



PAPER 3 MEMORANDUM

Question 1

a) $T_1 = 3$

$$T_2 = 2 \times 3$$

$$T_3 = 2 \times 2 \times 3$$

$$T_4 = 2 \times 2 \times 2 \times 3$$

$$T_{n+1} = 2T_n \checkmark \text{ with } T_1 = 3 \checkmark$$

(each term is twice the previous term)

b) $T_k = 2T_{k-1} + T_{k-2}$

$$T_3 = 2T_2 + T_1 \checkmark$$

$$= 2(2) + (1)$$

$$= \underline{5} \checkmark$$

$$T_4 = 2T_3 + T_2$$

$$= 2(5) + 2$$

$$= \underline{12} \checkmark$$

$$T_5 = 2T_4 + T_3$$

$$= 2(12) + 5$$

$$= \underline{29} \checkmark$$

Next 3 terms are 5;12;29

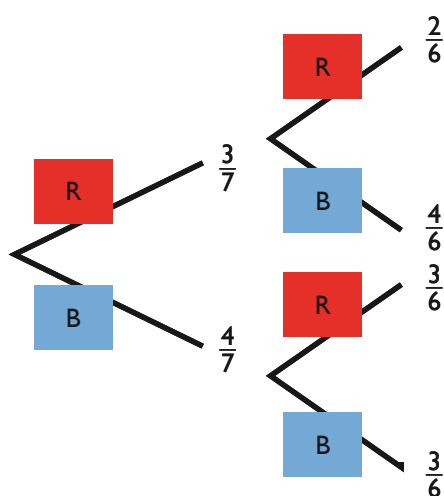
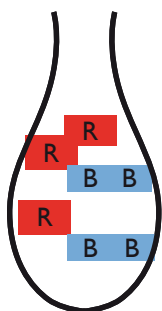
Collect your Paper 3 Lessons every week!!

Guys, both NSC and IEB examinations candidates have the option of writing Paper 3 at the end of the year! Paper 3 covers additional mathematics material and is out of 100 marks. Maths Paper 3 will really set you apart in the job market, and make studying technical subjects at tertiary level easier. We have hooked you up with these lessons - written by IEB Maths Paper 3 examiner Heather Frankiskos.

The Mock Examination Memo this week applies to candidates from both examining bodies. **Mark this and next week's attempt out of 100 and see how well you do.**

Question 2

(a)



Tree Diagram

$$\begin{aligned}
 &P(\text{Red, Red}) + P(\text{Blue, Blue}) \\
 &= \frac{3}{7} \times \frac{2}{6} + \frac{4}{7} \times \frac{3}{6} \\
 &= \frac{1}{7} + \frac{2}{7} \\
 &= \frac{3}{7}
 \end{aligned}$$

b) $P(A) \cdot P(B) = P(A \cap B)$ for independence

So $P(\text{Right}) \times P(\text{Light}) = a$

$$\frac{48}{60} \times \frac{20}{60} = \frac{4}{15}$$

$$\therefore a = \frac{4}{15} \times 60 = 16$$

$$\therefore b = 4$$

$$\therefore c = 32$$

Question 3

a) i) $9! = 362\,880$

ii) 4 choices for end number $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 \times 4$

$$= 161\,280$$

$$\text{or } \frac{4}{9} \times 362\,880$$

$$= 161\,280$$

b) $129 \times 345678 = 7! \times 3! = 30\,240$ are next to each other

\therefore are next to each other

Total arrangements

$$= \frac{30\,240}{362\,880}$$

$$= 0.083$$



Question 4

(a) As the number of hours without sleep increases, the number of errors increase. ✓

(b) $\hat{y} = A + Bx$

✓✓ ✓✓

$$\hat{y} = -24,78 + 1,71x$$

(c) $\hat{y} = -24,78 + 1,71(23)$

$$\hat{y} = 14,55 \quad \checkmark\checkmark \text{ (about 15 errors)}$$

(d) $r = 0,945974$

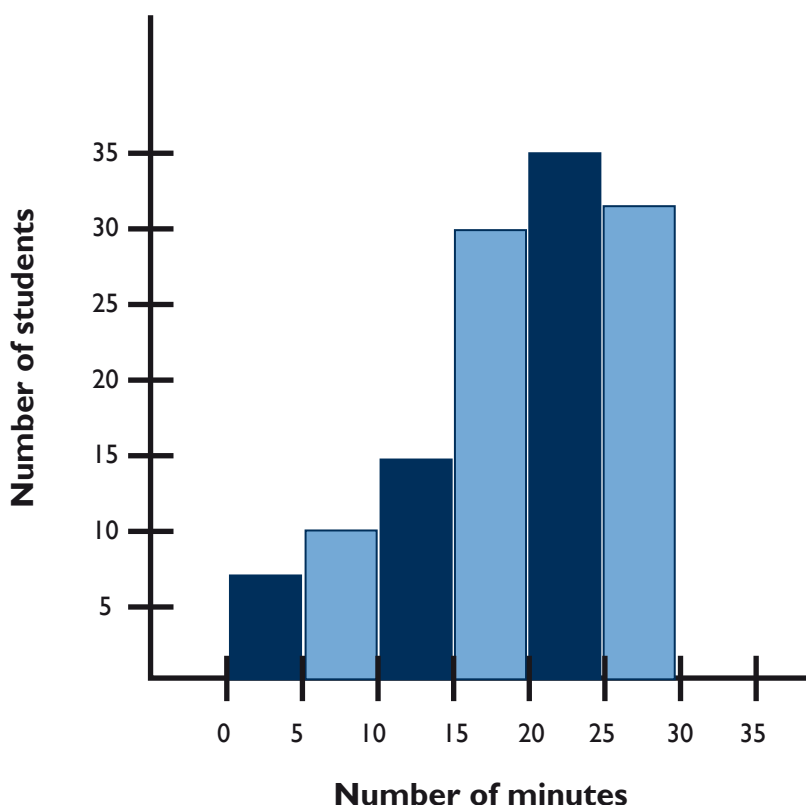
$$r = 0,95 \quad \checkmark\checkmark$$

✓

There is a strong positive correlation between the number of hours without sleep and the number of errors made.

Question 5

(a)



✓✓✓

(b) Interval with 66th score in it

$$20 \leq x < 25 \quad \checkmark\checkmark$$

(c) 19,13 ✓✓✓

$$\left[\text{take } \frac{2,5(8) + 7,5(10) + 12,5(15) + 17,5(30) + 22,5(36) + 27,5(33)}{132} \right]$$

(d) 7,30 ✓✓

(e) $\frac{1}{4} \times 132 = 33^{\text{rd}} \text{ score}$ read off Ogive $\rightarrow 15$ ✓

$\frac{3}{4} \times 132 = 99^{\text{th}}$ score read off Ogive $\rightarrow 25$ ✓

Interquartile range = 25 - 15

= 10 ✓

(f) Negatively skewed ✓

Referring to Ogive - gradual and then steep ✓

Referring to histogram - bulk of data on Right Hand side, data trails off to left.

Question 6

a) $x - s = 955$

$x + 2s = 1\ 495$

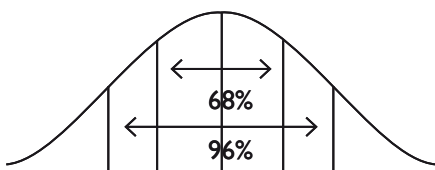
so $3s = 540$

$s = 180$ ✓✓

$\therefore x - 180 = 955$

$x = 1\ 135$ ✓✓

b)



$48\% + 34\%$

= 82% ✓✓

Question 7

7.1 The scale for the first 700 ✓ is the same as for the next 50 so the drop looks massive - it looks like the prices have dropped by $\frac{2}{3}$ ✓. Fix the scale ✓

7.2 C ✓✓

A random sample requires that every sample of size n has an equal chance of being selected. This is a stratified random sampling method.

Question 8

a) $OT = 2x$

$TN = x$

$\therefore ON = 3x \checkmark$

so $OM = 3x \checkmark$ (equal radii)

b) In ΔOTM

$MT = 15 \checkmark$ (line from centre \perp to chord)

$OT = 2x$

$OM = 3x$

$\therefore OM^2 = OT^2 + MT^2 \checkmark$

$(3x)^2 = (2x)^2 + 15^2 \checkmark$

$9x^2 = 4x^2 + 225$

$5x^2 = 225$

$x = 6.71 \checkmark$

Question 9

a) the sum of the two interior opposite angles \checkmark

b) i) $\hat{F} = \hat{B}_3 = 20^\circ \checkmark$ \checkmark (Isos Δ)

$\therefore \hat{D}_2 = 40^\circ \checkmark$ \checkmark (ext \angle of Δ)

ii) $\hat{B}_1 + \hat{B}_2 = 90^\circ \checkmark$ \checkmark (\angle in semi circle)

$\hat{A} = 50^\circ \checkmark$ \checkmark (\angle s of Δ)

iii) $\hat{O}_2 = 100^\circ \checkmark$ \checkmark (\angle at centre $2 \times \angle$ at circum)

iv) $\hat{C}_1 = 130^\circ \checkmark$ (opp \angle 's cyclic quad) \checkmark

Question 10

a) $\hat{O}_1 = 90^\circ \checkmark$ \checkmark
(given $FO \perp AK$)

$\hat{C}_2 + \hat{C}_3 = 90^\circ \checkmark$ \checkmark
(\angle in semi circle)

∴ In $\triangle AOM$ and $\triangle ACE$

A is common ✓

$$\hat{O}_1 = \hat{C}_2 + \hat{C}_3 = 90^\circ \text{ ✓ (proved)}$$

$$\hat{M}_1 = \hat{E}_1 \quad (\text{third } \angle \text{ of } \triangle)$$

∴ $\triangle AOM \parallel \triangle ACE$ (AAA)

b) $\hat{O}_1 = 90^\circ \text{ ✓}$

$$\hat{C}_2 + \hat{C}_3 = 90^\circ \text{ ✓ (proved)}$$

∴ OMCE cyclic (opp \angle 's supplementary) ✓

OR $\hat{M}_1 = \hat{E}_1$ (proved similarity)

∴ OMCE cyclic (ext $\angle =$ int opp \angle)

c) In $\triangle KAC$ and $\triangle KEC$

\hat{K} is common ✓

$$\hat{A} = \hat{C}_4 \text{ ✓ (tan chord)}$$

∴ $\triangle KAC \parallel \triangle KCE$ (AAA)

$$\therefore \frac{KC}{KE} = \frac{KA}{KC} \text{ ✓ (sim } \triangle\text{'s)}$$

$$\therefore KC^2 = KA \cdot KE \text{ ✓}$$

Question 11

a) In $\triangle AEC$, $AE \parallel BD$

$$\frac{AB}{BC} = \frac{ED}{DC} = \frac{5}{3} \text{ ✓✓ (line } \parallel \text{ one side of } \triangle)$$

In $\triangle AFC$, $AF \parallel BE$

$$\frac{AB}{BC} = \frac{FE}{EC} = \frac{5}{3} \text{ ✓✓ (line } \parallel \text{ one side of } \triangle)$$

b) now $\frac{FE}{DC} = \frac{FE}{EC} \times \frac{EC}{DC} \text{ ✓✓}$

$$= \frac{5}{3} \times \frac{8}{3}$$

$$= \frac{40}{9} \text{ ✓✓}$$

OR

$$ED = \frac{5}{8} \text{ of } 3 = \frac{15}{8} \text{ ✓}$$

$$DC = \frac{3}{8} \text{ of } 3 = \frac{9}{8} \text{ ✓}$$

$$\frac{FE}{DC} = \frac{5}{9} = \frac{40}{9} \text{ ✓✓}$$

SO