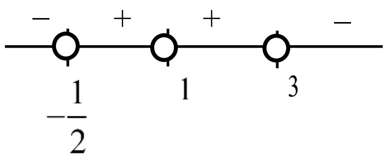
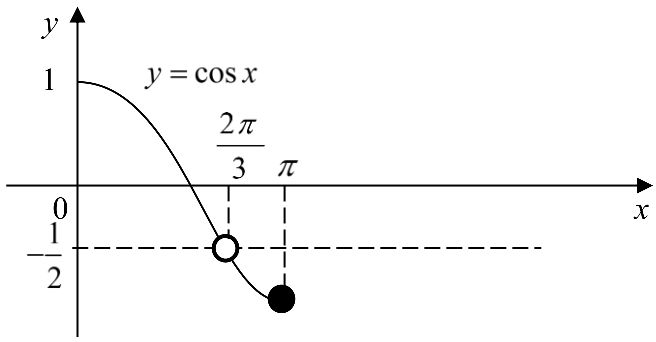
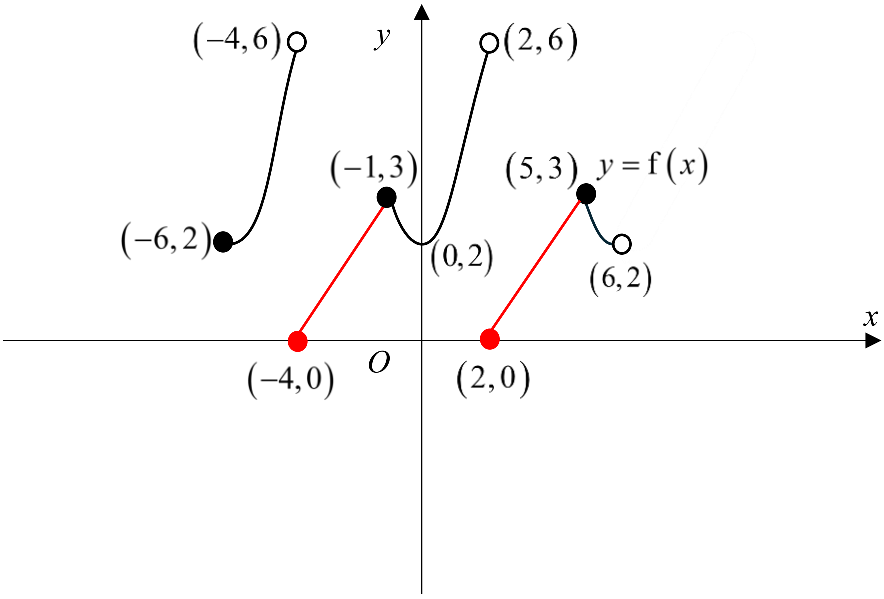
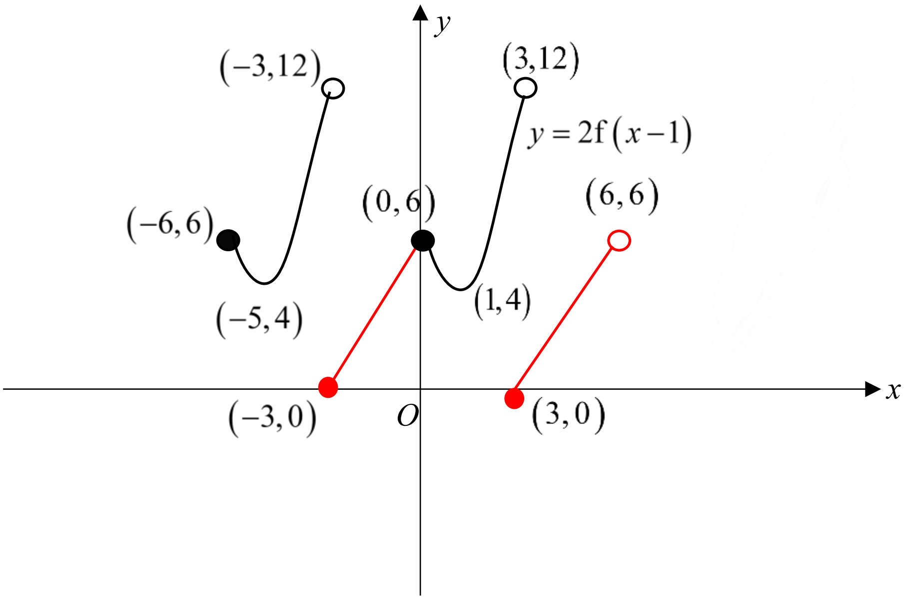
Qn	Solution
1	**Equations and Inequalities**
(a)	$\frac{x+5}{-2x^2+5x+3}<1$ $\frac{x+5}{-2x^2+5x+3}-1<0$ $\frac{x+5-\left(-2x^2+5x+3\right)}{-2x^2+5x+3}<0$ $\frac{x+5+2x^2-5x-3}{-2x^2+5x+3}<0$ $\frac{2x^2-4x+2}{-2x^2+5x+3}<0$ $\frac{2\left(x^2-2x+1\right)}{-2x^2+5x+3}<0$ $\frac{2\left(x-1\right)^2}{\left(3-x\right)\left(2x+1\right)}<0, \quad x\neq-\frac{1}{2}, x\neq 3$  $x<-\frac{1}{2}$ or $x>3$
(b)	$\frac{\cos x+5}{-2\cos^2 x+5\cos x+3}<1$ Replace x by $\cos x$: $\cos x<-\frac{1}{2}$ or $\cos x>3$ (Rej. $\because -1\leq\cos x\leq 1$)  $\therefore \frac{2\pi}{3}<x\leq\pi$

Qn	Solution
2	**Maclaurin Series**
(a)	Since the curve $f(\theta)=a\theta^2+b\theta+c$ passes through $(0,1)$, $c=1$ Since the curve $f(\theta)=a\theta^2+b\theta+c$ passes through $\left(-\frac{\sqrt{3}}{3},\frac{1}{2}\right)$, $a\left(-\frac{\sqrt{3}}{3}\right)^2+b\left(-\frac{\sqrt{3}}{3}\right)+1=\frac{1}{2}\Rightarrow\frac{1}{3}a-\frac{\sqrt{3}}{3}b=-\frac{1}{2}$ ....(1) $f'(\theta)=2a\theta+b$ Since the turning point is at $\left(-\frac{\sqrt{3}}{3},\frac{1}{2}\right)$, $f'(\theta)=0$ $2\left(-\frac{\sqrt{3}}{3}\right)a+b=0$ $-\frac{2\sqrt{3}}{3}a+b=0$ $b=\frac{2\sqrt{3}}{3}a$.......(2) Sub (2) into (1): $\frac{1}{3}a-\frac{\sqrt{3}}{3}b=-\frac{1}{2}$ $\frac{1}{3}a-\frac{\sqrt{3}}{3}\left(\frac{2\sqrt{3}}{3}a\right)=-\frac{1}{2}$ $-\frac{1}{3}a=-\frac{1}{2}\Rightarrow a=\frac{3}{2}$ $b=\frac{2\sqrt{3}}{3}a=\frac{2\sqrt{3}}{3}\left(\frac{3}{2}\right)=\sqrt{3}$ $a=\frac{3}{2},\ b=\sqrt{3},\ c=1$
(b)	$BC^2=AB^2+AC^2-2(AB)(AC)\cos\left(\theta+\frac{\pi}{6}\right)$ $=1^2+\left(\sqrt{3}\right)^2-2(1)\left(\sqrt{3}\right)\left(\cos\theta\cos\frac{\pi}{6}-\sin\theta\sin\frac{\pi}{6}\right)$ $=4-2\sqrt{3}\left(\frac{\sqrt{3}}{2}\cos\theta-\frac{1}{2}\sin\theta\right)$ $=4-3\cos\theta+\sqrt{3}\sin\theta$

	$\approx 4-3\left(1-\frac{\theta^2}{2!}\right)+\sqrt{3}\theta$ when θ is small $=4-3+\frac{3\theta^2}{2}+\sqrt{3}\theta$ $=1+\sqrt{3}\theta+\frac{3}{2}\theta^2$ $=\mathrm{f}(\theta)$ (Shown)
(c)	$BC \approx \sqrt{1+\sqrt{3}\theta+\frac{3}{2}\theta^2}$ $\approx\left(1+\sqrt{3}\theta+\frac{3}{2}\theta^2\right)^{\frac{1}{2}}$ $\approx 1+\frac{1}{2}\left(\sqrt{3}\theta+\frac{3}{2}\theta^2\right)+\frac{\frac{1}{2}\left(\frac{1}{2}-1\right)}{2!}\left(\sqrt{3}\theta+\frac{3}{2}\theta^2\right)^2$ $\approx 1+\frac{\sqrt{3}}{2}\theta+\frac{3}{4}\theta^2-\frac{1}{8}\left(3\theta^2\right)$ $=1+\frac{\sqrt{3}}{2}\theta+\frac{3}{8}\theta^2$ (Shown)

Qn	Solution
3	**Graphing Techniques, Transformation of Curves**
(a)	
(b)	

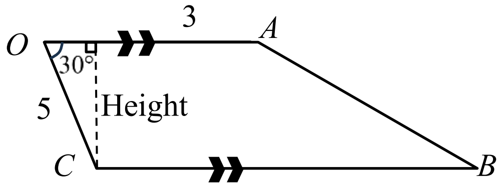
Qn	Solution
4	**Differential Equations**
(a)	$\dfrac{d^2P}{dt^2} = -0.05\left(\dfrac{dP}{dt}\right)^2$ Substituting $v = \dfrac{dP}{dt}$, we get $\dfrac{dv}{dt} = -0.05v^2$ Using separable variables, $\int \dfrac{1}{v^2}\,dv = \int -0.05\ dt$ $-\dfrac{1}{v} = -0.05t + c'$ where c' is an arbitrary constant $v = \dfrac{1}{0.05t - c'}$ $\quad = \dfrac{20}{t+C}$ where $C = -20c'$ is a constant (shown)
(b)	$v = \dfrac{20}{t+C}$ Given $P = 0$ and $v = 10$ when $t = 0$, $10 = \dfrac{20}{C} \Rightarrow C = 2$ $v = \dfrac{20}{t+2}$ $\therefore \dfrac{dP}{dt} = \dfrac{20}{t+2}$ $\therefore P = 20\ln\lvert t+2\rvert + D$ where D is a constant when $t = 0$, $P = 0$, $\therefore 0 = 20\ln\lvert 2\rvert + D$ $D = -20\ln 2$ $P = 20\ln\lvert t+2\rvert - 20\ln 2$ $\quad = 20\ln\left(\dfrac{t+2}{2}\right)$ since $t > 0$
(c)	When $t = 30, P = 20\ln\left(\dfrac{30+2}{2}\right) = 55.5$ (3 s.f)

<table>
<tr><th>Qn</th><th>Solution</th></tr>
<tr><td>5</td><td>Vectors</td></tr>
<tr><td>(a)</td><td>

$$\mathbf{a}\times\mathbf{b}=\mathbf{a}\times\mathbf{c}$$
$$\mathbf{a}\times\mathbf{b}-\mathbf{a}\times\mathbf{c}=\mathbf{0}$$
$$\mathbf{a}\times(\mathbf{b}-\mathbf{c})=\mathbf{0}$$

Since $\mathbf{a}\neq\mathbf{0}$ and $\mathbf{b}\neq\mathbf{c}$,
$\therefore \overrightarrow{OA}=\mathbf{a}$ is parallel to $\overrightarrow{CB}=\mathbf{b}-\mathbf{c}$.
$\mathbf{b}-\mathbf{c}=\lambda\mathbf{a}$ (shown)
</td></tr>
<tr><td>(b)</td><td>

Method 1:



$$\sin 30^\circ=\frac{\text{Height}}{OA}$$
$$\text{Height}=5\sin 30^\circ=\frac{5}{2}$$
$$\text{Area of Trapezium}=\frac{1}{2}(OA+BC)(\text{Height})$$
$$10=\frac{1}{2}(3+BC)\left(\frac{5}{2}\right)$$
$$BC=|\mathbf{c}-\mathbf{b}|=5 \quad (\text{shown})$$

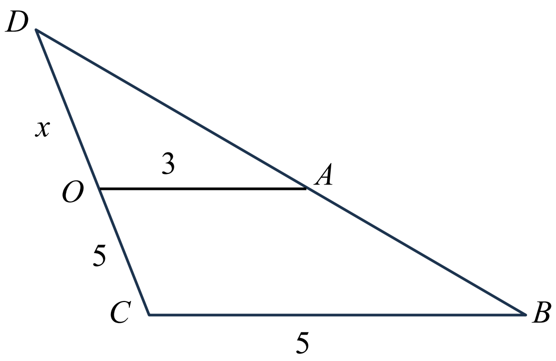
Method 2:

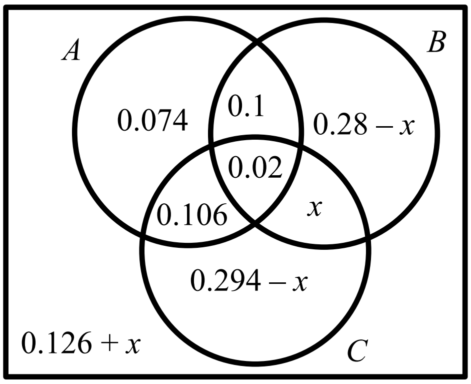
$$\text{Area of Trapezium}=\frac{1}{2}\left(|\mathbf{a}|+|\mathbf{c}-\mathbf{b}|\right)(\text{height of trapezium})$$
$$10=\frac{1}{2}\left(|\mathbf{a}|+|\mathbf{c}-\mathbf{b}|\right)\left(\frac{|\mathbf{c}\times\mathbf{a}|}{|\mathbf{a}|}\right)$$
$$10=\frac{1}{2}\left(3+|\mathbf{c}-\mathbf{b}|\right)\left(\frac{5\times 3\sin 30^\circ}{3}\right)$$
$$20=\left(3+|\mathbf{c}-\mathbf{b}|\right)\left(\frac{5}{2}\right)$$
$$BC=|\mathbf{c}-\mathbf{b}|=5 \quad (\text{shown})$$

Method 3:

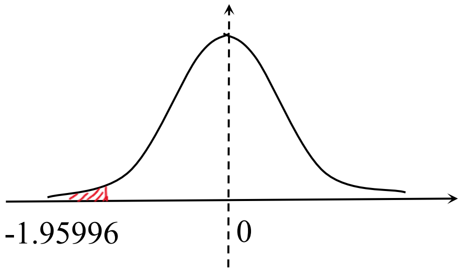
$$\text{Area of triangle OAC}=\frac{1}{2}\times|\mathbf{a}|\times|\mathbf{c}|\times\sin 30^\circ=\frac{1}{2}\times 3\times 5\times\frac{1}{2}=\frac{15}{4}$$
$$\text{Area of triangle ABC}=10-\frac{15}{4}=\frac{25}{4}$$
$$\frac{\text{Area of triangle ABC}}{\text{Area of triangle OAC}}=\frac{\frac{25}{4}}{\frac{15}{4}}=\frac{5}{3}$$
</td></tr>
</table>

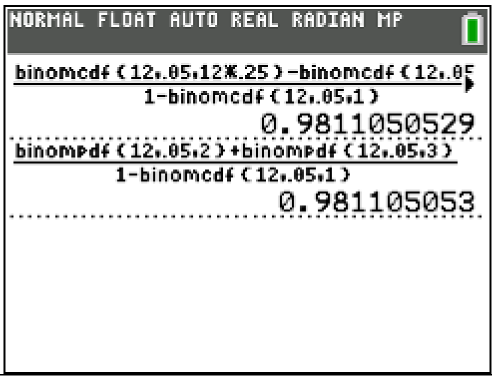
	Area of triangle OAC $=\frac{1}{2}\times\lvert\mathbf{a}\rvert\times h$ Area of triangle ABC $=\frac{1}{2}\times BC\times h$ $\frac{\text{Area of triangle ABC}}{\text{Area of triangle OAC}}=\frac{5}{3}=\frac{BC}{\lvert\mathbf{a}\rvert}=\frac{BC}{3}\Rightarrow BC=5\quad(\text{shown})$
(c)	$k=\frac{3}{5}$
(d)	$l_{OC}:\mathbf{r}=\lambda\mathbf{c},\quad \lambda\in\mathbb{R}$ $l_{AB}:\mathbf{r}=\mathbf{a}+\mu(\mathbf{b}-\mathbf{a}),\quad \mu\in\mathbb{R}$ From **(c)**, $\overrightarrow{OA}=\frac{3}{5}\overrightarrow{CB}\Rightarrow \mathbf{a}=\frac{3}{5}(\mathbf{b}-\mathbf{c})$. At point D, $\lambda\mathbf{c}=\mathbf{a}+\mu(\mathbf{b}-\mathbf{a})$ $l_{AB}:\mathbf{r}=\mathbf{a}+\mu(\mathbf{b}-\mathbf{a})$ $\mathbf{r}=\frac{3}{5}(\mathbf{b}-\mathbf{c})+\mu\left[\mathbf{b}-\frac{3}{5}(\mathbf{b}-\mathbf{c})\right]$ $=\frac{3}{5}\mathbf{b}-\frac{3}{5}\mathbf{c}+\mu\mathbf{b}-\frac{3}{5}\mu\mathbf{b}+\frac{3}{5}\mu\mathbf{c}$ $=\left(\frac{3}{5}-\frac{3}{5}\mu+\mu\right)\mathbf{b}+\left(\frac{3}{5}\mu-\frac{3}{5}\right)\mathbf{c}$ $=\left(\frac{3}{5}+\frac{2}{5}\mu\right)\mathbf{b}+\left(\frac{3}{5}\mu-\frac{3}{5}\right)\mathbf{c}$ At point D, $0\mathbf{b}+\lambda\mathbf{c}=\left(\frac{3}{5}+\frac{2}{5}\mu\right)\mathbf{b}+\left(\frac{3}{5}\mu-\frac{3}{5}\right)\mathbf{c}$ By comparison, $\frac{3}{5}+\frac{2}{5}\mu=0$ $\mu=-\frac{3}{2}$ and $\lambda=\frac{3}{5}\mu-\frac{3}{5}\Rightarrow\lambda=\frac{3}{5}\left(-\frac{3}{2}\right)-\frac{3}{5}=-\frac{3}{2}$ $\therefore\overrightarrow{OD}=-\frac{3}{2}\mathbf{c}$. **Alternatively,** Triangle DOA and triangle DCB are similar triangles.

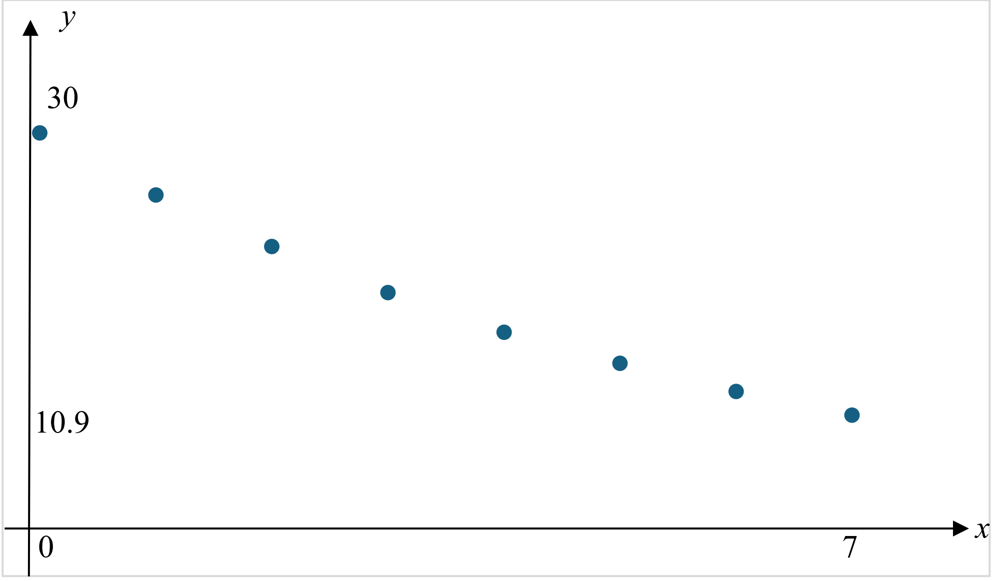
	$\frac{DC}{CB}=\frac{DO}{OA}$ $\frac{x+5}{5}=\frac{x}{3}$ $3x+15=5x$ $x=7.5$ $\overrightarrow{OD}=-\frac{7.5}{5}\mathbf{c}$ $=-\frac{3}{2}\mathbf{c}$ 

Qn	Suggested Solutions
6	**Probability (Venn diagram)**
(a)	$\mathrm{P}(A \cap B) = \mathrm{P}(A) \times \mathrm{P}(B)$ [since A and B are independent] $= 0.3 \times 0.4$ $= 0.12$ $\mathrm{P}(A \cap C) = \mathrm{P}(A) \times \mathrm{P}(C)$ [since A and C are independent] $= 0.3 \times 0.42$ $= 0.126$
(b)	Representing values into Venn diagram, 
(c)	From Venn diagram, For minimum x, let $x = 0 \Rightarrow$ greatest $\mathrm{P}(A' \cap B' \cap C) = 0.294$ For maximum x, let $x = 0.28 \Rightarrow$ least $\mathrm{P}(A' \cap B' \cap C) = 0.014$ $\therefore$ least $\mathrm{P}(A' \cap B' \cap C) = 0.014$, greatest $\mathrm{P}(A' \cap B' \cap C) = 0.294$.

Qn	Solution
7	**Hypothesis Testing**
(a)	Unbiased estimate of μ is $\bar{x}=\frac{\sum x}{n}=\frac{6960}{60}=116$ Unbiased estimate of σ^2 is $s^2=\frac{1}{n-1}\left[\sum x^2-\frac{\left(\sum x\right)^2}{n}\right]$ $=\frac{1}{59}\left[822465-\frac{(6960)^2}{60}\right]$ $=\frac{15105}{59}$ $=256.0169$ $=256$
(b)	Let X be the caffeine content per cup of signature coffee in mg. Let μ denote the population mean caffeine content per cup of signature coffee in mg. $\mathrm{H_0}: \mu=120$ $\mathrm{H_1}: \mu\neq 120$ Under $\mathrm{H_0}$, since $n=60$ is large, by Central Limit Theorem, $\bar{X}\sim \mathrm{N}\left(120,\frac{256.0169}{60}\right)$ approximately. Test Statistic: $Z=\frac{\bar{X}-120}{\sqrt{\frac{256.0169}{60}}}$ Level of significance: 5% Reject $\mathrm{H_0}$ if $p-\text{value}<0.05$ Using G.C, $p-\text{value}=0.0528\ (3\text{ s.f})$ Since $p-\text{value}=0.0528>0.05$, we do not reject $\mathrm{H_0}$ and conclude that there is insufficient evidence, at the 5% level of significance, that the population mean caffeine content per cup of coffee is not 120 mg. Hence the coffee shop owner's claim is supported by the data at the 5% level of significance.
(c)	Let Y be the caffeine content per cup of premium coffee in mg. Let μ_Y denote the population mean caffeine content per cup of premium coffee in mg. $\mathrm{H_0}: \mu_Y=120$ $\mathrm{H_1}: \mu_Y<120$ Under $\mathrm{H_0}$, $Y\sim \mathrm{N}(120,200)$, $\bar{Y}\sim \mathrm{N}\left(120,\frac{200}{n}\right)$ Test Statistic: $Z=\frac{\bar{Y}-120}{\sqrt{\frac{200}{n}}}$ Level of significance: 2.5%

	Reject H_0 if $p-\text{value}<0.025$  Reject H_0 if z-value < -1.95996 $z-\text{value}=\dfrac{116.6-120}{\sqrt{\dfrac{200}{n}}}$ i.e. For H_0 to be rejected at 2.5% level of significance, z-value <-1.95996 $\dfrac{116.6-120}{\sqrt{\dfrac{200}{n}}}<-1.95996$ $-3.4\sqrt{n}<-1.95996\sqrt{200}$ $n>200\left(\dfrac{1.95996}{3.4}\right)^2$ $n>66.461$ Therefore, the set of values is $\left\{n\in\mathbb{Z}:n\geq 67\right\}$

Qn	Solution
8	**Probability, Binomial Distribution**
(a)	1) Whether a randomly chosen mystery box contains a seasonal toy is independent of all other mystery boxes. 2) The probability that a randomly chosen mystery box contains a seasonal toy is constant at $\frac{p}{100}$ throughout the sample.
(b)	$S \sim \mathrm{B}\left(n, \frac{p}{100}\right)$ $\mathrm{P}(S=2)=\mathrm{P}(S=3)$ $\binom{n}{2}\left(\frac{p}{100}\right)^2\left(1-\frac{p}{100}\right)^{n-2}=\binom{n}{3}\left(\frac{p}{100}\right)^3\left(1-\frac{p}{100}\right)^{n-3}$ $\frac{n!}{2!(n-2)!}\left(1-\frac{p}{100}\right)=\frac{n!}{3!(n-3)!}\left(\frac{p}{100}\right)$ (since $p>0, 1-p>0$) $\frac{1}{n-2}\left(1-\frac{p}{100}\right)=\frac{1}{3}\left(\frac{p}{100}\right)$ (since $n>0$) $3-3\left(\frac{p}{100}\right)=n\left(\frac{p}{100}\right)-2\left(\frac{p}{100}\right)$ $n\left(\frac{p}{100}\right)=3-\frac{p}{100}$ Since $\mathrm{E}(S)=2.96$, $n\left(\frac{p}{100}\right)=3-\frac{p}{100}=2.96 \Rightarrow p=4$
(c)	Let X be the number of mystery boxes, out of 12, that contains a seasonal toy. $X \sim \mathrm{B}(12, 0.05)$ $12 \times 0.3 = 3.6$ $\mathrm{P}(X \le 3.6 \mid X \ge 2)=\frac{\mathrm{P}(X \le 3 \cap X \ge 2)}{\mathrm{P}(X \ge 2)}$ $=\frac{\mathrm{P}(2 \le X \le 3)}{\mathrm{P}(X \ge 2)}$ $=\frac{\mathrm{P}(X=2)+\mathrm{P}(X=3)}{1-\mathrm{P}(X \le 1)}$ $= 0.981$ (3 s.f) 

Qn	Solution
9	**Correlation & Regression**
(a)	
(b)	**(i)** $r = -0.987510 \approx -0.98751$ (5 d.p.) **(ii)** $r = -0.999839 \approx -0.99984$ (5 d.p.)
(c)	From the scatter diagram in (a), it is observed that as x increases, y decreases at a decreasing rate Also, from (b), the product moment correlation coefficient between $\ln y$ and x is closer to -1 than that of y and x. Hence $\ln y = c + dx$ is the better model.
(d)	Using GC, a suitable regression line is $\ln\ y = 3.3943 - 0.14493x \approx 3.39 - 0.145x$ When $y = 18$, $\ln\ 18\ = 3.3943 - 0.14493x$ $\therefore x = 3.4770 = 3.48$ years
(e)	$\ln\ y = 3.3943 - 0.14493\left(\frac{x}{12}\right)$ $\ln\ y = 3.3942 - 0.012078x$ $\ln\ y = 3.39 - 0.0121x$

Qn	Solution
10	**Discrete Random Variables**
(a)	$\mathrm{P}(X=4)=\mathrm{P}(T_4,P_1)+\mathrm{P}(T_2,P_2)$ $=\frac{1}{4}\times\frac{1}{3}+\frac{1}{4}\times\frac{1}{3}=\frac{1}{6}$ (Shown)

(b)

Blouse	Pants		
	P_1 (F)	P_2 (F)	P_3 (C)
T_1 (F)	2	3	3
T_2 (F)	3	4	6
T_3 (C)	3	6	6
T_4 (C)	4	8	7

x	2	3	4	6	7	8
$\mathrm{P}(X=x)$	$\frac{1}{12}$	$\frac{4}{12}=\frac{1}{3}$	$\frac{2}{12}=\frac{1}{6}$	$\frac{3}{12}=\frac{1}{4}$	$\frac{1}{12}$	$\frac{1}{12}$

(c)

$$\mathrm{E}(X)=2\left(\frac{1}{12}\right)+3\left(\frac{1}{3}\right)+4\left(\frac{1}{6}\right)+6\left(\frac{1}{4}\right)+7\left(\frac{1}{12}\right)+8\left(\frac{1}{12}\right)=\frac{55}{12}\quad\text{(Shown)}$$

$$\mathrm{E}(X^2)=2^2\left(\frac{1}{12}\right)+3^2\left(\frac{1}{3}\right)+4^2\left(\frac{1}{6}\right)+6^2\left(\frac{1}{4}\right)+7^2\left(\frac{1}{12}\right)+8^2\left(\frac{1}{12}\right)=\frac{293}{12}$$

$$\mathrm{Var}(X)=\frac{293}{12}-\left(\frac{55}{12}\right)^2=\frac{491}{144}$$

Or using G.C.

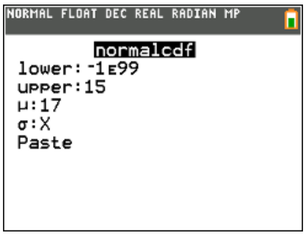
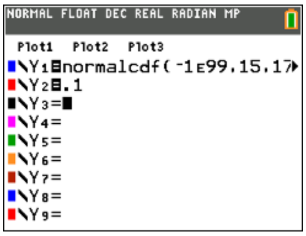
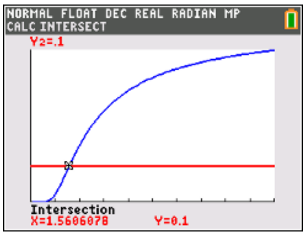
$\mathrm{Var}(X)=3.4097\approx 3.41$

(d)

Required probability = $\left(\frac{2}{4}\times\frac{2}{3}\right)\times\left(\frac{1}{3}\times\frac{1}{2}\right)\times\left(\frac{2}{2}\times\frac{1}{1}\right)\times\frac{3!}{2!}=\frac{1}{6}$

Alternatively,

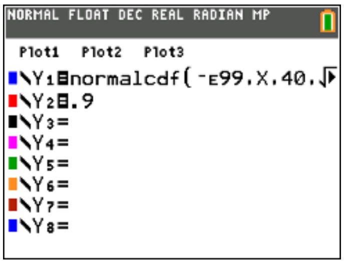
Required probability = $\frac{4}{12}\times\frac{1}{6}\times\frac{2}{2}\times\frac{3!}{2!}=\frac{1}{6}$

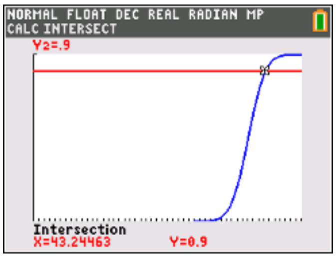
Qn	Solution
11	**Normal, Sampling & Binomial Distribution**
(a)	Let C be the time Anastasia takes to cycle to the train station on a randomly chosen school day (in mins). $C \sim \mathrm{N}\left(8, 0.2^2\right)$ Let T be the time Anastasia takes for a train ride on a randomly chosen school day (in mins). $T \sim \mathrm{N}\left(17, \sigma^2\right)$ Let B be the time Anastasia takes for a bus ride on a randomly chosen school day (in mins). $B \sim \mathrm{N}\left(15, 2.1^2\right)$ **Method 1: Standardisation** $\mathrm{P}\left(T \le 15\right) = 0.1$ $\mathrm{P}\left(Z \le \dfrac{15-17}{\sigma}\right) = 0.1$ $\dfrac{15-17}{\sigma} = -1.28155$ $\sigma = 1.5606$ $\quad = 1.56$ (3 s.f) **Method 2: Graphical** $\mathrm{P}\left(T \le 15\right) = 0.1$ Using GC, $\sigma = 1.5606$ $\quad = 1.56$ (3 s.f) 
(b)	Let J be the time Anastasia takes to travel to school on a randomly chosen school day (in mins). $J = C + T + B$ $\mathrm{E}\left(J\right) = 8 + 17 + 15 = 40$ $\mathrm{Var}\left(J\right) = 0.2^2 + 1.4^2 + 2.1^2 = 6.41$ $J \sim \mathrm{N}\left(40, 6.41\right)$ $\mathrm{P}\left(35 < J < 50\right) = 0.97582$ $\qquad = 0.976$ (3 s.f)
(c)	If Anastasia leaves house at 6:48 am, she will be late if she reaches school later than 7.30am, ie if the time she takes to travel to school exceed 42 minutes. $\mathrm{P}\left(J > 42\right) = 0.21478$ $\qquad = 0.215$ (3 s.f)

(d) Let k be the total duration Anastasia takes to travel to school on a randomly chosen school day (in mins).

$$\mathrm{P}(\text{not late for school}) \geq 0.9$$
$$\mathrm{P}(J < k) \geq 0.9$$
$$k \geq 43.245$$

Alternatively,





She needs a **minimum of 44 mins** to travel to school in order be at least 90% confident that she will not be late for school.

Thus the latest time to leave house is 6:46 am.

(e) Aim: To find $\mathrm{P}(C_1 + C_2 + \ldots + C_5 > 2T)$

$$\Rightarrow \mathrm{P}(C_1 + C_2 + \ldots + C_5 - 2T > 0)$$

Let $X = C_1 + C_2 + \ldots + C_5 - 2T$

$$\mathrm{E}(X) = 5\mathrm{E}(C) - 2\mathrm{E}(T) = 5(8) - 2(17) = 6$$
$$\mathrm{Var}(X) = 5\mathrm{Var}(C) + 2^2\mathrm{Var}(T) = 5(0.2^2) + 2^2(1.4^2) = 8.04$$
$$X \sim \mathrm{N}(6, 8.04)$$
$$\mathrm{P}(X > 0) = 0.98283$$
$$= 0.983 \text{ (3 s.f)}$$

(f) Let R be the number of days, out of 10, that Anastasia is late for school.

$$R \sim \mathrm{B}(10, 0.215)$$

Let S be the number of days, out of 15, that Anastasia is late for school.

$$S \sim \mathrm{B}(15, 0.215)$$

Required probability

$$= \mathrm{P}(R=2)\mathrm{P}(S=0)\left[0.215 + (0.785)(0.215) + \ldots + (0.785)^4(0.215)\right]$$
$$= \mathrm{P}(R=2)\mathrm{P}(S=0)\left[\frac{0.215(1-0.785^5)}{1-0.785}\right]$$
$$= 0.0055766$$
$$= 0.00558 \text{ (3 s.f)}$$

Alternatively,
Let W be the number of days, out of 5, that Anastasia is late for school.

$$W \sim \mathrm{B}(5, 0.215)$$

Required probability

	$= \mathrm{P}(R=2)(1-0.215)^{15}\,\mathrm{P}(W \geq 1)$ $= \mathrm{P}(R=2)(1-0.215)^{15}\,(1-\mathrm{P}(W=0))$ $= 0.0055766$ $= 0.00558$ (3 s.f)