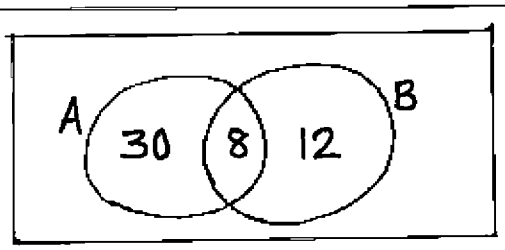
FIRST YEAR HIGHER SECONDARY EXAMINATION MARCH 2019

SUBJECT : MATHEMATICS (COMMERCE) **CODE. NO: FY 51**

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
1	(a)		2	3
		Remark: For any Venn diagram give 1 score		
	(b)	$30+12 = 42$	1	
		Remark: Alternate method give Full score		
2	(a)	$x+2=5$, $x=3$	½	3
		$y-1=4$, $y=5$	½	
	(b)	$(f+g)(x) = f(x)+g(x)$	½	
		$= x^2+x-1$	½	
		$(f+g)(2) = 2^2+2-1 = 5$	1	
3	(a)	$\bar{z} = 1-\sqrt{3}\,i$	1	3
	(b)	Let $1+\sqrt{3}\,i = r(\cos\theta + i\sin\theta)$	1	
		$r = \sqrt{1+3} = 2$	½	
		$\cos\theta = \frac{x}{r} = \frac{1}{2}$, $\sin\theta = \frac{y}{r} = \frac{\sqrt{3}}{2}$		
		$\therefore \theta = \frac{\pi}{3}$	½	
		Polar form is $2\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$		
		Remark: Polar form of $\bar{z}$ give full score		
4	(a)	${}^nC_7 = {}^nC_{n-7} = {}^nC_3$ (given)	1	3
		$n-7=3$, $n=10$		
		(ii) 10		
	(b)	${}^9P_4$	2	
		$= 3024$		
		Remark: Formula for ${}^nP_r$ give ½ score.		

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5	(a)	(1) ar^{n-1}	1	
	(b)	$ar = 12$ —①	½	3
		$ar^4 = 768$ —②	½	
		$\frac{②}{①} \Rightarrow r^3 = 64,\ r = 4$	½	
		$\therefore a = \frac{12}{4} = 3$	½	
6	(a)	Slope $= \frac{y_2 - y_1}{x_2 - x_1}$	½	
		$= \frac{2-3}{4-2} = -\frac{1}{2}$	½	
	(b)	$y - y_1 = m(x - x_1)$	½	3
		$y - 3 = -\frac{1}{2}(x-2)$	½	
	(c)	Since the lines are parallel Slopes are equal	1	
		$\therefore$ Slope $= -\frac{1}{2}$		
7	(a)	0 or ϕ	1	
	(b)	$n(S) = 36$	1	
		Let A: event of getting a sum greater than 10		3
		$A = \{(5,6),(6,5),(6,6)\}$	½	
		$\therefore P(A) = \frac{3}{36} = \frac{1}{12}$	½	
		Remark: $P(A) = \frac{n(A)}{n(S)}$ give ½ score		
8	(a)	$A \times B = \{(2,1),(2,3),(4,1),(4,3),(6,1),(6,3)\}$	2	
		Remark: for any 4 Correct ordered pairs give 2 Score		
	(b)	number of relations $= 2^{n(A) \times n(B)}$	½	4
		$= 2^6$	½	
	(c)	$R = \{(2,1),(4,3)\}$	1	

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9	(a)	LHS $= \frac{1}{2}$ and RHS $= 1-\frac{1}{2}=\frac{1}{2}$ $\therefore$ LHS = RHS $\therefore$ P(1) is true	1	
	(b)	Assume that P(k) is true $P(k) \Rightarrow \frac{1}{2}+\frac{1}{4}+\text{-------}+\frac{1}{2^k}=1-\frac{1}{2^k}$	1	
		$P(k+1) \Rightarrow \frac{1}{2}+\frac{1}{4}+\text{---}+\frac{1}{2^{k+1}}$	1	4
		$= 1-\frac{1}{2^k}+\frac{1}{2^{k+1}}$	½	
		$= 1-\left[\frac{2-1}{2^{k+1}}\right] = 1-\frac{1}{2^{k+1}}$	½	
		hence proved		
10		Let $\sqrt{3+4i} = x+iy$	½	
		Squaring on both sides, $3+4i = x^2-y^2+i2xy$	1	
		Equating real and imaginary parts		
		$x^2-y^2=3$ and $2xy=4$	½ + ½	
		$\therefore (x^2+y^2)^2 = (x^2-y^2)^2+(2xy)^2$ $= 3^2+4^2 = 25$		4
		$x^2+y^2=5$	½	
		$x^2-y^2=3$		
		Solving, $2x^2=8$, $x^2=4$, $x=\pm 2$	½	
		$2y^2=2$, $y^2=1$, $y=\pm 1$	½	
		$\sqrt{3+4i} = \pm 2 \pm i$		
		Remarks Alternate method give full score		
11	(a)	$(1-3x)^5 = 1-{}^5C_1(3x)+{}^5C_2(3x)^2-{}^5C_3(3x)^3+{}^5C_4(3x)^4-(3x)^5$	1½	
		$= 1-5(3x)+10(9x^2)-10(27x^3)+5(81x^4)-243x^5$	½	
		$= 1-15x+90x^2-270x^3+405x^4-243x^5$		
		Remark Formula for $(a+b)^n$ or $(a-b)^n$ give 1 score		

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	(b)	$T_{r+1} = {}^{n}C_r\, a^{n-r}\, b^r$	1	
		$= 12C_r\, x^{12-r}\left(\frac{1}{x}\right)^r$		4
		$= 12C_r\, x^{12-2r}$		
		term independent of $x \Rightarrow$ term with x^0		
		$\therefore\ 12-2r=0 \Rightarrow r=6$	½	
		$\therefore\ T_7 = 12C_6$ is the required term	½	
12	(a)	$d = \left\lvert \frac{ax_1+by_1+c}{\sqrt{a^2+b^2}} \right\rvert$	1	
		$= \left\lvert \frac{1-2(-2)+3}{\sqrt{1+4}} \right\rvert$	½	
		$= \frac{8}{\sqrt{5}}$	½	
	(b)	Equation of a line perpendicular to $x-2y+3=0$ is		
		$-2x-y+k=0$	1	4
		$2x+y-k=0$ — ①		
		Since ① passes through $(1,-2)$ $2-2-k=0$, $k=0$	½	
		$\therefore$ the required equation is $2x+y=0$	½	
		Remark Alternate method give full score		
13	(a)	(ii) $\frac{n(n+1)(2n+1)}{6}$	1	
	(b)	Let $S_n = 7+77+777+\cdots$ to n terms	½	
		$= 7[1+11+111+\cdots$ to n terms$]$	½	
		$= \frac{7}{9}[9+99+999+\cdots$ to n terms$]$	½	4
		$= \frac{7}{9}[(10-1)+(100-1)+(1000-1)+\cdots$ to n terms$]$	½	
		$= \frac{7}{9}[(10+100+\cdots$ to n terms$)-(1+1+\cdots+n$ terms$)]$	½	
		$= \frac{7}{9}\left[\frac{10(10^n-1)}{9}-n\right]$	½	
		Remark $S_n = \frac{a(r^n-1)}{r-1}$ give ½ Score		

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
14	(a)	comparing with $y^2 = 4ax$, $4a = 8$, $a = 2$	½	
		$\therefore$ focus $= (a,0) = (2,0)$	½	
		Remark: for the formula give ½ score		4
	(b)	Length of latus rectum $= 4a = 8$ units	½ + ½	
	(c)	$(x-h)^2 + (y-k)^2 = r^2$	1	
		$(x-2)^2 + (y-0)^2 = 5^2$	1	
		$x^2 + y^2 - 4x - 21 = 0$, is the equation of the circle		
15	(a)	$d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2 + (z_2-z_1)^2}$	½	
		$= \sqrt{(2--2)^2 + (1-1)^2 + (-3-3)^2} = \sqrt{52}$ units	½	
	(b)	On YZ plane x coordinate $= 0$	1	
		Let the ratio be $k:1$	½	
		$x = \frac{kx_2 + x_1}{k+1}$	½	4
		$0 = \frac{3k + -2}{k+1}$	½	
		$3k - 2 = 0 \Rightarrow k = \frac{2}{3}$	½	
		$\therefore$ ratio is 2:3		
		Remark Alternate method give full score		
16	(a)	(iii) $f(x)$	1	
	(b)	$\frac{dy}{dx} = \frac{(x-\sin x)\frac{d}{dx}(x+\sin x) - (x+\sin x)\frac{d}{dx}(x-\sin x)}{(x-\sin x)^2}$	1½	
		$= \frac{(x-\sin x)(1+\cos x) - (x+\sin x)(1-\cos x)}{(x-\sin x)^2}$	1½	4
		$= \frac{2(x\cos x - \sin x)}{(x-\sin x)^2}$		
		Remark: for Quotient rule give 1 score		

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
17	(a)	(ii) $\sim q \Rightarrow \sim p$	1	
	(b)	Let $\sqrt{11}$ be rational	1	
		$\sqrt{11} = \frac{a}{b}$, where a and b have no common factors	1	
		$a = \sqrt{11}\, b$, $a^2 = 11 b^2$ —①		
		11 divides a^2 ie 11 divides a	½	4
		Let $a = 11k$, Substituting in ①, $(11k)^2 = 11 b^2$		
		$121 k^2 = 11 b^2$, $11 k^2 = b^2$		
		⇒ 11 divides b^2 ie, 11 divides b	½	
		⇒ 11 is a common factor for a and b, which is a contradiction to our assumption		
		$\sqrt{11}$ is an irrational number		
18	(a)	$P \cup Q = \{1, 2, 3, 4, 6, 7, 8\}$	1	
		$P - Q = \{2, 4, 7\}$	1	
	(b)	$P' = \{1, 5, 8\}$	1	6
		$Q' = \{2, 4, 5, 7\}$	1	
	(c)	$(P \cup Q)' = \{5\}$	1	
		$P' \cap Q' = \{5\}$	1	
		$\therefore (P \cup Q)' = P' \cap Q'$		
19	(a)	120° or $2\frac{\pi}{3} \times \frac{180}{\pi}$	1	
	(b)	$\frac{2 \sin 5x \cos 2x}{2 \cos 5x \cos 2x} = \tan 5x$	2	
		Remark: For each formula give ½ Score		
	(c)	$\tan 3x = \tan(2x + x)$	1	6
		$= \frac{\tan 2x + \tan x}{1 - \tan 2x \tan x}$	1	

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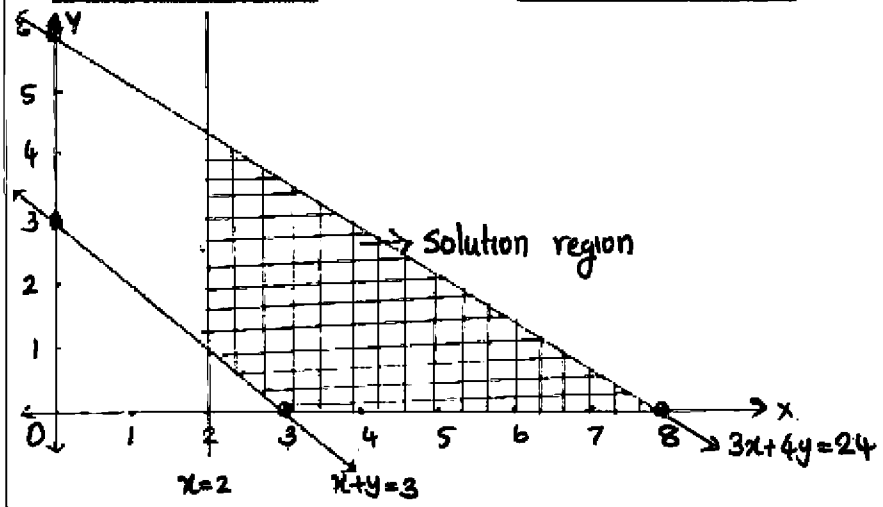
		$\tan 3x(1-\tan 2x\tan x)=\tan 2x+\tan x$	½	
		$\tan 3x-\tan 2x-\tan x=\tan 3x\tan 2x\tan x$	½	
		Remark: formula for $\tan(x+y)$ give ½ score		
20	(a)	$\frac{x}{2}\geq\frac{25x-10-21x+9}{15}$	½	
		$\frac{x}{2}\geq\frac{4x-1}{15}$	½	
		$15x\geq 8x-2$	½	
		$7x\geq -2$	½	
		$x\geq\frac{-2}{7}$		
	(b)	$3x+4y=24$: x: 0, 8; y: 6, 0		6
		$x+y=3$: x: 0, 3; y: 3, 0		
			4	
		Remark: For each correct line give 1 score For correct lines and incorrect solution region give 3½ score		
21	(a)	$\frac{{}^{2n}C_3}{{}^{n}C_3}=\frac{11}{1}$	1	
		$\frac{\frac{2n(2n-1)(2n-2)}{1\cdot 2\cdot 3}}{\frac{n(n-1)(n-2)}{1\cdot 2\cdot 3}}=11$	2	

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		$\frac{2n(2n-1)\,2(n-1)}{n(n-1)(n-2)} = 11$	½	
		$4(2n-1) = 11(n-2)$		
		$8n-4 = 11n-22$	½	6
		$-3n = -18$, $n=6$		
		Remark: Formula for ${}^nC_r$ give ½ Score		
	(b)	number of letters $n=8$, M's $=2$, I's $=2$	½	
		number of words $= \frac{n!}{P_1!\,P_2!\,\cdots\,P_k!}$	½	
		$= \frac{8!}{2!\,2!}$	1	
22	(a)	$\bar{x} = \frac{\Sigma x_i}{n}$	½	
		$= \frac{1+2+3+\cdots+n}{n}$	½	
		$= \frac{\frac{n(n+1)}{2}}{n}$	1	
		$= \frac{n+1}{2}$		
	(b)	ascending order ⇒ 3, 4, 5, 6, 7, 8, 9	½	6
		Median $= 6$	½	

x	3	4	5	6	7	8	9
$\lvert x-M\rvert$	3	2	1	0	1	2	3

1

$\Sigma\lvert x-M\rvert = 12$ ½

Mean deviation about median $= \frac{\Sigma\lvert x-M\rvert}{n}$ 1

$= \frac{12}{7}$ ½

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
23				

Mid x	f	fx	fx^2
5	5	25	125
15	9	135	2025
25	17	425	10625
35	14	490	17150
45	5	225	10125
	50	1300	40050

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(a) $\text{Mean} = \frac{\Sigma fx}{N} = \frac{1300}{50} = 26$ — ½ + ½

(b) $\text{Standard deviation} = \sqrt{\frac{\Sigma fx^2}{N} - \left(\frac{\Sigma fx}{N}\right)^2}$ — ½

$= \sqrt{\frac{40050}{50} - (26)^2}$

$= \sqrt{801 - 676} = \sqrt{125} = 11.18$ — ½

(c) Coefficient of Variation (CV) $= \frac{Sd}{\text{Mean}} \times 100$ — ½

$= \frac{11.18}{26} \times 100 = 43$ — ½

6

24	(a)	$P(A \text{ or } B) = P(A \cup B) = P(A) + P(B) - P(A \cap B)$	1	
		$= \frac{1}{2} + \frac{1}{3} - \frac{1}{4} = \frac{7}{12}$	1	
	(b)	$P(\text{not } A) = P(A') = 1 - P(A)$	½	
		$= 1 - \frac{1}{2} = \frac{1}{2}$	½	
	(c)	$P(\text{not A and not B}) = P(A' \cap B') = 1 - P(A \cup B)$	1	6
		$= 1 - \frac{7}{12} = \frac{5}{12}$	1	
	(d)	$P(A) = \frac{n(A)}{n(S)}$	½	
		$n(S) = \frac{n(A)}{P(A)} = 10$	½	