

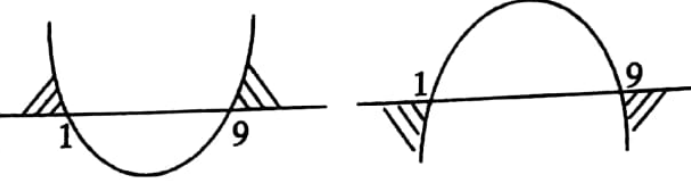
**Additional Mathematics Paper 1**  
**SPMRSM 2018**

**Answers Scheme**

<b>No</b>	<b>Answer</b>	<b>Marks</b>
1	<p>29.78</p> <p>I and II</p> <p>I or II</p> <p>I : <math>12 \times 1.284</math></p> <p>II : <math>2 \times 12 \times \sin\left(\frac{1.284}{2}\right)</math> or <math>12^2 + 12^2 - 2(12)(12)\cos 1.284</math> or</p> $\frac{RT}{\sin 1.284} = \frac{12}{\sin\left(\frac{\pi - 1.284}{2}\right)}$	<p>3</p> <p>B2</p> <p>B1</p>
2	$\frac{1}{\sqrt{1+k^2}}$ <p><math>\sqrt{1+k^2}</math> seen</p>	<p>2</p> <p>B1</p>
3	<p><math>14.04^\circ // 14^\circ 2'</math> , <math>194.04^\circ // 194^\circ 02'</math></p> <p><math>\tan x = \frac{1}{4}</math></p> <p><math>\cos 180^\circ \cos x + \sin 180^\circ \sin x</math></p>	<p>3</p> <p>B2</p> <p>B1</p>
4	<p><math>(4, 3)</math></p> <p><math>\frac{4(0)+1(20)}{5}</math> and <math>\frac{4(0)+1(15)}{5}</math></p> <p><math>\frac{4(0)+1(20)}{5}</math> or <math>\frac{4(0)+1(15)}{5}</math></p> <p>1:4 or 4:1 seen or implied</p>	<p>4</p> <p>B3</p> <p>B2</p> <p>B1</p>

No	Answer	Marks
5	108 $3! \times 3 \times 3!$ or $3 \times 2 \times 1 \times 3 \times 3 \times 2 \times 1$ $3!$ or $3 \times 3!$ or $3 \times 2 \times 1$ or $3 \times 3 \times 2 \times 1$ or ${}^3P_3$	3 B2 B1
6	$\frac{i-10j}{\sqrt{101}}$ or $\frac{1}{\sqrt{101}} \begin{pmatrix} 1 \\ -10 \end{pmatrix}$ or equivalent $i-10j$ or $\sqrt{101}$	2 B1
7	$\frac{3}{4}\underline{p} - \frac{1}{2}\underline{q}$ $\frac{3}{4}(\underline{p} - 2\underline{q}) + \underline{q}$ or $\frac{1}{4}(-\underline{p} + 2\underline{q}) + \underline{p} - \underline{q}$ $\overline{AD} = \underline{p} - 2\underline{q}$	3 B2 B1
8	$\frac{7}{64} // 0.1094 // 10.94\%$ $(0.25)^3 + (0.25)^2(0.5) + (0.25)(0.5)^2$ $(0.25)^3$ or $(0.25)^2(0.5)$ or $(0.25)(0.5)^2$ 0.25 or 0.5 or 20 or 3	4 B3 B2 B1
9	(a) 375 $n(0.4) = 150$ (b) 90	2 B1 1
)	(a) 1.5 (b) 1.151 // 1.15 0.125 seen $1 - \frac{*1.5}{2}$ (note : *accept for B1 only)	1 3 B2 B1
	(a) 2 and 3 (b) {2, 3, 4}	1 1

No	Answer	Marks
12	$\frac{x+6}{7}$ $g(x) = 7x - 6$ $g(x) = 7(x+3) - 27 \text{ or } f^{-1}(x) = x - 3$	3  B2  B1
13	(a) $f(x)$ and $h(x)$ and one object has one and only one image $f(x)$ and $h(x)$ (b) $g(x)$ and $k(x)$ and many to one relation $g(x)$ and $k(x)$	2 B1  2 B1
14	$4, \frac{1}{2}$ $(p-4)(2p-1) = 0$ $(2p-2)^2 - 4\left(\frac{5}{2}p-1\right) = 0 \text{ or equivalent OR}$ $2(1-p)+1 = (1-p)^2 + 2p(1-p) + \frac{5}{2}p \text{ or equivalent}$ $x^2 + 2px + \frac{5}{2}p = 2x+1 \text{ OR } 2x+2p = 2$	4  B3  B2  B1
15	$q = 1.125$ $p = 0.125$ $\frac{-4p}{-2\left(-\frac{1}{100}\right)} = 25 \text{ OR } \frac{25}{50} + 4p = 0 \text{ OR } 25 - 200p = 0$ $\frac{-4p}{-2\left(-\frac{1}{100}\right)} \text{ OR } h'(x) = -\frac{x}{50} + 4p \text{ OR}$ $h(x) = -\frac{1}{100}(x-200p)^2 + 400p^2 - 2q + 5$	4  B3  B2  B1

No	Answer	Marks
15	<p><u>ALTERNATIVE METHOD :</u></p> <p><math>p = 0.125</math> and <math>q = 1.125</math></p> <p><math>p = 0.125</math> or <math>q = 1.125</math></p> $-\frac{1}{100}(-5)^2 + 4p(-5) - 2q + 5 = 0 \dots I$ $-\frac{1}{100}(55)^2 + 4p(55) - 2q + 5 = 0 \dots II$ $-\frac{1}{100}(25)^2 + 4p(25) - 2q + 5 = 9 \dots III$ <p>Any two equations from I, II, III</p> <p>I or II or III</p>	<p>4</p> <p>B3</p> <p>B2</p> <p>B1</p>
16	<p><math>x &lt; 1, x &gt; 9</math></p> <p><math>(x-9)(x-1) &gt; 0</math> or</p>  <p>or equivalent method such as correct number line etc.</p> <p>OR</p> <p><math>x-5 &lt; -4, x-5 &gt; 4</math></p> <p><math>x^2 - 10x + 9 &gt; 0</math> or <math>-x^2 + 10x - 9 &lt; 0</math> OR <math>(x-5)^2 &gt; 16</math></p> <p>Note : Accept any symbol : =, &gt;, &lt;, ≤, ≥, for B1 only</p>	<p>3</p> <p>B2</p> <p>B1</p>
17	<p>24</p> <p><math>4 + (n-1)(12) \leq 290</math> (Note : accept '=')</p> <p><math>a = 4</math> and <math>d = 12</math></p>	<p>3</p> <p>B2</p> <p>B1</p>
18	<p>12</p> $\frac{a(1-(-2)^{10})}{1-(-2)} = -4092$ <p><math>r^2 = 4</math> or <math>ar^6 = 4ar^4</math></p>	<p>3</p> <p>B2</p> <p>B1</p>

No	Answer	Marks
19	<p>- 4</p> $3^x(-3) = -\frac{1}{27} \text{ or } 3^{x+1}(-1) = -\frac{1}{27}$ $3^x(3^2) \text{ or } 3 \times 3^{x+1} \text{ or } 4 \times 3^{x+1}$	<p>3</p> <p>B2</p> <p>B1</p>
20	<p><math>m = b^3</math></p> $\log_b m = 3 \text{ or } \log_m b = \frac{1}{3}$ $\frac{\log_b b}{\log_b m} \text{ or } \frac{\log_m m}{\log_m b}$	<p>3</p> <p>B2</p> <p>B1</p>
21	<p>- 4</p> $2 \log_p x + 3(5) = 7$ <p>I and III or II and III or I and II</p> <p>I or II or III</p> <p>Note :</p> <p>I : <math>\log_p x^2 + \log_p y^3</math></p> <p>II : <math>\log_p y = 5</math></p> <p>III : <math>2 \log_p x \text{ or } 3 \log_p y</math></p> <p><u>ALTERNATIVE METHOD :</u></p> <p>- 4</p> $x = p^{-4}$ $x^2(p^5)^3 = p^7$ $x^2 y^3 = p^7$	<p>4</p> <p>B3</p> <p>B2</p> <p>B1</p> <p>4</p> <p>B3</p> <p>B2</p> <p>B1</p>

No	Answer	Marks
22	<p>14.51</p> $\sqrt[3]{\pi(3)^2 108}$ <p>* <math>9\pi \times 2</math> or * <math>2 \times 54</math> or <math>\frac{72\pi}{4}</math></p> $\frac{dh}{dt} = 2 \text{ or } \frac{dv}{dh} = 9\pi$	<p>4</p> <p>B3</p> <p>B2</p> <p>B1</p>
23	<p><math>y = 7x + 5</math></p> $y - 12 = [10(1) - 3(1)^2](x - 1)$ $10x - 3x^2$	<p>3</p> <p>B2</p> <p>B1</p>
24	$\frac{1}{8}$ $\frac{1}{2} \left( \frac{2(0)}{(0+3)^3} - \frac{2(-1)}{(-1+3)^3} \right)$ $2 \int \frac{3-2x}{(x+3)^4} dx = \frac{2x}{(x+3)^3} \text{ seen}$	<p>3</p> <p>B2</p> <p>B1</p>
25	$y = \frac{5}{(2-x)^2} - 3$ $\frac{10(2-1)^{-2}}{(-2)(-1)} + c = 2$ $\frac{10(2-x)^{-2}}{(-2)(-1)} (+c)$	<p>3</p> <p>B2</p> <p>B1</p>