

ADVANCED PROGRAMME MATHEMATICS

GRADE 12

PAPER 2 EXAMINATION

27 July 2017

QUESTION 1

$$1.1 \quad (a) \quad z = \frac{100-90}{10} \checkmark \\ = 1 \quad \checkmark$$

$$P(z > 1) = 0,5 - 0,3413 \checkmark \checkmark \\ = 0,1587 \checkmark$$

(6)

$$(b) \quad P(z > k) = 0,08$$

$$P(0 < z < k) = 0,42 \checkmark \checkmark$$

$$k = 1,41 \checkmark \checkmark$$

$$1,41 = \frac{p-90}{10} \checkmark \checkmark$$

$$p = 104,1 \text{ km/h} \checkmark \checkmark$$

(8)

$$1.2 \quad (a) \quad p = \frac{160}{480} \pm 1,88 \sqrt{\frac{\frac{160}{480} \left(1 - \frac{160}{480}\right)}{480}} \checkmark \checkmark$$

$$= \frac{1}{3} \pm 1,88 \sqrt{\frac{\frac{1}{3} \left(\frac{2}{3}\right)}{480}}$$

$$p \in (0,2929 ; 0,3738) \checkmark \checkmark$$

(6)

(b) 94% of the time the interval will contain the population proportion. ✓✓

(2)

[22]

QUESTION 2

$$2.1 \quad P(X=0) = \binom{12}{0} (0,1)^0 (0,9)^{12} = 0,2824 \dots \checkmark \checkmark$$

$$P(X=1) = \binom{12}{1} (0,1)^1 (0,9)^{11} = 0,3765 \dots \checkmark \checkmark$$

$$P(X=2) = \binom{12}{2} (0,1)^2 (0,9)^{10} = 0,2301 \dots \checkmark \checkmark$$

$$\therefore 0,8891 \checkmark \checkmark$$

2.2

$$P(R=7) = \frac{\binom{30}{7} \binom{70}{13}}{\binom{100}{20}} \checkmark \checkmark \quad (8)$$

$$= 0,1803 \checkmark \checkmark$$

(6)

[14]

QUESTION 3

3.1 One-tailed test should be used. ✓
Nikola wants to see if the times have decreased. ✓

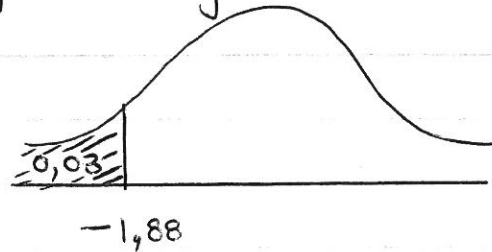
(2)

3.2

$$H_0: \mu = 15,2 \checkmark$$

$$H_1: \mu < 15,2 \checkmark$$

Rejection region:



Reject H_0 $\checkmark\checkmark$
if $z < -1,88$

$$\begin{aligned} \text{Test statistic: } z &= \frac{14,3 - 15,2}{\frac{5}{\sqrt{11}}} \checkmark \\ &= -0,597 \checkmark \end{aligned}$$

We fail to reject H_0 at a 3% l.o.s. and suggest insufficient evidence to support Nikola's claim. $\checkmark\checkmark$

(10)

[12]

QUESTION 4

$$P(A) = 0,7$$

$$P(B) = 0,3$$

$$P(A \cup B)' = 0,2 \checkmark$$

$$P(A \cup B) = 0,8 \checkmark$$

$$P(B|A) = \frac{P(B \cap A)}{P(A)}$$

$$= \frac{0,2 \checkmark\checkmark}{0,7} \checkmark$$

$$= 0,2857 \checkmark$$

[6]

(3)

QUESTION 5

$$\begin{aligned} 5.1 \quad \frac{1}{2} \times c \times c &= 1 \quad \checkmark \checkmark \\ c^2 &= 2 \quad \checkmark \\ c &= \sqrt{2} \quad \checkmark \end{aligned}$$

(4)

$$5.2 \quad P(a < X < 1) = 0,1$$

$$f(x) = x \quad \checkmark \checkmark$$

$$\int_a^1 x \, dx = 0,1 \quad \checkmark \checkmark$$

$$\left[\frac{x^2}{2} \right]_a^1 = 0,1$$

$$\frac{1^2}{2} - \frac{a^2}{2} = 0,1 \quad \checkmark$$

$$0,8 = a^2 \quad \checkmark$$

$$a = 0,8944 \quad \checkmark$$

OR $\frac{1}{2} \times (a+1) \times (1-a) = 0,1 \quad \checkmark$

$$1 - a^2 = 0,2 \quad \checkmark$$

$$0,8 = a^2 \quad \checkmark$$

$$a = 0,8944 \quad \checkmark$$

(8)

$$\begin{aligned}
 5.3 \quad E(X) &= \int_0^{\sqrt{2}} x \cdot x \, dx \quad \checkmark \\
 &= \int_0^{\sqrt{2}} x^2 \, dx \quad \checkmark \\
 &= \left[\frac{x^3}{3} \right]_0^{\sqrt{2}} \\
 &= \frac{(\sqrt{2})^3}{3} - 0 \quad \checkmark \\
 &= 0,9428 \quad \checkmark
 \end{aligned}$$

(6)
[18]

QUESTION 6

$$6.1 \quad y = 166,812 - 0,8568x \quad \checkmark \checkmark \quad (4)$$

6.2 $r = -0,884 \quad \checkmark$
A significant, negative linear correlation. (2)

$$\begin{aligned}
 6.3 \quad y &= 166,812 - 0,8568(18) \quad \checkmark \\
 &= 151,3896 \quad m \quad \checkmark \quad (2)
 \end{aligned}$$

6.4 It is not very reliable as extrapolation occurs. \checkmark

(2)
[10]

QUESTION 7

$$7.1 \quad 5! \times 4! \times 7! \times 3! = 87\,091\,200 \quad (5)$$

$$7.2 \quad \frac{\binom{5}{2} \binom{4}{2} \binom{7}{2}}{\binom{16}{6}} = \frac{45}{286} = 0,1573$$

$$7.3 \quad \binom{7}{3} \binom{5}{1} \binom{4}{3} + \binom{7}{3} \binom{5}{2} \binom{4}{2} + \binom{7}{3} \binom{5}{3} \binom{4}{1} \quad (5)$$

$$= 700 + 2100 + 1400 \checkmark$$

$$= 4200 \checkmark$$

(8)
[18]

TOTAL: [100]