





ADDITIONAL MATHEMATICS

Kertas 1

Ogos

2 jam



MAJLIS PENGETUA SEKOLAH MALAYSIA  
CAWANGAN PULAU PINANG

MODUL LATIHAN BERFOKUS SPM 2015

MARK SCHEME

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ADDITIONAL MATHEMATICS

Paper 1

Two hours

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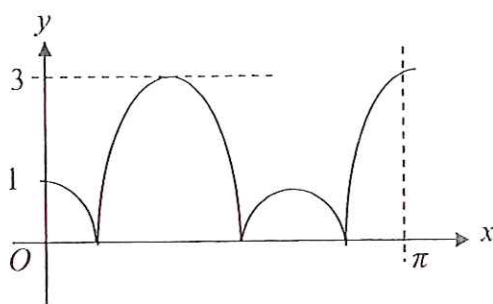
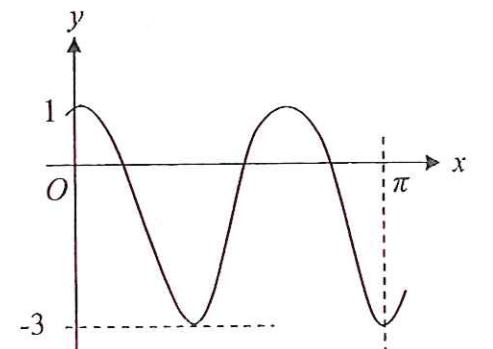
## ADDITIONAL MATHEMATICS PAPER 1 2015

Question	Solution and Mark Scheme	Sub Marks	Total Mark
1 (a)	Many to one	1	2
(b)	{c, g}	1	
2	3  B1: $\frac{2m}{4-m} = 6$ <u>or</u> $g^{-1}(x) = \frac{2m+mx}{x}$	2	2
3 (a)	3	1	2
(b)	1	1	
4	6  B2: $(-6)^2 - 4(1)(3+t) = 0$ <u>or</u> $y = -(x-3)^2 + 6$  B1: $x^2 - 6x + 3 + t = 0$ <u>or</u> $y = -[x^2 - 6x + (-3)^2 - (-3)^2] - 3$	3	3
5 (a)	$m = 1$ and $n = 8$  B1: $m = 1$	2	4
(b)	(1, -8)  (1, -4)	1  1	
6	3  B2: $4 + x + 2 = 3x$  B1: $16 = 2^4$ <u>or</u> $8 = 2^{3x}$	3	3



7	$\frac{2k-3-h}{2} \text{ or } \frac{1}{2}(2k-3-h) \text{ or } k - \frac{3}{2} - \frac{h}{2}$ <p>B3 : <math>\frac{2 \log_3 y - \log_3 27 - \log_3 x}{\log_3 9}</math>  <u>or</u> <math>\frac{2 \log_3 y}{\log_3 9} - \frac{\log_3 27}{\log_3 9} - \frac{\log_3 x}{\log_3 9}</math></p> <p>B2 : <math>\frac{\log_3 y^2 - \log_3 27x}{\log_3 9}</math>  <u>or</u> <math>\log_9 y^2 - \log_9 27 - \log_9 x</math></p> <p>B1 : <math>\frac{\log_3 \left(\frac{y^2}{27x}\right)}{\log_3 9}</math> <u>or</u> <math>\log_9 y^2 - \log_9 27x</math></p>	4	4
8	<p>2024</p> <p>B3 : <math>n = 11</math></p> <p>B2 : <math>100\,000(1.08)^{n-1} &gt; 120\,000(1.06)^{n-1}</math></p> <p>B1 : <math>a = 120\,000, r = 1.06</math> <u>or</u>  <math>a = 100\,000, r = 1.08</math> <u>or</u></p> <p style="text-align: center;"><u>OR</u></p> <p>2024</p> <p>B3 : <math>n = 11</math></p> <p>B2 : 120000 , 127200 , 134832, 142922, 151497, 160587,  170222 , 180435 , 191262, 202737, 214902  <u>and</u>  100000 , 108000, 116640, 125971, 136049 , 146933,  158687 , 171382, 185093 , 199900, 215892</p> <p>B1 : 120000 , 127200 , 134832, ... <u>or</u>  100000 , 108000, 116640, ...</p>	4	4
9	<p>(a) <math>\frac{8}{3}</math></p> <p>B1 : <math>\frac{k}{k+8} = \frac{k-2}{k}</math></p> <p>(b) <math>\frac{1}{4}</math></p>	2	3

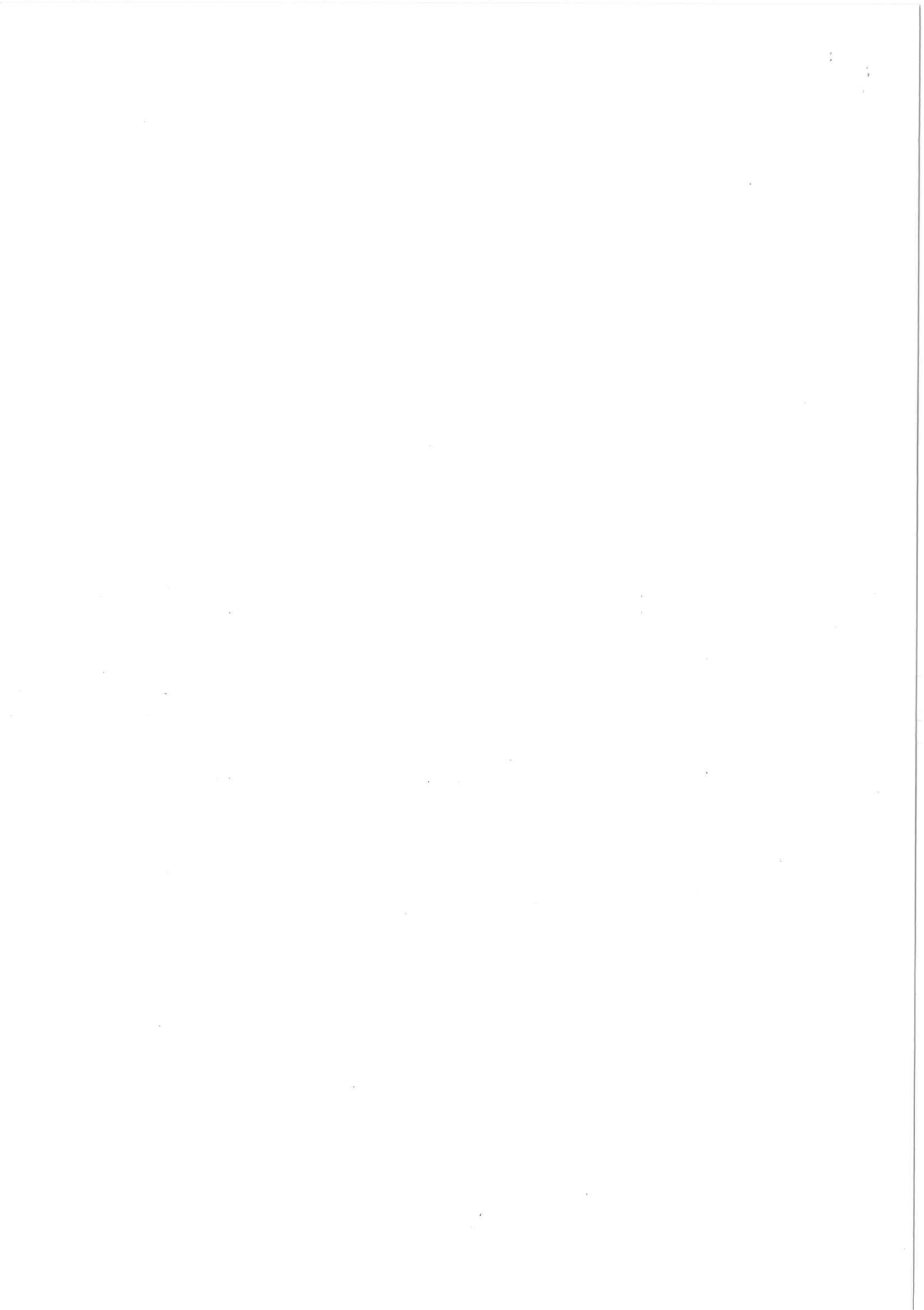
10	<p>4</p> <p>B2 : <math>\frac{8}{2}[2(15+10d)+7d]=552</math>  or <math>\frac{18}{2}[2(15)+(18-1)d] - \frac{10}{2}[2(15)+(10-1)d] = 552</math></p> <p>B1 : <math>T_{11} = 15 + 10d</math> or <math>\frac{18}{2}[2(15)+(18-1)d]</math> or <math>\frac{10}{2}[2(15)+(10-1)d]</math></p>	3	3
11	<p><math>3y = -2x + 9</math> or <math>y = -\frac{2}{3}x + 3</math></p> <p>B3 : <math>y - *1 = * - \frac{2}{3}(x - *3)</math> or <math>*1 = * - \frac{2}{3}(*3) + c</math></p> <p>B2 : (3, 1) <u>and</u> <math>m_{QS} = -\frac{2}{3}</math></p> <p>B1 : (3,1) <u>or</u> <math>m_{PR} = \frac{3}{2}</math></p>	4	4
12	<p><math>x^2 + y^2 - 25 = 0</math></p> <p>B1 : <math>\sqrt{(x-0)^2 + (y-0)^2} = 5</math></p> <p>Note : Accept any coordinates for the centre.</p>	2	2
13	<p><math>Y = \frac{y}{x^3}</math> , <math>X = \frac{1}{x^3}</math></p> <p>B2 : <math>Y = \frac{y}{x^3}</math> <u>or</u> <math>X = \frac{1}{x^3}</math></p> <p>B1 : <math>\frac{y}{x^3} = -2 + \frac{4}{x^3}</math></p>	3	3
14	<p><math>\frac{1}{\sqrt{52}}(4i-6j)</math></p> <p>B2 : <math>\sqrt{(4)^2 + (-6)^2}</math></p> <p>B1 : <math>\vec{AC} = 4i - 6j</math> <u>or</u> <math>\vec{AC} = \begin{pmatrix} 4 \\ -6 \end{pmatrix}</math></p>	3	3

15	<p>(a) (i) <math>k = 2</math></p> <p>(ii) <math>n = 3</math></p> <p>(b)</p>  <p>B1 :</p> 	1	1
16	<p><math>h = 2</math> <u>and</u> <math>k = \frac{-33}{4}</math> <u>or</u> <math>k = -8.25</math></p> <p>B2: <math>4 = 12 - 4h</math> <u>or</u> <math>6 = -3 - 4k - 12h</math></p> <p>B1: <math>2 \begin{pmatrix} 2 \\ 3 \end{pmatrix} = 3 \begin{pmatrix} 4 \\ -1 \end{pmatrix} - 4 \begin{pmatrix} h \\ k+3h \end{pmatrix}</math></p>	3	3
17	<p>(2, -4)</p> <p>B2: <math>x = 2</math></p> <p>B1: <math>\frac{dy}{dx} = 2x - 1</math> <u>or</u> <math>m_1 = 3</math></p>	3	3
18	<p>(a) <math>\frac{2}{5}\pi</math> <u>or</u> <math>0.4\pi</math> <u>or</u> <math>1.257</math></p> <p>B1: <math>\delta A = 10\pi \times 0.04</math></p> <p>(b) <math>25.4\pi</math> <u>or</u> <math>\frac{127}{5}\pi</math> <u>or</u> <math>79.80</math></p> <p>B1: <math>A_0 = 25\pi</math></p>	2	2
		2	4



19	(a)	-8	1	
	(b)	4	3	4
		$B2 : \left[ \frac{11^2}{2} - \frac{7^2}{2} \right] + 4(-8)$ $B1 : \frac{x^2}{2} \text{ or } 4(-8)$		
20	(a)	0.7855	1	
	(b)	40.19	3	4
		$B2 : \frac{1}{2} \times 12 \times 12 - \frac{1}{2} (9)^2 * (0.7855)$ $B1 : \frac{1}{2} \times 12 \times 12 \text{ or } \frac{1}{2} (9)^2 (0.7854)^*$		
21		$4.638 \text{ or } \frac{371}{80}$ $B2 : 4.45 + \left( \frac{\frac{40}{2} - 17}{8} \right) 0.5$ $B1 : L = 4.45 \text{ or } F = 17 \text{ or } f = 8 \text{ or } c = 0.5$	3	3
22	(a)	1	1	
	(b)	1.579	3	4
		$B2 : \sqrt{\frac{310}{30} - (2.8)^2}$ $B1 : \bar{x} = 2.8$		

23	(a) 20 (b) 7 B1: ${}^6C_5 + {}^6C_6$ <u>or</u> ${}^6C_5 + 1$ <u>or</u> $6 + {}^6C_6$	1 2	3
24	(a) $\frac{1}{18}$ (b) $\frac{11}{36}$	1 1	2
25	(a) $\frac{1}{4}$ B2: $q = \frac{3}{4}$ B1: $np = 15$ <u>or</u> $\sqrt{15q} = \frac{3}{2}\sqrt{5}$ (b) 60	3 1	4





ADDITIONAL MATHEMATICS

Kertas 2

Ogos

$2\frac{1}{2}$  jam



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MODUL LATIHAN BERFOKUS SPM 2015

MARK SCHEME

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ADDITIONAL MATHEMATICS

Paper 2

Two hours and thirty minutes

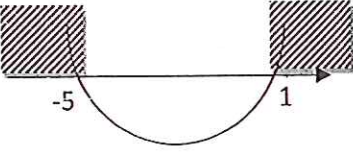
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## SECTION A ( 40 MARKS )

Ques	Mark Scheme	Sub Mark	Total Mark
1.	<p><math>p = 3 - 2k</math> or <math>k = \frac{3-p}{2}</math> <span style="border: 1px solid black; padding: 2px;">P1</span></p> <p>Eliminate <math>p</math> or <math>k</math></p> <hr style="border-top: 1px dashed black;"/> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><math>\frac{1}{*(3-2k)-1} - \frac{1}{k} = 1</math> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span></p> <p>or</p> <p><math>\frac{1}{p-1} - \frac{1}{*\left(\frac{3-p}{2}\right)} = 1</math></p> <p>or</p> <p>equivalent</p> <p><math>k = -1.281, 0.781</math> or <math>p = 5.562, 1.438</math> OR</p> <p><math>p = 5.562, 1.438</math> or <math>k = -1.281, 0.781</math> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">N1</span></p> </div> <div style="width: 45%;"> <p>Solve the Quadratic Equation</p> <p><u>Using formula</u></p> <p><math>k = \frac{-1 \pm \sqrt{(1)^2 - 4(2)(-2)}}{2(2)}</math></p> <p>or</p> <p><math>p = \frac{7 \pm \sqrt{(7)^2 - 4(1)(8)}}{2(1)}</math> OR</p> <p><u>Completing the square</u></p> <p><math>2 \left[ \left( k + \frac{1}{4} \right)^2 - \left( \frac{1}{4} \right)^2 \right] - 2 = 0</math></p> <p>or</p> <p><math>\left( p - \frac{7}{2} \right)^2 - \left( \frac{7}{2} \right)^2 + 8 = 0</math></p> </div> </div> <p><span style="border: 1px solid black; padding: 2px;">N1</span></p> <p><span style="border: 1px solid black; border-radius: 50%; padding: 2px;">N1</span></p> <p><u>Note:</u></p> <p>OW-1 if steps to solve quadratic equation are not shown.</p>	5	5

Ques	Mark Scheme	Sub Mark	Total Mark
2 (a)	$f^{-1}(x) = \frac{x-3}{4}$ <div style="text-align: center;"> <span style="border: 1px solid black; padding: 2px;">N1</span> </div>	1	
2 (b)	$gf^{-1}(x) = 2 * \left( \frac{x-3}{4} \right) - 5$ $= \frac{x-13}{2}$ <div style="text-align: center;"> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span>  <span style="border: 1px solid black; padding: 2px;">N1</span> </div>	2	
2 (c)	$h(y) = 8 * \left( \frac{y+5}{2} \right) - 9$ $h(x) = 4x + 11$ <div style="text-align: center;"> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span>  <span style="border: 1px solid black; padding: 2px;">N1</span> </div>	2	5
3 (a)	<p>Use  <math>\cos(A+B) = \cos A \cos B - \sin A \sin B</math>                      or  <math>\sin 2B = 2 \sin B \cos B</math></p> <div style="text-align: center;"> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span>  <span style="border: 1px solid black; padding: 2px;">N1</span> </div> <p>LHS = RHS</p> <p>(b) <math>\cos B = \frac{3}{5}</math> <span style="border: 1px solid black; padding: 2px;">P1</span></p> <p>(i) <math>\frac{24}{25}</math> <span style="border: 1px solid black; padding: 2px;">N1</span></p> <p>(ii) <math>\cos A = \frac{\sqrt{3}}{2}</math> or <math>\sin A = \frac{1}{2}</math> <span style="border: 1px solid black; padding: 2px;">P1</span></p> $\frac{\left( \frac{\sqrt{3}}{2} \right) * \left( \frac{1}{2} \right)}{\left( \frac{4}{5} \right) * \left( \frac{3}{5} \right)} \text{ or } \frac{2 \left[ \left( \frac{\sqrt{3}}{2} \right) * \left( \frac{3}{5} \right) - \left( \frac{1}{2} \right) * \left( \frac{4}{5} \right) \right]}{\left( \frac{24}{25} \right)}$ <div style="text-align: center;"> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span>  <span style="border: 1px solid black; padding: 2px;">N1</span> </div> $\frac{5}{24} (3\sqrt{3} - 4)$	2	7



Ques	Mark Scheme	Sub Mark	Total Mark
4 (a)	$c = 1$ <span style="border: 1px solid black; padding: 2px;">N1</span>	1	
(b)	$3[x^2 + 4x] + 1$ <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">P1</span>		
	<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span> Complete the square $3[(x + 2)^2 - (2)^2] + 1$		
	<span style="border: 1px solid black; padding: 2px;">N1</span> $3(x + 2)^2 - 11$		
	<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">N1</span> $A(-2, -11)$	4	
(c)	$(x - 1)(x + 5) \geq 0$ or 		
	<span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span> $x \leq -5, x \geq 1$	2	
	<span style="border: 1px solid black; padding: 2px;">N1</span>		
(d)	$f(x) = -3(x + 2)^2 + 11$ <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">N1</span>	1	8
5 (a)	(i) & (ii) <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span> Use Triangle Law for $\vec{QR}$ or $\vec{PB}$		
	$\vec{QR} = -6\underline{x} + 8\underline{y}$ <span style="border: 1px solid black; padding: 2px;">N1</span>		
	<span style="border: 1px solid black; padding: 2px;">N1</span> $\vec{PB} = 4\underline{x} + \frac{8}{3}\underline{y}$	3	

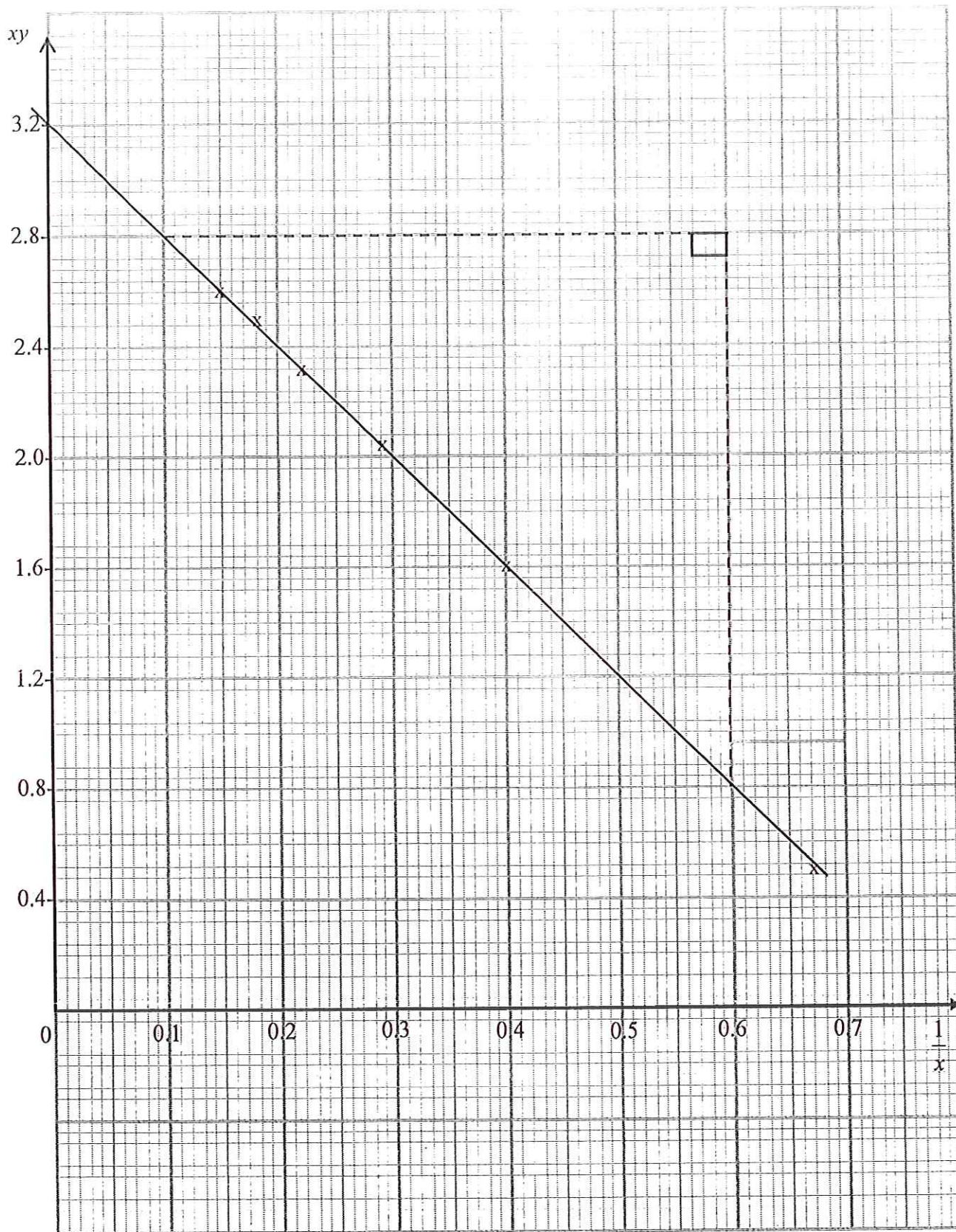
Ques	Mark Scheme	Sub Mark	Total Mark
5 (b)	<p><math>\vec{PA} = k * \left( 4\vec{x} + \frac{8}{3}\vec{y} \right)</math> (P1)</p> <p>Use Triangle Law to find <math>\vec{CQ}</math> and use <math>\vec{PA} = \vec{PC} + h\vec{CQ}</math> (K1)</p> <p>Compare coefficients <math>\vec{x}</math> and <math>\vec{y}</math> and solve simultaneous linear equations (K1)</p> <p><math>h = \frac{4}{7}</math> or <math>k = \frac{6}{7}</math> (N1)</p> <p><math>k = \frac{6}{7}</math> or <math>h = \frac{4}{7}</math> (N1)</p>	5	8
6 (a)	<p><math>m_1 = -3</math> (P1)</p> <p>Use <math>m_1 \times m_2 = -1</math> ----- <math>m_2 = \frac{1}{3}</math> (K1)</p> <p>Use <math>y - 8 = * \frac{1}{3}(x - 5)</math> or <math>8 = * \frac{1}{3}(5) + c</math> (K1)</p> <p><math>3y = x + 19</math> (N1)</p> <p>(b) Integrate <math>2 - x</math> wrt <math>x</math> ----- <math>y = 2x - \frac{x^2}{2} + c</math> (K1)</p> <p>Substitute (5, 8) into *y to find c (K1)</p> <p><math>y = 2x - \frac{x^2}{2} + \frac{21}{2}</math> (N1)</p>	4	7

## SECTION B ( 40 MARKS)

Ques	Mark Scheme	Sub Mark	Total Mark
7 (a) (i)	$m_{GH} = \frac{1}{2}$ $m_{BC} = -\frac{1}{2}, m_{AD} = 2$ <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>K1</p> <p>2y = x + 3</p> <p>N1</p> </div> <div style="text-align: center;"> <p>K1</p> <p>N1</p> </div> </div> <div style="margin-left: 200px;"> <math>y - 2 = * \frac{1}{2}(x - 1)</math>  <math>2 = * \frac{1}{2}(1) + c</math>  OR  <math>y - 6 = * \frac{1}{2}(x - 9)</math>  <math>6 = * \frac{1}{2}(9) + c</math> </div>	3	
(ii)	$B(5, 4)$ <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>N1</p> </div> <div style="text-align: center;"> <p>K1</p> <p>N1</p> </div> </div> <p>Use <math>\frac{x+2(2)}{3} = *5</math> or <math>\frac{y+2(5)}{3} = *4</math></p> <p><math>C(11, 2)</math></p>	3	
(iii)	<p>Use <math>\frac{1}{2} \left  \begin{array}{cc cc} 1 &amp; *5 &amp; 2 &amp; 1 \\ 2 &amp; *4 &amp; 5 &amp; 2 \end{array} \right </math></p> <p>until <math>\frac{1}{2} \left( \begin{array}{c} \phantom{0} \\ \phantom{0} \end{array} \right) - \left( \begin{array}{c} \phantom{0} \\ \phantom{0} \end{array} \right)</math></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>K1</p> <p>N1</p> </div> <div style="text-align: center;"> <p>5</p> </div> </div>	2	
(b)	<p>Find the gradient of AC and use <math>m_{AC} \times m_{GH} = -1</math></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>K1</p> <p>N1</p> </div> <div style="text-align: center;"> <p>Not Perpendicular</p> </div> </div>	2	10




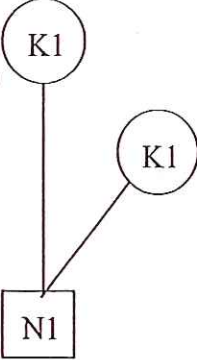
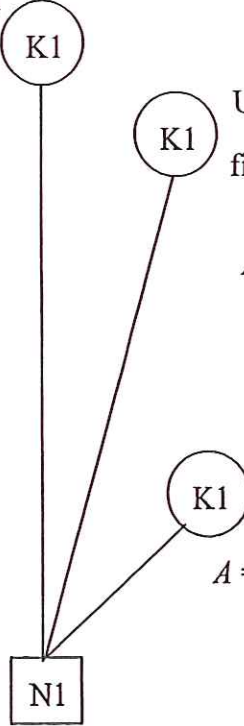
Ques	Mark Scheme							Sub Mark	Total Mark	
8 (a)	$\frac{1}{x}$	0.67	0.40	0.29	0.22	0.18	0.15	N1	2	
	$xy$	0.50	1.60	2.03	2.34	2.48	2.60	N1		
8 (b) & (c)	<p style="text-align: center;">Plot <math>xy</math> against <math>\frac{1}{x}</math></p> <p style="text-align: center;">6 *points plotted correctly</p> <p style="text-align: center;">Line of best fit</p> <p><math>xy = \frac{p}{x} + q</math> <span style="border: 1px solid black; padding: 2px;">P1</span></p> <p>Use *<math>m = p</math> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span></p> <p style="text-align: center;">Use *<math>c = q</math> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span></p> <p><math>p = -4</math> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">N1</span> <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">N1</span> <math>q = 3.2</math></p>							3		
								5	10	
<p>Note : SS-1 if part of the scale is not uniform or not using the scales given or not using the graph paper</p>										



Ques	Mark Scheme	Sub Mark	Total Mark
9 (a)	<p>(i) <math>p = 0.55</math> and <math>q = 0.45</math> <span style="border: 1px solid black; padding: 2px;">P1</span></p> <div style="display: flex; align-items: center; margin-left: 40px;"> <div style="text-align: center; margin-right: 20px;"> </div> <div style="border: 1px solid black; padding: 5px;">             Use <math>\frac{{}^8C_r (0.55)^r (0.45)^{8-r}}{{}^8C_3 (0.55)^3 (0.45)^{8-3}}</math> </div> </div> <p>(ii) <span style="border: 1px solid black; padding: 2px;">P1</span> Write <math>P(X \geq 3)</math></p> <div style="display: flex; align-items: center; margin-left: 40px;"> <div style="text-align: center; margin-right: 20px;"> </div> <div style="border: 1px solid black; padding: 5px;"> <math>= 1 - [P(X=0) + P(X=1) + P(X=2)]</math>  <u>OR</u>  <math>= [P(X=3) + P(X=4) + P(X=5) + P(X=6) + P(X=7) + P(X=8)]</math> </div> </div>	5	
(b)	<p>(i) <math>Z = \frac{50 - 60}{\sqrt{64}}</math></p> <div style="display: flex; align-items: center; margin-left: 40px;"> <div style="text-align: center; margin-right: 20px;"> </div> <div style="border: 1px solid black; padding: 5px;">             Use <math>1 - P(Z \geq * -1.25)</math> </div> </div> <p>(ii) <math>*0.8944 \times 280</math></p> <div style="display: flex; align-items: center; margin-left: 40px;"> <div style="text-align: center; margin-right: 20px;"> </div> <div style="border: 1px solid black; padding: 5px;">             250         </div> </div>	5	10



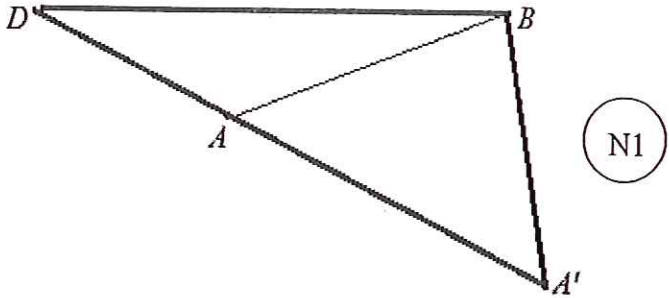
Ques	Mark Scheme	Sub Mark	Total Mark
10 (a)	<p>Find <math>\frac{dy}{dx}</math> and subst <math>x = 2</math></p> <p><math>y = 2x + 4</math></p> <p>Use <math>y - 8 = *m_1(x - 2)</math> or <math>8 = *m_1(2) + c</math></p>	3	
(b)	<p>Integrate <math>(6x - x^2)</math> wrt <math>x</math></p> <p><math>A_1 = \frac{6x^2}{2} - \frac{x^3}{3}</math></p> <p>Use limit <math>\int_0^2</math> in <math>A_1</math> OR Find the area of trapezium</p> <p><math>A_2 = \frac{1}{2} \times (*4 + 8) \times (2)</math></p> <p>or <math>\left[ \frac{2x^2}{2} + 4x \right]_0^2</math></p> <p><math>\frac{8}{3} // 2\frac{2}{3} // 2.667</math></p>	4	
(c)	<p>Integrate <math>\pi(6x - x^2)^2</math> wrt <math>x</math></p> <p><math>V = \pi \left[ 12x^3 - 3x^4 + \frac{x^5}{5} \right]</math></p> <p>Use <math>\int_0^2 \pi \left[ 12x^3 - 3x^4 + \frac{x^5}{5} \right]</math></p> <p><math>\frac{272}{5} \pi // 54\frac{2}{5} \pi // 54.4\pi</math></p>	3	10

Ques	Mark Scheme	Sub Mark	Total Mark
11 (a)	<p>Use <math>s = r\theta</math> to find arc <math>PQ</math></p> <p>-----</p> <p><math>9 \times 1.3</math></p> <p>11.7</p> 	2	
11 (b)	<p><math>PQ = 2(9 \sin \frac{1}{2}(1.3))</math> OR Use cosine rule in <math>\Delta POQ</math> to find <math>PQ</math> <math>PQ = 10.89</math></p> <p>22.59</p> 	3	
11 (c)	<p><math>\angle QPR = 0.65</math> rad or equivalent</p> <p>P1</p> <p>Use <math>A = \frac{1}{2}r^2\theta</math> to find area of sector <math>POQ</math></p> <p>-----</p> <p><math>A_1 = \frac{1}{2}9^2(1.3)</math></p> <p>24.912</p>  <p>Use <math>\frac{1}{2} \times b \times h</math> OR <math>\frac{1}{2}ab \sin C</math> to find <math>A_2 = \Delta POQ</math> or <math>A_3 = \Delta PQR</math></p> <p><math>A_2 = 39.024; A_3 = 38.55</math></p> <p><math>A = A_2 + A_3 - A_1</math> OR <math>A = A_3 - (A_1 - A_2)</math></p>	5	10



SECTION C ( 20 MARKS)

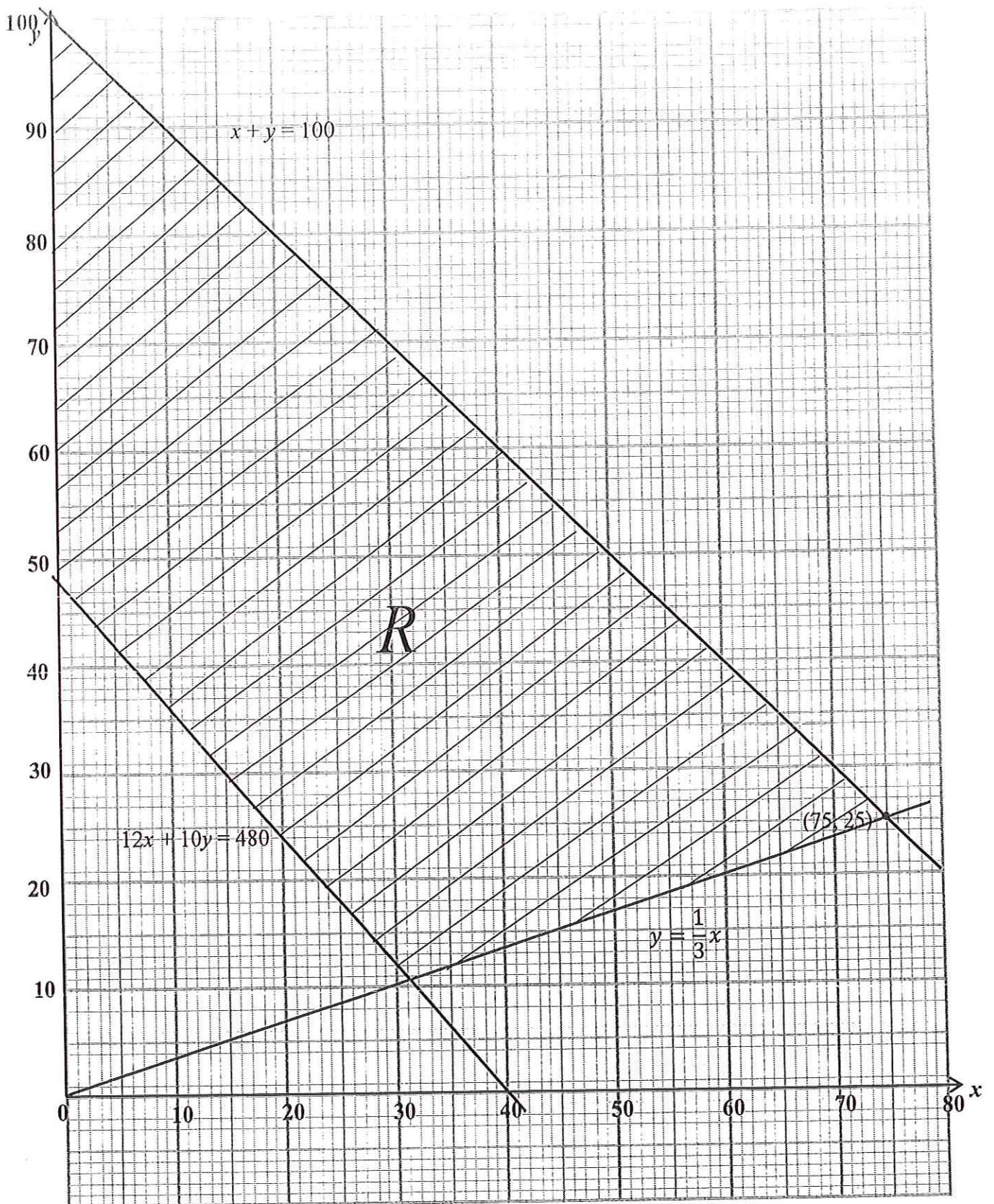
Ques	Mark Scheme	Sub Mark	Total Mark
12 (a)	<p>Substitute <math>t = 1</math> into <math>v = 0</math></p> $v = -(1)^2 + m(1) - 7 = 0$ $m = 8$	2	
(b)	<p>Solve <math>v = 0</math> to find <math>t</math></p> $(t-7)(-t+1) = 0$ $t = 7$	2	
(c)	<p><math>\int -t^2 + 8t - 7 dt</math></p> $s = -\frac{t^3}{3} + 4t^2 - 7t$ <p>36</p>	3	
(c)	<p>Find <math>\frac{dv}{dt}</math> and equate to 0 to find <math>t</math>.</p> $t = 4$ $v = 9$	3	10

Ques	Mark Scheme	Sub Mark	Total Mark
13	<p>(i) Use cosine rule in <math>\triangle ABD</math> to find <math>BD</math></p> <hr style="border-top: 1px dashed black;"/> $BD^2 = 6^2 + 7^2 - 2(6)(7) \cos 120^\circ$ <p style="text-align: right;">(K1)</p> $BD = 11.27$ <p style="text-align: right;">(N1)</p> <p>(ii) Use sine rule in <math>\triangle BCD</math> to find <math>\angle BCD</math></p> <hr style="border-top: 1px dashed black;"/> $\frac{\sin C}{*11.27} = \frac{\sin 28}{8}$ $C = 41.4^\circ$ <p style="text-align: right;">(K1)</p> $180^\circ - 28^\circ - *41.4$ <p style="text-align: right;">(P1)</p> $110.6^\circ$ <p style="text-align: right;">(N1)</p> <p>(i)</p>  <p style="text-align: right;">(N1)</p> $\angle BA'A = 60^\circ$ <p style="text-align: right;">(N1)</p> <p>(ii) Equilateral triangle (N1)</p> <p>(iii) Use <math>\frac{1}{2}(7)(6+7) \sin *60</math> (K1)</p> $39.4$ <p style="text-align: right;">(N1)</p>	<p style="text-align: center;">2</p> <p style="text-align: center;">3</p> <p style="text-align: center;">2</p> <p style="text-align: center;">1</p> <p style="text-align: center;">2</p>	<p style="text-align: center;">10</p>

Ques	Mark Scheme	Sub Mark	Total Mark
14 (a)	<p>(i) Use <math>\frac{Q_1}{Q_0} \times 100</math> <span style="float: right;">(K1)</span></p> <p style="text-align: center;">RM 2.25 <span style="float: right;">(N1)</span></p> <p>(ii) <math>I_{14/08} = \frac{110 \times 130}{100}</math> <span style="float: right;">(K1)</span></p> <p style="text-align: center;">143 <span style="float: right;">(N1)</span></p>	4	
(b)	<p>(i) <math>\bar{I} = \frac{*90(20) + 120(16) + 130(34) + 250(30)}{20 + 16 + 34 + 30}</math> <span style="float: right;">(K1)</span></p> <p style="text-align: center;">156.4 <span style="float: right;">(N1)</span></p> <p>(ii) <math>\frac{95.10}{Q_{11}} \times 100 = *156.4</math> <span style="float: right;">(K1)</span></p> <p style="text-align: center;">RM 60.80 <span style="float: right;">(N1)</span></p>		
(c)	<p><math>\frac{109}{100} \times *156.4</math> <span style="float: right;">(K1)</span></p> <p style="text-align: center;">170.48 <span style="float: right;">(N1)</span></p>	2	10

Ques	Mark Scheme	Sub Mark	Total Mark
15 (a)	$x + y \leq 100$ <u>or</u> equivalent <span style="border: 1px solid black; padding: 2px;">N1</span> $x \leq 3y$ <u>or</u> equivalent <span style="border: 1px solid black; padding: 2px;">N1</span> $12x + 10y \leq 480$ <u>or</u> equivalent <span style="border: 1px solid black; padding: 2px;">N1</span>	3	
(b)	Draw correctly at least one straight line from the *inequalities which involves $x$ and $y$ <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span>  Draw correctly all the three *straight lines <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">N1</span> Note : Accept dashed lines  The correct region shaded <span style="border: 1px solid black; padding: 2px;">N1</span>		
(c)	(i) 36 <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">N1</span>  (ii) Maximum point = (75, 25) <span style="border: 1px solid black; padding: 2px;">N1</span>  Use $12x + 10y$ for point in the *region $R$ <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">K1</span>  RM 1 150 <span style="border: 1px solid black; padding: 2px;">N1</span>	4	10
	<u>Note:</u> SS-1 if in (a), the symbol “=” is not used at all <u>or</u> more than three inequalities are given  in (b), does not use the scale given <u>or</u> does not use graph paper <u>or</u> interchange between $x$ -axis and $y$ -axis		





END OF MARK SCHEME





MALIS PENGETUA SEKOLAH MALAYSIA  
CAWANGAN PULAU PINANG

MODUL LATIHAN BERFOKUS SPM 2015

ADDITIONAL MATHEMATICS

KERTAS 2

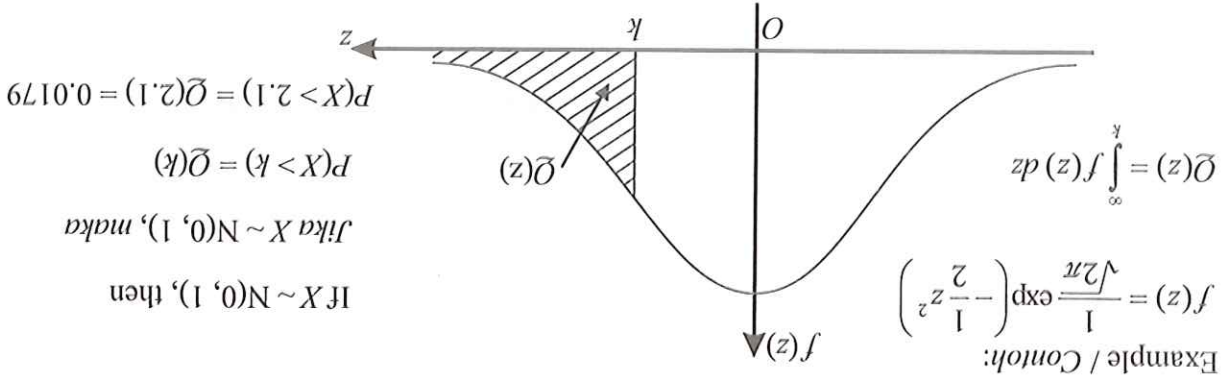
Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. Kertas soalan ini adalah dalam dwibahasa.
2. Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.
3. Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.
4. Calon dikehendaki menцевeralkan halaman 19 dan ikal sebagai muka hadapan bersama-sama dengan kertas jawapan.

Kertas soalan ini mengandungi 19 halaman bercetak dan 1 halaman tidak bercetak.

[Lihat halaman sebelah



z	0	1	2	3	4	5	6	7	8	9	Minus / Tolak
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100	0 1 1
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139	0 1 1
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193	1 1 2
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264	1 2 3
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357	1 2 3
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480	2 3 5
2.4	0.00820	0.00798	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639	2 4 6
2.3	0.0107	0.0104	0.0102	0.00990	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842	2 5 7
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110	0 1 1
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143	0 1 1
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183	0 1 1
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233	1 1 2
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294	1 1 2
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367	1 2 3
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455	1 2 3
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559	1 2 4
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681	1 3 4
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823	2 3 5
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985	2 4 6
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170	2 4 6
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379	2 5 7
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611	3 5 8
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867	3 5 8
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148	3 6 9
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451	3 7 10
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776	3 7 10
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121	4 7 11
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483	4 7 11
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859	4 8 12
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247	4 8 12
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641	4 8 12

THE UPPER TAIL PROBABILITY  $Q(z)$  FOR THE NORMAL DISTRIBUTION  $N(0, 1)$  (KEBARANGKALIAN HUNJUNG ATAS  $Q(z)$  BAGI TABURAN NORMAL  $N(0, 1)$ )

[Lihat halaman sebelah]

$$\int_b^a \pi x^2 dy =$$

$$\int_b^a \pi y^2 dx \text{ or (atau)}$$

Isi padu kitaran  
5 Volume of revolution

$$\int_b^a x dy =$$

$$\int_b^a y dx \text{ or (atau)}$$

4 Area under a curve  
Luas di bawah lengkung

$$3 \frac{dy}{dx} = \frac{dp}{du} \times \frac{du}{dx}$$

$$2 y = \frac{v}{n} \frac{dy}{dx}, \frac{dp}{dx} = \frac{v}{n} \frac{dv}{dx}$$

$$1 y = uv, \frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

**KALKULUS**  
**CALCULUS**

$$7 \log_a m^n = n \log_a m$$

$$6 \log_a \frac{n}{m} = \log_a n - \log_a m$$

$$5 \log_a mn = \log_a m + \log_a n$$

$$4 (a^m)^n = a^{mn}$$

$$3 a^m \div a^n = a^{m-n}$$

$$2 a^m \times a^n = a^{m+n}$$

$$1 x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$13 S_\infty = \frac{1}{d}, |r| < 1$$

$$12 S_n = \frac{a(r^n - 1)}{r - 1} = \frac{a(1 - r^n)}{1 - r}, r \neq 1$$

$$11 T_n = ar^{n-1}$$

$$10 S_n = \frac{2}{n} [2a + (n-1)d]$$

$$9 T_n = a + (n-1)d$$

$$8 \log_a b = \frac{\log_c b}{\log_c a}$$

**ALGEBRA**

The following formulae may be helpful in answering the questions. The symbols given are the ones commonly used.  
Rumus-rumus berikut boleh membantu anda menjawab soalan. Simbol-simbol yang diberi adalah yang biasa digunakan.

$$= \frac{1}{2} \left| (x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3) \right|$$

4 Area of triangle / Luas segi tiga

$$(x, y) = \left( \frac{mx_1 + mx_2}{m+n}, \frac{ny_1 + ny_2}{m+n} \right)$$

Titik yang membahagi suatu lengkung garis

3 A point dividing a segment of a line

$$(x, y) = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

2 Midpoint / Titik tengah

$$r = \frac{\sqrt{x^2 + y^2}}{\sqrt{x_1^2 + y_1^2}}$$

$$= \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

1 Distance / Jarak

$$5 \quad |r| = \sqrt{x^2 + y^2}$$

**GEOMETRY**  
**GEOMETRI**

$$6 \quad I = \frac{\bar{O}}{O_1} \times 100$$

$$14 \quad Z = \frac{\sigma}{X - \mu}$$

$$13 \quad \sigma = \sqrt{npq}$$

12 Mean / Mtm,  $\mu = np$

$$5 \quad m = L + \left( \frac{\frac{1}{2}N - F}{f_m} \right) C$$

$$11 \quad P(X = r) = C_n^r p^r q^{n-r}, p + q = 1$$

$$10 \quad P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$4 \quad \sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f} - \bar{x}^2}$$

$$9 \quad C_n^r = \frac{n!}{r!(n-r)!}$$

$$3 \quad \sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{N} - \bar{x}^2}$$

$$8 \quad P_r^n = \frac{n!}{i!(n-i)!}$$

$$2 \quad \bar{x} = \frac{\sum fx}{\sum f}$$

$$7 \quad \bar{I} = \frac{\sum W'_I}{\sum W'_I}$$

$$1 \quad \bar{x} = \frac{\sum x}{N}$$

**STATISTICS**  
**STATISTIK**



**TRIGONOMETRY**  
**TRIGONOMETRI**

1	Arc length, $s = r\theta$	
2	Area of sector, $A = \frac{1}{2}r^2\theta$	Luas sektor, $L = \frac{1}{2}r^2\theta$
3	$\sin^2 A + \cos^2 A = 1$	$\sin^2 A + \cos^2 A = 1$
4	$\sec^2 A = 1 + \tan^2 A$	$\sec^2 A = 1 + \tan^2 A$
5	$\operatorname{cosec}^2 A = 1 + \cot^2 A$	$\operatorname{cosec}^2 A = 1 + \cot^2 A$
6	$\sin 2A = 2 \sin A \cos A$	$\sin 2A = 2 \sin A \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	$\cos 2A = \cos^2 A - \sin^2 A$
		$= 2 \cos^2 A - 1$
		$= 1 - 2 \sin^2 A$
8	$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$	$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$
9	$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$	$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
		$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$
10	$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$	$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$
11		$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
12		$a^2 = b^2 + c^2 - 2bc \cos A$
13		$a^2 = b^2 + c^2 - 2bc \cos A$
14	Area of triangle / Luas segi tiga	$= \frac{1}{2} ab \sin C$

[Lihat halaman sebelah]



**Section A**  
**Bahagian A**

[40 marks]  
[40 markah]

Answer all questions.  
Jawab semua soalan.

**1** Solve the simultaneous equations  $p + 2k = 3$  and  $\frac{1}{1} \frac{p-1}{k} = 1$ .  
Give your answers correct to three decimal places.

Selesaikan persamaan serentak  $p + 2k = 3$  dan  $\frac{1}{1} \frac{p-1}{k} = 1$ .  
Beri jawapan anda betul kepada tiga tempat perpuluhan.

**2** Given that  $f: x \rightarrow 4x + 3$  and  $g: x \rightarrow 2x - 5$ , find  
Diberi  $f: x \rightarrow 4x + 3$  dan  $g: x \rightarrow 2x - 5$ , cari

- (a)  $f^{-1}(x)$ , [1 mark]
- (b)  $gf^{-1}(x)$ , [1 markah]

(c)  $h(x)$  such that  $hg(x) = 8x - 9$ .  
 $h(x)$  dengan keadaan  $hg(x) = 8x - 9$ .

**3** (a) Prove that  $\frac{\cos A}{\sin A} - \frac{\cos B}{\sin B} = \frac{2\cos(A+B)}{\sin 2B}$ . [2 marks]

Buktikan  $\frac{\cos A}{\sin A} - \frac{\cos B}{\sin B} = \frac{2\cos(A+B)}{\sin 2B}$ . [2 markah]

(b) Given that  $\tan A = \frac{\sqrt{3}}{1}$  and  $\sin B = \frac{4}{5}$ , where  $A$  and  $B$  are acute angles, find the value of

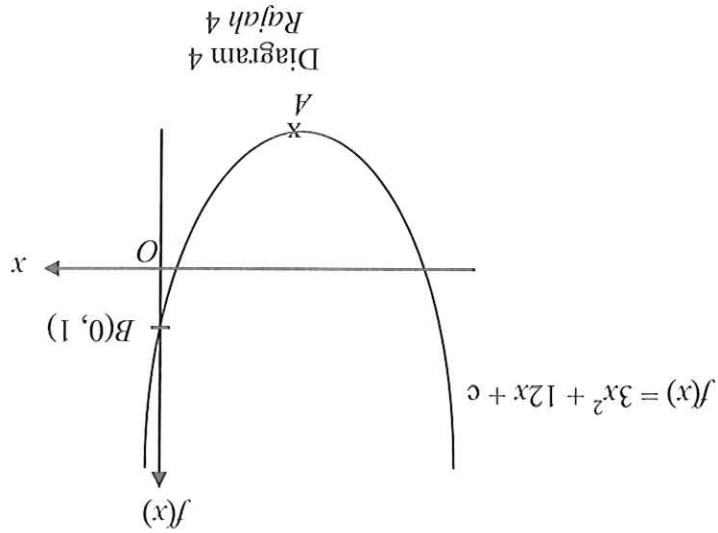
Diberi  $\tan A = \frac{\sqrt{3}}{1}$  dan  $\sin B = \frac{4}{5}$ , dengan keadaan  $A$  dan  $B$  adalah sudut tirus, cari nilai

(i)  $\sin 2B$ ,

(ii)  $\frac{2\cos(A+B)}{\sin 2B}$ .

[5 marks]  
[5 markah]

- (a) State the value of  $c$ . [1 mark]
- Nyatakan nilai  $c$ . [1 mark]
- (b) By using the method of completing the square, find the coordinates of  $A$ . [4 marks]
- Dengan menggunakan kaedah penyempurnaan kuasa dua, cari koordinat  $A$ . [4 mark]
- (c) Determine the range of values of  $x$ , if  $f(x) \geq 16$ . [2 marks]
- Tentukan julat nilai  $x$ , jika  $f(x) \geq 16$ . [2 mark]
- (d) If the above graph is reflected about the  $x$ -axis, write down the equation of the curve. [1 mark]
- Jika graf di atas dipantulkan pada paksi- $x$ , tuliskan persamaan lengkung itu. [1 mark]



- 4 Diagram 4 shows the graph of a quadratic function  $f(x) = 3x^2 + 12x + c$ . The graph has a minimum point at  $A$  and intersects the  $f(x)$ -axis at  $B(0, 1)$ .  
Rajah 4 menunjukkan graf fungsi kuadratik  $f(x) = 3x^2 + 12x + c$ . Graf itu mempunyai titik minimum pada  $A$  dan menyalang paksi  $f(x)$  pada  $B(0, 1)$ .

[3 marks]

persamaan lengkung itu.

[3 marks]

(b) the equation of the curve.

[4 marks]

persamaan normal kepada lengkung itu pada titik A,

[4 marks]

(a) the equation of the normal to the curve at point A,

Cari

Find

6 The gradient function of a curve that passes through A (5, 8) is  $2 - x$ .  
Fungsi kecerunan suatu lengkung yang melalui A (5, 8) ialah  $2 - x$ .

[5 marks]

nilai k dan nilai h.

Diberi  $\vec{PA} = k\vec{PB}$  dan  $\vec{PA} = \vec{PC} + h\vec{CQ}$ , dengan keadaan k dan h ialah pemalar, cari

[5 marks]

of k and of h.

(b) Given that  $\vec{PA} = k\vec{PB}$  and  $\vec{PA} = \vec{PC} + h\vec{CQ}$ , where k and h are constants, find the value

[3 marks]

(ii)  $\frac{PB}{PB}$ .

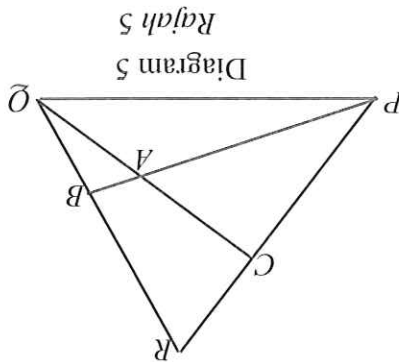
(i)  $\frac{QR}{QR}$ ,

Ungkapkan, dalam sebutan  $\bar{x}$  dan  $\bar{y}$

(a) Express, in terms of  $\bar{x}$  and  $\bar{y}$

Diberi bahawa  $PC = 2CR$ ,  $QB = \frac{3}{4}QR$ ,  $PQ = 6\bar{x}$  dan  $PR = 8\bar{y}$ .

It is given that  $PC = 2CR$ ,  $QB = \frac{3}{4}QR$ ,  $PQ = 6\bar{x}$  and  $PR = 8\bar{y}$ .



5 Diagram 5 shows a triangle PQR. The straight line PB intersects the straight line QC at point A. Rajah 5 menunjukkan sebuah segi tiga PQR. Garis lurus PB bersilang dengan garis lurus QC pada titik A.

**Section B**  
**Bagian B**

[40 marks]  
[40 markah]

Answer any **four** questions from this section.

Jawab mana-mana **empat** soalan daripada bahagian ini.

7 Diagram 7 shows triangle  $AGB$  and triangle  $BCH$ . The straight line  $AC$  intersects the straight line  $GH$  at point  $B$ .

Rajah 7 menunjukkan tiga  $AGB$  dan segi tiga  $BCH$ . Garis lurus  $AC$  bersilang dengan garis lurus  $GH$  pada titik  $B$ .

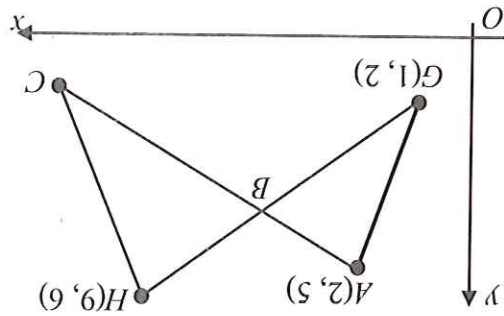


Diagram 7  
Rajah 7

It is given that  $B$  is the midpoint of  $GH$  and  $AB : BC = 1 : 2$ .  
Diberi bahawa  $B$  ialah titik tengah  $GH$  dan  $AB : BC = 1 : 2$ .

(a) Find

*Cari*

(i) the equation of the straight line  $GH$ ,

*persamaan garis lurus  $GH$ ,*

(ii) the coordinates of  $C$ ,

*koordinat  $C$ ,*

(iii) the area, in unit<sup>2</sup>, of triangle  $AGB$ .

*luas, dalam unit<sup>2</sup>, segi tiga  $AGB$ .*

[8 marks]  
[8 markah]

(b) Determine whether the straight lines  $AC$  and  $GH$  are perpendicular to each other.

*Tentukan sama ada garis lurus  $AC$  dan  $GH$  berserenjang antara satu sama lain.*

[2 marks]  
[2 markah]

[5 marks]  
[5 markah]

(ii)  $q$ .

(i)  $p$ .

Guna graf di 8(b) untuk mencari nilai

(c) Use the graph in 8(b) to find the value of

[3 markah]

Seterusnya, lukis garis lurus penyuaian terbaik.

2 cm kepada 0.4 unit pada paksi-xy.

Plot xy melawan  $\frac{1}{x}$ , dengan menggunakan skala 2 cm kepada 0.1 unit pada paksi- $\frac{1}{x}$  dan

[3 marks]

Hence, draw the line of best fit.

the xy-axis.

(b) Plot xy against  $\frac{1}{x}$ , using a scale of 2 cm to 0.1 unit on the  $\frac{1}{x}$ -axis and 2 cm to 0.4 unit on

[2 markah]

Berdasarkan Jadual 8, bina satu jadual bagi nilai-nilai xy dan  $\frac{1}{x}$ .

[2 marks]

(a) Based on Table 8, construct a table for the values of xy and  $\frac{1}{x}$ .

Table 8  
Jadual 8

$y$	0.33	0.64	0.58	0.52	0.45	0.40
$x$	1.5	2.5	3.5	4.5	5.5	6.5

keadaan  $p$  dan  $q$  ialah pemalar:

Jadual 8 menunjukkan nilai-nilai bagi dua pembolehubah,  $x$  dan  $y$ , yang diperoleh daripada suatu eksperimen. Pembolehubah  $x$  dan  $y$  dihubungkan oleh persamaan  $y = \frac{p+qx}{x^2}$ , dengan

$x$  and  $y$  are related by the equation  $y = \frac{p+qx}{x^2}$ , where  $p$  and  $q$  are constants.

Table 8 shows the values of two variables,  $x$  and  $y$  obtained from an experiment. The variables

Guna kertas graf untuk menjawab soalan ini.

Use the graph paper to answer this question.

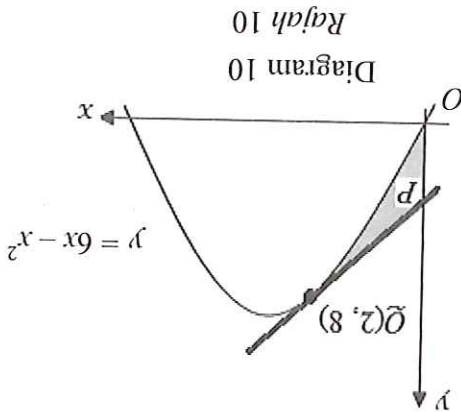
8



- 9 (a) In Bandar Mutiara, 55% of the residents are adults aged above 25 years old. Di Bandar Mutiara, 55% daripada penghuninya adalah dewasa yang bernumur 25 tahun ke atas.
- If 8 residents of Bandar Mutiara are chosen at random, calculate the probability that *Jika 8 penghuni Bandar Mutiara dipilih secara rawak, hitung kebarangkalian bahawa*
- (i) exactly 3 of them are adults above 25 years old, *tepat 3 orang daripada mereka adalah dewasa yang bernumur 25 tahun ke atas,*
- (ii) at least 3 of them are adults above 25 years old. *sekurang-kurangnya 3 orang daripada mereka adalah dewasa yang bernumur 25 tahun ke atas.*
- [5 marks]  
[5 markah]
- (b) The marks in a Mathematics test in a certain school follow a normal distribution with a mean of 60 and a variance of 64. *Markah bagi suatu ujian Matematik di sebuah sekolah tertentu adalah mengikut taburan normal dengan min 60 dan varians 64.*
- (i) If the passing mark is 50, find the probability that a student chosen at random from the school passes the test. *Jika markah lulus ialah 50, cari kebarangkalian bahawa seorang pelajar yang dipilih secara rawak daripada sekolah itu lulus ujian tersebut.*
- (ii) Find the number of students who pass the test if 280 students took the test. *Cari bilangan pelajar yang lulus ujian jika 280 pelajar mengambil ujian itu.*
- [5 marks]  
[5 markah]

- (a) the equation of the tangent to the curve at  $Q$ ,  
 [3 marks] *persamaan tangen kepada lengkung itu pada  $Q$ .*
- (b) the area of the shaded region  $P$ ,  
 [4 marks] *luas rantau berlorek  $P$ ,*
- (c) the volume of revolution, in terms of  $\pi$ , when the region bounded by the curve, x-axis and the straight line  $x = 2$ , is rotated through  $360^\circ$  about the x-axis.  
 [3 marks] *Isi padu kitaran, dalam sebutan  $\pi$ , apabila rantau yang dibatasi oleh lengkung itu, paksi-x dan garis lurus  $x = 2$ , diputarikan  $360^\circ$  pada paksi-x.*
- [3 markah]

Hitung  
 Calculate



- 10 Diagram 10 shows the curve  $y = 6x - x^2$  and the tangent to the curve at  $Q(2, 8)$ .  
 Rajah 10 menunjukkan lengkung  $y = 6x - x^2$  dan tangen kepada lengkung itu pada  $Q(2, 8)$ .

Rajah 11 menunjukkan satu bulatan berpusat  $O$  dan berjari 9 cm.  $PR$  ialah tangen kepada bulatan itu pada  $P$ .

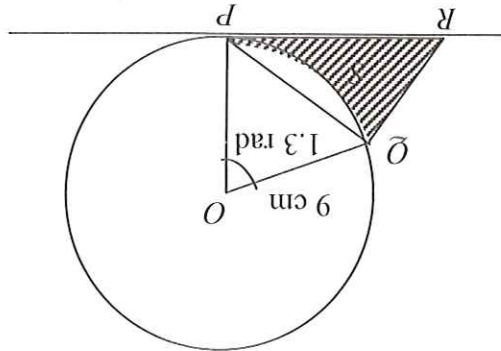


Diagram 11

Rajah 11

The length of  $PR$  is equal to the length of arc  $PQ$ .  
 Panjang  $PR$  sama dengan panjang lengkok  $PQ$ .

[Use / Guna  $\pi = 3.142$ ]

Calculate

Hitung

(a) the length, in cm, of the arc  $PQ$ ,

panjang, dalam cm, lengkok  $PQ$ ,

[2 marks]

[2 markah]

(b) the perimeter, in cm, of segment  $PQ$ ,

perimeter, dalam cm, bagi lembereg  $PQ$ ,

[3 marks]

[3 markah]

(c) the area, in  $\text{cm}^2$ , of the shaded region.

luas, dalam  $\text{cm}^2$ , kawasan bertorek.

[5 marks]

[5 markah]

**Section C**  
**Bahagian C**

[20 marks]  
[20 markah]

Answer any two questions from this section.

Jawab mana-mana dua soalan daripada bahagian ini.

- 12 A particle moves in a straight line and passes through a fixed point  $O$ . Its velocity,  $v$  in  $\text{m s}^{-1}$ , is given by  $v = -t^2 + mt - 7$ , where  $t$  is the time, in seconds, after leaving  $O$  and  $m$  is a constant. The particle stops instantaneously for the 1<sup>st</sup> time at point  $P$  and the 2<sup>nd</sup> time at point  $Q$ .  
Suatu zarah bergerak di sepanjang suatu garis lurus dan melalui satu titik tetap  $O$ . Halajunya,  $v$  in  $\text{m s}^{-1}$ , diberi oleh  $v = -t^2 + mt - 7$ , dengan keadaan  $t$  ialah masa, dalam saat, selepas melalui  $O$  dan  $m$  ialah pemalar. Zarah berhenti seketika di titik  $P$  pada kali pertama dan di titik  $Q$  pada kali kedua.

[Assume motion to the right is positive]

[Anggapkan gerakan ke arah kanan sebagai positif]

Find

Cari

- (a) the value of  $m$  if the particle is at  $P$ , one second after leaving  $O$ ,  
nilai  $m$  jika zarah berada di  $P$ , satu saat selepas meninggalkan  $O$ ,

[2 marks]  
[2 markah]

- (b) the time, in seconds, at which the particle stops instantaneously for the 2<sup>nd</sup> time,  
masa, dalam saat, ketika zarah berhenti seketika pada kali kedua,

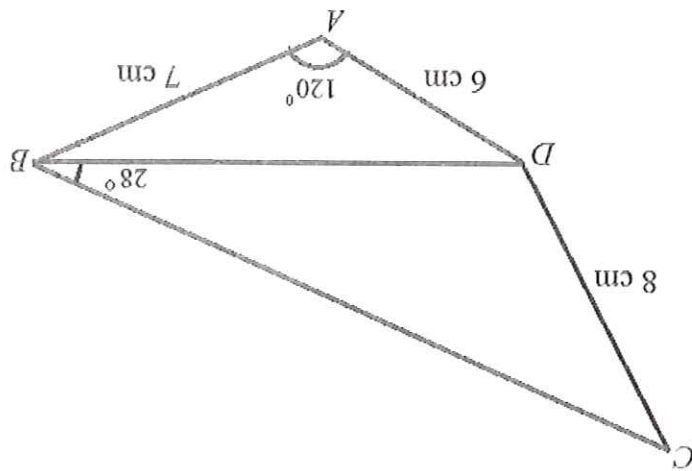
[2 marks]  
[2 markah]

- (c) the distance, in  $m$ , between  $P$  and  $Q$ ,  
jarak, dalam  $m$ , di antara  $P$  dan  $Q$ ,

[3 marks]  
[3 markah]

- (d) the maximum velocity, in  $\text{m s}^{-1}$ , of the particle.  
halaju maksimum, dalam  $\text{m s}^{-1}$ , bagi zarah itu.

[3 marks]  
[3 markah]



Rajah 13 menunjukkan sisi empat ABCD dan  $\angle BCD$  ialah tirus.

13 Diagram 13 shows a quadrilateral ABCD and  $\angle BCD$  is acute.

(a) Calculate  
Hitung

(i) the length, in cm, of BD,

panjang, dalam cm, bagi BD,

(ii)  $\angle CDB$ .

(b) The straight line DA is extended to A' such that BA = BA'.

Garis lurus DA dipanjangkan ke A' dengan keadaan BA = BA'.

(i) Sketch the triangle BA'D and state  $\angle BA'D$ .

Lakarkan segi tiga BA'D dan nyatakan  $\angle BA'D$ .

(ii) State the type of triangle BA'A.

Nyatakan jenis segi tiga BA'A.

(iii) Find the area, in  $\text{cm}^2$ , of triangle BA'D.

Cari luas, dalam  $\text{cm}^2$ , segi tiga BA'D.

[5 marks]

[5 marks]

[5 marks]

[5 marks]



14 Table 14 shows the prices, price indices and percentage of usage of four ingredients A, B, C and D used in the making of a particular type of cake. *Jadual 14 menunjukkan harga, indeks harga dan peratus penggunaan empat bahan A, B, C dan D untuk membuat sejenis kek.*

Ingredient	Price index in the year 2014 based on the year 2011	Indeks harga pada tahun 2014 berasaskan tahun 2011	Percentage of usage (%)	Peratus penggunaan (%)
A	90	90	20	20
B	120	120	16	16
C	130	130	34	34
D	250	250	30	30

Jadual 13  
Table 13

(a) Find

*Cari*

- (i) the price of ingredient A in the year 2014 if its price in the year 2011 is RM 2.50, *harga bahan A pada tahun 2014 jika harganya pada tahun 2011 ialah RM 2.50,*
- (ii) the price index of ingredient C in the year 2014 based on the year 2008 if its price index in the year 2011 based on the year 2008 is 110. *indeks harga baham C pada tahun 2014 berasaskan tahun 2008 jika indeks harganya pada tahun 2011 berasaskan tahun 2008 ialah 110.*

[4 marks]  
[4 marks]

(b) Calculate

*Hitung*

- (i) the composite index for the cost of making the cake in the year 2014 based on the year 2011, *indeks gubahan bagi kos membuat kek pada tahun 2014 berasaskan tahun 2011,*
- (ii) the price of a cake in the year 2011 if its corresponding price in the year 2014 is RM 95.10. *harga sebiji kek pada tahun 2011 jika harganya yang sepatutan pada tahun 2014 ialah RM 95.10.*

[4 marks]  
[4 marks]

- (c) The cost of making the cake is expected to increase by 9% from the year 2014 to the year 2016, find the expected composite index for the year 2016 based on the year 2011. *Kos membuat kek dijangka meningkat 9% daripada tahun 2014 ke tahun 2016, cari indeks gubahan pada tahun 2016 berasaskan tahun 2011.*

[2 marks]  
[2 marks]

## END OF ASSESSMENT MODULE

- 15 Use graph paper to answer this question.
- Gunakan kertas graf untuk menjawab soalan ini.
- A factory produces two types of lamps,  $A$  and  $B$ .  
 In a particular day, the factory produced  $x$  lamps of type  $A$  and  $y$  lamps of type  $B$ . The profit from the sales of a lamp of type  $A$  is RM 12 and a lamp of type  $B$  is RM 10. The production of the lamps per day is based on the following constraints:
- Sebuah kilang mengeluarkan dua jenis lampu,  $A$  dan  $B$ .  
 Dalam suatu hari tertentu, kilang itu mengeluarkan  $x$  lampu jenis  $A$  dan  $y$  lampu jenis  $B$ . Keuntungan daripada jualan sebuah lampu jenis  $A$  ialah RM 12 dan sebuah lampu jenis  $B$  ialah RM 10. Pengeluaran lampu sehari adalah berdasarkan kekangan berikut:
- I The total number of lamps produced is not more than 100.  
 Jumlah lampu yang dihasilkan tidak lebih daripada 100.
- II The number of lamps of type  $A$  produced is at most three times the number of lamps of type  $B$ .  
 Bilangan lampu jenis  $A$  yang dihasilkan adalah selebih-lebihnya tiga kali bilangan lampu jenis  $B$ .
- III The minimum total profit for both types of lamps is RM 480.  
 Jumlah keuntungan minimum bagi kedua-dua jenis lampu adalah RM 480.
- (a) Write three inequalities, other than  $x \geq 0$  and  $y \geq 0$ , which satisfy all the above constraints. [3 marks]  
 Tulis tiga ketaksamaan, selain  $x \geq 0$  dan  $y \geq 0$ , yang memenuhi semua kekangan di atas. [3 markah]
- (b) Using a scale of 2 cm to 10 units on both axes, construct and shade the region  $R$  which satisfies all of the above constraints. [3 marks]  
 Menggunakan skala 2 cm kepada 10 unit pada kedua-dua paksi, bina dan lorek rantau  $R$  yang memenuhi semua kekangan di atas. [3 markah]
- (c) Using the graph constructed in 15(b), find  
 Menggunakan graf yang dibina di 15(b), cari  
 (i) the minimum number of lamps of type  $B$  if 10 lamps of type  $A$  is produced, bilangan minimum lampu jenis  $B$  jika 10 biji lampu jenis  $A$  dihasilkan,  
 (ii) the maximum total profit per day. jumlah keuntungan maksimum dalam sehari.
- [4 marks]  
 [4 markah]

*HALAMAN KOSONG*

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**INFORMATION FOR CANDIDATES**  
**MAKLUMAT UNTUK CALON**

1. This question paper consists of three sections: Section A, Section B and Section C. *Kertas soalan ini mengandungi tiga bahagian : Bahagian A, Bahagian B dan Bahagian C.*

2. Answer all questions in Section A, any four questions from Section B and any two questions from Section C. *Jawab semua soalan dalam Bahagian A, mana-mana empat soalan daripada Bahagian B dan mana-mana dua soalan daripada Bahagian C.*

3. Write your answers on the papers provided. If the papers are insufficient, you may ask for extra papers from the invigilator. *Jawapan anda hendaklah ditulis di dalam kertas jawapan yang disediakan. Sekiranya kertas jawapan tidak mencukupi, sila dapatkan helaan tambahan daripada pengawas peperiksaan.*

4. Show your working. It may help you to get marks. *Tunjukkan langkah-langkah penting dalam kerja mengira anda. Ini boleh membantu anda untuk mendapatkan markah.*

5. The diagrams in the questions provided are not drawn to scale unless stated. *Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*

6. The marks allocated for each question and sub-part of a question are shown in brackets. *Markah yang diperuntukkan bagi setiap soalan dan ceratan, soalan ditunjukkan dalam kurungan.*

7. The Upper Tail Probability  $Q(z)$  For The Normal Distribution  $N(0, 1)$  Table is provided on page 2. *Jadual Kebarangkalian Hujung Atas  $Q(z)$  Bagi Taburan Normal  $N(0, 1)$  disediakan di halaman 2.*

8. A list of formulae is provided on pages 3 to 5. *Satu senarai rumus disediakan di halaman 3 hingga 5.*

9. Graph papers are provided. *Kertas graf disediakan.*

10. You may use a scientific calculator. *Anda dibenarkan menggunakan kalkulator saintifik.*

11. Tie the papers and the graph papers together and hand in to the invigilator at the end of the examination. *Ikat kertas jawapan bersama-sama dengan kertas graf dan serahkan kepada pengawas peperiksaan pada akhir peperiksaan.*



MALIS PENGETUA SEKOLAH MALAYSIA  
CAWANGAN PULAU PINANG

NAMA \_\_\_\_\_ :

TINGKATAN \_\_\_\_\_ :

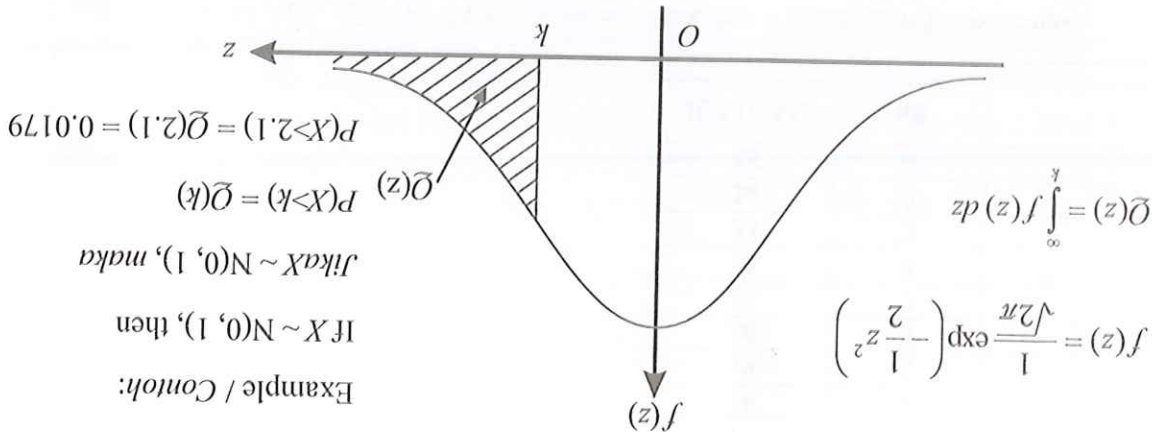
MODUL LATIHAN BERFOKUS SPM 2015  
ADDITIONAL MATHEMATICS  
Kertas 1  
Ogos  
2 jam  
Dua jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

Untuk Kegunaan Pemeriksa		Soalan	Jumlah
Markah	Penuh	1	2
Markah	Diperolehi	1	2
		2	2
		3	2
		4	3
		5	4
		6	3
		7	4
		8	4
		9	3
		10	3
		11	4
		12	2
		13	3
		14	3
		15	4
		16	3
		17	3
		18	4
		19	4
		20	4
		21	3
		22	4
		23	3
		24	2
		25	4
		Jumlah	80

- Tulis nama dan tingkatan anda pada ruangan yang disediakan.
- Kertas soalan ini adalah dalam dwibahasa.
- Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.
- Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu.
- Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.

Kertas soalan ini mengandungi 24 halaman bercetak dan 1 halaman tidak bercetak.  
3472/1  
Lihat halaman sebelah



Example / Contoh:  
 IF  $X \sim N(0, 1)$ , then  
 jika  $X \sim N(0, 1)$ , maka

z	0	1	2	3	4	5	6	7	8	9	Minus / Total
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100	0
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139	0
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193	1
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264	1
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357	1
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480	2
2.4	0.00820	0.00798	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639	2
2.3	0.0107	0.0104	0.0102	0.00990	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842	3
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110	0
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143	0
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183	0
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233	1
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294	1
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367	1
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455	1
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559	1
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681	1
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823	2
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985	2
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170	2
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379	3
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611	3
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867	3
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148	3
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451	3
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776	3
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121	4
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483	4
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859	4
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247	4
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641	4

THE UPPER TAIL PROBABILITY Q(z) FOR THE NORMAL DISTRIBUTION N(0, 1)  
 KEBARANGKALIAN HUNJUNG ATAS Q(z) BAGI TABURAN NORMAL N(0, 1)



The following formulae may be helpful in answering the questions. The symbols given are the ones commonly used.

Rumus-rumus berikut boleh membantu anda menjawab soalan. Simbol-simbol yang diberi adalah yang biasa digunakan.

**ALGEBRA**

1  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2  $a^m \times a^n = a^{m+n}$

3  $a^m \div a^n = a^{m-n}$

4  $(a^m)^n = a^{mn}$

5  $\log_a m + \log_a n = \log_a mn$

6  $\log_a m - \log_a n = \log_a \frac{m}{n}$

7  $\log_a m^n = n \log_a m$

**CALCULUS**

1  $y = nv, \frac{dy}{dx} = n \frac{dv}{dx} + v \frac{dn}{dx}$

2  $y = \frac{v}{n}, \frac{dy}{dx} = \frac{v \frac{dn}{dx} - n \frac{dv}{dx}}{n^2}$

3  $\frac{dy}{dx} = \frac{dy}{dn} \times \frac{dn}{dx}$

4 Area under a curve  
Luas di bawah lengkung

$\int_b^a y \, dx$  or (area)

$\int_b^a x \, dy$

5 Volume of revolution  
Isi padu kitaran

$\int_b^a \pi y^2 \, dx$  or (area)

$\int_b^a \pi x^2 \, dy$

Lihat halaman sebelah



- 4 Area of triangle / Luas segi tiga 
$$= \frac{1}{2} |(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)|$$
- 3 A point dividing a segment of a line  
Titik yang membahagi suatu tembereng garis 
$$(x, y) = \left( \frac{mx_1 + nx_2}{m+n}, \frac{ny_1 + my_2}{m+n} \right)$$
- 2 Midpoint / Titik tengah 
$$(x, y) = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$
- 1 Distance / Jarak 
$$= \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$
- 5 
$$|\bar{r}| = \sqrt{x^2 + y^2}$$
- 6 
$$\bar{r} = \frac{x\bar{x} + y\bar{y}}{\sqrt{x^2 + y^2}}$$

**GEOMETRY**  
**GEOMETRI**

- 6 
$$I = \frac{Q_1}{Q_0} \times 100$$
- 5 
$$m = L + \left( \frac{1}{N} - F \right) C$$
- 4 
$$\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}} = \sqrt{\frac{\sum f x^2 - \frac{(\sum f x)^2}{N}}{\sum f}}$$
- 3 
$$\sigma = \sqrt{\frac{\sum (x - \bar{x})^2}{N}} = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{N}}{N}}$$
- 2 
$$\bar{x} = \frac{\sum fx}{\sum f}$$
- 1 
$$\bar{x} = \frac{\sum x}{N}$$
- 7 
$$\bar{I} = \frac{\sum W_i I_i}{\sum W_i}$$
- 8 
$${}^n P_r = \frac{(n-r)!}{n!}$$
- 9 
$${}^n C_r = \frac{(n-r)! r!}{n!}$$
- 10 
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
- 11 
$$P(X=r) = {}^n C_r p^r q^{n-r}, p+q=1$$
- 12 Mean / Min,  $\mu = np$
- 13 
$$\sigma = \sqrt{npq}$$
- 14 
$$Z = \frac{\sigma}{X - \mu}$$

**STATISTICS**  
**STATISTIK**

**TRIGONOMETRY**  
**TRIGONOMETRI**

1	Arc length, $s = r\theta$	1	$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$	14	Area of triangle / Luas segitiga $= \frac{1}{2} ab \sin C$
2	Area of sector, $A = \frac{1}{2} r^2 \theta$	2	$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$	13	$a^2 = b^2 + c^2 - 2bc \cos A$
3	$\sin^2 A + \cos^2 A = 1$	3	$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$	12	$a^2 = b^2 + c^2 - 2bc \cos A$
4	$\sec^2 A = 1 + \tan^2 A$	4	$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$	11	$a^2 = b^2 + c^2 - 2bc \cos A$
5	$\operatorname{cosec}^2 A = 1 + \cot^2 A$	5	$\sin 2A = 2 \sin A \cos A$	10	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	6	$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$	9	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	7	$\cos 2A = \cos^2 A - \sin^2 A$	8	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	8	$\sin^2 A + \cos^2 A = 1$	7	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	9	$\sec^2 A = 1 + \tan^2 A$	6	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	10	$\operatorname{cosec}^2 A = 1 + \cot^2 A$	5	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	11	$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$	4	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	12	$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$	3	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	13	$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$	2	$a^2 = b^2 + c^2 - 2bc \cos A$
7	$\cos 2A = \cos^2 A - \sin^2 A$	14	$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$	1	$a^2 = b^2 + c^2 - 2bc \cos A$

○	
2	
2	

2	
1	

For Examiner's Use

Answer all questions. Jawab semua soalan.

1 Diagram 1 shows the relation between set  $P$  and set  $Q$ . Rajah 1 menunjukkan hubungan antara set  $P$  dan set  $Q$ .

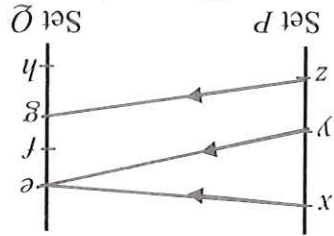


Diagram 1  
Rajah 1

State  
Nyatakan

- (a) the type of relation between set  $P$  and set  $Q$ , jenis hubungan antara set  $P$  dan set  $Q$ ,
- (b) the range of the relation. julai bagi hubungan itu.

Answer / Jawapan:

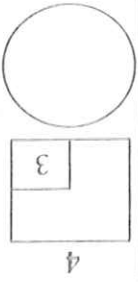
- (a)
- (b)

[2 marks]  
[2 markah]

2 The function  $g$  is defined by  $g : x \rightarrow \frac{2m}{x-m}, x \neq m$ . Find the value of  $m$  if  $g^{-1}(6) = 4$ .  
Fungsi  $g$  ditakrifkan sebagai  $g : x \rightarrow \frac{2m}{x-m}, x \neq m$ . Cari nilai  $m$  jika  $g^{-1}(6) = 4$ .

Answer / Jawapan:

[2 markah]



4

Answer / Jawapan:

Cari nilai  $t$ .

Find the value of  $t$ .

[3 marks]

[3 marks]

$$y = t$$

$$y = -x^2 + 6x - 3$$

Maklumat berikut merujuk kepada persamaan garis lurus  $y = t$  iaitu tangen kepada lengkung  $y = -x^2 + 6x - 3$ .

The following information refers to the equation of the straight line  $y = t$  which is the tangent to the curve  $y = -x^2 + 6x - 3$ .

4

(b)

(a)

Answer / Jawapan:

(b)  $g^{-1}f^{-1}(5)$ .

(a)  $f^{-1}(5)$ .

[2 marks]

[2 marks]

Determine  
Tentukan

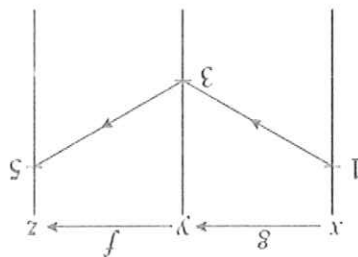


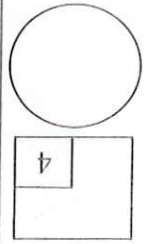
Diagram 3  
Rajah 3

In Diagram 3, the function  $g$  maps  $x$  onto  $y$  and the function  $f$  maps  $y$  onto  $z$ .  
Dalam Rajah 3, fungsi  $g$  memetakan  $x$  kepada  $y$  dan fungsi  $f$  memetakan  $y$  kepada  $z$ .

3

For  
Examiner's  
Use





5

(b)

(a)

Answer / Jawapan:

[4 marks]  
[4 markah]

- (a) the value of  $m$  and of  $n$ ,  
nilai  $m$  dan nilai  $n$ ,  
(b) the coordinates of the minimum point of each curve,  
koordinat titik minimum bagi setiap lengkung itu.

Find  
Cari

Diagram 5  
Rajah 5

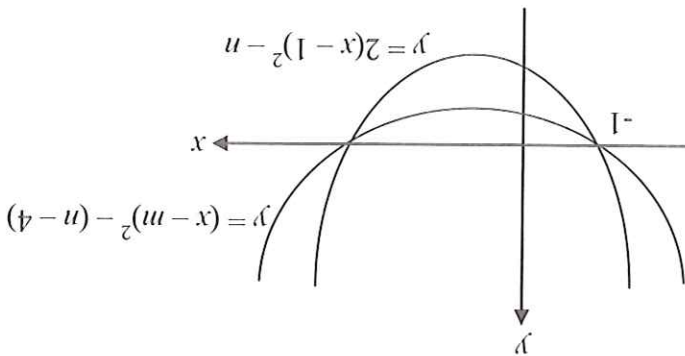


Diagram 5 shows the curves  $y = 2(x - 1)^2 - n$  and  $y = (x - m)^2 - (n - 4)$ , where  $m$  and  $n$  are constants. Both the curves intersect the  $x$ -axis at  $x = -1$ .  
Rajah 5 menunjukkan lengkung  $y = 2(x - 1)^2 - n$  dan  $y = (x - m)^2 - (n - 4)$ , dengan  $m$  dan  $n$  adalah pemalar. Kedua-dua lengkung itu menyalang paksi- $x$  pada  $x = -1$ .

5

For  
Examiner's  
Use

6 Solve the equation  $16(2^{x+2}) = 8^x$

Sesaikan persamaan  $16(2^{x+2}) = 8^x$

Answer / Jawapan:

[3 marks]

[3 markah]

For  
Examiner's  
Use

3	
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6

7 Given that  $\log_3 x = h$  and  $\log_3 y = k$ , express  $\log_9 \left[ \frac{y^2}{27x} \right]$  in terms of  $h$  and  $k$ .

Diberi  $\log_3 x = h$  dan  $\log_3 y = k$ , ungkapkan  $\log_9 \left[ \frac{y^2}{27x} \right]$  dalam sebutan  $h$  dan  $k$ .

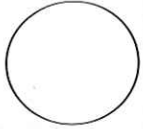
[4 marks]

[4 markah]

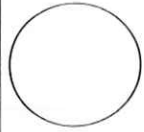
Answer / Jawapan:

4	
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7



[Lihat halaman sebelah



4	
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8

For  
Examiner's  
Use

8

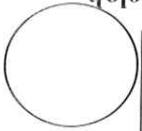
The price of a medium cost house in Butterworth on 1<sup>st</sup> April 2014 is RM 120,000. At that time Hassan has a saving of RM 100,000. The price of the house is expected to increase by 6% every year while Hassan's saving is expected to increase by 8% every year. On the 1st April of which year Hassan manage to purchase the house in cash?

*Harga sebuah rumah kos sederhana di Butterworth pada 1 April 2014 adalah RM120,000. Pada masa itu Hassan mempunyai simpanan sebanyak RM 100,000. Harga rumah itu dijangka naik sebanyak 6% setiap tahun manakala simpanan Hassan dijangka naik sebanyak 8% setiap tahun. Pada 1 April tahun ke berapakah Hassan dapat membeli rumah tersebut secara tunai?*

Answer / Jawapan:

[4 marks]  
[4 markah]

[Lihat halaman sebelah



3	

10

10 An arithmetic progression has 18 terms. The first term is 15. Given that the sum of the last 8 terms is 552, find the common difference of the progression.

Suatu jantang aritmetik mempunyai 18 sebutan. Sebutan pertama ialah 15. Diberi hasil tambah 8 sebutan terakhir adalah 552, cari beza sepunya jantang itu.

[3 marks]  
[3 marks]

Answer / jawapan:

3	

9

9 It is given that  $k + 8$ ,  $k$  and  $k - 2$  are the first three terms of a geometric progression.

Diberi bahawa  $k + 8$ ,  $k$  dan  $k - 2$  adalah tiga sebutan pertama bagi suatu jantang geometri.

Find  
Cari

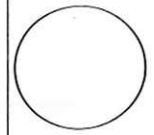
(a) the value of  $k$ ,  
nilai  $k$ ,

(b) the common ratio of the progression.  
nisbah sepunya jantang ini.

Answer / jawapan:

(a)  
(b)

[3 marks]  
[3 marks]



2	
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12

Answer / Jawapan:

Please help Amin to determine the equation of the movement of the minute hand if the length is 5 cm from the centre.  
 Tolong bantu Amin menentukan persamaan pergerakan jarum minit jika panjangnya ialah 5 cm daripada pusat.  
 [2 marks] [2 markah]



After finishing his lesson, Amin looked at the clock on the wall. He thought he could find the equation of the movement of the minute hand if he knew the length of the minute hand from the centre.  
 Selepas selesai pembelajaran, Amin melihat jam di dinding. Dia terfikir dia boleh mencari persamaan pergerakan jarum minit jika dia tahu panjang jarum minit daripada pusat.  
 12

4	
---	--

11

Answer / Jawapan:

The points  $P(1,-2)$ ,  $Q, R(5,4)$  and  $S$  are the vertices of a rhombus. Find the equation of the diagonal  $QS$ .  
 Titik-titik  $P(1,-2)$ ,  $Q, R(5,4)$  dan  $S$  adalah bucu-bucu bagi sebuah rombus. Cari persamaan pepenjuru  $QS$ .  
 [4 marks] [4 markah]

For Examiner's Use



For Examiner's Use

13 Diagram 11(a) shows the curve  $y = -2x^3 + 4$ . Diagram 11(b) shows the straight line graph obtained when  $y = -2x^3 + 4$  is expressed in the linear form  $Y = 4X + c$ . Rajah 11(a) menunjukkan lengkung  $y = -2x^3 + 4$ . Rajah 11(b) menunjukkan garis lurus yang diperoleh apabila  $y = -2x^3 + 4$  diungkapkan dalam bentuk linear.  $Y = 4X + c$ .

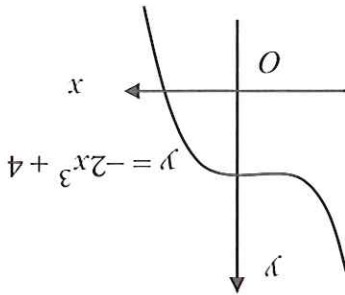


Diagram 11(a)  
Rajah 11(a)

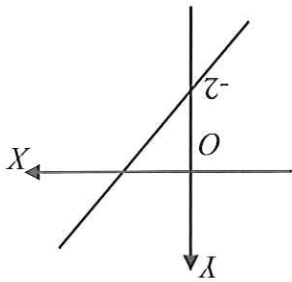


Diagram 11(b)  
Rajah 11(b)

Express  $X$  and  $Y$  in terms of  $x$  and / or  $y$ .  
Ungkapkan  $X$  dan  $Y$  dalam sebutan  $x$  dan / atau  $y$ .

[3 marks]  
[3 markah]

Answer / Jawapan:

13

14 Given  $ABCD$  is a parallelogram, where  $\vec{BC} = i - 2j$  and  $\vec{CD} = -3i + 4j$ . Find the unit vector in the direction of  $\vec{AC}$ .

Diberi  $ABCD$  ialah segi empat selari, dengan keadaan  $\vec{BC} = i - 2j$  dan  $\vec{CD} = -3i + 4j$ . Cari vector unit dalam arah  $\vec{AC}$ .

[3 marks]  
[3 markah]

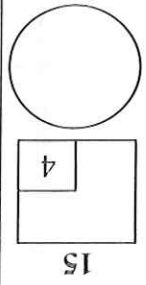
Answer / Jawapan:

14

3
13

3
14

[Lihat halaman sebelah]



For Examiner's Use

15

Diagram 15 shows the graph of  $y = 2 \cos nx$ .  
Rajah 15 menunjukkan graf  $y = 2 \cos nx$ .

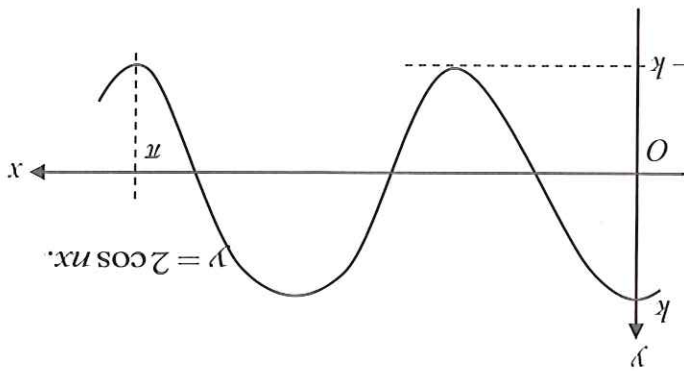


Diagram 15  
Rajah 15

(a) State the value of  
Nyatakan nilai

- (i)  $k$ ,
- (ii)  $n$ .

(b) Hence, on the axes in the answer space, sketch the graph of  $y = |2 \cos nx - 1|$

for  $0 \leq x \leq \pi$ .  
Seterusnya, pada paksi yang diberi yang paksi yang diberi dalam ruang jawapan, lakarkan graf  $y = |2 \cos nx - 1|$  untuk  $0 \leq x \leq \pi$ .

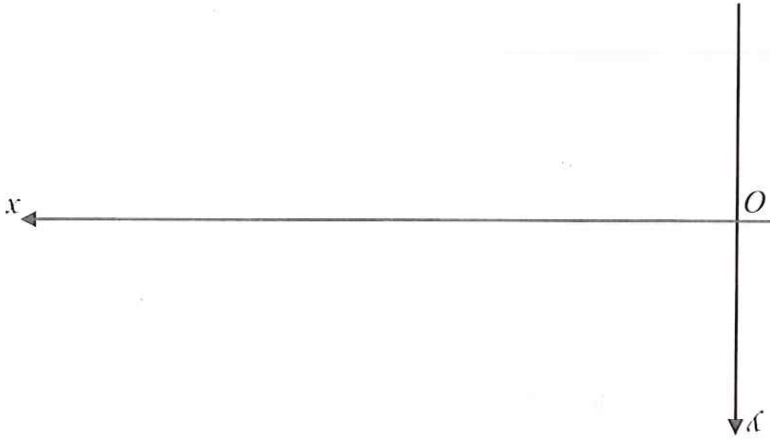
[4 marks]  
[4 markah]

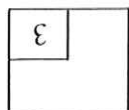
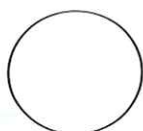
Answer / Jawapan:

(a) (i)

(ii)

(b)





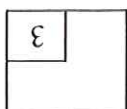
17

[3 marks]  
[3 markah]

Find the coordinates of  $M$ .  
 Persamaan suatu lengkung yang melalui satu titik  $M$  ialah  $y = (x - 3)(x + 2)$ .  
 Kecewaan normal kepada lengkung itu pada titik  $M$  ialah  $-\frac{1}{3}$ . Cari koordinat  $M$ .

Answer / Jawapan:

17 The equation of a curve which passes through the point  $M$  is  $y = (x - 3)(x + 2)$ .  
 The gradient of the normal to the curve at point  $M$  is  $-\frac{1}{3}$ .  
 Find the coordinates of  $M$ .  
 Persamaan suatu lengkung yang melalui satu titik  $M$  ialah  $y = (x - 3)(x + 2)$ .  
 Kecewaan normal kepada lengkung itu pada titik  $M$  ialah  $-\frac{1}{3}$ . Cari koordinat  $M$ .



16

[3 marks]  
[3 markah]

Use the above information to find the value of  $h$  and of  $k$  if  $2\bar{a} = 3\bar{b} - 4\bar{c}$ .  
 Gunakan maklumat yang di atas untuk mencari nilai  $h$  dan nilai  $k$  jika  $2\bar{a} = 3\bar{b} - 4\bar{c}$ .

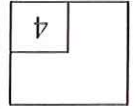
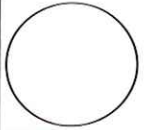
Answer / Jawapan:

$$\begin{aligned} \bar{a} &= 2\bar{x} + 3\bar{y} \\ \bar{b} &= 4\bar{x} - \bar{y} \\ \bar{c} &= h\bar{x} + (k + 3h)\bar{y} \end{aligned}$$

where  $h$  and  $k$  are constants  
 dengan keadaan  $h$  dan  $k$  ialah pemalar

16

For  
Examiner's  
Use



18

For  
Examiner's  
Use

18

A circle that is formed from an iron wire has a diameter of 10 cm. When the wire is heated, its radius increases by 0.04 cm.

Sebuah bulatan yang dihasilkan daripada suatu logam mempunyai diameter 10 cm. Apabila dipanaskan jejari bulatan tersebut bertambah sebanyak 0.04 cm.

Find

Cari

(a) the small change in the area of the circle,

perubahan kecil pada luas bulatan tersebut,

(b) the approximate value of the new area of the circle.

anggaran nilai bagi luas bulatan yang baru.

Answer / Jawapan:

(a)

(b)

[4 marks]  
[4 markah]

For Examiner's Use

Diagram 19 shows the shaded region bounded by the curve  $y = h(x)$  and the straight line  $x = 7$ .  
 Rajah 19 menunjukkan rantau berlorek yang dibatasi oleh lengkung  $y = h(x)$  dan garis lurus  $x = 7$ .

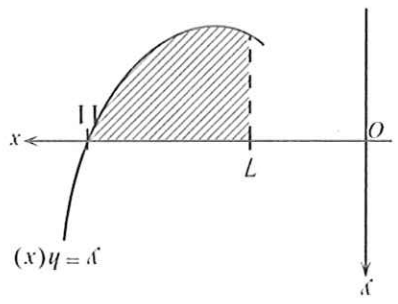


Diagram 19  
 Rajah 19

It is given that the area of the shaded region is 8 unit<sup>2</sup>.  
 Diberi bahawa luas rantau berlorek ialah 8 unit<sup>2</sup>.

Find  
 Cari

(a)  $\int_{11}^7 h(x) dx,$   
 (b)  $\int_{11}^7 [x + 4h(x)] dx$

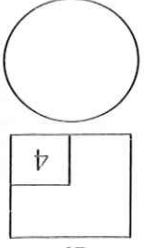
Answer / Jawapan:

(a)

(b)

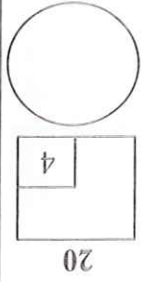
[4 marks]  
 [4 markah]

19



[Lihat halaman sebelah





20

For  
Examiner's  
Use

Diagram 20 shows a right angled triangle  $ABC$  and sector  $XCY$  with centre  $C$ .  
Rajah 20 menunjukkan segi tiga bersudut tepat  $ABC$  dan sector  $XCY$  berpusat  $C$ .

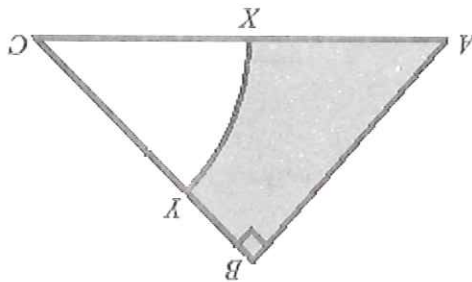


Diagram 20  
Rajah 20

It is given that  $AB = BC = 12$  cm and the ratio  $CY : CB = 3 : 4$ .  
Diberi bahawa  $AB = BC = 12$  cm dan nisbah  $CY : CB = 3 : 4$ .  
[Use / Guna  $\pi = 3.142$ ]

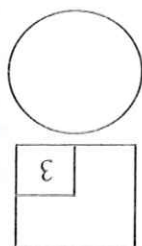
Find  
Cari

- (a)  $\angle ACB$  in radians. Give your answer correct to 4 decimal places.  
 $\angle ACB$  dalam radian. Beri jawapan anda betul kepada 4 tempat perpuluhan.
- (b) the area, in  $\text{cm}^2$ , of the shaded region.  
luas, dalam  $\text{cm}^2$ , kawasan berlorek.

Answer / Jawapan:

- (a)  
(b)

[4 marks]  
[4 markah]



21

Answer / Jawapan:

Find the median of the talk time.  
Cari median bagi masa bercakap.

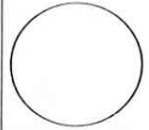
[3 marks]  
[3 markah]

Table 21  
Jadual 21

Number of people <i>Bilangan orang</i>	Talk time (minutes) <i>Masa Bercakap (minit)</i>
3	5.50 – 5.90
12	5.00 – 5.40
8	4.50 – 4.90
7	4.00 – 4.40
4	3.50 – 3.90
6	3.00 – 3.40

21 Table 21 shows the frequency distribution of the talk time during a call of 40 people. *Jadual 21 menunjukkan taburan kekerapan masa bercakap dalam telefon bagi 40 orang.*

For  
Examiner's  
Use



22

22

For  
Examiner's  
Use

A class of 30 students took a special test. Their scores are shown in Table 22. *Sebuah kelas yang terdiri daripada 30 orang pelajar mengambil ujian khas. Keputusan skor mereka adalah seperti dalam Jadual 22.*

Score	Number of students
5	8
4	2
3	5
2	6
1	9

Table 22  
Jadual 22

(a) State the modal score.  
*Nyatakan skor mod.*

(b) Calculate the standard deviation.  
*Hitung sisihan piawai.*

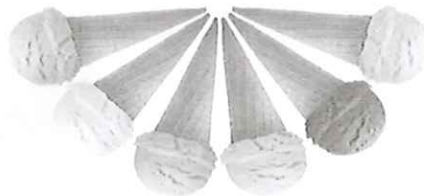
Answer / Jawapan:

(b)

(a)

[4 marks]  
[4 markah]

There are 6 different flavours of ice cream : Carrot, Mango, Honey Dew, Vanilla, Strawberry and Chocolate.  
 Terdapat 6 perisa ais krim yang berbeza : Lobak, Mangga, Tembikai Susu, Vanilla, Strawberi dan Coklat.



Find  
Cari

(a) the number of ways 3 different flavours of ice cream can be chosen,  
 bilangan cara 3 perisa ais krim yang berbeza boleh dipilih,

(b) the number of ways at least 5 different flavours of ice cream can be chosen.  
 bilangan cara sekurang-kurangnya 5 perisa ais krim yang berbeza boleh dipilih.

[3 marks]  
[3 markah]

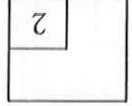
Answer / Jawapan:

(a)

(b)

23

3	
---	--



24

For  
Examiner's  
Use

24

Two fair dice are rolled together.  
*Dua dadu adil dilambungkan bersama.*



Find the probability that the numbers on them  
*Cari kebarangkalian bahawa nombor pada dadu itu*

(a) have a sum of 11

*mempunyai hasil tambah 11*

(b) have at least one number '6'

*mempunyai sekurang-kurangnya satu nombor '6'.*

Answer / *Jawapan:*

(a)

(b)

[2 marks]  
[2 markah]



25 In a game of guessing, the probability of guessing correctly is  $p$ . The mean and the standard deviation of success are  $15$  and  $\frac{2}{3}\sqrt{5}$  respectively.

Dalam permainan tekaan, kebarangkalian tekaan betul ialah  $p$ . Min dan sisihan piawai kejayaan masing-masing adalah  $15$  dan  $\frac{2}{3}\sqrt{5}$ .

Find

Cari

(a) the value of  $p$ ,

nilai  $p$ ,

(b) the number of trials required.

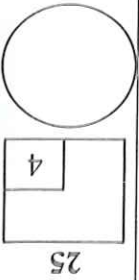
bilangan cubaan yang diperlukan.

Answer / Jawapan:

(a)

(b)

END OF QUESTION PAPER  
KERTAS SOALAN TAMAT



INFORMATION FOR CANDIDATES  
MAKLUMAT UNTUK CALON

1. This question paper consists of 25 questions.  
*Kertas soalan ini mengandungi 25 soalan.*
2. Answer all questions.  
*Jawab semua soalan.*
3. Write your answers in the spaces provided in this question paper.  
*Jawapan hendaklah ditulis pada ruang yang disediakan dalam kertas soalan ini.*
4. Show your working. It may help you to get marks.  
*Tunjukkan langkah-langkah penting dalam kerja mengira anda. Ini boleh membantu anda untuk mendapatkan markah.*
5. If you wish to change your answer, cross out the work that you have done.  
Then write down the new answer.  
*Sekiranya anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.*
6. The diagrams in the questions provided are not drawn to scale unless stated.  
*Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*
7. The marks allocated for each question are shown in brackets.  
*Markah yang diperuntukkan bagi setiap soalan ditunjukkan dalam kurungan.*
8. The Upper Tail Probability  $\bar{Q}(z)$  For The Normal Distribution  $N(0, 1)$  Table is provided on page 2.  
*Jadual Kebarangkalian Hujung Atas  $\bar{Q}(z)$  Bagi Taburan Normal  $N(0, 1)$  disediakan di halaman 2.*
9. A list of formulae is provided on pages 3 to 5.  
*Satu senarai rumus disediakan di halaman 3 hingga 5.*
10. You may use a scientific calculator.  
*Anda dibenarkan menggunakan kalkulator saintifik.*
11. Hand in this question paper to the invigilator at the end of the examination.  
*Serahkan kertas soalan ini kepada pengawas peperiksaan di akhir peperiksaan.*