actions 8	olution	Marks	Remarks
$(a^{-1}b)^3$ $a^{-3}b^3$	4 ==	1M	for $(m)^n = n \cdot n$
$\frac{(a^{-1}b)^3}{b^2} = \frac{a^{-3}b^3}{b^2}$		11/1	for $(xy)^n = x^n y^n$ and can be absorbed
			x^m
$=a^{-3}b$		1M	for $\frac{x^m}{x^n} = x^{m-n}$ or $x^{-n} = \frac{1}{x^n}$
$=\frac{b}{a^3}$			and can be absorbed
$=\frac{1}{a^3}$		1A	
		(3)	
2			
$y = \frac{2}{a - x}$			
y(a-x)=2		HERSON ILLIAN	
ay - xy = 2		1M	for expanding
-xy = 2 - ay		1M	for putting x on one side
ALCOHOLOGICAL CONTROL OF CONTROL			
$x = \frac{ay - 2}{y}$		1A	accept $x = a - \frac{2}{y}$ or $x = \frac{2 - ay}{-y}$
2			
$y = \frac{2}{a - x}$ $y(a - x) = 2$			
y(a-x)=2			Elifer what figures
$a-x=\frac{2}{}$		13.4	C 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		1M	for making $a - x$ the subject
$-x = \frac{2}{y} - a$			
-x = -a		1M	for putting x on one side
2			av-2 $2-av$
$x = a - \frac{2}{y}$		1A	accept $x = \frac{ay - 2}{y}$ or $x = \frac{2 - ay}{-y}$
		(3)	
3. The amount			
$= $5000 (1+2\%)^3$		1A	u-1 for missing unit r.t. \$ 5 306
		1A	u-1 for missing unit f.t. \$ 5 306
The required interest			
$=5000(1+2\%)^3-5000$		1M	for $5000 (1+r\%)^n - 5000 (n \ge 2)$
= 306.04		To ad Marc	
≈ \$ 306		1A	u−1 for missing unit
		(3)	
Since $(a, 0)$ lies on $y = -x^2 +$	0r - 25 we have		
	on 25 , we have	- P & Aqued	Communication of the second se
$-a^2 + 10a - 25 = 0$		1M	for putting $y = 0$
$-\left(a-5\right)^2=0$			
a = 5		1A	
<i>b</i> = −25		1A	
		(3)	
		at the same	
2004-CE-MATH 1-3	100		

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Solution	Marks	Remarks
North 130 m		
θ East		
Refer to the figure,		
$\sin \theta = \frac{60}{130}$ $\theta \approx 27.48642625^{\circ}$	1M	pp-1 for any undefined symbo
$\theta \approx 27.5^{\circ}$ Thus, the bearing of B from A is N62.5°E.	1A 1M	u-1 for missing unit r.t. 27.5° accept 063, 062.5° or N62°31'E
North 60 m		
A East Refer to the figure,		
$\cos \theta = \frac{60}{130}$ $\theta \approx 62.51357375^{\circ}$	1M	pp-1 for any undefined symbo
$\theta \approx 62.5^{\circ}$ Thus, the bearing of B from A is N62.5°E.	1A 1M	u-1 for missing unit r.t. 27.5° accept 063, 062.5° or N62°31'
(a) $a^2 - ab + 2a - 2b$ = $a(a-b) + 2(a-b)$ = $(a+2)(a-b)$	1M 1A	for taking out a common factor or using cross-metho
(b) $169y^2 - 25$ = $(13y)^2 - 5^2$		Moneyett Cott x () 000 Z Z=
= (13y + 5)(13y - 5)	1M+1A (4)	remathi tentiga e edT gotta - Sacra e panala
Let the number of oranges bought be x . Then, the number of apples bought will be $20-x$. Now, $2x+3(20-x)=46$	1A 1M+1A	pp-1 for any undefined symbo 1M for $2x+3(20-x)$
Solving, we have $x = 14$. Thus, the number of oranges bought is 14.	1A	- y world (0.c) stalk
Let x and y be the number of oranges and the number of apples bought respectively. Then, we have		pp-1 for any undefined symbo
$\begin{cases} x + y = 20 \\ 2x + 3y = 46 \end{cases}$	1A+1A	
Then, we have $2x + 3(20 - x) = 46$. Solving, we have $x = 14$. Thus, the number of oranges bought is 14.	1M 1A	for leaving x or y only

	Solution	Marks	Remarks
(a)	The required probability $= \frac{5}{9}$	1A	r.t. 0.556
(b)	The required probability $=1-(\frac{5}{9})^{2}$ $=\frac{56}{81}$	1M+1M+1A	1M for $1-p$ where $0 M for p = (a)^2r.t. 0.691$
	The required probability $= (1 - \frac{5}{9})(\frac{5}{9}) + (\frac{5}{9})(1 - \frac{5}{9}) + (1 - \frac{5}{9})(1 - \frac{5}{9})$ $= (\frac{4}{9})(\frac{5}{9}) + (\frac{5}{9})(\frac{4}{9}) + (\frac{4}{9})(\frac{4}{9})$ $= \frac{56}{81}$	1M+1M+1A	r.t. 0.691
	The required probability $= (1 - \frac{5}{9})(1) + (1 - \frac{5}{9})(\frac{5}{9})$	1M+1M+1A	telitari pritcul Files
	$= \frac{4}{9} + (\frac{4}{9})(\frac{5}{9})$ $= \frac{56}{81}$	- 1A	r.t. 0.691
(a)	Let r cm be the radius of the sector. Then, we have $(\pi r^2)(\frac{80}{360}) = 162\pi$ $r = 27$ Thus, the radius of the sector is 27 cm.	1M+1A 1A	pp-1 for any undefined symbo $1M \text{ for } \frac{80}{360}$ u-1 for missing unit
	Let r cm be the radius of the sector. Then, we have $(\frac{1}{2}r^2)(\frac{80\pi}{180}) = 162\pi$ $r = 27$ Thus, the radius of the sector is 27 cm.	1M+1A 1A	pp-1 for any undefined symbolomic $\frac{80\pi}{180}$ u-1 for missing unit
(b)	The perimeter of the sector = $((2)(27))(\pi)(\frac{80}{360}) + (2)(27)$ = $(12\pi + 54)$ cm	1M 1A	for $((2)(a))(\pi)(\frac{80}{360}) + (2)(a)$ u-1 for missing unit
	The perimeter of the sector = $(27)(\frac{80\pi}{180}) + (2)(27)$ = $(12\pi + 54)$ cm	1M 1A	for $(a)(\frac{80\pi}{180}) + (2)(a)$ u-1 for missing unit
	The perimeter of the sector $= \frac{2(162\pi)}{27} + (2)(27)$ $= (12\pi + 54) \text{ cm}$	1M	for $\frac{2(162\pi)}{(a)}$ + (2)(a) u-1 for missing unit

	a a seriest	Solution	Marks	Remarks
. (a)	Let $y = ax^2 + bx$, who	ere a and b are non-zero constants.	1A	pp−1 for writing $y \propto ax^2 + bx$
	When $x = 3$, $y = 3$, so $9a + 3b = 3$	we have		
		(1)	IM	for substitution (either)
	When $x = 4$, $y = 12$, s 16a + 4b = 12	o we have		ac
	4a + b = 3	(2)		
	Solving (1) and (2), we	have	1M	for solving
	$\begin{cases} a = 2 \\ b = -5 \end{cases}$		} 1A	for both correct
	$\therefore y = 2x^2 - 5x$			
	y = 2x - 3x		(4)	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
(b)	When $y < 42$, we have			
(b)		(by (a))	1M	
	Therefore, we have	(-)("))		
	$2x^2 - 5x - 42 < 0$		3.4	Conformation Collins
	(2x+7)(x-6) < 0		1A	for factorization or finding roots
	$\frac{-7}{2} < x < 6$		1M	12
	Since x is an integer, y	ve have 0, 1, 2, 3, 4 or 5.	1A	
			(4)	The state of the s
			(4)	epting the later
			460 (4) (17)(18)	
			(4)	epiting of the section of the sectio
			460 (4) (17)(18)	The decision of the latest to
			und (15 dimens)	
			and (1) at recommend of the colors of the co	nest a rest of the second
			and (15 a) years or for each of Theorems decay to 25 am	74581 × 2 (401 × 1) (402 × 1) (402 × 1)
			and (1) at recommend of the colors of the co	min a manual of a min and a min a mi
			and (15 a) years of the said of "Then, we decke to 25 am	nest a rest of the second
			and (15 a) years of the said of "Then, we decke to 25 am	min a manual of a min and a min a mi
			nas (1 a) reco O O De seco o Them. vol. 10 Inc. 31 al 11 acres 175 X 2	The process of the series of t
			nas (1 a) reco O O De seco o Them. vol. 10 Person III 23 cm	The process of the column of t
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	Solution		Marks	Remarks
(a)	The standard score of Paper I			33¥60 5 6 m
	54 – 46.1			
	$=\frac{15.2}{1}$	1361	1A	
	$=\frac{79}{152}$	727 = 10C4 1	E = GSG(X)	+3002 = 1010 GB =
				either one
	≈ 0.519736842			
	≈ 0.520		1A	r.t. 0.52
	The continue of the continue o			ONLY SINGS
	The standard score of Paper II			and a second
	$=\frac{66-60.3}{1000000000000000000000000000000000000$		A-1-	, RSI/ 6 1 (6) (6)
	11.6	(7,917,78)		
	$=\frac{57}{1100}$		1000	00 × 30 0 0
	$=\frac{116}{116}$	(Isupate seed)	- 14.	
	≈ 0.49137931			
			1A	** 0.40
	≈ 0.491		IA	r.t. 0.49
	:: the standard score of Paper II < th	e standard soors of Dancy I	1081=120	
			1M	
	John did not perform better in Pape	er ii than in Paper I.		
			(4)	
(h)			dan salah	
(b)			1.4	1 6
	the new mean = 50.1 marks,	angrew range of	1A	u-1 for missing unit
	the new median = 50 marks,	ammarii broth	1A	u-1 for missing unit
	the new range = 91 marks.	ger blin de han gelê kemên kûn em û	1A	u-1 for missing unit
			(3)	
			734	
		(th = 5).	1	
		and the second		
		31	r al	
			D	
		(45 - 51 - 51	1786.00	

			Solution	Marks	Remarks
. ((a)	(i)	$CD = CE$ $\angle CED = \angle CDE = 36^{\circ}$ So, we have $\angle AEF = \angle CED = 36^{\circ}$	1A	u-1 for missing unit
		(ii)	$\angle ACB = \angle CDE + \angle CED = 36^{\circ} + 36^{\circ} = 72^{\circ}$ $\therefore AB = AC$ $\therefore \angle ABC = \angle ACB = 72^{\circ}$ $\therefore \angle BAC = 180^{\circ} - 72^{\circ} - 72^{\circ}$ $\therefore \angle BAC = 36^{\circ}$	1M 1A	u-1 for missing unit
- 14	(b)	(i)	In $\triangle AEF$, $\angle BFE = 36^{\circ} + 36^{\circ} = 72^{\circ}$ (ext. \angle of \triangle) $\therefore \angle AEF = 36^{\circ} = \angle EAF$	(3)	[Δ的外角]
			∴ $AF = EF$ (base ∠s equal) ∴ $AF = FB$		[底角相等] [等角對邊相等] [等角對等邊] [等腰 Δ 底角(等)的逆理
			$\therefore EF = FB$ $\angle FEB + \angle FBE + 72^{\circ} = 180^{\circ} \qquad (\angle \text{ sum of } \Delta)$		[△內角和]
			$\angle FEB = \angle FBE = \frac{180^{\circ} - 72^{\circ}}{2} = 54^{\circ}$ (base \angle s, isos. \triangle)	of relied or	[等腰△底角]
			$\angle AEB = 54^{\circ} + 36^{\circ} = 90^{\circ}$ Thus, $\angle AEB$ is a right angle.		pp-1 for missing unit
			Marking Scheme: Case 1 Any correct proof with correct reasons.	3	i – mitur von ndi – mitur was ndf
			Case 2 Any correct proof without reasons. Case 3 Incomplete proof with any one correct step and correct reason.	2 1	Document and and
		(ii)	$\cos 36^{\circ} = \frac{10}{AB}$	1M	
			$AB = \frac{10}{\cos 36^{\circ}}$ $AB \approx 12.36067977$ The required area $= \frac{1}{2} (AB)(AC) \sin 36^{\circ}$		
			$= \frac{1}{2} \left(\frac{10}{\cos 36^{\circ}} \right)^{2} \sin 36^{\circ} (\because AC = AB)$ $\approx \frac{1}{2} (12.36067977)^{2} \sin 36^{\circ}$ ≈ 44.9027966	1M	
			$\approx 44.9 \text{ cm}^2$	1A	u-1 for missing unit
			$\tan 36^{\circ} = \frac{BE}{10}$ and $\cos 36^{\circ} = \frac{10}{AB}$ $BE \approx 7.26542528$ and $AB \approx 12.36067977$ The required area $= \frac{1}{2} (AC)(BE)$	1M	either
			$= \frac{1}{2} \left(\frac{10}{\cos 36^{\circ}} \right) (10 \tan 36^{\circ}) (:: AC = AB)$ $\approx \frac{1}{2} (12.36067977) (7.26542528)$ ≈ 44.90279764	1M	
			$\approx 44.9 \text{ cm}^2$	1A	u-1 for missing unit

	Solution	Marks	Remarks
3. (a) (i)	Let the coordinates of E be (x, y) . Then, we have		
	$\begin{cases} x = \frac{2+8}{2} = 5\\ y = \frac{9+1}{2} = 5 \end{cases}$	in at a hin	
	$\begin{cases} 2\\ 9+1 \end{cases}$		
	$y = \frac{3}{2} = 5$	No total	
	So, the coordinates of E are $(5, 5)$.	1A	pp-1 for missing '(' or ')'
(ii)	: ABCD is a rhombus.		
	\therefore BD \perp AC		
	The slope of $AC = \frac{9-1}{2-8} = \frac{-4}{3}$		
	The slope of $BD = \frac{-1}{1} = \frac{3}{2}$	1M	
	The slope of $BD = \frac{-1}{\frac{-4}{3}} = \frac{3}{4}$		
	The equation of BD is		
	$y-5=\frac{3}{4}(x-5)$	1M	for point-slope form
	3x - 4y + 5 = 0	1A	or equivalent
		(4)	
(b) (i)	The slope of BC		±
	= the slope of AD		
	$=\frac{-1}{7}$	1M	
	The equation of BC is		
	$y-1=\frac{-1}{7}(x-8)$		*
	x + 7y - 15 = 0	1A	or equivalent
	∵ BC // AD		
	\therefore let the equation of BC be $x + 7y + c = 0$,	1M	
	where c is a constant.		
	Since $C(8, 1)$ lies on $x + 7y + c = 0$, we have $8 + 7(1) + c = 0$		
	c = -15	1A	
	Thus, the equation of BC is $x + 7y - 15 = 0$.	IA	
(ii)	Let the coordinates of B be (h, k) . Then, we have		
	$\begin{cases} 3h - 4k + 5 = 0 \\ h + 7k - 15 = 0 \end{cases}$		
	Therefore, we have $h = 1$ and $k = 2$.	1A	for both correct
	Thus, the coordinates of B are $(1, 2)$. The length of AB		
	$=\sqrt{(2-1)^2+(9-2)^2}$	1M	for distance formula
	$=\sqrt{50}$	1A	r.t. 7.07
	$=5\sqrt{2}$ units		

Remaiki	Solution	Marks	Remarks
20		WIT BY LITTLE	Soften Street to Int
$\begin{cases} 3h - 4k + 5 = \\ h + 7k - 65 = \end{cases}$ Therefore, we have	h = 9 and $k = 8$. test of D are $(9, 8)$.	1A	for both correct
The length of AE = the length of DC		and the second	and 6054 (ii)
$= \sqrt{(9-8)^2 + (8-1)^2}$	$\overline{)^2}$	1M	for distance formula
$= \sqrt{50}$ $= 5\sqrt{2} \text{ units}$		1A	r.t. 7.07
$= 5\sqrt{2}$ units		(5)	CAR TO SQUEEN I
			To nothing a set it
			ing (t) Thenland of oc
			Lin. In equita sell se
			30 soldings-off
		The same	COLUMN TO THE REAL PROPERTY OF THE PERTY OF
		Annual Control of the	d - made it (1 (1) to small
		-0.	- 179 +2
			Elemon
		Clark Of the	daga ah sadi).
			melhadas adetad (ii)
		0-	a mag
		(C,I) so C local	Harefore, on he Thus, the coordin
		64.	to discovered
			0) = 3(1-11), =
			Office State
			NAME OF TAXABLE PARTY.

$V = \pi r^{2}h$ $V = \pi (144 - \frac{h^{2}}{4})h$ $V = 144\pi h - \frac{\pi}{4}h^{3}$ $h^{3} - 576h + 2400 = 0$ Let $f(h) = h^{3} - 576h + 2400$ $f(4) = 160 > 0 \text{ and } f(5) = -355 < 0$ $a value of h lies between 4 and 5.$ (ii) $\frac{a}{4} + \frac{b}{4.5} + \frac{b}{4.5} + \frac{b}{4.5} + \frac{b}{4.88} + \frac{b}{4.25} + \frac{b}{4.375} + \frac{b}{36.3} + \frac{b}{4.25} + \frac{b}{4.3125} + \frac{b}{3.80}$ $\frac{4.25}{4.25} + \frac{4.3125}{4.3125} + \frac{4.3125}{4.3125} - \frac{3.80}{4.25} + \frac{4.3125}{4.3125} + \frac{5.80}{4.25} + \frac{4.3125}{4.3125} + \frac{5.80}{4.25} + \frac{4.3125}{4.3125} + \frac{5.80}{4.25} + \frac{5.80}{4.3125} + \frac{5.80}{4.25} + \frac{5.80}$	1A 1M	pp-1 for any undefined symbol or equivalent
$V = \pi r^2 h$ $V = \pi (144 - \frac{h^2}{4})h$ $V = 144\pi h - \frac{\pi}{4}h^3$ (b) (i) $600\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 2400 = 0$ Let $f(h) = h^3 - 576h + 2400$ $f(4) = 160 > 0 \text{ and } f(5) = -355 < 0$ $a \text{ value of } h \text{ lies between } 4 \text{ and } 5.$ (ii) $\frac{a}{4} + \frac{b}{4} + \frac{b}{4$	d a s	
$V = \pi (144 - \frac{h^2}{4})h$ $V = 144\pi h - \frac{\pi}{4}h^3$ (b) (i) $600\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 2400 = 0$ Let $f(h) = h^3 - 576h + 2400$ $f(4) = 160 > 0 \text{ and } f(5) = -355 < 0$ $a \text{ value of } h \text{ lies between } 4 \text{ and } 5.$ (ii) $\frac{a}{4} = \frac{b}{4.5} = \frac{4.5}{4.5} = \frac{101}{4.5}$ $\frac{4}{4.25} = \frac{4.5}{4.375} = \frac{4.375}{4.3125} = \frac{36.3}{4.25}$ $\frac{4.25}{4.25} = \frac{4.375}{4.3125} = \frac{4.3125}{4.3125}$ $\frac{4.25}{4.3125} = \frac{4.3125}{4.3125}$ Thus, $h \approx 4.3$ (correct to 1 decimal place) (c) $286\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 1144 = 0$ Let $g(h) = h^3 - 576h + 1144$ $g(2) = (2)^3 - 576(2) + 1144$ $= 0$ $1 \text{ Therefore, we have } (h-2)(h^2 + 2h - 572) = 0.$ So, we have $h = 2$ or $h = \sqrt{573} - 1$ (rejected).	1M	
(b) (i) $600\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 2400 = 0$ Let $f(h) = h^3 - 576h + 2400$ \therefore $f(4) = 160 > 0$ and $f(5) = -355 < 0$ \therefore a value of h lies between 4 and 5. (ii) $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		with r^2 substituted
(b) (i) $600\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 2400 = 0$ Let $f(h) = h^3 - 576h + 2400$ \therefore $f(4) = 160 > 0$ and $f(5) = -355 < 0$ \therefore a value of h lies between 4 and 5 . (ii) $ \begin{array}{c ccccc} & a & b & m = \frac{a+b}{2} & f(m) \\ \hline & (f(a) > 0) & (f(b) < 0) & m = \frac{a+b}{2} & 1011 \\ \hline & 4 & 5 & 4.5 & -1011 \\ \hline & 4 & 4.5 & 4.25 & +28.8 \\ \hline & 4.25 & 4.5 & 4.375 & -36.3 \\ \hline & 4.25 & 4.375 & 4.3125 & -3.80 \\ \hline & & 4.25 < h < 4.3125 & -3.80 \end{array} $ $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1	
$h^{3} - 576h + 2400 = 0$ Let $f(h) = h^{3} - 576h + 2400$ $f(4) = 160 > 0 \text{ and } f(5) = -355 < 0$ $a \text{ value of } h \text{ lies between } 4 \text{ and } 5.$ (ii) $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(3)	
Let $f(h) = h^3 - 576h + 2400$ \therefore $f(4) = 160 > 0$ and $f(5) = -355 < 0$ \therefore a value of h lies between 4 and 5. (ii) $ \begin{array}{c ccccc} & a & b & b & b & b & b \\ \hline & (f(a) > 0) & (f(b) < 0) & m = \frac{a+b}{2} & f(m) \\ \hline & 4 & 5 & 4.5 & -101 \\ \hline & 4 & 4.5 & 4.25 & +28.8 \\ \hline & 4.25 & 4.375 & 4.3125 & -36.3 \\ \hline & 4.25 & 4.375 & 4.3125 & -3.80 \\ \hline & 4.25 & 4.3125 & -3.80 \\ \hline & & 4.25 < h < 4.3125 \\ \hline & Thus, h \approx 4.3 (correct to 1 decimal place) (c) 286\pi = 144\pi h - \frac{\pi}{4}h^3h^3 - 576h + 1144 = 0Let g(h) = h^3 - 576h + 1144\Rightarrow g(2) = (2)^3 - 576(2) + 1144\Rightarrow 0\therefore 2 is a root of h^3 - 576h + 1144 = 0.Therefore, we have (h-2)(h^2 + 2h - 572) = 0.So, we have h = 2 or h = \sqrt{573} - 1 (rejected).$	o etatod vizid se	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	hana	accept omitting the conclusion
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		
4.25 4.5 4.375 - 36.3 4.25 4.375 4.3125 - 3.80 4.25 4.3125 Thus, $h \approx 4.3$ (correct to 1 decimal place) (c) $286\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 1144 = 0$ Let $g(h) = h^3 - 576h + 1144$ $g(2) = (2)^3 - 576(2) + 1144$ g(3) = 0 $g(3) = (3)^3 - 576h + 1144 = 0$ Therefore, we have $g(3) = (3)^3 - 576h + 1144 = 0$ Therefore, we have $g(3) = (3)^3 - 576h + 1144 = 0$ So, we have $g(3) = (3)^3 - 576h + 1144 = 0$.	1M	for testing sign of $f(m)$
$4.25 \qquad 4.3125$ $\therefore 4.25 < h < 4.3125$ Thus, $h \approx 4.3$ (correct to 1 decimal place) (c) $286\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 1144 = 0$ Let $g(h) = h^3 - 576h + 1144$ $\therefore g(2) = (2)^3 - 576(2) + 1144$ $= 0$ $\therefore 2 \text{ is a root of } h^3 - 576h + 1144 = 0.$ Therefore, we have $(h-2)(h^2 + 2h - 572) = 0$. So, we have $h = 2$ or $h = \sqrt{573} - 1$ (rejected).	1M	for choosing the correct interval
Thus, $h \approx 4.3$ (correct to 1 decimal place) (c) $286\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 1144 = 0$ Let $g(h) = h^3 - 576h + 1144$ $\therefore g(2) = (2)^3 - 576(2) + 1144$ $= 0$ $\therefore 2 \text{ is a root of } h^3 - 576h + 1144 = 0.$ Therefore, we have $(h-2)(h^2 + 2h - 572) = 0$. So, we have $h = 2$ or $h = \sqrt{573} - 1$ (rejected).	W	
(c) $286\pi = 144\pi h - \frac{\pi}{4}h^3$ $h^3 - 576h + 1144 = 0$ Let $g(h) = h^3 - 576h + 1144$ $g(2) = (2)^3 - 576(2) + 1144$ g(3) = 0 $g(3) = (2)^3 - 576(2) + 1144$ g(3) = 0 $g(3) = (2)^3 - 576h + 1144 = 0$ Therefore, we have $g(4h - 2)(h^2 + 2h - 572) = 0$.	1A (4)	f.t.
$g(2) = (2)^3 - 576(2) + 1144$ $= 0$ $\therefore 2 \text{ is a root of } h^3 - 576h + 1144 = 0.$ Therefore, we have $(h-2)(h^2 + 2h - 572) = 0$. So, we have $h = 2$ or $h = \sqrt{573} - 1$ or $h = -\sqrt{573} - 1$ (rejected).		
Therefore, we have $(h-2)(h^2+2h-572)=0$. So, we have $h=2$ or $h=\sqrt{573}-1$ or $h=-\sqrt{573}-1$ (rejected).	1M	for attempting to find a root by substitution
	M+1A 1A (4)	1M for $(h-2)(ah^2 + bh + c) = 0$ for both correct u-1 for missing unit
M1 - M2 -	- P-0	Refrontact
The partie of the later of the	in.	

			Solution	Marks	Remarks
• //	(a)	(i)	The perimeter of F_{10} = 8 + (10 - 1)(4) = 44 cm	1A 1A	u-1 for missing unit
		(ii)	$\frac{n}{2}(2(8) + (n-1)(4)) \le 1000$	1A	for correct sum of AP
			$n^2 + 3n - 500 \le 0$ -23.91093483 \le n \le 20.91093483 Thus, the required number of distinct square frames is 20.	1M 1A (5)	
	(b)		$V_1 \text{ cm}^3$, $V_2 \text{ cm}^3$ and $V_3 \text{ cm}^3$ be the volumes of S_1 , S_2 and S_3 ectively.		pp-1 for any undefined symbol
		(i)	Note that the perimeters of F_2 and F_3 are 12 cm and 16 cm respectively. So, we have		
			$\frac{V_1}{V_2} = \left(\frac{8}{12}\right)^3 = \left(\frac{2}{3}\right)^3 \text{and} \frac{V_2}{V_3} = \left(\frac{12}{16}\right)^3 = \left(\frac{3}{4}\right)^3$	1A	for either one
			$\frac{V_1}{V_2} = \frac{8}{27}$ and $\frac{V_2}{V_3} = \frac{27}{64}$ $\frac{V_1}{V_2} \neq \frac{V_2}{V_3}$	il how to	
			V_2 V_3 Thus, the volumes of S_1 , S_2 , S_3 do not form a geometric sequence.	1M	f.t.
		(ii)	The length of each side of the base of $S_1 = \frac{8}{4} = 2 \text{ cm}$		
			The length of each diagonal of the base of $S_1 = \sqrt{2^2 + 2^2} = 2\sqrt{2}$ cm The height of $S_1 = \sqrt{5^2 - (\sqrt{2})^2} = \sqrt{23}$ cm	1M	5 cm /
			$V_1 = \frac{1}{3}(2)^2 \sqrt{23}$	1M	2 cm
			$V_1 = \frac{4}{3}\sqrt{23}$	Tyr trops	
			$\frac{V_3}{V_1} = \left(\frac{16}{8}\right)^3 = 8$	1A	can be absorbed
			$V_3 = 8\left(\frac{4}{3}\sqrt{23}\right) = \frac{32}{3}\sqrt{23}$	1A	December 1 and 1 a
			Thus, the volumes of S_3 is $\frac{32}{3}\sqrt{23}$ cm ³ .		u-1 for missing unit
			The length of each slant edge of $S_3 = 5\left(\frac{16}{8}\right) = 10 \text{ cm}$	1A	can be absorbed
			The length of each side of the base of $S_3 = \frac{16}{4} = 4 \text{ cm}$		So, sie terre de 2 de Transille Selfat of the
			The length of each diagonal of the base of $S_3 = \sqrt{4^2 + 4^2} = 4\sqrt{2}$ cm The height of $S_3 = \sqrt{10^2 - (2\sqrt{2})^2} = 2\sqrt{23}$ cm	1M	
			$V_3 = \frac{1}{3}(16)(2\sqrt{23}) = \frac{32}{3}\sqrt{23}$	1M+1A	
			Thus, the volumes of S_3 is $\frac{32}{3}\sqrt{23}$ cm ³ .		u-1 for missing unit

	Solution		Marks	Remarks
N/ 1: C.L	for (a) and (b) .			
	eme for (a) and (b): y correct proof with correct	t reasons	3	Liberturne III (6) T
	y correct proof without rea		2	The state of the s
Case 3 Inc	omplete proof with any on	e correct step and one correct reason.	1	10E mix 0C = "12"
(a) In $\triangle ADE$	and $\triangle BOE$			20 01 = 193
	= ∠DBC	(alt. \angle s, $OD//BC$)		[錯角, OD//BC]
	= ∠BOE	(∠ in alt. segment)		[交錯弓形的圓周角][弦切角定理
	= ∠OBE	(ext. ∠, cyclic quad.)		[圓內接四邊形外角]
	= BO	(given)		[已知]
∴ ΔADE		(ASA)		
ΔADE	± ΔDUE	(ASA)	(3)	and the second second
			(3)	
(b) <i>AE</i>	=BE	(by (a))		
∠AOE	= ∠BOE	(equal chords, equal ∠s)		[等弦對等角]
∠BEO	= ∠AED	(by (a))		
	= ∠AOB	(ext. ∠, cyclic quad.)		[圓內接四邊形外角]
	$= \angle AOE + \angle BOE$. 39	
	= 2∠ <i>BOE</i>		- Wilan	a Charles Land
F	DE = OE	(by (a))		
	$1DE = \angle AOE$	(base \angle s, isos. \triangle)		[等腰△底角]
4	$ADE = \angle BOE$	(by (a))		
Hence, Z	$AOE = \angle BOE$	A grant and a grant and a		
Thus, ∠I	$BEO = \angle AOE + \angle ADE$	(ext. \angle of \triangle)		[△的外角]
	= 2∠ <i>BOE</i>			
$\angle BC$	JE + ZDEU + ZUDE = 10	0°		
∠B0 Thus (ii) Note	$DE + \angle BEO + \angle OBE = 18$ $DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ $BOE + 2AOE = 30^{\circ}$ $COE + AOE $	$(6,2\sqrt{3})$. Then,	1A 1A	
∠B0 Thus (ii) Note th	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ $E = 30^{\circ}$ that $E = (6, 6 \tan 30^{\circ}) = 0$ the coordinates of the centre	$(6,2\sqrt{3})$. Then,		either one
$\angle BC$ Thus (ii) Note th $= (\frac{6}{2})^{\frac{1}{2}}$	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ $E + ABOE = 30^{\circ}$ $E + ABOE = $	$(6,2\sqrt{3})$. Then, e of the circle <i>OAEB</i>	1A	either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ $E + 2\angle BOE = 30^{\circ}$ That $E = (6, 6 \tan 30^{\circ}) = 6$ The coordinates of the centre $\frac{1+0}{2}, \frac{2\sqrt{3}+0}{2}) = (3, \sqrt{3})$ $E + 10^{\circ}, \frac{10^{\circ}}{2}, \frac{10^{\circ}}{$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$		either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ $E + 2\angle BOE = 30^{\circ}$ That $E = (6, 6 \tan 30^{\circ}) = 6$ The coordinates of the centre $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1}{2} = \frac{1}{2} = \frac{1}{2}$ The radius of the circle of the	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is	1A	either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ $E + 2\angle BOE = 30^{\circ}$ That $E = (6, 6 \tan 30^{\circ}) = 6$ The coordinates of the centre $\frac{1+0}{2}, \frac{2\sqrt{3}+0}{2}) = (3, \sqrt{3})$ $E + 10^{\circ}, \frac{10^{\circ}}{2}, \frac{10^{\circ}}{$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is	1A	either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ $E + 2\angle BOE = 30^{\circ}$ That $E = (6, 6 \tan 30^{\circ}) = 6$ The coordinates of the centre $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1}{2} = \frac{1}{2} = \frac{1}{2}$ The radius of the circle of the	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is	1A 1M	either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is, $\angle BOE = 30^{\circ}$ whether $E = (6, 6 \tan 30^{\circ}) = 6$ is coordinates of the centre $\frac{1+0}{2}$, $\frac{2\sqrt{3}+0}{2}$) = $(3, \sqrt{3})$ is, the radius of the circle $(x-3)^2 + (y-\sqrt{3})^2 = (2x^2 + y^2 - 6x - 2\sqrt{3}y = 0)$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ the $OAEB$ is $\sqrt{3}$) ²	1A 1M	either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ c , $\angle BOE = 30^{\circ}$ That $E = (6, 6 \tan 30^{\circ}) = 6$ the coordinates of the centre $(x+0)$,	$(6, 2\sqrt{3})$. Then, the of the circle $OAEB$ and $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ and $OAEB$ is $OAEB$ is through the origin.	1M 1A	either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is, $\angle BOE = 30^{\circ}$ In that $E = (6, 6 \tan 30^{\circ}) = 6$ the coordinates of the centre $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the circle $(0.00, 0.00) = (0.00)$ is the circle $(0.00, 0.00) = (0.00)$ is the circle $(0.00, 0.00) = (0.00)$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is $\sqrt{3}$) ² through the origin. ecle $OAEB$ be $x^2 + y^2 + ax + by = 0$.	1A 1M	either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^\circ = 180^\circ$ is, $\angle BOE = 30^\circ$ In that $E = (6, 6 \tan 30^\circ) = 6$ the coordinates of the centre $(6, 6, 6 \tan 30^\circ) = (3, \sqrt{3})$ is, the radius of the circle $(6, 6 \tan 30^\circ) = (3, \sqrt{3})$ is, the radius of the circle $(6, 6 \tan 30^\circ) = (3, \sqrt{3})$ is, the radius of the circle $(6, 6 \tan 30^\circ) = (3, \sqrt{3})$ is, the radius of the circle $(6, 6 \tan 30^\circ) = (3, \sqrt{3})$ is, the radius of the circle $(6, 6 \tan 30^\circ) = (3, \sqrt{3})$ is the circle $(6, 6 \tan 30^\circ) = (3, \sqrt{3})$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is $\sqrt{3}$) ² through the origin. ecle $OAEB$ be $x^2 + y^2 + ax + by = 0$.	1M 1A	either one
$\angle BC$ Thus $(ii) \text{ Note}$ th $= (\frac{6}{2})$ Also	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is, $\angle BOE = 30^{\circ}$ In that $E = (6, 6 \tan 30^{\circ}) = 6$ the coordinates of the centre $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the radius of the circle $(0.00, 0.00) = (0.00)$ is, the circle $(0.00, 0.00) = (0.00)$ is the circle $(0.00, 0.00) = (0.00)$ is the circle $(0.00, 0.00) = (0.00)$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is $\sqrt{3}$) ² through the origin. ecle $OAEB$ be $x^2 + y^2 + ax + by = 0$.	1M 1A	either one
∠BC Thus (ii) Note th = (6 Also Hence	$2E + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is, $\angle BOE = 30^{\circ}$ In that $E = (6, 6 \tan 30^{\circ}) = 6$ The coordinates of the centre $\frac{1+0}{2}$, $\frac{2\sqrt{3}+0}{2}$) = $(3, \sqrt{3})$ In the radius of the circle of the circle of the equation of the circle $(x-3)^2 + (y-\sqrt{3})^2 = (2x^2 + y^2 - 6x - 2\sqrt{3}y = 0)$ The circle $OAEB$ passes let the equation of the circle the coordinates of $B = (6 + 6^2 + 0^2 + a(6) + b(0) = 0$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is $\sqrt{3}$) ² through the origin. ecle $OAEB$ be $x^2 + y^2 + ax + by = 0$.	1M 1A	either one
∠BC Thus (ii) Note th = (6 Also Hence	$2E + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is, $\angle BOE = 30^{\circ}$ In that $E = (6, 6 \tan 30^{\circ}) = 6$ The coordinates of the centre $\frac{1}{2} + 0$, $\frac{2\sqrt{3} + 0}{2} = (3, \sqrt{3})$ In the radius of the circle of the	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ $CAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ $AEB = \sqrt{3}$	1A 1M 1A	either one
∠BC Thus (ii) Note th = (6 Also Hence	$2E + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is, $\angle BOE = 30^{\circ}$ In that $E = (6, 6 \tan 30^{\circ}) = 6$ The coordinates of the centre $(0, 0) = (0, 1)$ In the radius of the circle of the radius of the circle of the equation of the circle $(x-3)^2 + (y-\sqrt{3})^2 = (2x^2 + y^2 - 6x - 2\sqrt{3}y = 0)$ The circle $OAEB$ passes let the equation of the circle the coordinates of $B = (66^2 + 0^2 + a(6) + b(0) = 0)$ We have $a = -6$. The coordinates of $E = (66^2 + 6$	(6, $2\sqrt{3}$). Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is $\sqrt{3}$) ² through the origin. rcle $OAEB$ be $x^2 + y^2 + ax + by = 0$. 5, 0)	1A 1M 1A	either one
∠BC Thus (ii) Note th = (6 Also Hence ∴ ∴ ∴ ∴ So, ∴ ∴	$DE + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is, $\angle BOE = 30^{\circ}$ what $E = (6, 6 \tan 30^{\circ}) = 6$ that $E = (6, 6 \tan 30^{\circ}) = 6$ the coordinates of the centre $(x + 0) = (3, \sqrt{3})$ is, the radius of the circle of the equation of the circle $(x - 3)^2 + (y - \sqrt{3})^2 = (2x^2 + y^2 - 6x - 2\sqrt{3}y = 0)$ The circle $OAEB$ passes let the equation of the circle the coordinates of $B = (66^2 + 0^2 + a(6) + b(0) = 0)$ where $a = -6$. The coordinates of $E = (66^2 + (2\sqrt{3})^2 - 6(6) + b(26^2 + (2$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is $\sqrt{3}$) ² through the origin. rcle $OAEB$ be $x^2 + y^2 + ax + by = 0$. $(5, 6 \tan 30^\circ) = (6, 2\sqrt{3})$ $(5, 6 \tan 30^\circ) = (6, 2\sqrt{3})$	1A 1M 1A 1M	either one
∠BC Thus (ii) Note th = (6 Also Hence ∴ ∴ ∴ ∴ So, ∴ ∴	$2E + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is, $\angle BOE = 30^{\circ}$ In that $E = (6, 6 \tan 30^{\circ}) = 6$ The coordinates of the centre $(0, 0) = (0, 1)$ In the radius of the circle of the radius of the circle of the equation of the circle $(x-3)^2 + (y-\sqrt{3})^2 = (2x^2 + y^2 - 6x - 2\sqrt{3}y = 0)$ The circle $OAEB$ passes let the equation of the circle the coordinates of $B = (66^2 + 0^2 + a(6) + b(0) = 0)$ We have $a = -6$. The coordinates of $E = (66^2 + 6$	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is $\sqrt{3}$) ² through the origin. rcle $OAEB$ be $x^2 + y^2 + ax + by = 0$. $(5, 6 \tan 30^\circ) = (6, 2\sqrt{3})$ $(5, 6 \tan 30^\circ) = (6, 2\sqrt{3})$	1A 1M 1A	either one
∠BC Thus (ii) Note th = (6 Also Hene So, The	$2E + 2\angle BOE + 90^{\circ} = 180^{\circ}$ is that $E = (6, 6 \tan 30^{\circ}) = 6$ is coordinates of the centre $\frac{1+0}{2}$, $\frac{2\sqrt{3}+0}{2}$) = $(3, \sqrt{3})$ is the radius of the circle of the equation of the circle $(x-3)^2 + (y-\sqrt{3})^2 = (2x^2 + y^2 - 6x - 2\sqrt{3}y = 0)$ The circle $OAEB$ passes let the equation of the circle the coordinates of $B = (6 + 6^2 + 6^2 + a(6) + b(0) = 0)$ where $a = -6$. The coordinates of $E = (6 + 6^2 + (2\sqrt{3})^2 - 6(6) + b(2))$ where $a = -6$ is the coordinates of $a = (6 + 6^2 + (2\sqrt{3})^2 - 6(6) + b(2))$ is the coordinates of $a = (6 + 6^2 + (2\sqrt{3})^2 - 6(6) + b(2))$ is the coordinates of $a = (6 + 6^2 + (2\sqrt{3})^2 - 6(6) + b(2))$ is the coordinates of $a = (6 + 6^2 + (2\sqrt{3})^2 - 6(6) + b(2))$ is that $a = (6 + 6 + 6)$ and $a = (6 + 6)$ and a	$(6, 2\sqrt{3})$. Then, e of the circle $OAEB$ $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$ cle $OAEB$ is $\sqrt{3}$) ² through the origin. rcle $OAEB$ be $x^2 + y^2 + ax + by = 0$. $(5, 6 \tan 30^\circ) = (6, 2\sqrt{3})$ $(5, 6 \tan 30^\circ) = (6, 2\sqrt{3})$	1A 1M 1A 1M	either one

	Solution	Marks	Remarks
	FF'	· · · · · · · · · · · · · · · · · · ·	Tates) envelopment and
7. (a) (i)	$\sin 30^{\circ} = \frac{FF'}{20}$	1M	
	$FF' = 20 \sin 30^{\circ}$	amena timuliye la	either one
	<i>FF'</i> = 10 m	1A	u-1 for missing unit
	$\cos 30^{\circ} = \frac{EF'}{20}$		Office and Bostal of 10
		2 30 100 (23 A)	
	$EF' = 20\cos 30^{\circ}$	T have aftern a tree A	
	$EF' = 10\sqrt{3}$	Lands	<i>EF</i> ′≈ 17.32050808
	$\tan 60^{\circ} = \frac{FF'}{AF'}$	1M	with FF' substituted
	$AF' = \frac{10}{\tan 60^{\circ}}$	Total Control	100 may 200 miles
	tan 60°	N. Barres of and Schools 1	30th = 30th
	$AF' = \frac{10\sqrt{3}}{3}$		AF'≈ 5.773502692
		Line allows to me I	KONA -
	$AE^2 = AF'^2 + EF'^2$	108	# \$090x #
	$AE^2 = (\frac{10\sqrt{3}}{3})^2 + (10\sqrt{3})^2$	1M	30235=
			No. of the last of
	$AE = \frac{10\sqrt{30}}{3} \mathrm{m}$	1A	u−1 for missing unit
	3		
			r.t. 18.3 m, $AE \approx 18.25741858$ n
	FF'	(20 pt 2 pt) (100 pt)	The second of the second
(ii)	$\sin 60^{\circ} = \frac{FF'}{AF}$		
	10		
	$AF = \frac{10}{\sin 60^{\circ}}$	- 1510 place in by the	MERCHANICAL CO. INC.
	$20\sqrt{3}$		
	$AF = \frac{20\sqrt{3}}{3}$	100	AF ≈ 11.54700538
	By cosine formula, we have	787 7974	AND CARREST
	$\cos \angle AEF = \frac{EF^2 + AE^2 - AF^2}{2EF \cdot AE}$		o Distriction possible and
	$\cos \angle AEF = {2EF \cdot AE}$	and the second	
	$20^{2} + \left(\frac{10\sqrt{30}}{20}\right)^{2} - \left(\frac{20\sqrt{3}}{20}\right)^{2}$	\int_{0}^{2}	TO SECURE AND LINES
	20 1 2	BANK BERKER BURKER DE	
	$\cos \angle AEF = \frac{3}{(10\sqrt{20})}$)1M	$\cos \angle AEF \approx \frac{20^2 + 18.25741858^2 - 11.54700538^2}{2(20)(18.25741858)}$
	$\cos \angle AEF = {(2)(20)\left(\frac{10\sqrt{30}}{3}\right)}$		
	3)	their teleport to be presented on the service	substant to the conflict
	$\cos \angle AEF = \frac{3\sqrt{30}}{20}$	and the diele OAEH IS	cos ∠AEF ≈ 0.821583836
		(6.2 - 10.5)	COS ZAEI ~ 0.021303030
	∠AEF ≈ 34.75634244°	4.70,000	Strate
	∠AEF ≈ 34.8°	1A	u-1 for missing unit r.t. 34.8°
		(7)	
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Solution	Marks	Remarks
Let $t_{\rm red}$ s and $t_{\rm yellow}$ s be the time required for the red toy car and the yellow toy car to reach B respectively. Then, we have $BE = 2t_{\rm red}$ and $BF = 3t_{\rm yellow}$		
By sine formula, we have		
$\frac{BE}{\sin 20^{\circ}} \approx \frac{BF}{\sin(180^{\circ} - 34.75634244^{\circ})}$	1M	
$\frac{2t_{\text{red}}}{\sin 20^{\circ}} \approx \frac{3t_{\text{yellow}}}{\sin 34.75634244^{\circ}}$		
$\frac{t_{\text{yellow}}}{t_{\text{red}}} \approx \frac{2\sin 34.75634244^{\circ}}{3\sin 20^{\circ}}$	1M	for attempting to find $\frac{t_{\text{yellow}}}{t_{\text{red}}}$
$\frac{t_{\text{yellow}}}{t_{\text{red}}} \approx 1.111216642$		$\frac{t_{\rm red}}{t_{\rm yellow}} \approx 0.899914528$
$\frac{t_{\text{yellow}}}{t_{\text{red}}} \approx 1.11$	1A	accept $\frac{t_{\rm red}}{t_{\rm yellow}} \approx 0.900$ and can be absorbed
$\frac{t_{\text{yellow}}}{t_{\text{red}}} > 1$		$\frac{t_{\text{red}}}{t_{\text{yellow}}} < 1$
Thus, $t_{\text{yellow}} > t_{\text{red}}$		$t_{\rm red} < t_{ m yellow}$
So, the yellow toy car will not reach the point B before the red toy car.	1A	f.t.
∠EBF ≈ 34.75634244° – 20° ≈ 14.75634244° By sine formula, we have $\frac{BE}{\sin 20^{\circ}} = \frac{20}{\sin \angle EBF} \text{ and } \frac{BF}{\sin (180^{\circ} - 34.75634244^{\circ})} \approx \frac{20}{\sin \angle EBF}$	1M	either with $\angle EBF$ substituted
$BE \approx \frac{20 \sin 20^{\circ}}{\sin 14.75634244^{\circ}}$ and $BF \approx \frac{20 \sin 34.75634244^{\circ}}{\sin 14.75634244^{\circ}}$ $BE \approx 26.85575694$ and $BF \approx 44.76384605$ Let t_{red} s and t_{yellow} s be the time required for the red toy car and the		
yellow toy car to reach B respectively. Then, we have $BE = 2t_{red}$ and $BF = 3t_{yellow}$		
$t_{\text{red}} \approx \frac{26.85575694}{2}$ and $t_{\text{yellow}} \approx \frac{44.76384605}{3}$	1M	for both
$t_{\rm red} \approx 13.42787847$ and $t_{\rm yellow} \approx 14.92128202$ $t_{\rm red} \approx 13.4$ and $t_{\rm yellow} \approx 14.9$	1A	for either (can be absorbed)
Thus, $t_{\text{yellow}} > t_{\text{red}}$ So, the yellow toy car will not reach the point B before the red toy car.	1A	f.t.
	(1)	