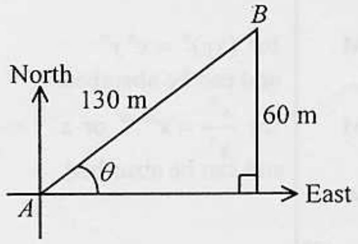
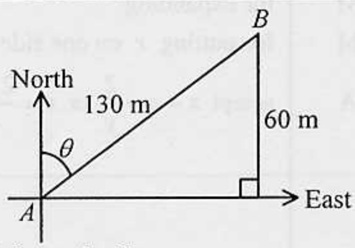
Solution	Marks	Remarks
1. $\dfrac{(a^{-1}b)^3}{b^2} = \dfrac{a^{-3}b^3}{b^2}$	1M	for $(xy)^n = x^n y^n$ and can be absorbed
$= a^{-3}b$	1M	for $\dfrac{x^m}{x^n} = x^{m-n}$ or $x^{-n} = \dfrac{1}{x^n}$ and can be absorbed
$= \dfrac{b}{a^3}$	1A	
	----------(3)	
2. $y = \dfrac{2}{a-x}$		
$y(a-x) = 2$		
$ay - xy = 2$	1M	for expanding
$-xy = 2 - ay$	1M	for putting x on one side
$x = \dfrac{ay-2}{y}$	1A	accept $x = a - \dfrac{2}{y}$ or $x = \dfrac{2-ay}{-y}$
$y = \dfrac{2}{a-x}$		
$y(a-x) = 2$		
$a - x = \dfrac{2}{y}$	1M	for making $a-x$ the subject
$-x = \dfrac{2}{y} - a$	1M	for putting x on one side
$x = a - \dfrac{2}{y}$	1A	accept $x = \dfrac{ay-2}{y}$ or $x = \dfrac{2-ay}{-y}$
	----------(3)	
3. The amount $= \$\,5\,000\,(1+2\%)^3$	1A	u–1 for missing unit r.t. $\$\,5\,306$
The required interest $= 5\,000\,(1+2\%)^3 - 5000$	1M	for $5\,000\,(1+r\%)^n - 5000$ $(n \geq 2)$
$= 306.04$		
$\approx \$\,306$	1A	u–1 for missing unit
	----------(3)	
4. Since $(a, 0)$ lies on $y = -x^2 + 10x - 25$, we have		
$-a^2 + 10a - 25 = 0$	1M	for putting $y = 0$
$-(a-5)^2 = 0$		
$a = 5$	1A	
$b = -25$	1A	
	----------(3)	

Solution	Marks	Remarks
5. 		
Refer to the figure,		
$\sin\theta = \dfrac{60}{130}$	1M	pp−1 for any undefined symbol
$\theta \approx 27.48642625°$		
$\theta \approx 27.5°$	1A	u−1 for missing unit r.t. 27.5°
Thus, the bearing of B from A is N62.5°E .	1M	accept 063 , 062.5° or N62°31'E
		
Refer to the figure,		
$\cos\theta = \dfrac{60}{130}$	1M	pp−1 for any undefined symbol
$\theta \approx 62.51357375°$		
$\theta \approx 62.5°$	1A	u−1 for missing unit r.t. 27.5°
Thus, the bearing of B from A is N62.5°E .	1M	accept 063 , 062.5° or N62°31'E
	----------(3)	
6. (a) $a^2 - ab + 2a - 2b$		
$= a(a-b) + 2(a-b)$ $\quad$ $= a(a+2) - b(a+2)$	1M	for taking out a common factor or using cross-method
$= (a+2)(a-b)$	1A	
(b) $169y^2 - 25$		
$= (13y)^2 - 5^2$		
$= (13y+5)(13y-5)$	1M+1A	
	----------(4)	
7. Let the number of oranges bought be x .		pp−1 for any undefined symbol
Then, the number of apples bought will be $20-x$.	1A	
Now, $2x + 3(20-x) = 46$	1M+1A	1M for $2x+3(20-x)$
Solving, we have		
$x = 14$.	1A	
Thus, the number of oranges bought is 14 .		
Let x and y be the number of oranges and the number of apples bought respectively. Then, we have		pp−1 for any undefined symbol
$\begin{cases} x + y = 20 \\ 2x + 3y = 46 \end{cases}$	1A+1A	
Then, we have $2x + 3(20-x) = 46$.	1M	for leaving x or y only
Solving, we have $x = 14$.	1A	
Thus, the number of oranges bought is 14 .		
	----------(4)	

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

Solution	Marks	Remarks
10. (a) Let $y = ax^2 + bx$, where a and b are non-zero constants.	1A	pp−1 for writing $y \propto ax^2 + bx$
When $x = 3$, $y = 3$, so we have $9a + 3b = 3$ $3a + b = 1$ .... (1) When $x = 4$, $y = 12$, so we have $16a + 4b = 12$ $4a + b = 3$ .... (2)	1M	for substitution (either)
Solving (1) and (2), we have	1M	for solving
$\begin{cases} a = 2 \\ b = -5 \end{cases}$	1A	for both correct
$\therefore$ $y = 2x^2 - 5x$		
	----------(4)	
(b) When $y < 42$, we have $2x^2 - 5x < 42$ (by (a))	1M	
Therefore, we have $2x^2 - 5x - 42 < 0$ $(2x + 7)(x - 6) < 0$	1A	for factorization or finding roots
$\frac{-7}{2} < x < 6$	1M	
Since x is an integer, we have $x =$ −3 , −2 , −1 , 0 , 1 , 2 , 3 , 4 or 5 .	1A	
Thus, all the possible values of x are −3 , −2 , −1 , 0 , 1 , 2 , 3 , 4 and 5 .		
	----------(4)	

Solution	Marks	Remarks
11. (a) The standard score of Paper I		
$= \dfrac{54-46.1}{15.2}$	1A	either one
$= \dfrac{79}{152}$		
≈ 0.519736842		
≈ 0.520	1A	r.t. 0.52
The standard score of Paper II		
$= \dfrac{66-60.3}{11.6}$		
$= \dfrac{57}{116}$		
≈ 0.49137931		
≈ 0.491	1A	r.t. 0.49
$\because$ the standard score of Paper II $<$ the standard score of Paper I		
$\therefore$ John did not perform better in Paper II than in Paper I .	1M	
	----------(4)	
(b) After the mark adjustment,		
the new mean = 50.1 marks ,	1A	u−1 for missing unit
the new median = 50 marks ,	1A	u−1 for missing unit
the new range = 91 marks .	1A	u−1 for missing unit
	----------(3)	

Solution	Marks	Remarks
12. (a) (i) $\because\ CD = CE$		
$\therefore\ \angle CED = \angle CDE = 36°$		
So, we have $\angle AEF = \angle CED = 36°$	1A	u−1 for missing unit
(ii) $\angle ACB = \angle CDE + \angle CED = 36° + 36° = 72°$		
$\because\ AB = AC$		
$\therefore\ \angle ABC = \angle ACB = 72°$		
$\because\ \angle BAC = 180° - 72° - 72°$	1M	
$\therefore\ \angle BAC = 36°$	1A	u−1 for missing unit
	----------(3)	
(b) (i) In ΔAEF,		
$\angle BFE = 36° + 36° = 72°$ (ext. $\angle$ of Δ)		[Δ的外角]
$\because\ \angle AEF = 36° = \angle EAF$		
$\therefore\ AF = EF$ (base $\angle$s equal)		[底角相等] [等角對邊相等] [等角對等邊] [等腰Δ底角(等)的逆理]
$\because\ AF = FB$		
$\therefore\ EF = FB$		
$\angle FEB + \angle FBE + 72° = 180°$ ($\angle$ sum of Δ)		[Δ內角和]
$\angle FEB = \angle FBE = \dfrac{180° - 72°}{2} = 54°$ (base $\angle$s, isos. Δ)		[等腰Δ底角]
$\angle AEB = 54° + 36° = 90°$		pp−1 for missing unit
Thus, $\angle AEB$ is a right angle.		
Marking Scheme :		
Case 1 Any correct proof with correct reasons.	3	
Case 2 Any correct proof without reasons.	2	
Case 3 Incomplete proof with any one correct step and correct reason.	1	
(ii) $\cos 36° = \dfrac{10}{AB}$	1M	
$AB = \dfrac{10}{\cos 36°}$		
$AB \approx 12.36067977$		
The required area		
$= \dfrac{1}{2}(AB)(AC)\sin 36°$		
$= \dfrac{1}{2}\left(\dfrac{10}{\cos 36°}\right)^2 \sin 36°$ ($\because\ AC = AB$)	1M	
$\approx \dfrac{1}{2}(12.36067977)^2 \sin 36°$		
≈ 44.9027966		
$\approx 44.9\ \text{cm}^2$	1A	u−1 for missing unit
$\tan 36° = \dfrac{BE}{10}$ and $\cos 36° = \dfrac{10}{AB}$	1M	either
$BE \approx 7.26542528$ and $AB \approx 12.36067977$		
The required area		
$= \dfrac{1}{2}(AC)(BE)$		
$= \dfrac{1}{2}\left(\dfrac{10}{\cos 36°}\right)(10\tan 36°)$ ($\because\ AC = AB$)	1M	
$\approx \dfrac{1}{2}(12.36067977)(7.26542528)$		
≈ 44.90279764		
$\approx 44.9\ \text{cm}^2$	1A	u−1 for missing unit
	----------(6)	

Solution	Marks	Remarks
13. (a) (i) Let the coordinates of E be (x, y). Then, we have $\begin{cases} x = \dfrac{2+8}{2} = 5 \\ y = \dfrac{9+1}{2} = 5 \end{cases}$		
So, the coordinates of E are $(5, 5)$.	1A	pp−1 for missing '(' or ')'
(ii) $\because$ $ABCD$ is a rhombus. $\therefore$ $BD \perp AC$ The slope of AC $= \dfrac{9-1}{2-8} = \dfrac{-4}{3}$		
The slope of BD $= \dfrac{-1}{\dfrac{-4}{3}} = \dfrac{3}{4}$	1M	
The equation of BD is $y - 5 = \dfrac{3}{4}(x-5)$	1M	for point-slope form
$3x - 4y + 5 = 0$	1A	or equivalent
	----------(4)	
(b) (i) The slope of BC = the slope of AD $= \dfrac{-1}{7}$	1M	
The equation of BC is $y - 1 = \dfrac{-1}{7}(x-8)$ $x + 7y - 15 = 0$	1A	or equivalent
$\because$ $BC \,//\, AD$ $\therefore$ let the equation of BC be $x + 7y + c = 0$, where c is a constant.	1M	
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 $x + 7y - 15 = 0$.		
(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
$= \sqrt{50}$ $= 5\sqrt{2}$ units	1A	r.t. 7.07

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Solution	Marks	Remarks
Let the coordinates of D be (h, k). Then, we have		
$\begin{cases} 3h-4k+5=0 \\ h+7k-65=0 \end{cases}$		
Therefore, we have $h=9$ and $k=8$.	1A	for both correct
Thus, the coordinates of D are $(9, 8)$.		
The length of AB		
= the length of DC		
$=\sqrt{(9-8)^2+(8-1)^2}$	1M	for distance formula
$=\sqrt{50}$	1A	r.t. 7.07
$=5\sqrt{2}$ units		
	-----------(5)	

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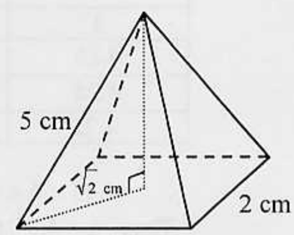
Solution	Marks	Remarks
14. (a) Let r cm be the radius of the base of the cylinder.		pp−1 for any undefined symbol
$(2r)^2 + h^2 = ((12)(2))^2$	1A	or equivalent
$4r^2 + h^2 = 576$		
$r^2 = 144 - \frac{h^2}{4}$		
$V = \pi r^2 h$		
$V = \pi(144 - \frac{h^2}{4})h$	1M	with r^2 substituted
$V = 144\pi h - \frac{\pi}{4}h^3$	1	
	----------(3)	
(b) (i) $600\pi = 144\pi h - \frac{\pi}{4}h^3$		
$h^3 - 576h + 2400 = 0$		
Let $f(h) = h^3 - 576h + 2400$		
$\because$ $f(4) = 160 > 0$ and $f(5) = -355 < 0$		
$\therefore$ a value of h lies between 4 and 5 .	1	accept omitting the conclusion

(ii)

a $(f(a) > 0)$	b $(f(b) < 0)$	$m = \frac{a+b}{2}$	$f(m)$	Marks	Remarks
4	5	4.5	− 101	1M	for testing sign of $f(m)$
4	4.5	4.25	+28.8	1M	for choosing the correct interval
4.25	4.5	4.375	− 36.3		
4.25	4.375	4.3125	− 3.80		
4.25	4.3125				

Solution	Marks	Remarks
$\therefore$ $4.25 < h < 4.3125$		
Thus, $h \approx 4.3$ (correct to 1 decimal place)	1A	f.t.
	----------(4)	
(c) $286\pi = 144\pi h - \frac{\pi}{4}h^3$		
$h^3 - 576h + 1144 = 0$		
Let $g(h) = h^3 - 576h + 1144$		
$\because$ $g(2) = (2)^3 - 576(2) + 1144$ $= 0$	1M	for attempting to find a root by substitution
$\therefore$ 2 is a root of $h^3 - 576h + 1144 = 0$.		
Therefore, we have $(h-2)(h^2 + 2h - 572) = 0$.	1M+1A	1M for $(h-2)(ah^2 + bh + c) = 0$
So, we have $h = 2$ or $h = \sqrt{573} - 1$ or $h = -\sqrt{573} - 1$ (rejected) .	1A	for both correct
Thus, the height of the cylinder is 2 cm or $(\sqrt{573} - 1)$ cm .		u−1 for missing unit
	----------(4)	

Solution	Marks	Remarks
15. (a) (i) The perimeter of F_{10}		
$= 8 + (10 - 1)(4)$	1A	
$= 44$ cm	1A	u−1 for missing unit
(ii) $\frac{n}{2}(2(8)+(n-1)(4)) \le 1000$	1A	for correct sum of AP
$n^2 + 3n - 500 \le 0$		
$-23.91093483 \le n \le 20.91093483$	1M	
Thus, the required number of distinct square frames is 20 .	1A	
	----------(5)	
(b) Let $V_1\text{ cm}^3$, $V_2\text{ cm}^3$ and $V_3\text{ cm}^3$ be the volumes of S_1 , S_2 and S_3 respectively.		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		
$\frac{V_1}{V_2} = \left(\frac{8}{12}\right)^3 = \left(\frac{2}{3}\right)^3$ 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 $\frac{V_2}{V_3} = \frac{27}{64}$		
$\frac{V_1}{V_2} \ne \frac{V_2}{V_3}$		
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 $S_1 = \frac{8}{4} = 2$ cm		
The length of each diagonal of the base of $S_1 = \sqrt{2^2 + 2^2} = 2\sqrt{2}$ cm		
The height of $S_1 = \sqrt{5^2 - \left(\sqrt{2}\right)^2} = \sqrt{23}$ cm	1M	
$V_1 = \frac{1}{3}(2)^2\sqrt{23}$	1M	
$V_1 = \frac{4}{3}\sqrt{23}$		
$\frac{V_3}{V_1} = \left(\frac{16}{8}\right)^3 = 8$	1A	can be absorbed
$V_3 = 8\left(\frac{4}{3}\sqrt{23}\right) = \frac{32}{3}\sqrt{23}$	1A	
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 $S_3 = 5\left(\frac{16}{8}\right) = 10$ cm	1A	can be absorbed
The length of each side of the base of $S_3 = \frac{16}{4} = 4$ cm		
The length of each diagonal of the base of $S_3 = \sqrt{4^2 + 4^2} = 4\sqrt{2}$ cm		
The height of $S_3 = \sqrt{10^2 - \left(2\sqrt{2}\right)^2} = 2\sqrt{23}$ 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
	----------(6)	

Solution	Marks	Remarks
16. **Marking Scheme for (a) and (b) :**		
Case 1 Any correct proof with correct reasons.	3	
Case 2 Any correct proof without reasons.	2	
Case 3 Incomplete proof with any one correct step and one correct reason.	1	
(a) In ΔADE and ΔBOE,		
$\angle ADE = \angle DBC$ (alt. $\angle$s, $OD // BC$)		[錯角，$OD//BC$]
$= \angle BOE$ ($\angle$ in alt. segment)		[交錯弓形的圓周角] [弦切角定理]
$\angle DAE = \angle OBE$ (ext. $\angle$, cyclic quad.)		[圓內接四邊形外角]
$AD = BO$ (given)		[已知]
$\therefore \Delta ADE \cong \Delta BOE$ (ASA)		
	----------(3)	
(b) $AE = BE$ (by (a))		
$\angle AOE = \angle BOE$ (equal chords, equal $\angle$s)		[等弦對等角]
$\angle BEO = \angle AED$ (by (a))		
$= \angle AOB$ (ext. $\angle$, cyclic quad.)		[圓內接四邊形外角]
$= \angle AOE + \angle BOE$		
$= 2\angle BOE$		
$DE = OE$ (by (a))		
$\angle ADE = \angle AOE$ (base $\angle$s, isos. Δ)		[等腰Δ底角]
$\angle ADE = \angle BOE$ (by (a))		
Hence, $\angle AOE = \angle BOE$		
Thus, $\angle BEO = \angle AOE + \angle ADE$ (ext. $\angle$ of Δ)		[Δ的外角]
$= 2\angle BOE$		
	----------(3)	
(c) (i) $\because$ OE is a diameter of the circle $OAEB$.		
$\therefore$ $\angle OBE = 90°$	1A	
By (b), $\angle BEO = 2\angle BOE$		
$\angle BOE + \angle BEO + \angle OBE = 180°$		
$\angle BOE + 2\angle BOE + 90° = 180°$		
Thus, $\angle BOE = 30°$	1A	
(ii) Note that $E = (6, 6\tan 30°) = (6, 2\sqrt{3})$. Then,	1A	either one
the coordinates of the centre of the circle $OAEB$		
$= (\frac{6+0}{2}, \frac{2\sqrt{3}+0}{2}) = (3, \sqrt{3})$		
Also, the radius of the circle $OAEB = \sqrt{3^2 + (\sqrt{3})^2} = 2\sqrt{3}$	1M	
Hence, the equation of the circle $OAEB$ is		
$(x-3)^2 + (y-\sqrt{3})^2 = (2\sqrt{3})^2$	1A	
$x^2 + y^2 - 6x - 2\sqrt{3}y = 0$		
$\because$ the circle $OAEB$ passes through the origin.		
$\therefore$ let the equation of the circle $OAEB$ be $x^2 + y^2 + ax + by = 0$.	1M	
$\because$ the coordinates of $B = (6, 0)$		
$\therefore$ $6^2 + 0^2 + a(6) + b(0) = 0$		
So, we have $a = -6$.	1A	
$\because$ the coordinates of $E = (6, 6\tan 30°) = (6, 2\sqrt{3})$		
$\therefore$ $6^2 + (2\sqrt{3})^2 - 6(6) + b(2\sqrt{3}) = 0$		
Therefore, we have $b = -2\sqrt{3}$.	1A	
Thus, the equation of the circle $OAEB$ is $x^2 + y^2 - 6x - 2\sqrt{3}y = 0$.		
	----------(5)	

Solution	Marks	Remarks
17. (a) (i) $\sin 30° = \dfrac{FF'}{20}$	1M	
$FF' = 20\sin 30°$		either one
$FF' = 10\ \text{m}$	1A	u−1 for missing unit
$\cos 30° = \dfrac{EF'}{20}$		
$EF' = 20\cos 30°$		
$EF' = 10\sqrt{3}$		$EF' \approx 17.32050808$
$\tan 60° = \dfrac{FF'}{AF'}$	1M	with FF' substituted
$AF' = \dfrac{10}{\tan 60°}$		
$AF' = \dfrac{10\sqrt{3}}{3}$		$AF' \approx 5.773502692$
$AE^2 = AF'^2 + EF'^2$		
$AE^2 = (\dfrac{10\sqrt{3}}{3})^2 + (10\sqrt{3})^2$	1M	
$AE = \dfrac{10\sqrt{30}}{3}\ \text{m}$	1A	u−1 for missing unit r.t. $18.3\ \text{m}$, $AE \approx 18.25741858\ \text{m}$
(ii) $\sin 60° = \dfrac{FF'}{AF}$		
$AF = \dfrac{10}{\sin 60°}$		
$AF = \dfrac{20\sqrt{3}}{3}$		$AF \approx 11.54700538$
By cosine formula, we have		
$\cos\angle AEF = \dfrac{EF^2 + AE^2 - AF^2}{2EF \cdot AE}$		
$\cos\angle AEF = \dfrac{20^2 + \left(\dfrac{10\sqrt{30}}{3}\right)^2 - \left(\dfrac{20\sqrt{3}}{3}\right)^2}{(2)(20)\left(\dfrac{10\sqrt{30}}{3}\right)}$	1M	$\cos\angle AEF \approx \dfrac{20^2 + 18.25741858^2 - 11.54700538^2}{2(20)(18.25741858)}$
$\cos\angle AEF = \dfrac{3\sqrt{30}}{20}$		$\cos\angle AEF \approx 0.821583836$
$\angle AEF \approx 34.75634244°$		
$\angle AEF \approx 34.8°$	1A	u−1 for missing unit r.t. $34.8°$
	----------(7)	

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Solution	Marks	Remarks
(b) 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		
$BE = 2t_{\text{red}}$ and $BF = 3t_{\text{yellow}}$		
By sine formula, we have		
$\dfrac{BE}{\sin 20^\circ} \approx \dfrac{BF}{\sin(180^\circ - 34.75634244^\circ)}$	1M	
$\dfrac{2t_{\text{red}}}{\sin 20^\circ} \approx \dfrac{3t_{\text{yellow}}}{\sin 34.75634244^\circ}$		
$\dfrac{t_{\text{yellow}}}{t_{\text{red}}} \approx \dfrac{2\sin 34.75634244^\circ}{3\sin 20^\circ}$	1M	for attempting to find $\dfrac{t_{\text{yellow}}}{t_{\text{red}}}$
$\dfrac{t_{\text{yellow}}}{t_{\text{red}}} \approx 1.111216642$		$\dfrac{t_{\text{red}}}{t_{\text{yellow}}} \approx 0.899914528$
$\dfrac{t_{\text{yellow}}}{t_{\text{red}}} \approx 1.11$	1A	accept $\dfrac{t_{\text{red}}}{t_{\text{yellow}}} \approx 0.900$ and can be absorbed
$\dfrac{t_{\text{yellow}}}{t_{\text{red}}} > 1$		$\dfrac{t_{\text{red}}}{t_{\text{yellow}}} < 1$
Thus, $t_{\text{yellow}} > t_{\text{red}}$		$t_{\text{red}} < t_{\text{yellow}}$
So, the yellow toy car will not reach the point B before the red toy car.	1A	f.t.
$\angle EBF \approx 34.75634244^\circ - 20^\circ \approx 14.75634244^\circ$		
By sine formula, we have		
$\dfrac{BE}{\sin 20^\circ} = \dfrac{20}{\sin \angle EBF}$ and $\dfrac{BF}{\sin(180^\circ - 34.75634244^\circ)} \approx \dfrac{20}{\sin \angle EBF}$	1M	either with $\angle EBF$ substituted
$BE \approx \dfrac{20\sin 20^\circ}{\sin 14.75634244^\circ}$ and $BF \approx \dfrac{20\sin 34.75634244^\circ}{\sin 14.75634244^\circ}$		
$BE \approx 26.85575694$ 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		
$BE = 2t_{\text{red}}$ and $BF = 3t_{\text{yellow}}$		
$t_{\text{red}} \approx \dfrac{26.85575694}{2}$ and $t_{\text{yellow}} \approx \dfrac{44.76384605}{3}$	1M	for both
$t_{\text{red}} \approx 13.42787847$ and $t_{\text{yellow}} \approx 14.92128202$		
$t_{\text{red}} \approx 13.4$ and $t_{\text{yellow}} \approx 14.9$	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.
	----------(4)	