

BOARD OF SCHOOL EDUCATION HARYANA

Practice Paper -XI

(2024-25)

Marking Scheme

MATHEMATICS

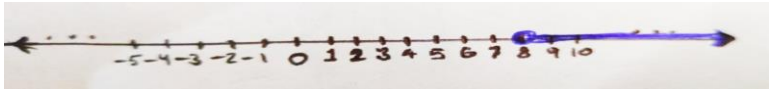
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⇒ Important Instructions: • All answers provided in the Marking scheme are SUGGESTIVE
• Examiners are requested to accept all possible alternative correct answer(s).

SECTION – A (1Mark × 20Q)		
Q. No.	EXPECTED ANSWERS	Marks
Question 1.	If $X = \{a, b, c, d, e\}$ and $Y = \{d, e, f, g\}$ then $(X - Y) \cap (X + Y)$ is	
Solution:	(B) $\{a, b, c\}$	1
Question 2	If $A = \{a, d\}$, $B = \{b, c, e\}$, $C = \{b, c, f\}$, then $A \times (B - C)$ is	
Solution:	(A) $\{(a, e), (d, e)\}$	1
Question 3	75° in radian measure is	
Solution:	(B) $5\pi/12$	1
Question 4.	$a + ib$ form of i^{-35} is :	
Solution:	(A) i	1
Question 5.	If $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$ then value of x is:	
Solution:	(A) 100	1
Question 6.	The G.M. between 1 and 64 is :	
Solution:	(C) 8	1
Question 7.	The value of x for which the numbers $-3/11$, x, $-11/3$ are in G.P	
Solution:	(B) ± 1	1
Question 8.	The derivative of $\sin(x + a)$ is:	
Solution:	(A) $\cos(x + a)$	1

Question 9.	If the variance of a data is 25, then its standard deviation is:	
Solution:	(B) 5	1
Question10.	If $P(A \cup B) = P(A \cap B)$ for any two events A and B, then	
Solution:	(C) $P(A) = P(B)$	1
Question11.	Find the number of terms in the expansion of $(3x + 9)^9$.	
Solution:	$9 + 1 = 10$	1
Question12.	Find the centre and radius of the circle $x^2 + y^2 + 8x + 10y - 8 = 0$.	
Solution:	Centre (-4 , -5) and Radius is 7	1
Question13.	Write the value of $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$.	
Solution:	$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = n.a^{n-1}$	1
Question14.	Find the mean deviation about the mean for the following data: 6, 7, 10, 12, 13, 4, 8, 12 .	
Solution:	<p>Mean of the given data is $\bar{x} = \frac{6+7+10+12+13+4+8+12}{8} = 9$</p> <p>Deviations from mean ($x_i - \bar{x}$) are -3, -2, 1, 3, 4, -5, -1, 3</p> <p>Absolute deviations i.e. $x_i - \bar{x}$ are 3, 2, 1, 3, 4, 5, 1, 3</p> <p>Mean Deviation = $\frac{\sum_{i=1}^8 x_i - \bar{x} }{n} = \frac{3+2+1+3+4+5+1+3}{8} = \frac{22}{8} = 2.75$</p>	1
Question15.	Let $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$ and $B = \{3, 4, 5\}$, then $(A \cup B)' =$	
Solution:	$(A \cup B)' = \{2, 3, 4, 5\}' = \{1\}$	1
Question16.	$\cos(A - B)$ is equal to	
Solution:	$\cos(A - B) = \cos A \cdot \cos B + \sin A \cdot \sin B$	1
Question17.	If $C(n, a) = C(n, b)$, then either $a = b$ or $n = a + b$. (True/ False)	
Solution:	True	1
Question18.	A die is rolled. Let A be the event of getting a multiple of 2 and B be the event of getting a multiple of 3. Then A and B are mutually exclusive events. (True/ False)	

Solution:	False	1
Question19.	Assertion (A): If $(x+1, y-2) = (3, 1)$, then $x = 3$ and $y = 2$. Reason (R) : Two ordered pairs are equal if their corresponding elements are equal.	
Solution:	(D) Assertion (A) is false and Reason (R) is true.	1
Question20.	Assertion (A): The point $(-5, 2, 0)$ lies on the XY plane. Reason(R): The coordinates of a point $P(x, y, z)$ in XY plane are $(0, 0, z)$.	
Solution:	(C) Assertion (A) is true and Reason (R) is false.	1
	SECTION – B (2Marks × 5Q)	
Question21.	If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$ and $D = \{15, 17\}$; find $(A \cup D) \cap (B \cup C)$	
Solution:	$A \cup D = \{3, 5, 7, 9, 11, 13\}$ $B \cup C = \{7, 9, 11, 13, 15\}$ $\therefore (A \cup D) \cap (B \cup C) = \{7, 9, 11, 13\}$	1 1
Question22.	Find the multiplicative inverse of $4 - 3i$.	
Solution:	Multiplicative Inverse of $4 - 3i = \frac{1}{4 - 3i}$ $\Rightarrow \text{M.I.} = \frac{1}{4 - 3i} \times \frac{4 + 3i}{4 + 3i}$ $\Rightarrow = \frac{4 + 3i}{(4)^2 - (3i)^2}$ $\Rightarrow = \frac{4 + 3i}{16 - 9i^2}$ $\Rightarrow = \frac{4 + 3i}{16 + 9} = \frac{4}{25} + \frac{3i}{25}$	1 1
OR Question22.	Find the conjugate of $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$	
Solution:	Given $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)} = \frac{6 + 9i - 4i - 6i^2}{2 - i + 4i - 2i^2}$ $\Rightarrow = \frac{6 + 5i + 6}{2 + 3i + 2}$ $\Rightarrow = \frac{12 + 5i}{4 + 3i}$ $\Rightarrow = \frac{12 + 5i}{4 + 3i} \times \frac{4 - 3i}{4 - 3i}$	

	$\Rightarrow = \frac{48 - 36i + 20i - 15i^2}{16 - 12i + 12i - 9i^2} = \frac{48 - 16i + 15}{16 + 9} = \frac{63}{25} - \frac{16i}{25}$ $\therefore \text{Conjugate of } \frac{(3-2i)(2+3i)}{(1+2i)(2-i)} = \frac{63}{25} + \frac{16i}{25}$	$1\frac{1}{2}$ $\frac{1}{2}$
Question23.	Solve the inequality $\frac{5-2x}{3} \leq \frac{x}{6} - 5$ and show the graph of the solution on number line.	
Solution:	<p>We have $\frac{5-2x}{3} \leq \frac{x}{6} - 5$</p> $\Rightarrow \frac{5-2x}{3} \leq \frac{x-30}{6}$ <p>Multiply on both side by 6, we have</p> $\Rightarrow 2(5 - 2x) \leq x - 30$ $\Rightarrow 10 - 4x \leq x - 30$ $\Rightarrow -5x \leq -40$ $\Rightarrow 5x \geq 40$ $\Rightarrow x \geq 8$ <p>Graph of the solution on number line</p> 	$1\frac{1}{2}$ $\frac{1}{2}$
Question24.	Find the 12 th term of a G.P. whose 8 th term is 192 and the common ratio is 2.	
Solution:	<p>We have, $a_8 = 192$ $r = 2$</p> $\Rightarrow ar^7 = 192$ $\Rightarrow a(2)^7 = 192$ $\Rightarrow a = \frac{192}{128} = \frac{3}{2}$ $\therefore a_{12} = a.r^{11} = \frac{3}{2} \cdot (2)^{11}$ $a_{12} = 3 \cdot (2)^{10} = 3 \cdot (1024) = 3072$	$\frac{1}{2}$ $\frac{1}{2}$ 1
Question25.	Find the coordinates of the focus, axis, the equation of directrix and the length of the latus rectum of the parabola $y^2 = 12x$.	
Solution:	<p>Equation of parabola is $y^2 = 12x$</p> <p>Comparing with $y^2 = 4ax$, we have $4a = 12 \Rightarrow a = 3$</p>	

Question29.	Find the sum of the sequence 7, 77, 777, 7777, to n terms.	
Solution:	<p>This is not a GP., however, we can relate it to a GP. by writing the terms as $S_n = 7+77+777 + 7777 + \dots$ to n terms</p> $= \frac{7}{9} [9 + 99 + 999 + 9999 + \dots \text{ to n term}]$ $= \frac{7}{9} [(10^1 - 1) + (10^2 - 1) + (10^3 - 1) + (10^4 - 1) + \dots n \text{ terms}]$ $= \frac{7}{9} [(10+10^2+10^3+\dots n \text{ terms}) - (1+1+1+\dots n \text{ terms})]$ <p>It is a G.P. where $a = 10$ and $r = 10 > 1$</p> $\therefore S_n = \frac{a(r^n - 1)}{r - 1}$ $= \frac{7}{9} \left[\frac{10(10^n - 1)}{10 - 1} - n \right] = \frac{7}{9} \left[\frac{10(10^n - 1)}{9} - n \right]$	<p>1</p> <p>1</p> <p>1</p>
OR Question 29	The sum of first three terms of a G.P. is $\frac{39}{10}$ and their product is 1. Find the common ratio and the terms.	
Solution:	<p>Let three terms in G.P. are $\frac{a}{r}, a, ar$</p> $\therefore \frac{a}{r} \times a \times ar = 1 \Rightarrow a^3 = 1 \Rightarrow a = 1$ <p>\therefore three terms now are $\frac{1}{r}, 1, r$</p> <p>A.T.Q. $\frac{1}{r} + 1 + r = \frac{39}{10}$</p> $\Rightarrow \frac{1+r+r^2}{r} = \frac{39}{10}$ $\Rightarrow 10r + 10r + 10r^2 = 39r$ $\Rightarrow 10r^2 - 29r + 10 = 0$ $\Rightarrow 10r^2 - 25r - 4r + 10 = 0$ $\Rightarrow (10r - 2)(r - 5) = 0$ $\Rightarrow r = \frac{1}{5} \text{ or } 5$ <p>\therefore if common ratio $r = \frac{1}{5}$, term are 5, 1, $\frac{1}{5}$</p> <p>if common ratio $r = 5$, terms are $\frac{1}{5}, 1, 5$</p>	<p>1</p> <p>$\frac{1}{2}$</p> <p>$1\frac{1}{2}$</p>

Question30.	Find the equation of the set of the points which are equidistant from the points (1, 2, 3) and (3, 2, -1)	
Solution:	<p>Let P(x, y, z) be any point which is equidistant from the points A(1, 2, 3) and B(3, 2, -1).</p> <p>$\therefore PA = PB$</p> <p>$\Rightarrow PA^2 = PB^2$</p> <p>$\Rightarrow (x - 1)^2 + (y - 2)^2 + (z - 3)^2 = (x - 3)^2 + (y - 2)^2 + (z + 1)^2$</p> <p>$\Rightarrow x^2 + 1 - 2x + y^2 + 4 - 4y + z^2 + 9 - 6z = x^2 + 9 - 6x + y^2 + 4 - 4y + z^2 + 1 + 2z$</p> <p>$\Rightarrow -2x - 6z = -6x + 2z$</p> <p>$\Rightarrow 4x - 8z = 0$</p> <p>$\Rightarrow x - 2z = 0$</p>	<p>1</p> <p>2</p>
Question31.	In an entrance test that is graded on the basis of two examinations, the probability of a randomly chosen student passing the first examination is 0.8 and the probability of passing the second examination is 0.7. The probability of passing atleast one of them is 0.95. What is the probability of passing both?	
Solution:	<p>Let P(A) be the probability of passing the first exam $\Rightarrow P(A) = 0.8$</p> <p>Let P(B) be the probability of passing the first exam $\Rightarrow P(B) = 0.7$</p> <p>\therefore Probabilty of passing atleast one of them $= P(A \cup B) = 0.95$</p> <p>\therefore Probabilty of passing both $= P(A \cap B)$</p> <p>We know, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$</p> <p>$0.95 = 0.8 + 0.7 - P(A \cap B)$</p> <p>$P(A \cap B) = 1.5 - 0.95 = 0.55$</p> <p>$\therefore$ Probabilty of passing both $= P(A \cap B) = 0.55$</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>

Question33.	Find the equation of the right bisector of the line segment joining the points (3, 4) and (-1, 2).	
Solution:	<p>Let the given points be A (3, 4) and B (-1, 2).</p> <p>Let M be the midpoint of AB.</p> <p>\therefore Coordinates of M = $(\frac{3-1}{2}, \frac{4+2}{2}) = (1, 3)$</p> <p>And, slope of AB = $\frac{2-4}{-1-3} = \frac{1}{2}$</p> <p>Let m be the slope of the right bisector of the line joining the points (3, 4) and (-1, 2).</p> <p>$\therefore m \times \text{Slope of AB} = -1$</p> <p>$m \times \frac{1}{2} = -1$</p> <p>$\Rightarrow m = -2$</p> <p>So, the equation of the line that passes through M (1, 3) and has slope -2 is</p> <p>$y - 3 = -2(x - 1)$</p> <p>$\Rightarrow 2x + y - 5 = 0$</p> <p>Hence, the equation of the right bisector of the line segment joining the points (3, 4) and (-1, 2) is $2x + y - 5 = 0$</p>	<p>1</p> <p>1</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$1\frac{1}{2}$</p>
OR Question33.	Find the equation of the line passing through (-3, 5) and perpendicular to the line through the points (2, 5) and (-3, 6).	
Solution:	<p>Slope of the line passing through the points A(2, 5) and B(-3, 6)</p> <p>$m_1 = \frac{y_2 - y_1}{x_2 - x_1}$</p> <p>$m_1 = \frac{6-5}{-3-2} = \frac{1}{-5}$</p> <p>$m_1 = -\frac{1}{5}$</p>	$\frac{1}{2}$

	<div data-bbox="970 208 1329 454" data-label="Figure"> </div> <p> $P(-3, 5)$ $A(2, 5)$ $B(-3, 6)$ </p> <p>If PL is perpendicular to AB from the point P(-3, 5), then consider its slope as m_2.</p> <p>Lines PL and AB are mutually perpendicular if,</p> <p>Slope of PL x Slope of AB = -1 $\Rightarrow m_1 \times m_2 = -1$</p> <p>In other words, $m_2 \times \left(-\frac{1}{5}\right) = -1$</p> <p>$\therefore m_2 = 5$</p> <p>The slope of PL is 5 and it passes through P(-3, 5), then the equation of PL is, $(y - y_1) = m_2 (x - x_1)$</p> <p>or $(y - 5) = 5 (x + 3)$</p> <p>$y - 5 = 5x + 15$</p> <p>$5x - y + 20 = 0$</p>	<p>1</p> <p>1</p> <p>1</p> <p>$1\frac{1}{2}$</p>
Question34.	Find the derivative of tan x from first principle.	
Solution:	<p>Let $f(x) = \tan x$, the</p> $\frac{d(f(x))}{dx} = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\tan(x+h) - \tan(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{\sin(x+h)}{\cos(x+h)} - \frac{\sin(x)}{\cos(x)} \right]$ $= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{\sin(x+h)\cos(x) - \cos(x+h)\sin(x)}{\cos(x+h)\cos(x)} \right]$ $= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{\sin(x+h-x)}{\cos(x+h)\cos(x)} \right] \quad [\text{Using formula for } \sin(A - B)]$	<p>1</p> <p>2</p>

	<p>From (1) and (2)</p> $a + b = 4$ <p>From (1) and (3)</p> $b - a = 4$ <p>Adding both $a + b + b - a = 4 + 4$</p> $2b = 8$ $b = 4$ <p>Also,</p> $a + b = 4$ $a + 4 = 4$ $a = 0$	1																																																						
Question35.	<p>Calculate mean, variance and standard deviation for the following distribution.</p> <table><tr><td>Classes</td><td>30- 40</td><td>40-50</td><td>50-60</td><td>60-70</td><td>70-80</td><td>80-90</td><td>90-100</td></tr><tr><td>Frequency</td><td>3</td><td>7</td><td>12</td><td>15</td><td>8</td><td>3</td><td>2</td></tr></table>	Classes	30- 40	40-50	50-60	60-70	70-80	80-90	90-100	Frequency	3	7	12	15	8	3	2																																							
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Frequency	3	7	12	15	8	3	2																																																	
Solution:	<p>From the given data, we construct the following table.</p> <table><tr><th>Class</th><th>Frequency f_i</th><th>Midpoint x_i</th><th>$f_i x_i$</th><th>$(x_i - \bar{x})^2$</th><th>$f_i(x_i - \bar{x})^2$</th></tr><tr><td>30 – 40</td><td>3</td><td>35</td><td>105</td><td>729</td><td>2187</td></tr><tr><td>40 – 50</td><td>7</td><td>45</td><td>315</td><td>289</td><td>2023</td></tr><tr><td>50 – 60</td><td>12</td><td>55</td><td>660</td><td>49</td><td>588</td></tr><tr><td>60 – 70</td><td>15</td><td>65</td><td>975</td><td>9</td><td>135</td></tr><tr><td>70 – 80</td><td>8</td><td>75</td><td>600</td><td>169</td><td>1352</td></tr><tr><td>80 – 90</td><td>3</td><td>85</td><td>255</td><td>529</td><td>1587</td></tr><tr><td>90 – 100</td><td>2</td><td>95</td><td>190</td><td>1089</td><td>2178</td></tr><tr><td></td><td>50</td><td></td><td>3100</td><td></td><td>10050</td></tr></table>	Class	Frequency f_i	Midpoint x_i	$f_i x_i$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$	30 – 40	3	35	105	729	2187	40 – 50	7	45	315	289	2023	50 – 60	12	55	660	49	588	60 – 70	15	65	975	9	135	70 – 80	8	75	600	169	1352	80 – 90	3	85	255	529	1587	90 – 100	2	95	190	1089	2178		50		3100		10050	$3\frac{1}{2}$
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	<p>Thus $\text{Mean } \bar{x} = \frac{1}{N} \sum_{i=1}^{i=7} f_i x_i$</p> $= \frac{3100}{50} = 62$ <p>Variance (σ^2) = $\frac{1}{N} \sum_{i=1}^{i=7} f_i (x_i - \bar{x})^2$</p> $= \frac{10050}{50} = 201$ <p>and Standard deviation(σ) = $\sqrt{201} = 14.18$</p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	SECTION – E (4Marks × 3Q)	
Question36.	<p>To demonstrate the compound angle formulae in trigonometry, Mahesh and Siraj selected two angles ‘A’ and ‘B’ such that $A, B \in (0, \frac{\pi}{2})$ and $\sin A = \frac{3}{5}$, $\cos B = \frac{9}{41}$.</p> <p><i>Based on the above information, answer the following questions.</i></p> <p>(i) Find the value of $\sin B + \cos A$. (2)</p> <p>(ii) Find the value of $\cos (A + B)$. (2)</p>	
Solution:	<p>Given, $\sin A = \frac{3}{5}$ and $\cos B = \frac{9}{41}$</p> <p>we know, $\cos A = \sqrt{1 - \sin^2 A}$</p> <p>So, $\cos A = \sqrt{1 - \left(\frac{3}{5}\right)^2} = \sqrt{\frac{16}{25}} = \frac{4}{5}$</p> <p>Also $\sin B = \sqrt{1 - \cos^2 B}$</p> <p>So, $\sin B = \sqrt{1 - \left(\frac{9}{41}\right)^2} = \sqrt{\frac{1681-81}{1681}} = \sqrt{\frac{1600}{1681}} = \frac{40}{41}$</p> <p>So, $\sin B = \frac{40}{41}$</p> <p>Thus $\sin B + \cos A = \frac{40}{41} + \frac{4}{5}$</p> $\Rightarrow \sin B + \cos A = \frac{200+164}{205}$	1

	$\Rightarrow \sin B + \cos A = \frac{364}{205}$	1
	<p>ii) $\cos (A + B) = \cos A \times \cos B - \sin A \times \sin B$</p> $= \left(\frac{3}{5}\right)\left(\frac{9}{41}\right) - \left(\frac{4}{5}\right)\left(\frac{40}{41}\right)$ $= \frac{27}{205} - \frac{160}{205}$ $= -\frac{27-133}{205}$ $= -\frac{133}{205}$	$\frac{1}{2}$ 1 $\frac{1}{2}$
Question37.	<p>The assembly incharge of a school wants to generate signals for calling classes for the assembly. He has got 5 coloured flags viz., Yellow, Red, Orange, Green and Blue to make signals.</p> <p><i>Based on the above information answer the following questions:</i></p> <p>(i) How many different signals can be generated by using all 5 flags? (1)</p> <p>(ii) To call the middle section for the assembly, he has to generate different signals by using 2 flags only. How many such arrangements are possible? $(1\frac{1}{2})$</p> <p>(iii) To call the senior section for the assembly, he has to generate different signals by using 4 flags only. How many such arrangements are possible? $(1\frac{1}{2})$</p>	
Solution: (i)	<p>Total number of different flags given = 5</p> <p>Number of ways to generate a signal of 5 flags together = 5P_5</p> $= \frac{5!}{(5-5)!}$ $= 5! = 120\text{ways}$	1

(ii)	<p>To call the middle section for the assembly, a signal of only two flags is to be generated.</p> <p>Number of ways to generate a signal of 2 flags together = 5P_2</p> $= \frac{5!}{(5-2)!}$ $= \frac{5!}{3!}$ $= \frac{5.4.3!}{3!} = 5.4 = 20 \text{ways}$	$1\frac{1}{2}$
(iii)	<p>To call the senior section for the assembly, a signal of only four flags is to be generated.</p> <p>Number of ways to generate a signal of 4 flags together = 5P_4</p> $= \frac{5!}{(5-4)!}$ $= \frac{5!}{1!}$ $= \frac{5.4.3!}{1!} = 5! = 120 \text{ways}$	$1\frac{1}{2}$
Question 38.	<p>Due to heavy storm, an electric wire got broken and fell on the ground and is bent taking a shape of a mathematical figure as shown below.</p> <p><i>Based on the above information, answer the following questions.</i></p> <p>(i) Name of the shape in which wire is bent. (a) circle (b) parabola (c) ellipse (d) hyperbola</p> <p>(ii) The equation of the shape so formed is: (a) $\frac{x^2}{9} + \frac{y^2}{4} = 1$ (b) $\frac{x^2}{4} + \frac{y^2}{9} = 1$ (c) $\frac{x^2}{9} - \frac{y^2}{4} = 1$ (d) none of these</p> <p>(iii) The eccentricity of the shape so formed is: (a) $\frac{2}{3}$ (b) $\frac{\sqrt{x}}{\sqrt{3}}$ (c) $\frac{\sqrt{5}}{3}$ (d) $\frac{\sqrt{5}}{4}$</p> <p>(iv) The length of the latus rectum of the shape so formed is: (a) 9 (b) $\frac{8}{3}$ (c) -4 (d) none of these.</p>	

Solution: (i)	(c) ellipse	1
(ii)	(a) $\frac{x^2}{9} + \frac{y^2}{4} = 1$	1
(iii)	(c) Here $a = 3$ and $b = 2$ Eccentricity $e = \frac{\sqrt{a^2 - b^2}}{a}$ $\Rightarrow e = \frac{\sqrt{3^2 - 2^2}}{3} = \frac{\sqrt{5}}{3}$	1
(iv)	(b) The length of the latus rectum $= \frac{2b^2}{a}$ $= \frac{2(2)^2}{3} = \frac{8}{3}$	1