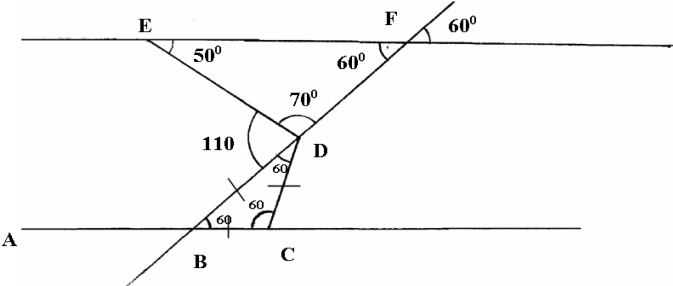


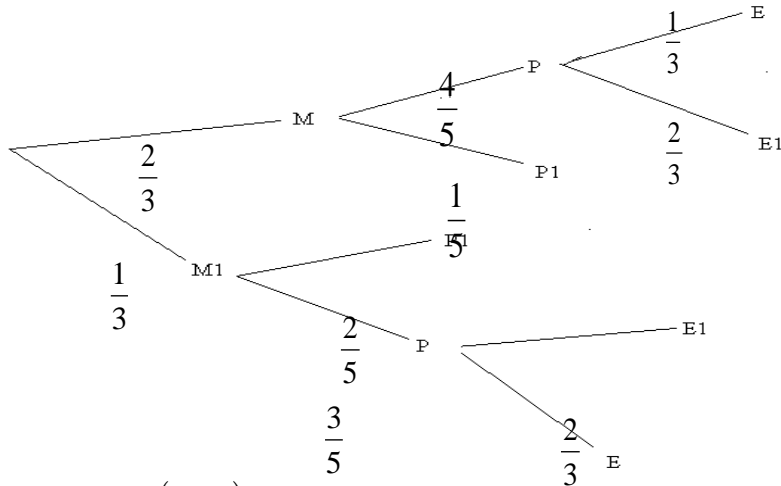
	$OT = \frac{1}{2} AO + \frac{1}{2} OB$ $\begin{pmatrix} 2 \\ 0 \\ 1.5 \end{pmatrix} = \frac{1}{2} \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix} + \frac{1}{2} \begin{pmatrix} x \\ y \\ z \end{pmatrix}$ $\begin{pmatrix} 2 \\ 0 \\ 1.5 \end{pmatrix} = \begin{pmatrix} 0.5 \\ -0.5 \\ 0.5 \end{pmatrix} + \begin{pmatrix} 0.5x \\ 0.5y \\ 0.5z \end{pmatrix}$ $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ 1 \\ 2 \end{pmatrix}$ $= 3\mathbf{i} + \mathbf{j} + 2\mathbf{k}$	<p>M1</p> <p>A1</p> <p>B1</p>	
		3	
4.	<p>a) Co-ordinate of</p> $A \left(\frac{5-3}{2}, \frac{5-1}{2} \right)$ $A \left(\frac{2}{2}, \frac{4}{2} \right)$ $A (1, 2)$ <p>b) $r = \sqrt{(5-1)^2 + (5-2)^2}$</p> $= \sqrt{16+9}$ $= 5 \text{ units}$ $(x-1)^2 + (y-2)^2 = 5^2$ $x^2 - 2x + 1 + y^2 - 4y + 4 = 25$ $x^2 + y^2 - 2x - 4y + 5 = 25$ $x^2 + y^2 - 2x - 4y - 20 = 0$	<p>B1</p> <p>Or equivalent</p> <p>B1</p> <p>B1</p>	
		3	
5.		B2	

	 <p>Angle on straight line</p>	B1	
		3	
6.	$4 \sin(x + 30^\circ) = 2$ $\sin(x + 30) = \frac{2}{4} = \frac{1}{2}$ $x + 30 = 30$ $x_1 = 30 - 30$ $= 0$ $x + 30 = 150$ $\frac{1}{2} = 150 - 30$ $= 120^\circ$	B1 B1 B1	
		3	
7.	<p>Fraction of water emptied per hour.</p> <p>For A = $\frac{1}{8}$</p> <p>B = $\frac{1}{6}$</p> <p>C = $\frac{1}{3}$</p> <p>All working for 1 hour</p> $\frac{1}{8} + \frac{1}{6} + \frac{1}{3} = \frac{3+4+8}{24}$ $= \frac{15}{24}$ <p>All working for 30 minutes</p> $\frac{15}{24} \times \frac{30}{60} = \frac{5}{16}$ <p>Remaining fraction</p> $\frac{16}{16} - \frac{5}{16} = \frac{11}{16}$ <p>B & C working for one hour</p> $\frac{1}{6} + \frac{1}{3} = \frac{1+2}{6} = \frac{3}{6}$	B1	

	$= \frac{1}{2}$ $1h \equiv \frac{1}{2}$ $? \equiv \frac{11}{16}$ $\frac{11}{16} \times 1 \times 2 = \frac{11}{8}$ $\frac{11}{8} + \frac{1}{2} = \frac{15}{8} = 1\frac{7}{8} \text{ hrs}$	M1 A1	
7.	$\frac{3x^2 - 4xy + y^2}{9x^2 - y^2}$ $3x^2 - 4xy + y^2 = 3x^2 - 3xy - xy + y^2$ $= 3x(x-y) - y(x-y)$ $= (3x-y)(x-y)$ $9x^2 - y^2 = (3x-y)(3x+y)$ $\therefore \frac{(3x-y)(x-y)}{(3x-y)(3x+y)}$ $= \frac{x-y}{3x+y}$	M1 M1 A1	
		3	
8.	Distance = 72+78 $= 150\text{M}$ Relative speed = 72+108 $= 180\text{km/h}$ $t = \frac{150}{1000} \times \frac{1}{180}$ $= 8.333 \times 10^{-4}$ $= 2.999$ $\approx 3 \text{ seconds}$	B1 B1 M1 A1	
		4	

12.	$\begin{aligned} \text{Width} &= (3x + 1) - 3 \\ &= 3x - 2 \\ (3x + 1)(3x - 2) &\rightarrow 9x^2 - 3x - 2 = 28 \\ &\rightarrow 9x^2 - 3x - 30 = 0 \\ &\rightarrow 3x^2 - x - 10 = 0 \\ x &= \frac{1 \pm \sqrt{121}}{6} \\ x &= \frac{12}{6} \quad \text{or} \quad \frac{-10}{6} \\ &= 2 \\ \text{Length} &= 3x + 1 \\ &= 3(2) + 1 \\ &= 7 \end{aligned}$	M1	
		M1	
		A1	
		03	
13	$\begin{aligned} y &\geq 0 \\ x + y &< 2 \quad \text{or} \quad y < -x + 2 \\ y &\leq 2x + 2 \end{aligned}$	B1 B1 B1	
		03	
14	$\begin{aligned} y &\geq 0 \\ x + y &< 2 \quad \text{or} \quad y < -x + 2 \\ y &\leq 2x + 2 \end{aligned}$	B1 B1 B1	
		03	
15	$\begin{aligned} \text{Grad AB} &= \frac{-4 - 4}{8 - 2} = \frac{-4}{3} \\ \text{grad } \perp \text{ of AB} &= \frac{3}{4} \\ \text{coordinates of mid points} &= \left(\frac{2 + 8}{2}, \frac{4 + -4}{2} \right) \\ &= (5, 0) \\ \therefore EQ &= \frac{y - 0}{x - 5} = \frac{3}{4} \\ y &= \frac{3}{4}x - \frac{15}{4} \end{aligned}$	M1 B1 A1	
		3	
16.	$\begin{aligned} R^2 &= \frac{3TP - 3T^2}{P} \\ PR^2 &= 3TP - 3T^2 \\ PR^2 - 3TP &= -3T^2 \\ P(R^2 - 3T) &= -3T^2 \\ P &= \frac{-3T^2}{R^2 - 3T} \end{aligned}$	M1 A1	

20.a)



b)

$P(M P) \text{ or } P(M^1 P)$

$$\left(\frac{2}{3} \times \frac{4}{5}\right) + \left(\frac{1}{3} \times \frac{1}{5}\right) = \frac{8}{15} + \frac{1}{15}$$

$$= \frac{9}{15}$$

ii) $P(Mpt) \text{ or } (M^1 pt)$

$$= \left(\frac{2}{3} \times \frac{7}{5} \times \frac{1}{3}\right) + \left(\frac{1}{3} \times \frac{3}{5} \times \frac{1}{3}\right) = \frac{14}{45} + \frac{1}{45}$$

$$= \frac{15}{45}$$

$P(p \text{ and } t) \text{ or } p(\text{and } t)$

$$\left(\frac{4}{5} \times \frac{1}{3}\right) + \left(\frac{2}{5} \times \frac{1}{3}\right) = \frac{4}{15} + \frac{2}{15} = \frac{6}{15}$$

$$= \frac{2}{5}$$

$$\frac{2}{3} \times \frac{4}{5} \times \frac{1}{3} = \frac{8}{45}$$

21.

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

$$a = 2, n = 8 \text{ and } S_n = 156, d$$

$$\frac{8}{2} \{2 \times 2 + (8-1)d\} = 156$$

$$4(4 + 7d) = 156$$

$$16 + 28d = 156$$

$$\Rightarrow 28d = 156 - 16$$

$$28d = 140$$

$$d = 5$$

https://teacher.co.ke/notes	$\frac{n}{2} \{2 \times 2 + (n-1)5\} = 416$ $\frac{n}{2} (4 + 5n - 5) = 416$ $4n + 5n^2 - 5n = 416 \times 2 \Rightarrow 4n - 5n + 5n^2 = 832$ $5n^2 - n - 832 = 0$ $n = \frac{1 \pm \sqrt{(1) - 4 \times 5 - 832}}{10} = \frac{1 \pm 129}{129}$ $n = \frac{1 \pm 129}{10} = \frac{130}{10} = 13$ $n = \frac{1 - 129}{10} = \frac{-128}{10} = n = 12.8$ <p>ignore $n = 12.8$</p> <p>$\therefore n = 13$</p>		
Download this and other FREE materials from	$\therefore a + 2d, a + 4d, a + 7d$ $\frac{a + 4d}{a + 2d} = \frac{a + 7d}{a + 4d}$ $(a + 4d)(a + 4d) = (a + 2d)(a + 7d)$ $a^2 + 4ad + 4ad + 16d^2 = a^2 + 2ad + 14d^2$ $8ad + 16d^2 = 2ad + 14d^2$ $16d^2 = 2ad - 8ad$ $\frac{16d^2}{9} = \frac{ad}{d}$ $a = 16d$ <p>but $d = 3$</p> $\Rightarrow a = 16 \times 3$ $= 48$ $r = \frac{a + 4d}{a + 2d} = \frac{48 + 4 \times 3}{48 + (2 \times 3)} = \frac{60}{54} = \frac{10}{9}$ $S_n = \frac{a(r^n - 1)}{r - 1}$ $= \frac{48 \left(\frac{10}{9} \right)^n - 48}{\frac{10}{9} - 1}$ $= 683.067$ <p style="text-align: right;">p</p>		
22.	<p>A: Taxable income = 25,000 + 10,480</p> <p style="text-align: right;">M1</p> <p style="text-align: center;">= 35,480/=</p>		

Download and other FREE materials from https://teacher.co.ke/notes	B: First $4350 \times 2/20 = 435$		
	Next $4350 \times 3/20 = 682.50$	B1	
	Next $4555 \times 4/20 = 911$		
	Next $4550 \times 5/20 = 1137.50$	B1	
	Remaining $17475 \times 6/20 = 5242.50$	B1	
		8408.50	M1
	Less relief	800	
	Net tax	7608.50	A1
	C) $140 \times 35480 = 49672$	M1	
	$(31667 \times 6) + 435 + 682.50 + 911 + 1137.50 = 12666.10$		
Less relief	<u>800</u>		
	11,866.10	M1	
% increase = $\frac{11866.10 - 7608.50}{7608.50} \times 100 = 55.96\%$		A1	

Download and other FREE materials from https://teacher.co.ke/notes	24. a) $3^2 + 5^2$ $9 + 25 = \sqrt{36}$ $= 6\text{cm}$	M1 A1	
	b) $\tan \beta = \frac{5}{3}$ $\beta = 59.04^\circ$	M1 A1	
	c) $121 = 64 + 25 - (2 \times 5 \times 8) \cos \alpha$ $\alpha = 113.58^\circ$	M1 A1	

Download this and other FREE materials from https://teacher.co.ke/notes	d) $\frac{1}{2}bh + \frac{1}{2}ab\sin\beta$	M1	
	$=0.5 \times 5 \times 3 + 0.5 \times 5 \times 8 \sin 113.58$		
	$=7.5 + 18.33$	M1	
$=25.83 \text{cm}^2$	A1		

