level, whether there is evidence that the proportion of people using Oriels powder is 20%. State your hypothesis carefully.

Summer Assignment 1 Version R

1. A boy of mass 30 kg slides from rest down a straight slide of length 20m. The slide is inclined to the horizontal at angle of 5.8° . The coefficient of friction between the boy and the slide is 0.1

By modelling the boy as a particle, find

- the acceleration of the boy
- the speed of the boy at the bottom of the slide

Give your answer to 2 d.p.

2. Solve the equation $\sec^2 x = 2 \tan x$ for $-\pi \leq x \leq \pi$ giving an exact answer in terms of π

3. It is claimed that 30% of people use Oriels washing powder. In a random survey of 30 people, 18 said they did not use Oriels powder.

Test at the 5% significance level, whether there is evidence that the proportion of people using Oriels powder is 30%. State your hypothesis carefully.

Answers Version O

1 a) 3.20 b) 6.20

$$2) \frac{5\pi}{12}, \frac{\pi}{12}, -\frac{11\pi}{12}, -\frac{7\pi}{12}$$

$$3) H_0: p = 0.5$$

$$H_1: p \neq 0.5$$

$$X \sim B(20, 0.5)$$

Two tail test

Significance level = 5% (2.5% at each end)

First method:

$$P(X \geq 12) = 1 - p(X \leq 11) = 1 - 0.7483 = 0.2517 > 0.025$$

There is insufficient evidence to reject H_0

There is evidence to support the claim that the proportion of people using Oriels powder is 50%.

Second method:

$$P(X \geq x) \leq 0.025$$

$$\therefore P(X \leq x - 1) \geq 0.975$$

$$\therefore x - 1 = 14$$

$$\therefore x = 15$$

The critical region is 15 and above. So 12 is not in the critical region.

There is evidence to support the claim that the proportion of people using Oriels powder is 50%.

Answers Version P

1 a) 2.81 b) 4.74

$$2) -\frac{\pi}{4}, \frac{3\pi}{4}$$

$$3) H_0: p = 0.4$$

$$H_1: p \neq 0.4$$

$$X \sim B(25, 0.4)$$

Two tail test

Significance level = 5% (2.5% at each end)

First method:

$$P(X \geq 15) = 1 - p(X \leq 14) = 1 - 0.9656 = 0.0344 > 0.025$$

There is insufficient evidence to reject H_0

There is evidence to support the claim that the proportion of people using Oriels powder is 40%.

Second method:

$$P(X \geq x) \leq 0.025$$

$$\therefore P(X \leq x - 1) \geq 0.975$$

$$\therefore x - 1 = 15$$

$$\therefore x = 16$$

The critical region is 16 and above. So 15 is not in the critical region.

There is evidence to support the claim that the proportion of people using Oriels powder is 40%.

Answers Version Q

1 a) 5.92 b) 15.39

$$2) -\frac{5\pi}{12}, -\frac{\pi}{12}, \frac{11\pi}{12}, \frac{7\pi}{12}$$

$$3) H_0: p = 0.2$$

$$H_1: p \neq 0.2$$

$$X \sim B(20, 0.2)$$

Two tail test

Significance level = 5% (2.5% at each end)

First method:

$$P(X \geq 9) = 1 - p(X \leq 8) = 1 - 0.9900 = 0.001 < 0.025$$

There is sufficient evidence to reject H_0

There is evidence to support the claim that the proportion of people using Oriels powder is not 20%.

Second method:

$$P(X \geq x) \leq 0.025$$

$$\therefore P(X \leq x - 1) \geq 0.975$$

$$\therefore x - 1 = 8$$

$$\therefore x = 9$$

The critical region is 9 and above. So 9 is in the critical region.

There is evidence to support the claim that the proportion of people using Oriels powder is not 20%.

Answers Version R

1 a) 0.02 b) 0.78

$$2) \frac{\pi}{4}, -\frac{3\pi}{4}$$

$$3) H_0: p = 0.3$$

$$H_1: p \neq 0.3$$

$$X \sim B(30, 0.3)$$

Two tail test

Significance level = 5% (2.5% at each end)

First method:

$$P(X \geq 18) = 1 - p(X \leq 17) = 1 - 0.9994 = 0.0006 < 0.025$$

There is sufficient evidence to reject H_0

There is evidence to support the claim that the proportion of people using Oriels powder is not 30%.

Second method:

$$P(X \geq x) \leq 0.025$$

$$\therefore P(X \leq x - 1) \geq 0.975$$

$$\therefore x - 1 = 14$$

$$\therefore x = 15$$

The critical region is 15 and above. So 18 is in the critical region.

There is evidence to support the claim that the proportion of people using Oriels powder is not 30%.