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Class: 13RH

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A Level Maths Mock Applied (Paper 2)

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Maths Stats and Mechanics Ethan Tesdale

①

~~1181 x 1.2~~ ~~1181~~ ~~1181~~ $3 \times 15 + 4 \times 4 + 2 \times 2 = 65$

$78 \div 65 = 1.2$

$1 \times 10 \times 1.2 + 1.2 \times 8 = 21.6$

$8 \times 1.2 + 2 \times 10 \times 1.2 + 3 \times 5 \times 1.2 + 78 = 129.6$

$21.6 \div 129.6 \times 100 = 16.7\%$

②

a) weak negative correlation

b)

i) frequency

ii) no units

c) critical value = -0.3061

$H_0: r = -0.377$

$H_1: r < -0.377$

As $-0.3061 > -0.377$, there is not enough evidence to reject H_0

d) There is a negative correlation, so the number of hours of Sunshine will be low, e.g. 3 hours as the humidity is high

③

a) $68 - 7 = 61$

b) $25 - 14 = 11$

c) $607.5 \div 27 = 22.5$

d) $\sqrt{\frac{17623.25}{27} - 22.5^2}$
 $= 12.1$

e) ~~2 as there is only 1 value that has more than 3 standard deviations from the mean~~

1, as there is only 1 value that is greater than 58.8

f) $a = 2$ & $b = 21$

$$\frac{607.5 + 21 + 24}{29} = 22.5 \quad \bar{x} = 22.5$$

as the both values are above the current median, the median will increase

g), all more values are closer to the mean, so, the spread is less

4)

$$a) \frac{k}{10} + \frac{k}{20} + \frac{k}{30} + \frac{k}{40} + \frac{k}{50} = 1$$

$$\frac{3k}{50} + \frac{2.5k}{50} + \frac{5}{3} \frac{k}{50} + \frac{5}{4} \frac{k}{50} + \frac{k}{50} = 1$$

$$\frac{137}{12} k = 50$$

$$k = \frac{600}{137}$$

5) ~~1000~~

$$\frac{k}{50} \times \frac{k}{30}$$

$$\frac{\frac{600}{137}}{50} \times \frac{\frac{600}{137}}{30} = 0.0128$$

$$c) a_n = \frac{k}{10} + d(n-1)$$

$$a_n = \frac{k}{10} + 50(4-1)$$

$$a_n =$$

5) $p(x \geq 3)$

a)

$$x \sim B(9, 1/6)$$

$$p(x \geq 3) = 1 - p(x \leq 2)$$

$$= 0.178$$

b)

$$0.178^1 \times 0.822^4 = 0.0812$$

c)

$$H_0: p = 1/6$$

$$H_1: p > 1/6$$

$$x \sim B(35, 1/6)$$

$$p(x \geq 7/11) = 1 - p(x \leq 10)$$

=

0.023

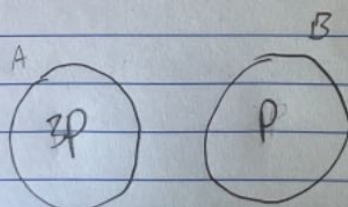
$$0.023 < 0.05$$

There is sufficient evidence to reject H_0 . Rowan is more successful

6)

i)

a)



b)

~~all integer~~ all positive real values

ii)

a) ~~They~~ They are not, as there is ~~an~~ ^{the} probability that C occurs given that D occurs. Knowing that $P(C|D)$ occurs changes $P(C)$

b)

$$P(C \cap D) = P(C|D) \times P(D)$$

$$\frac{7}{10} = P(C|D) \times P(D)$$

$$P(C \cap D) = \frac{1}{2} \times P(C)$$

$$P(C) \times P(D) = P(C|D) \times P(D) = \frac{1}{2} P(C)$$

~~Therefore~~

$$P(C) \times \frac{P(D|C)}{P(C)} = \frac{1}{2} P(C)$$

~~Therefore~~

①

$$a) \quad v = 7t - 2t^2 + 14 - 4t$$

$$v = -2t^2 + 3t + 14$$

$$\frac{dv}{dt} = -4t + 3$$

$$0 = -4t + 3$$

$$4t = 3$$

$$t = \frac{3}{4} \text{ s}$$

$$b) \quad s = -\frac{2}{3}t^3 + \frac{3}{2}t^2 + 14t + c$$

$$\frac{d^2v}{dt^2} = -4 \text{ ms}^{-1}$$

$$4 \times \frac{3}{4} = 3 \text{ m}$$

②

a) ~~2x60x16 = 1920 m~~

$$15 \times 60 \times 16 = 14400 \text{ m}$$

$$10 \times 60 \times 16 = 9600$$

$$1920 + 14400 + 9600 = 25920 \text{ m}$$

b)

~~25920~~

$$25920 = 24 \times t$$

$$t = 1080$$

$$24 \times 60 \times 2 = 2880$$

$$25920 - 2880 = 23040 \text{ m}$$

$$23040 = 24 \times t$$

$$t = 960 \text{ s}$$

$$960 + 2 = 962$$

$$962 : 60 = 16 \text{ minutes}$$

~~25920~~

~~25920~~
~~24 \times 60 \times 2 = 2880~~
~~25920 - 2880 = 23040~~
~~23040 = 24 \times t~~
~~t = 960~~
~~960 + 2 = 962~~
~~962 : 60 = 16 \text{ minutes}~~

c) There are no other trains on the track

③

$$a) R = 20 \times \frac{12}{15} + 30 \times \frac{5}{13}$$

$$R = 27.5 N$$

$$\frac{13}{12} \Delta 5$$

$$b) F = 30 \times \frac{12}{13} + \frac{5}{13} \times 20$$

$$F = 35.38$$

$$35.38 = \mu 27.5 \quad F = \mu R$$

$$\mu = 1.29$$

$$\frac{5}{13} \times 20 \quad F = 30 \times \frac{12}{13} - \frac{5}{13} \times 20$$

$$F = 20$$

$$20 = \mu 27.5$$

$$\mu = 0.727$$

$$0.727 \mu \leq 1.29$$

$$c) R = 20 \times \frac{12}{15}$$

$$F = \mu R$$

$$F = \frac{1}{3} \times 16$$

$$10 \times \frac{16}{3}$$

$$F = \frac{16}{3}$$

$$20 \times \frac{5}{13} - \frac{16}{3} = \frac{20}{9.8} \times a$$

$$a = 1.16 \text{ m/s}^2$$

$$F = ma$$

④

a)

$$\frac{5}{3} \Delta 4$$

$$\frac{4}{5} = \frac{4a}{H}$$

$$H = 5a \quad AC = 5a$$

~~mass~~ $m(A)$:

$$3a \times Mg \times \frac{3}{5} = N \times 5a \times \frac{4}{5}$$

$$\frac{3a \times Mg \times \frac{3}{5}}{5a \times \frac{4}{5}} = N$$

$$N = \frac{9Mg}{20}$$

b)

$$N = F \quad F = \mu R$$

$$R = Mg$$

$$\frac{9Mg}{25} = \mu \times Mg$$

$$\mu = \frac{9}{25}$$

⑤ a) $s = 25$

↓ $u = u \sin 45$

$v = ?$

$a = -9.81$

$t = ?$

$$-25 = u \sin 45 t + \frac{1}{2} (-9.81) t^2$$

~~$v = u \sin 45$~~

~~$25 = u \sin 45 t$~~

→

$$t = 100 \div u \cos 45$$

$$-25 = u \sin 45 \times \frac{100}{u \cos 45} + \frac{1}{2} (-9.81) \left(\frac{100}{u \cos 45} \right)^2$$

$$-25 = 100 \tan(45) + -4.9 \times \frac{10000}{u^2 \cos^2 45}$$

→

~~$100 \tan 45 = 10000 \div u^2 \cos^2 45$~~

$$-125 = -4.9 \times \frac{10000}{u^2 \cos^2 45}$$

~~$u^2 \cos^2 45 =$~~

$$u^2 \cos^2 45 = 392$$

$$u^2 = 784$$

$$u = 28$$

b)

$s = ?$

$u = 28 \sin 45$

$$0^2 = 28^2 \sin^2 45 + 2 \times -9.81 \times s$$

$v = 0$

$s = 0.714$

$a = -9.81$

$0.714 + \cancel{25} = \underline{\underline{25.7 \text{ m}}}$

$t = ?$

c) it would be lower

d) factor in the spin of the ball