No.	Solution and Mark Scheme	Sub Marks	Total Marks
1			
(a)	$\underline{\text{arc AB} = 28\times 0.5236}$ *or* other valid method **K1** 14.66 Perimeter = 20 +18+ 14.66 **K1** 52.66 **N1**		
(b)	Area of sector *or* Area of Δ $\frac{\frac{1}{2}\times 28^2\times 0.5236}{205.25}$ $\frac{\frac{1}{2}\times 28\times 10\times \sin 30}{70}$ **K1** Area = 205.25 – 70 **K1** = 135.25 **N1**		

No.	Solution and Mark Scheme	Sub Marks	Total Marks
2			
(a)	Find k (Substitute any corresponding value of x °C and y °F) **P1** $k=32$ $substitute\ x = 3\ into\ y = 1.8x + 32$ **K1** 89.6 °F **N1**		
(b)	Use $f^{-1}(x) = y\ or\ x = f(y)$ **K1** $1.8y + 32 = x$ $f^{-1}(x) = \frac{x-32}{1.8}$ **N1**		

No.	Solution and Mark Scheme	Sub Marks	Total Marks
3	$2x + 2x + y + y = 34$ **P1** $\quad 2xy = 60$ **P1** $2x + y = 17$ $y = 17 - 2x$ or $x = \frac{17-y}{2}$ **P1** **K1** Eliminate *x or y* (involving one linear equation and one non linear equations interms of *x and y*) $2x(17-2x) = 60$ **or** $2\left(\frac{17-y}{2}\right)y = 60$ OR $2x^2 - 17x + 30 = 0$ **or** $y^2 - 17y + 60 = 0$ **K1** Solve the quadratic equation **Factorisation** $(x-6)(2x-5) = 0$ or $(y-12)(y-5) = 0$ OR **Use formula** $x = \frac{-(-17) \pm \sqrt{(-17)^2 - 4(2)(30)}}{2(2)}$ **or** $y = \frac{-(-17) \pm \sqrt{(-17)^2 - 4(1)(60)}}{2(1)}$ **N1** $x = 6, \frac{5}{2}$ *or* $y = 5, 12$ **N1** $y = 5, 12$ *or* $x = 6, \frac{5}{2}$		

No.	Solution and Mark Scheme	Sub Marks	Total Marks
4			
(a)	$a = 6$ *or* $r = 0.6$ **P1**		
	Use $T_5 = 6(0.6)^4$ **K1**		
	$\frac{486}{625}$ **N1**		
	OR listing method $6, \frac{18}{5}, \frac{54}{25}, \frac{162}{125}, \frac{486}{625}$		
(b)	Use $S_4 = 6\left(\frac{1-0.6^4}{1-0.6}\right)$ **K1** **K1** $10 + *T_5 + 2 * S_4$		
	$\frac{23056}{625}$ **N1**		
	OR listing method $10 + 2(6) + 2\left(\frac{18}{5}\right) + 2\left(\frac{54}{25}\right) + 2\left(\frac{162}{125}\right) + \frac{486}{625}$		

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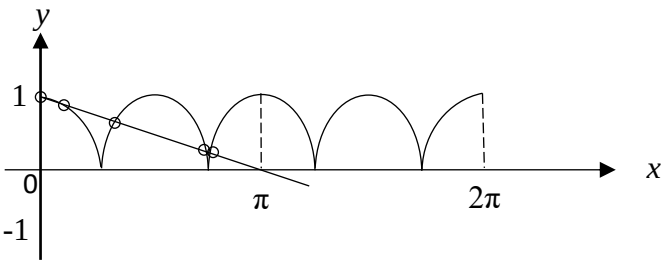
5

(a) Use $\sin 2x = 2\sin x \cos x$ **K1**

$$2\left[\frac{k}{\sqrt{k^2+1}}\right]\left[\frac{1}{\sqrt{k^2+1}}\right]$$

N1 $\dfrac{2k}{k^2+1}$

(b)



Shape of cosine graph **P1**

2 cycles for $0 \le x \le 2\pi$ **P1**

Modulus of cosine graph for $0 \le x \le 2\pi$ **P1**

(c) $y = 1 - \dfrac{x}{\pi}$ **N1**

Sketch the straight line
with *gradient or * y-intercept
and straight line involves x and y **K1**
must be correct.

No. of solutions = 4 **N1**

6

(a) $6(5^t) + (5^t)(5^1) + 2\left(\frac{5^t}{5^1}\right) = 7125$ **K1**

$5^t = 625$ **K1**

$t = 4$ **N1**

(b) $log_3 x = m \text{ or } log_3 y = n$ **P1**

$log_9 27 + log_9 y - log_9 x^4$ **K1**

$\frac{log_3 27}{log_3 9} + \frac{log_3 y}{log_3 9} - \frac{log_3 x^4}{log_3 9}$ **K1**

$\frac{3}{2} + \frac{n}{2} - \frac{4log_3 x}{2}$ **K1**

$\frac{3}{2} + \frac{n}{2} - 2m$ **N1**

7			
(a)	Find $\frac{dy}{dx}$ and substitute $x=1$ **K1** $\frac{dy}{dx} = 2(1)$ $y - 6 = 2(x - 1)$ **K1** $y = 2x + 4$ **N1**		
(b)	Integrate, $\int x^2 + 5$ **K1** A_1 Use $\int_0^1 x^2 + 5$ *or* find the area of trapezium **K1** A_2 $A_1 - A_2$ **K1** $\frac{1}{3}$ **N1**		
(c)	Integrate $\int \pi(y - 5)$ **K1** Use $\int_5^7 in\ \pi \left[\frac{y^2}{2} - 5y\right]$ **K1** 2π **N1**		

8

a) i) $\mu = 10(0.7) = 7$ **N1**

$\sigma^2 = 7(0.3) = 2.1$ **N1**

ii) ${}^{10}C_9 \times 0.7^9 \times 0.3^1$ or ${}^{10}C_{10} \times 0.7^{10} \times 0.3^0$ **K1**

$P(X = 9) + P(X = 10)$ **K1**

0.1493 **N1**

b) i) $P\left[z \leq \frac{345-350}{5}\right]$ **K1**

0.15866 **N1**

ii) $z = -0.468$ **P1**

$\frac{m-350}{5} = -0.468$ **K1**

$m = 347.66$ **N1**

9

(a)

$\log_{10} x$	0.30	0.48	0.60	0.70	0.78	0.85
$\log_{10} y$	1.06	1.30	1.48	1.64	1.74	1.87

N1

N1

(b)

Plot $\log_{10} x$ against $\log_{10} y$ **K1**

6* points plotted correctly **N1**

Line of best fit **N1**

(c) $\log_{10} y = \frac{n}{2}\log_{10} x + \log_{10} p$ **P1**

i) $\log_{10} p = 0.56$ **K1**

$p = 3.63$ **N1**

ii) $\frac{n}{2} = *m$ **K1**

$n = 3.08$ **N1**

10

(a) i) $m_{PQ} = -\frac{1}{3}$ **P1**

$m_{QR} = -\frac{1}{m_{PQ}}$ or $m_{QR} = 3$ **K1**

Use $y-(-2) = 3(x-4)$ **K1**

$y = 3x - 14$ **N1**

ii) Solve the simultaneous equation *PQ and QR* **K1**

$3(3x-14) + x = 18$

Q (6 , 4) **N1**

(b) $\frac{8-(-2)}{-6-4} = \frac{y-(-2)}{0-4}$ **K1**

S(0,2) **N1**

Use distance formula for ST=3 **K1**

$\sqrt{(x-0)^2+(y-2)^2} = 3$

$x^2 + y^2 - 4y - 5 = 0$ **N1**

11

(a) i)

Find resultant vector of $\overrightarrow{BD}$ or $\overrightarrow{AF}$ **K1**

$\overrightarrow{BD} = \overrightarrow{BA}+\overrightarrow{AD}$ $\overrightarrow{AF}=\overrightarrow{AB}+\overrightarrow{BF}$

$-\underset{\sim}{x}+\underset{\sim}{y}$ **N1**

ii)

$\frac{3}{5}\underset{\sim}{x}+\frac{2}{5}\underset{\sim}{y}$ **N1**

(b)

Find $\overrightarrow{DC}=\overrightarrow{DA}+\overrightarrow{AC}$ *or* $\overrightarrow{DC}=\overrightarrow{DB}+\overrightarrow{BC}$ **K1**

i)

$-\underset{\sim}{y}+\frac{\overrightarrow{AF}}{m}$ $\underset{\sim}{x}-\underset{\sim}{y}+\frac{n\overrightarrow{AD}}{5}$

or *or*

$-\underset{\sim}{y}+\frac{1}{m}\left[\frac{3}{5}\underset{\sim}{x}+\frac{2}{5}\underset{\sim}{y}\right]$ $\underset{\sim}{x}-\underset{\sim}{y}+\frac{n\underset{\sim}{y}}{5}$

ii) $\frac{3}{5m}\underset{\sim}{x}+\left(\frac{2}{5m}-1\right)\underset{\sim}{y}$ **N1**

(c) $\underset{\sim}{x}+\left(\frac{n}{5}-1\right)\underset{\sim}{y}$ **N1**

Equate the coefficient of $\underset{\sim}{x}$ *or* $\underset{\sim}{y}$ **K1**

$\frac{3}{5m}=1$ or $\frac{2}{5m}-1=\frac{n}{5}-1$

Solve the linear equation **K1**
To find *m or n.*

$m = \frac{3}{5}$ **N1** $n = 2$ **N1**

12			
(a)	$x + y \leq 350$ **N1**		
	$y \geq \frac{2}{5}x$ **N1**		
	$60x + 45y \geq 10800$ **N1**		
(b)	Draw correctly at least one straight line from the *inequalities with involves x and y **K1**		
	Draw correctly all *straight lines **N1**		
	The correct region shaded **N1**		
(c)			
i)	$105 \leq x \leq 250$ **N1**		
ii)	(250,100) **N1**		
	Substitute any points into $60x + 45y$ in the *shaded region **K1**		
	19,500 **N1**		

13

(a) $\frac{\sin \measuredangle PRQ}{10} = \frac{\sin 30}{6}$ **K1**

56.44°

$\measuredangle PRQ = 180^\circ - 56.44^\circ$ **K1**

123.56° **N1**

(b) $(PS)^2 = 5^2 + 6^2 - 2(5)(6)\cos 56.44^\circ$ **K1**

$PS = 5.28$ **N1**

(c) $\frac{1}{2}(5.28)(12)\sin \measuredangle SPT = 30$ **K1**

$\measuredangle SPT = 71.26^\circ$ **N1**
$(71.25^o - 71.81^o)$

(d) Find area PRS

$\frac{1}{2}(5)(6)\sin \measuredangle 56.44^\circ$ **K1**

Area PST + Area PRS
$30 + \frac{1}{2}(5)(6)\sin \measuredangle 56.44^\circ$ **K1**

42.5 **N1**

14

(a) Differentiate $12-3t$ wrt *t:*

$$a=\frac{dv}{dt}=-3 \qquad \textbf{N1}$$

(b) Use *v=0*

$12-3t=0$ **K1**

$t=4s$ **N1**

(c) Use $s=\int(12-3t)dt$ **K1**

and substitute $t=0, s=0$

$$s=12t-\frac{3t^2}{2}$$

Use *s* = -30 **K1**

$$-30=12t-\frac{3t^2}{2}$$

$3t^2-24t-60=0$

$(t+2)(t-10)=0$

$t=-2, t=10$

$t\geq 0, t=10$ **N1**

$velocity, v=12-3t$

$=12-3(10)$

$=-18ms^{-1}$

N1

(d)

At *Q*, *t* = 4

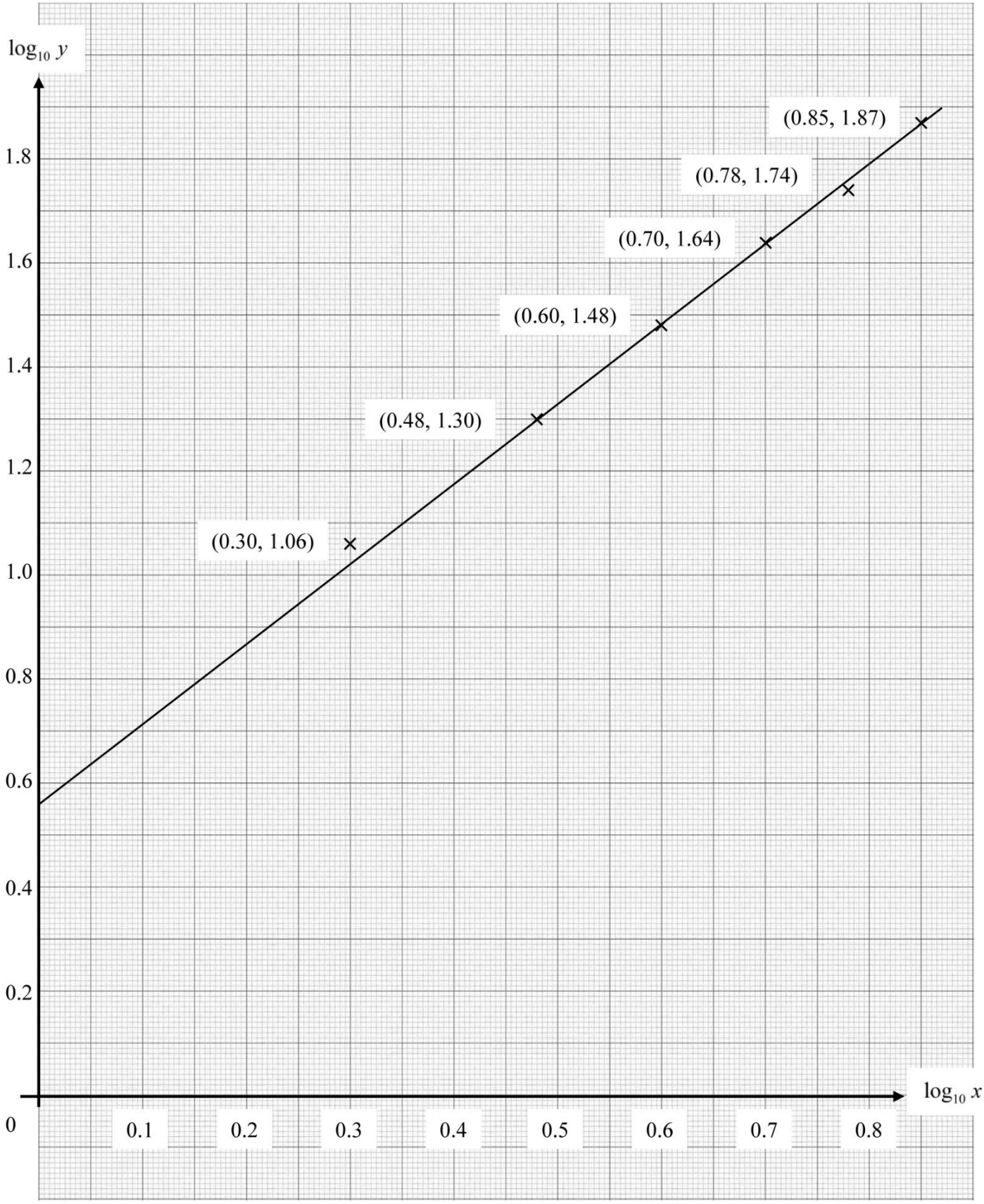
$$S_{OQ}=12(4)-\frac{3(4)^2}{2}=24m \qquad \text{K1}$$

Total distance = 24 + 24 + 30 **K1**

= 78 m **N1**

15			
(a)	$\frac{P_{2015}}{45}\times 100 = 120$ **K1** **N1** 54		
(b)	$2(120) + 4x + 1(90) + 3(110)$ **P1** $\frac{2(120)+4x+1(90)+3(110)}{2+4+1+3} = 112$ **K1** $x = 115$ **N1** Price is increasing 15%. **N1**		
(c)i)	Use $\bar{I}_{2016} = 112\times\frac{125}{100}$ **K1** **N1** 140		
ii)	Use $\frac{126}{P_{2014}}\times 100 = 140$ **K1** **N1** 90		

Graph for Question 9(*b*)



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Graph for Question 12(*b*)