CATHOLIC JUNIOR COLLEGE
General Certificate of Education Advanced Level
Higher 2
JC2 Preliminary Examination

CANDIDATE NAME

CLASS

INDEX NUMBER

MATHEMATICS **9758/02**
Paper 2 **17 Sep 2025**
3 hours

Additional Materials: Printed Answer Booklet
List of Formulae (MF27)

READ THESE INSTRUCTIONS FIRST

Answer **all** the questions.
Write your answers on the Printed Answer Booklet. Follow the instructions on the front cover of the answer booklet.

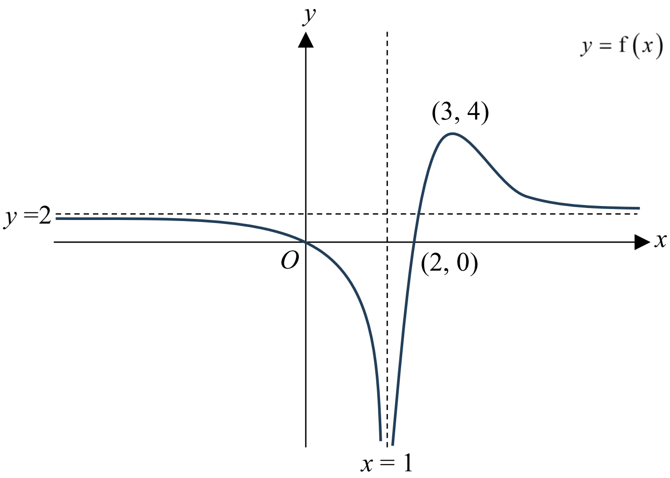
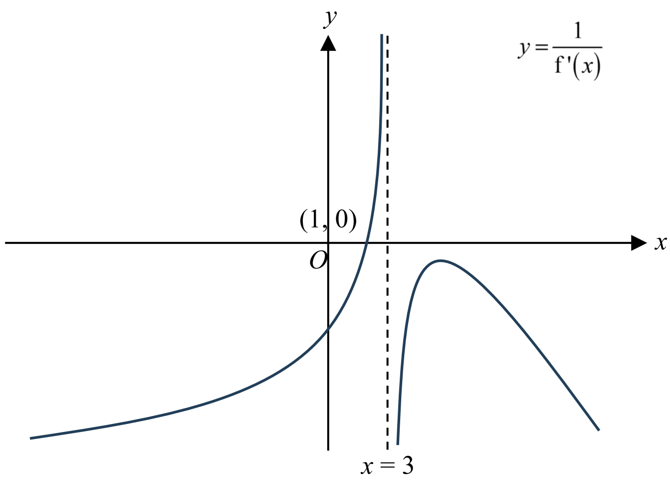
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
You are expected to use an approved graphing calculator.
Unsupported answers from a graphing calculator are allowed unless a question specifically states otherwise.
Where unsupported answers from a graphing calculator are **not** allowed in a question, you must present the mathematical steps using mathematical notations and not calculator commands.
You must show all necessary working clearly.

The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **43** printed pages.

Section A: Pure Mathematics [40 marks]

Solution:

Q1	
(a)	
(b)	

(c)

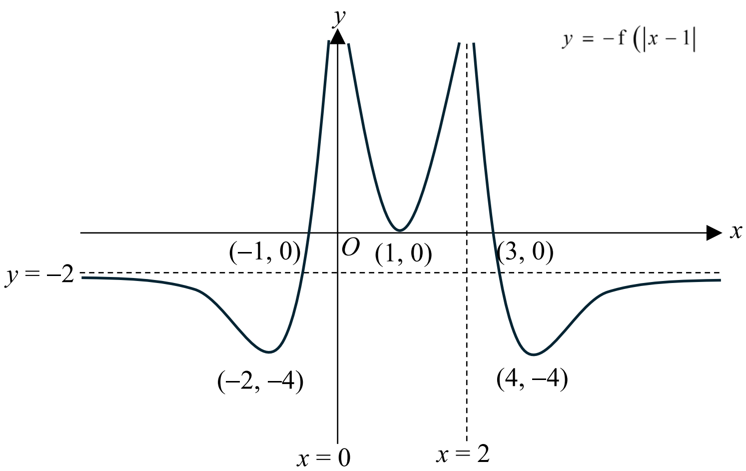
$y=\mathrm{f}\left(|x|\right)$

$\downarrow$ translate 1 unit in positive x-axis direction

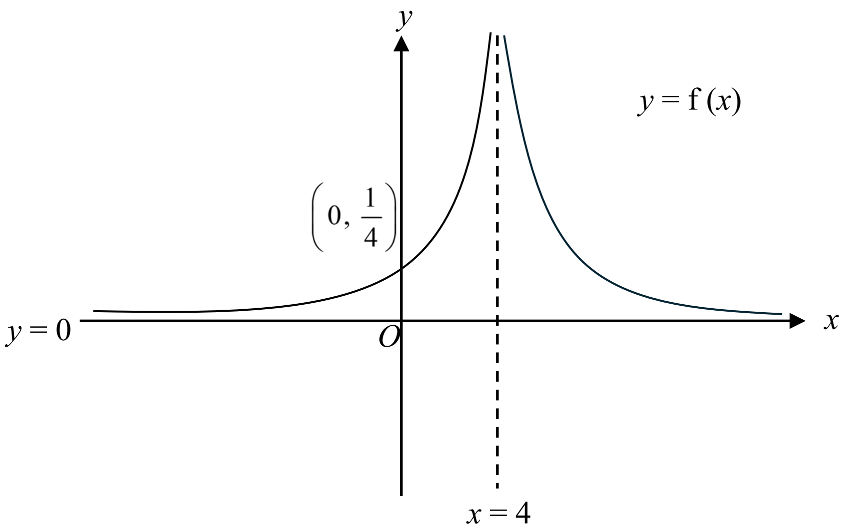
$y=\mathrm{f}\left(|x-1|\right)$

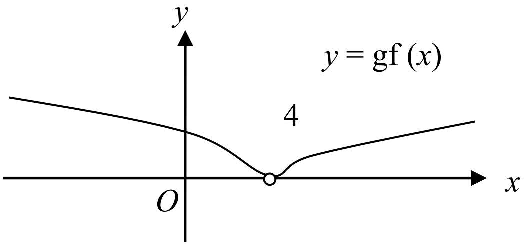
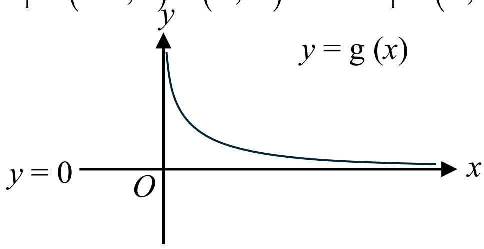
$\downarrow$ reflect in x-axis

$y=-\mathrm{f}\left(|x-1|\right)$

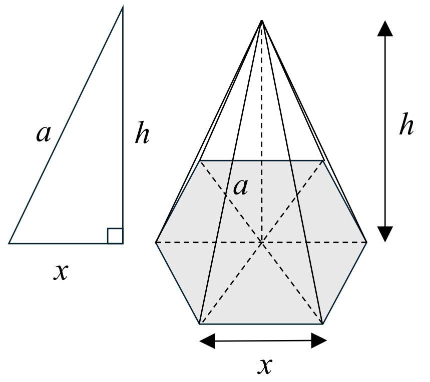


Solution:

Q2	
(a)	
(b)	For gf to exist, $\mathrm{R_f} \subseteq \mathrm{D_g}$, $\mathrm{R_f} = (0, \infty)$ $\mathrm{D_g} = (0, \infty)$ Since $\mathrm{R_f} \subseteq \mathrm{D_g}$, gf exists (shown) $\mathrm{gf}(x) = \mathrm{g}\left[\frac{4}{(x-4)^2}\right]$ $= \ln\left[1 + \left(\frac{1}{\frac{4}{(x-4)^2}}\right)\right]$ $= \ln\left[1 + \frac{(x-4)^2}{4}\right]$ $\mathrm{D_{gf}} = \mathrm{D_f} = (-\infty, 4) \cup (4, \infty)$ OR $\mathrm{D_{gf}} = \mathrm{D_f} = \mathbb{R} \backslash \{4\}$

	<u>Method ①:</u> Sketch $y=\mathrm{gf}\left(x\right)$ **for given domain**  $\mathrm{R_{gf}}=\left(0,\infty\right)$ **<u>Method ②:</u> Mapping** $\mathrm{D_f}=\left(-\infty,4\right)\cup\left(4,\infty\right)\xrightarrow{\mathrm{f}}\mathrm{R_f}=\left(0,\infty\right)\xrightarrow{\mathrm{g}}\mathrm{R_{gf}}=\left(0,\infty\right)$ 
(c)	Largest value of k is 4.
(d)	$y=\dfrac{4}{\left(x-4\right)^2}$ $\left(x-4\right)^2=\dfrac{4}{y}$ $x-4=\pm\dfrac{2}{\sqrt{y}}$ $x=4+\dfrac{2}{\sqrt{y}}\left(\text{rej.}\because x<4\right)$ or $x=4-\dfrac{2}{\sqrt{y}}$ $\mathrm{D_{f^{-1}}}=\mathrm{R_f}=(0,\infty)$ $\mathrm{f}^{-1}:x\rightarrow 4-\dfrac{2}{\sqrt{x}},\quad x\in\mathbb{R},x>0$

<u>Solution:</u>

Q3	
(a)	By Pythagoras Theorem, $a^2 = x^2 + h^2$ $h = \sqrt{a^2 - x^2}$  $V = \frac{\sqrt{3}}{2} x^2 h$ $= \frac{\sqrt{3}}{2} x^2 \sqrt{a^2 - x^2}$ $V^2 = \frac{3}{4} x^4 \left(a^2 - x^2\right)$ $V^2 = \frac{3}{4}\left(a^2 x^4 - x^6\right)$ (shown)
(b)	**<u>Method ①:</u>** $V^2 = \frac{3}{4}\left(a^2 x^4 - x^6\right)$ Differentiate implicitly with respect to x: $2V \frac{\mathrm{d}V}{\mathrm{d}x} = \frac{3}{4}\left(4a^2 x^3 - 6x^5\right)$ At stationary point, $\frac{\mathrm{d}V}{\mathrm{d}x} = 0$ $4a^2 x^3 - 6x^5 = 0$ $2x^3\left(2a^2 - 3x^2\right) = 0$ Since $x \neq 0$, $2a^2 - 3x^2 = 0$ $x^2 = \frac{2}{3} a^2$ $\max V = \sqrt{\frac{3}{4}\left[a^2\left(\frac{2}{3}a^2\right)^2 - \left(\frac{2}{3}a^2\right)^3\right]}$ $= \sqrt{\frac{3}{4}\left[\frac{4}{9}a^6 - \frac{8}{27}a^6\right]}$ $= \sqrt{\frac{3}{4}\left(\frac{4}{27}a^6\right)}$ $= \sqrt{\frac{a^6}{9}}$ $= \frac{a^3}{3}$

Method ②:

$$V^2 = \frac{3}{4}\left(a^2x^4 - x^6\right)$$

$$V = \frac{\sqrt{3}}{2}\left(a^2x^4 - x^6\right)^{\frac{1}{2}}$$

$$\frac{\mathrm{d}V}{\mathrm{d}x} = \frac{\sqrt{3}}{2}\left[\frac{1}{2}\left(a^2x^4 - x^6\right)^{-\frac{1}{2}}\left(4a^2x^3 - 6x^5\right)\right]$$

$$= \frac{\sqrt{3}}{4}\left[\left(4a^2x^3 - 6x^5\right)\left(a^2x^4 - x^6\right)^{-\frac{1}{2}}\right]$$

At stationary point, $\frac{\mathrm{d}V}{\mathrm{d}x} = 0$

$$\frac{\sqrt{3}}{4}\left[\left(4a^2x^3 - 6x^5\right)\left(a^2x^4 - x^6\right)^{-\frac{1}{2}}\right] = 0$$

$$4a^2x^3 - 6x^5 = 0$$

$$2x^3\left(2a^2 - 3x^2\right) = 0$$

Since $x \neq 0$, $2a^2 - 3x^2 = 0$

$$x^2 = \frac{2}{3}a^2$$

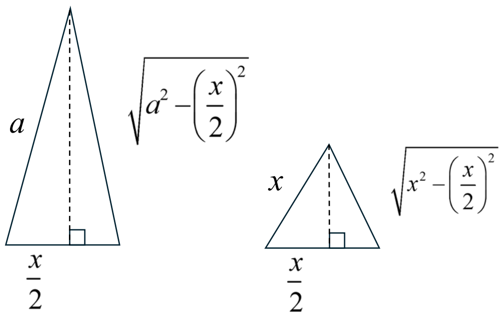
$$\max V = \sqrt{\frac{3}{4}\left[a^2\left(\frac{2}{3}a^2\right)^2 - \left(\frac{2}{3}a^2\right)^3\right]}$$

$$= \sqrt{\frac{3}{4}\left[\frac{4}{9}a^6 - \frac{8}{27}a^6\right]}$$

$$= \sqrt{\frac{3}{4}\left(\frac{4}{27}a^6\right)}$$

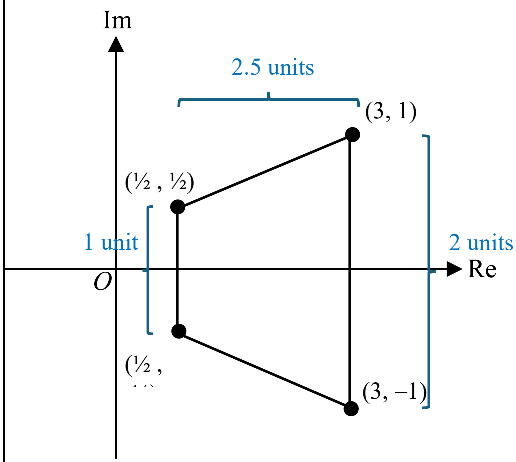
$$= \sqrt{\frac{a^6}{9}}$$

$$= \frac{a^3}{3}\ \text{units}^3$$

(c)	Total surface area, $A = 6 \times$ area of isosceles triangles $+$ area of hexagon  $A = 6\times\frac{1}{2}\times x\times\sqrt{a^2-\left(\frac{x}{2}\right)^2}+6\times\frac{1}{2}\times x\times\sqrt{x^2-\left(\frac{x}{2}\right)^2}$ $= 3x\sqrt{a^2-\frac{x^2}{4}}+3x\sqrt{\frac{3x^2}{4}}$ $= 3\sqrt{\frac{2}{3}a^2}\sqrt{a^2-\frac{1}{4}\times\frac{2}{3}a^2}+3\sqrt{\frac{2}{3}a^2}\sqrt{\frac{3}{4}\times\frac{2}{3}a^2}$ $= 3\sqrt{\frac{2}{3}a^2\times\frac{5}{6}a^2}+3\sqrt{\frac{2}{3}a^2\times\frac{1}{2}a^2}$ $= 3\sqrt{\frac{5}{9}}a^2+\frac{3}{\sqrt{3}}a^2$ $= \left(\sqrt{5}+\sqrt{3}\right)a^2$ units^2

Solution:

Q4	
(a)	The student's claim may not be true as p may not be real.
(b)	$2z^4-14z^3+33z^2-26z+p=0$ $2(3+\mathrm{i})^4-14(3+\mathrm{i})^3+33(3+\mathrm{i})^2-26(3+\mathrm{i})+p=0$ $2(8+6\mathrm{i})(8+6\mathrm{i})-14(3+\mathrm{i})(8+6\mathrm{i})+33(8+6\mathrm{i})-78-26\mathrm{i}+p=0$ $2(28+96\mathrm{i})-14(18+26\mathrm{i})+264+198\mathrm{i}-78-26\mathrm{i}+p=0$ $56+192\mathrm{i}-252-364\mathrm{i}+264+198\mathrm{i}-78-26\mathrm{i}+p=0$ $-10+p=0$ $p=10$
(c)	**Method ①:** Since the coefficients of the polynomial are all real, $3+\mathrm{i}$ is a root, $3-\mathrm{i}$ is also a root. $[z-(3+\mathrm{i})][z-(3-\mathrm{i})]$ $=[(z-3)-\mathrm{i}][(z-3)+\mathrm{i}]$ $=(z-3)^2-\mathrm{i}^2$ $=z^2-6z+9+1$ $=z^2-6z+10$ Long division of $2z^4-14z^3+33z^2-26z+10$ by $z^2-6z+10$: quotient $2z^2-2z+1$ $-(2z^4-12z^3+20z^2)$ $-2z^3+13z^2-26z$ $-(-2z^3+12z^2-20z)$ $z^2-6z+10$ $-(z^2-6z+10)$ $\therefore\ 2z^4-14z^3+33z^2-26z+p=(z^2-6z+10)(2z^2-2z+1)$ **Method ②:** Since the coefficients of the polynomial are all real, $3+\mathrm{i}$ is a root, $3-\mathrm{i}$ is also a root. $2z^4-14z^3+33z^2-26z+10=[z-(3+\mathrm{i})][z-(3-\mathrm{i})](2z^2+Az+B)$ $=[(z-3)-\mathrm{i}][(z-3)+\mathrm{i}](2z^2+Az+B)$ $=[(z-3)^2-\mathrm{i}^2](2z^2+Az+B)$ $=(z^2-6z+9+1)(2z^2+Az+B)$ $=(z^2-6z+10)(2z^2+Az+B)$ Comparing constants: $10=10B \Rightarrow B=1$ Comparing coefficients of z: $-26=-6(1)+10A \Rightarrow A=-2$

	$\therefore\ 2z^4-14z^3+33z^2-26z+p=\left(z^2-6z+10\right)\left(2z^2-2z+1\right)$ $2z^2-2z+1=0$ $z=\dfrac{2\pm\sqrt{4-4(2)}}{4}$ $=\dfrac{2\pm\sqrt{-4}}{4}$ $=\dfrac{2\pm 2\mathrm{i}}{4}$ $=\dfrac{1}{2}\pm\dfrac{1}{2}\mathrm{i}$ 
(d)	Trapezium Area of qualilateral $=\dfrac{1}{2}(1+2)(2.5)=3.75$ units^2 (or $\dfrac{15}{4}$ units^2)

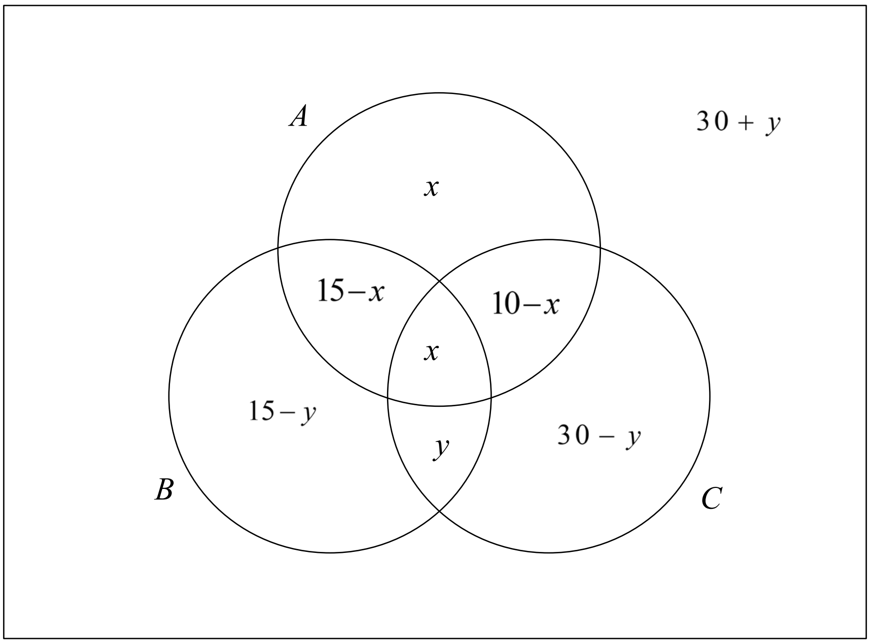
Section B: Probability and Statistics [60 marks]

<u>Solution:</u>

Q5	
(a)	The 20 members form a population since the coach gave questionnaire to all members in the basketball club which consists of 20 members.
(b)	Having a random sample reduces biasedness, or that it would be fair, or that it would be representative of the whole membership of the club.
(c)	No. of teams $= {}^5C_1 \times {}^8C_2 \times {}^7C_2 = 2940$
(d)	Let A be one of the remaining guards who can play either as a guard or as a forward. 5 centres ~~8 forwards~~ ~~7 guards~~ 5 centres 7 forwards 6 guards (A + 5 other guards) <u>Method 1:</u> **<u>Case ①:</u> A plays as a guard** No. of teams $= \underbrace{{}^5C_1}_{\text{choose 1 center}} \times \underbrace{{}^7C_2}_{\text{choose 2 forwards from the remaining}} \times \underbrace{{}^5C_1}_{\text{A plays as a guard choose 1 guard from remaining 5}} = 525$ **<u>Case ②:</u> A plays as a forward** No. of teams $= \underbrace{{}^5C_1}_{\text{choose 1 center}} \times \underbrace{{}^7C_1}_{\text{A plays as a forward choose 1 forward from the remaining 7}} \times \underbrace{{}^5C_2}_{\text{choose 2 guards from remaining 5}} = 350$ **<u>Case ③:</u> A does not play at all** No. of teams $= \underbrace{{}^5C_1}_{\text{choose 1 center}} \times \underbrace{{}^7C_2}_{\text{choose 2 forwards from the remaining 7}} \times \underbrace{{}^5C_2}_{\text{choose 2 guards from remaining 5}} = 1050$ Total no. of teams $= 525 + 350 + 1050 = 1925$
	<u>Method 2:</u> **<u>Case ①:</u> A plays as a guard, including the case that A may not be selected** No. of teams $= \underbrace{{}^5C_1}_{\text{choose 1 center}} \times \underbrace{{}^7C_2}_{\text{choose 2 forwards from the remaining}} \times \underbrace{{}^6C_2}_{\text{choose 2 guards from 6 guards including A}} = 1575$ **<u>Case ②:</u> A confirmed that he plays as a forward**

	No. of teams = $\underbrace{{}^5C_1}_{\text{choose 1 center}} \times \underbrace{{}^7C_1}_{\text{A plays as a forward choose 1 forward from the remaining 7}} \times \underbrace{{}^5C_2}_{\text{choose 2 guards from remaining 5}} = 350$ Total no. of teams $= 1575 + 350 = 1925$

Solution:

Q6	
(a)	 $\text{P}(A)=\frac{25}{100}$ $\text{P}(B)=\frac{30}{100}$ $\text{P}(C)=\frac{40}{100}$ $\text{P}(A\cap B)=\frac{15}{100}$ $\text{P}(A\cap B\cap C)=\frac{x}{100}$ Since *A* and *C* are independent, $\text{P}(A\cap C)=\text{P}(A)\times\text{P}(C)$ $\text{P}(A\cap C)=\frac{25}{100}\times\frac{40}{100}=\frac{10}{100}$ $\text{n}(A\cap C)=10$
(b)	Since *B* and *C* are independent, $\text{P}(B\cap C)=\text{P}(B)\times\text{P}(C)$ $\text{P}(B\cap C)=\frac{30}{100}\times\frac{40}{100}=\frac{12}{100}$ $\text{n}(B\cap C)=12$ $x+y=12$ $y=12-x$ **Hence,** $x\geq 0$, $y\geq 0$ $y=12-x\geq 0$ Greatest value of $y=12$ occurs when $x=0$. $\text{n}(A\cap B'\cap C)=10-x\geq 0$ $x\leq 10$ Least value of $y=2$ occurs when $x=10$.

Solution:

Q7

(a)

$$P(X=2)=\frac{n-1}{n}\times\frac{n-2}{n-1}\times\frac{1}{n-2}=\frac{1}{n}$$

(b)

$$P(X=0)=\frac{1}{n}$$

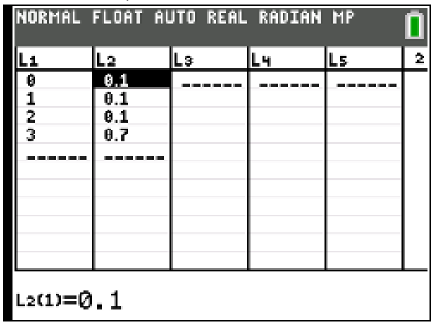
$$P(X=1)=\frac{n-1}{n}\times\frac{1}{n-1}=\frac{1}{n}$$

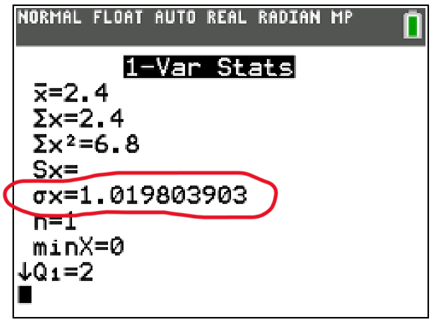
$$P(X=2)=\frac{n-1}{n}\times\frac{n-2}{n-1}\times\frac{1}{n-2}=\frac{1}{n}$$

$$P(X=3)=\frac{n-1}{n}\times\frac{n-2}{n-1}\times\frac{n-3}{n-2}=\frac{n-3}{n}$$

(c)

From GC, σ = 1.0198





Hence,

$$P(X\le 1.0198)=P(X=0)+P(X=1)=0.2$$

(d) **Method ①:**

Let Y (in dollars) be the amount obtained by Happie in a game.

x	0	1	2	3
y	5	8	10.5	10.5
$\mathrm{P}(Y=y)$	$\frac{1}{n}$	$\frac{1}{n}$	$\frac{1}{n}$	$\frac{n-3}{n}$

$$\mathrm{E}(Y)=\left(5\times\frac{1}{n}\right)+\left(8\times\frac{1}{n}\right)+\left(10.5\times\frac{1}{n}\right)+\left(10.5\times\frac{n-3}{n}\right)$$
$$=\frac{10.5n-8}{n}$$

For Happie to not have any profit/loss,

$$\mathrm{E}(Y)-10=0$$
$$\frac{10.5n-8}{n}=10$$
$$n=16$$

Happie should prepare 16 boxes.

Method ②:

Let Y (in dollars) be the amount of "profit" Happie makes in a game.

x	0	1	2	3
y	-5	-2	0.5	0.5
$\mathrm{P}(Y=y)$	$\frac{1}{n}$	$\frac{1}{n}$	$\frac{1}{n}$	$\frac{n-3}{n}$

If the doll is not won after 3 tries, it is donated away. Therefore it is still considered as a -$10 profit to Happie

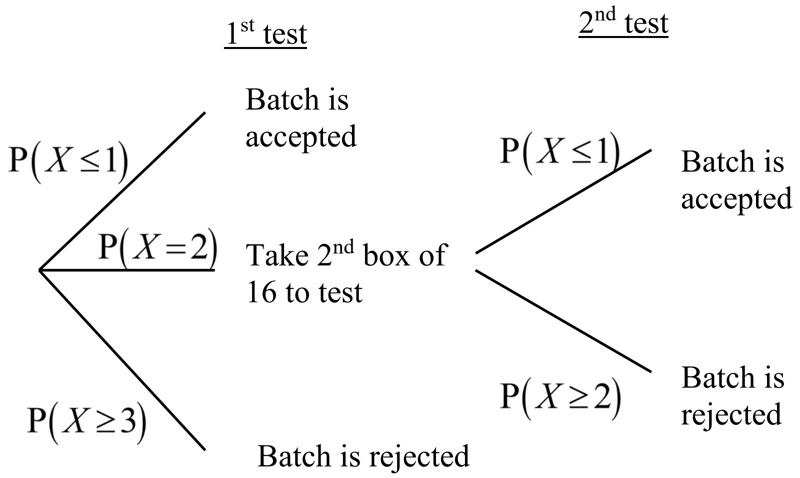
$$\mathrm{E}(Y)=\left(-5\times\frac{1}{n}\right)+\left(-2\times\frac{1}{n}\right)+\left(0.5\times\frac{1}{n}\right)+\left(0.5\times\frac{n-3}{n}\right)$$
$$=\frac{0.5n-8}{n}$$

For Happie to not have a profit,

$$\mathrm{E}(Y)=0$$
$$\frac{0.5n-8}{n}=0$$
$$n=16$$

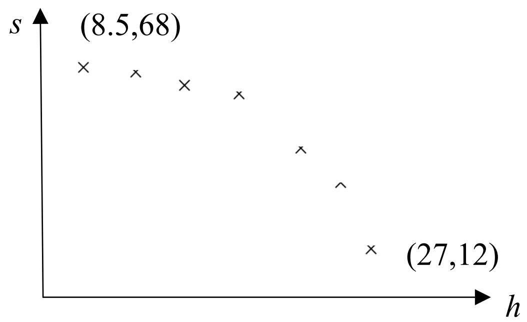
Happie should prepare 16 boxes.

Solution:

Q8	
(a)(i)	• The probability of pralines that exceed the recommended sugar content is constant at p for every praline. • Whether a praline has exceeded the recommended sugar content is independent of any other pralines.
(a)(ii)	$X \sim \mathrm{B}(16, p)$ Since mode = 2, $\mathrm{P}(X=2) > \mathrm{P}(X=1)$ and $\mathrm{P}(X=2) > \mathrm{P}(X=3)$ ${}^{16}\mathrm{C}_2 p^2(1-p)^{14} > {}^{16}\mathrm{C}_1 p(1-p)^{15}$; ${}^{16}C_2 p^2(1-p)^{14} > {}^{16}C_3 p^3(1-p)^{13}$ $120p^2(1-p)^{14} > 16p(1-p)^{15}$; $120p^2(1-p)^{14} > 56p^3(1-p)^{13}$ $15p > 2(1-p)$; $3(1-p) > 14p$ $p > \frac{2}{17}$; $p < \frac{3}{17}$ $\therefore \frac{2}{17} < p < \frac{3}{17}$
(b)(i)	 $X \sim \mathrm{B}(16, 0.15)$ $\mathrm{P}(\text{batch is accepted}) = \mathrm{P}(X \le 1) + \mathrm{P}(X=2)\mathrm{P}(X \le 1)$ $= \mathrm{P}(X \le 1)\left[1 + \mathrm{P}(X=2)\right]$ $= 0.2839012136(1 + 0.2774781077)$ $= 0.3626775851$ ≈ 0.363 (3 s.f.)

(b)(ii)	$\mathrm{P}(\text{2nd box is tested} \mid \text{batch is accepted}) = \dfrac{\mathrm{P}(\text{2nd box is tested} \cap \text{batch is accepted})}{\mathrm{P}(\text{batch is accepted})}$ $= \dfrac{\mathrm{P}(X=2)\mathrm{P}(X \le 1)}{0.3626775851}$ $= \dfrac{0.2774781077 \times 0.2839012136}{0.3626775851}$ $= 0.2172077205$ ≈ 0.217 (3 s.f.)

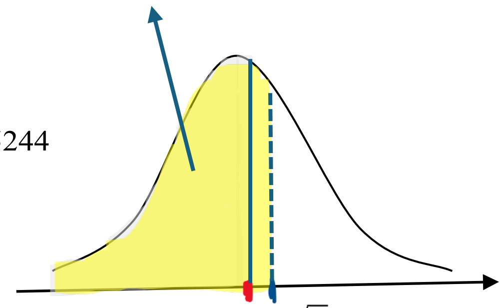
Solution:

Q9	
(a)	$s=-3.00799h+100.27974$ From GC, $\bar{h}=17.1429$ $\bar{s}=-3.00799\bar{h}+100.27974$ $\bar{s}=-3.00799(17.1429)+100.27974=48.7140$ $\frac{68+61+44+12+\alpha+58+31}{7}=48.7140$ $\alpha=67.0$
(b)	
(c)	r- value between s and h is -0.961. r- value between s and h^2 is -0.991 which is closer to -1 which means that there is a stronger linear correlation between s and h^2. Also, from the scatter diagram, as h increases, s decreases at an increasing rate, which indicates that the curve does not have a linear behaviour. From G.C., $k=-0.0873$ and $c=77.7$. Hence $s=-0.0873h^2+77.7$
(d)	When $h=7$, $s=-0.087331(7)^2+77.727=73.4$ His predicted score is 73.4. Since $h=7$ is outside the data range, the estimate is obtained via extrapolation and thus is not reliable.
(e)	Correlation is not causation. There may be other factors that contribute to this trend.

Solution:

<table>
<tr><td>Q10</td><td></td></tr>
<tr><td>(a)</td><td>Let S and L be the random variable denoting the amount of fish caught by the Standard and Large vessels respectively.
$$S \sim \mathrm{N}(300,\ \sigma^2)$$
$$L \sim \mathrm{N}(540,\ 110^2)$$
$\mathrm{P}(S > 400) = 0.08$
$\mathrm{P}\left(Z > \dfrac{400-300}{\sigma}\right) = 0.08$
$\dfrac{400-300}{\sigma} = 1.40507$
$\sigma = 71.2\ \ (3 \text{ s.f.})(\text{shown})$</td></tr>
<tr><td>(b)</td><td>Let $A = S_1 + S_2 + S_3 + L_1 + L_2$
$$A \sim \mathrm{N}\left(3\times300 + 2\times540,\ 3\times71.171^2 + 2\times110^2\right)$$
$$\sim \mathrm{N}\left(1980,\ 198.484^2\right)$$
$\mathrm{P}(A \ge 2100) = 0.273$</td></tr>
<tr><td>(c)</td><td>The amount of fish caught by all the vessels are independent from one another.</td></tr>
<tr><td>(d)</td><td>Let $B = 3S + 2L$
$B \sim \mathrm{N}\left(3\times300 + 2\times540,\ 3^2\times71.171^2 + 2^2\times110^2\right)$
$\sim \mathrm{N}\left(1980,\ 306.574^2\right)$
$\mathrm{P}(B \ge 2100) = 0.348$</td></tr>
<tr><td>(e)</td><td>$$\overline{L} \sim \mathrm{N}\left(540,\ \frac{110^2}{n}\right)$$
$\mathrm{P}(\overline{L} < 552) \ge 0.7$

<u>Method ①:</u>
<table><tr><td>n</td><td>$\mathrm{P}\left(\overline{L} < 552\right)$</td></tr><tr><td>23</td><td>0.6996</td></tr><tr><td>24</td><td>0.7035</td></tr><tr><td>25</td><td>0.7073</td></tr></table>
From GC, least value of n is 24</td></tr>
</table>

	Method ②: Standardizing, $\mathrm{P}\left(Z<\dfrac{552-540}{\sqrt{110^2/n}}\right)\geq 0.7$ $\mathrm{P}\left(Z<\dfrac{6\sqrt{n}}{55}\right)\geq 0.7$ Consider $\mathrm{P}(Z<k)=0.7 \quad \Rightarrow \quad k=0.5244$ Hence $\dfrac{6\sqrt{n}}{55}\geq 0.5244$ $6\sqrt{n}\geq 28.842$ $n\geq 23.1$ $\therefore$ least value of n is 24. 

Solution:

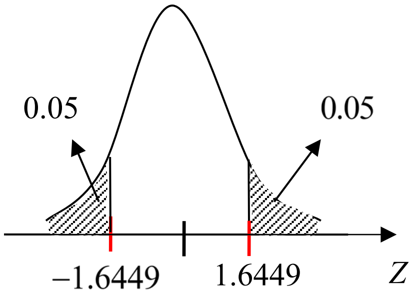
<table>
<tr><td>Q11</td><td></td></tr>
<tr><td>(a)</td><td>The sample mean time for 35 matches is approximated to have a normal distribution by the Central Limit Theorem, since sample size is sufficiently large. Hence there is no need to make any assumptions about the distribution of the time taken to score the first goal.</td></tr>
<tr><td>(b)</td><td>Unbiased estimate for population mean $= \dfrac{1650}{35} = 47.143$ (to 3d.p.)
Unbiased estimate for population variance is $s^2 = \dfrac{35}{34}(250) = 257.353$ (to 3d.p.)</td></tr>
<tr><td>(c)</td><td>Let X be the random variable denoting time taken by EastHam to score the first goal in a match.

$H_0 : \mu = 50$
$H_1 : \mu < 50$, where μ is the population mean time taken by EastHam to score the first goal in a match

Under H_0,
Since n is large,
$$\bar{X} \sim N\left(50, \frac{257.353}{35}\right) \text{ approximately by CLT}$$
$$Z = \frac{\bar{X} - 50}{\sqrt{s^2/n}} \sim N(0,1)$$
Method ①:
By GC, p-value $= 0.146$ (3 s.f.).

Since p-value > 0.1, we do not reject H_0 and conclude that there is insufficient evidence at 10% significance level to say that average time taken by EastHam to score the first goal has decreased.

Method ②:
$$z_{\text{test}} = \frac{\left(\frac{1650}{35}\right) - 50}{\sqrt{\frac{4375/17}{35}}} = -1.05366, \; z_{\text{test}} = -1.28155$$
Since $z_{\text{test}} > z_{\text{critical}}$, we do not reject H_0 and conclude that there is insufficient evidence at 10% significance level to say that average time taken by EastHam to score the first goal has decreased.</td></tr>
</table>

(d)	Let Y be the random variable denoting time taken by NewPalace to score the first goal in a match. $H_0 : \mu = 40$ $H_1 : \mu \neq 40$ Under H_0, $\bar{Y} \sim N\left(40, \frac{280}{50}\right)$  Since H_0 is rejected, $\frac{\bar{y}-40}{\sqrt{280/50}} < -1.6449$ or $\frac{\bar{y}-40}{\sqrt{280/50}} > 1.6449$ $\bar{y} < 36.1 \text{ (3 s.f.)}$ or $\bar{y} > 43.9 \text{ (3 s.f.)}$ Hence, range of values of $\bar{y}$ is: $0 < \bar{y} < 36.1$ or $\bar{y} > 43.9$