

只限教師參閱

FOR TEACHERS' USE ONLY

香港考試局

HONG KONG EXAMINATIONS AUTHORITY

一九九八年香港中學會考

HONG KONG CERTIFICATE OF EDUCATION EXAMINATION, 1998

數學 試卷一

MATHEMATICS PAPER I

本評卷參考乃考試局專為今年本科考試而編寫，供閱卷員參考之用。閱卷員在完成閱卷工作後，若將本評卷參考提供其任教會考班的本科同事參閱，本局不表反對，但須切記，在任何情況下均不得容許本評卷參考落入學生手中。學生若索閱或求取此等文件，閱卷員/教師應嚴詞拒絕，因學生極可能將評卷參考視為標準答案，以致但知硬背死記，活剝生吞。這種落伍的學習態度，既不符現代教育原則，亦有違考試着重理解能力與運用技巧之旨。因此，本局籲請各閱卷員/教師通力合作，堅守上述原則。

This marking scheme has been prepared by the Hong Kong Examinations Authority for markers' reference. The Examinations Authority has no objection to markers sharing it, after the completion of marking, with colleagues who are teaching the subject. However, under no circumstances should it be given to students because they are likely to regard it as a set of model answers. Markers/teachers should therefore firmly resist students' requests for access to this document. Our examinations emphasise the testing of understanding, the practical application of knowledge and the use of processing skills. Hence the use of model answers, or anything else which encourages rote memorisation, should be considered outmoded and pedagogically unsound. The Examinations Authority is counting on the co-operation of markers/teachers in this regard.

考試結束後，各科評卷參考將存放於教師中心，供教師參閱。

After the examinations, marking schemes will be available for reference at the Teachers' Centres.



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**Hong Kong Certificate of Education Examination
Mathematics Paper I**

NOTES FOR MARKERS

1. It is very important that all markers should adhere as closely as possible to the marking scheme. In many cases, however, candidates will have obtained a correct answer by an alternative method not specified in the marking scheme. In general, a correct answer merits *all the marks* allocated to that part, provided that the method used is sound.
 2. In a question consisting of several parts each depending on the previous parts, marks may be awarded to steps or methods correctly deduced from previous erroneous answers. However, marks for the corresponding answers should NOT be awarded. In the marking scheme, marks are classified as:

‘M’ marks	awarded for correct methods being used;
‘A’ marks	awarded for the accuracy of the answers;
Marks without ‘M’ or ‘A’	awarded for correctly completing a proof or arriving at an answer given in a question.
 3. Use of notation different from those in the marking scheme should not be penalized.
 4. In marking candidates’ work, the benefit of doubt should be given in the candidates’ favour.
- | IA | IB |
|--|--|
| 5. Each mark deducted for <i>poor presentation</i> (p.p.) should be denoted by [pp-1] : <ol style="list-style-type: none"> a. At most deduct 1 mark for (p.p.) in each question, up to a maximum of 2 marks for Sections A(1) and A(2). b. For similar (p.p.), deduct 1 mark for the first time that it occurs.
i.e. do not penalize candidates twice for the same p.p | Each mark deducted for <i>poor presentation</i> (p.p.) should be denoted by [pp-1]. At most deduct 1 mark for Section B. |
| 6. Each Mark deducted for <i>wrong/no unit</i> (u.) should be denoted by [u-1]. At most deduct 1 mark for questions in Sections A(1) and A(2). | Each Mark deducted for <i>wrong/no unit</i> (u.) should be denoted by [u-1]. At most deduct 1 mark for Section B. |
| 7. Marks entered in the Question Total Box should be the NET total scored on that question. | Marks entered in the Page Total Box should be the NET total scored on that page. |

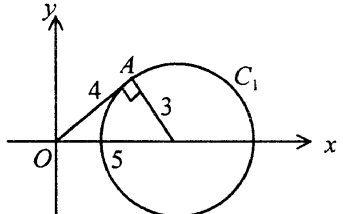
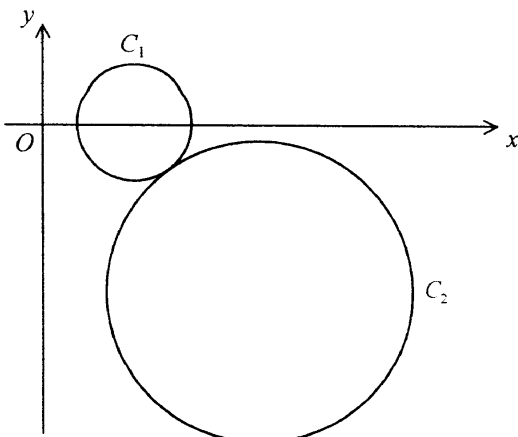
Solution	Marks	Remarks
<p>1. Area of cross-section = $\frac{(6+4)\times 3}{2}$ (cm²)</p> <p style="padding-left: 40px;">= 15 (cm²)</p> <p>Volume of the prism = 15×8 (cm³)</p> <p style="padding-left: 40px;">= 120 cm³</p>	<p>1M</p> <p>1M</p> <hr/> <p>1A</p> <p>(3)</p>	<p>or $4\times 3 + \frac{2\times 3}{2}$, $6\times 3 - \frac{2\times 3}{2}$ can be omitted</p>
<p>2. $x = 180 - 120$</p> <p style="padding-left: 40px;">= 60</p> <p>$y = 360 - 140 - 80 - 60$</p> <p style="padding-left: 40px;">= 80</p>	<p>1A</p> <p>1M</p> <hr/> <p>1A</p> <p>(3)</p>	<p>$pp-1$ for $x^\circ = 60^\circ$, $\angle x = 60$</p>
<p>3. $\tan x^\circ = \frac{7}{5}$</p> <p style="padding-left: 40px;">$x \approx 54.5$</p> <p>$y = 90 - x$</p> <p style="padding-left: 40px;">≈ 35.5</p>	<p>1M</p> <p>1A</p> <hr/> <p>1A</p> <p>(3)</p>	<p>or $\tan y^\circ = \frac{5}{7}$ etc.</p> <p>r.t. 54.5, $u-1$ for $54^\circ 28'$</p> <p>r.t. 35.5, $u-1$ for $35^\circ 32'$</p>
<p>4. $\frac{a^3 a^4}{b^{-2}} = a^{3+4} b^{-(-2)}$ (or $\frac{a^{3+4}}{\frac{1}{b^2}}$)</p> <p style="padding-left: 40px;">= $a^7 b^2$</p>	<p>1M+1M</p> <hr/> <p>1A</p> <p>(3)</p>	<p>1M for applying $x^m x^n = x^{m+n}$</p> <p>1M for applying $x^{-n} = \frac{1}{x^n}$</p> <p>can be omitted</p>
<p>5. $b = 2x + (1-x)a$</p> <p style="padding-left: 40px;">$b = 2x + a - ax$</p> <p style="padding-left: 40px;">$ax - 2x = a - b$</p> <p>$x = \frac{a-b}{a-2}$ (or $x = \frac{b-a}{2-a}$)</p>	<p>1A</p> <p>1M</p> <hr/> <p>1A</p> <p>(3)</p>	<p>for putting terms involving x on one side (can be omitted)</p>
<p>6. (a) $\triangle EBA$</p> <p>(b) $\frac{y}{6} = \frac{3}{4}$</p> <p style="padding-left: 40px;">$y = \frac{9}{2}$ (or 4.5)</p>	<p>1A</p> <p>1M+1A</p> <hr/> <p>1A</p> <p>(4)</p>	<p>accept EBA or ABE etc.</p> <p>1M for setting up equation</p> <p>do not accept 4.50</p>

Solution	Marks	Remarks
7. (a) Selling price = (\$) $29 \times (1 - 20\%)$ = \$ 23.2	1A 1A	accept \$ 23.20
(b) Percentage profit = $\frac{23.2 - 18}{18} \times 100$ (%) ≈ 28.9 (%)	1M <hr/> 1A	for $\frac{23.2 - 18}{18}$ r.t. 28.9 or $28\frac{8}{9}$
	(4)	
8. (a) Slope of $AB = \frac{4 - 1}{0 - (-2)}$ $= \frac{3}{2}$	1M 1A	can be omitted
(b) Equation of the line: $\frac{y - 3}{x - 1} = -\frac{2}{3}$ (or $\left(\frac{y - 3}{x - 1}\right)\left(\frac{3}{2}\right) = -1$) $2x + 3y - 11 = 0$ (or $y = -\frac{2}{3}x + \frac{11}{3}$)	1M+1A <hr/> 1A	1M for the slope or equivalent
	(5)	
9. (a) $f(2) = 2^3 + 2(2^2) - 5(2) - 6$ $= 0$ $\therefore x - 2$ is a factor of $f(x)$	1M 1A	or by long division $pp-1$ for missing $f(2)$ 1A only for just writing $f(2)=0$
(b) $f(x) = (x - 2)(x^2 + 4x + 3)$ $= (x - 2)(x + 1)(x + 3)$	1A <hr/> 1A+1A	1A for $x^2 + 4x + 3$ 1A for $(x + 1)(x + 3)$
	(5)	

Solution		Marks	Remarks																												
10. (a)	<table border="1"> <thead> <tr> <th>Test score (x)</th> <th>Cumulative frequency</th> </tr> </thead> <tbody> <tr> <td>$x \leq 50$</td> <td>8</td> </tr> <tr> <td>$x \leq 60$</td> <td>50</td> </tr> <tr> <td>$x \leq 70$</td> <td>102</td> </tr> <tr> <td>$x \leq 80$</td> <td>158</td> </tr> <tr> <td>$x \leq 90$</td> <td>188</td> </tr> <tr> <td>$x \leq 100$</td> <td>200</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Test score (x)</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>$40 < x \leq 50$</td> <td>8</td> </tr> <tr> <td>$50 < x \leq 60$</td> <td>42</td> </tr> <tr> <td>$60 < x \leq 70$</td> <td>52</td> </tr> <tr> <td>$70 < x \leq 80$</td> <td>56</td> </tr> <tr> <td>$80 < x \leq 90$</td> <td>30</td> </tr> <tr> <td>$90 < x \leq 100$</td> <td>12</td> </tr> </tbody> </table>	Test score (x)	Cumulative frequency	$x \leq 50$	8	$x \leq 60$	50	$x \leq 70$	102	$x \leq 80$	158	$x \leq 90$	188	$x \leq 100$	200	Test score (x)	Frequency	$40 < x \leq 50$	8	$50 < x \leq 60$	42	$60 < x \leq 70$	52	$70 < x \leq 80$	56	$80 < x \leq 90$	30	$90 < x \leq 100$	12	1A+1A+1A	1A for any correct entry in c.f. column 1A for any correct entry in f. column 1A for all being correct
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		(3)																													
(b)	Number of students whose score is below 55 $= 29$ (or 28, 30)	1A	can be omitted (refer to the graph)																												
	Passing percentage $= \frac{200 - 29}{200} \times 100$ (%) $= 85.5$ (%) (or 86, 85)	1M+1M	1M for the numerator 1M for the denominator																												
		1A																													
		(4)																													
11. (a)	The probability that the socks taken out are both white $= \frac{8}{14} \times \frac{7}{13}$ $= \frac{4}{13}$ (or 0.308)	1A+1M	1A for $\frac{8}{14}$, 1M for $p_1 \times p_2$																												
		1A	r.t. 0.308 (p_3)																												
		(3)																													
(b)	The probability that the socks taken out are of the same colour $= \frac{4}{13} + \frac{4}{14} \times \frac{3}{13} + \frac{2}{14} \times \frac{1}{13}$ $= \frac{5}{13}$ (or 0.385)	1M+1A+1A	1M for $p_3 + p_4 + p_5$ 1A for $\frac{4}{14} \times \frac{3}{13}$ or $\frac{2}{14} \times \frac{1}{13}$																												
		1A	r.t. 0.385																												
	Alternatively, $1 - 2 \left(\frac{8}{14} \times \frac{4}{13} + \frac{4}{14} \times \frac{2}{13} + \frac{2}{14} \times \frac{8}{13} \right)$ $= \frac{5}{13}$ (or 0.385)	1M+1A+1A	1M for $1 - 2(p_6 + p_7 + p_8)$ 1A for $\frac{8}{14} \times \frac{4}{13}$ etc. (must have 1 - ...)																												
		1A																													
		(4)																													

Solution	Marks	Remarks
<p>12. (a) $S = a + bt$ for some constants a and b.</p> $\begin{cases} 230 = a + 100b & \dots\dots\dots (1) \\ 284 = a + 130b & \dots\dots\dots (2) \end{cases}$ <p>(2) – (1): $54 = 30b$ $b = 1.8$ Sub. into (1): $230 = a + 180$ $a = 50$ $\therefore S = 50 + 1.8t$</p> <p>(b) When $t = 110$,</p> <p>(i) the monthly service charge of network A $= (\\$) (50 + 1.8 \times 110)$ $= (\\$) 248$</p> <p>(ii) the monthly service charge of network B $= (\\$) 2.2 \times 110$ $= (\\$) 242$</p>	<p>1M</p> <p>} 1A</p> <p>1M</p> <p>1A</p> <p>(4)</p> <p>1M</p> <p>1A</p>	<p>or $a = 50, b = 1.8$</p> <p>or $230 + \frac{1}{3}(284 - 230)$</p>
<p><u>Alternatively,</u></p> <p>(ii) The cost of using network A when $t = 110$ is \$2.25 per minute.</p>	<p>1A</p>	<p>r.t. 2.25</p>
<p>\therefore The man should join network B as the monthly service charge (alternatively, the cost per minute) is less.</p>	<p>1</p> <p>(3)</p>	<p>the values in (i) and (ii) must be correct</p>
<p>13. (a) $A_2 B_2 = \sqrt{6^2 + 8^2}$ (cm) $= 10$ cm</p>	<p>1M</p> <p>1A</p> <p>(2)</p>	<p>can be omitted</p>
<p>(b) $A_2 A_3 : A_1 A_2 = 10 \times \frac{3}{7} : 6$ $= 5 : 7$</p>	<p>1M</p> <p>1A</p> <p>(2)</p>	<p>for $10 \times \frac{3}{7}$ accept $\frac{5}{7}, 1 : \frac{7}{5}$ or $\frac{5}{7} : 1$</p>
<p>(c) $A_1 A_2 + A_2 A_3 + A_3 A_4 + \dots$ $= 6[1 + \frac{5}{7} + (\frac{5}{7})^2 + \dots]$ (cm) $= \frac{6}{1 - \frac{5}{7}}$ (cm) $= 21$ (cm) \therefore The total distance crawled by the ant cannot exceed 21 cm.</p>	<p>1M</p> <p>1A</p> <p>1</p> <p>1</p> <p>(3)</p>	<p>for the first 3 terms can be omitted $pp-1$ for missing ‘...’</p> <p>} no marks for using 0.714 instead of $\frac{5}{7}$</p>

Solution	Marks	Remarks
14. $\therefore OB = OD$ $\therefore \angle OBD = \angle ODB$ (base \angle s, isos. Δ) $\therefore BC = AB$ $\therefore \angle CDB = \angle ODB$ (equal chords, equal \angle s) Hence $\angle OBD = \angle CDB$ $BO \parallel CD$ (alt. \angle s equal)		[等腰 Δ 底角] [等弦對等角] 或 [等角對等弦] [(內)錯角等]
Alternatively, $\therefore BC = AB$ $\therefore \angle BDC = \angle ADB$ (equal chords, equal \angle s) $\angle ODC = \angle ADB + \angle BDC$ $= 2\angle ADB$ $= \angle AOB$ (\angle at centre twice \angle at circumference) Hence $BO \parallel CD$ (corr. \angle s equal)		[等弦對等角] 或 [等角對等弦] [圓心角=2 \times 圓周角] [同位角等]
Marking Scheme :		
Case 1 Any correct proof with correct reasons.	5	
Case 2 Any correct proof without reasons. In addition, any relevant correct argument with correct reason.	3 1	Maximum 1 mark
Case 3 Any relevant correct argument with correct reason. They refer to the above 5 arguments with reasons and $\angle AOB = \angle ODB + \angle OBD$ (ext. \angle of Δ)	1	Maximum 2 marks [Δ 的外角]
(5)		

Solution	Marks	Remarks
<p>15. (a) Distance between the centres of C_1 and C_2</p> $= \sqrt{(11-5)^2 + (-8-0)^2}$ $= 10$ <p>Radius of $C_1 = 10 - 7 = 3$</p> <p>Equation of C_1: $(x-5)^2 + y^2 = 9$ (or $(x-5)^2 + y^2 = 3^2$)</p> <p>(b) Let $y = mx$ be a tangent to C_1 from the origin.</p> <p>Sub. $y = mx$ into the equation of C_1, then</p> $(x-5)^2 + (mx)^2 = 9$ $(1+m^2)x^2 - 10x + 16 = 0$ <p>Since the discriminant is zero, therefore</p> $100 - 64(1+m^2) = 0$ $1+m^2 = \frac{25}{16}$ $m^2 = \frac{9}{16}$ $m = \pm \frac{3}{4}$ <p>The tangents to C_1 from the origin are $y = \pm \frac{3}{4}x$.</p>	<p>1A</p> <p>1M</p> <p>1A</p> <p>(3)</p> <p>1M</p> <p>1M+1A</p> <p>1A</p>	<p>or $x^2 + y^2 - 10x + 16 = 0$</p> <p>for constant term = 0</p>
<p><u>Alternatively,</u></p> <p>Consider the right-angled triangle in the figure.</p> <p>OA is one of the tangents.</p> $\text{Slope of } OA = \frac{3}{4}$ $\text{Slope of the other tangent} = -\frac{3}{4}$ <p>The tangents to C_1 from the origin are $y = \pm \frac{3}{4}x$.</p>	<p>1A</p> <p>1M</p> <p>1M+1A</p>	 <p>can be omitted</p> <p>1M for constant term = 0</p>
 <p style="text-align: center;">Figure 8</p>	<p>(4)</p>	

Solution	Marks	Remarks
<p>(c) The tangent $y = -\frac{3}{4}x$ cuts C_2 at two points.</p> <p>Sub. $y = -\frac{3}{4}x$ into the equation of C_2, then</p> $(x-11)^2 + (-\frac{3}{4}x+8)^2 = 49$ $\frac{25}{16}x^2 - 34x + 136 = 0$ $25x^2 - 544x + 2176 = 0$ <p>Let (x_0, y_0) be the mid-point of AB, then</p> $x_0 = \frac{1}{2}(\frac{544}{25}) = \frac{272}{25} \quad (10\frac{22}{25} \text{ or } 10.9)$ $y_0 = -\frac{3}{4}(\frac{272}{25}) = -\frac{204}{25} \quad (-8\frac{4}{25} \text{ or } -8.16)$	<p>1M</p> <p>1A</p> <p>1M</p> <p>1A</p>	<p>r.t. (10.9, -8.16)</p>
<p><u>Alternatively,</u></p> <p>Solving the equation for x:</p> $x \approx 5.282 \text{ or } 16.48$ $\therefore x_0 \approx \frac{5.282 + 16.48}{2} \approx 10.9 \text{ (10.88)}$ $y_0 \approx -\frac{3}{4} \times 10.88 \approx 8.16$	<p>Solving the equation for y:</p> $y \approx -12.36 \text{ or } -3.962$ $\therefore y_0 \approx \frac{-12.36 - 3.962}{2} \approx -8.16$ $x_0 \approx -\frac{4}{3} \times (-8.161) \approx 10.9$	<p>r.t. (10.9, -8.16)</p>
<p>\therefore The mid-point of $AB = (\frac{272}{25}, -\frac{204}{25})$</p>		
<p><u>Alternatively,</u></p> <p>(c) The tangent $y = -\frac{3}{4}x$ cuts C_2 at two points.</p> <p>The line passing through $(11, -8)$ and perpendicular to $y = -\frac{3}{4}x$ has eqn.</p> $\frac{y+8}{x-11} = \frac{4}{3}$ $4x - 3y - 68 = 0$ <p>Sub. $y = -\frac{3}{4}x$ into the equation, we have</p> $4x + \frac{9}{4}x - 68 = 0$ $x = \frac{272}{25}, y = -\frac{204}{25}$	<p>1M</p> <p>1A</p> <p>1M</p> <p>1A</p>	<p>r.t. (10.9, -8.16)</p>
	<p>(4)</p>	

Solution	Marks	Remarks
<p>16. (a) Let r cm be the radius of the surface of the melted ice-cream.</p> <p>By considering the volume of the ice-cream,</p> $\frac{4}{3}\pi(2^3) + \frac{4}{3}\pi x^3 = \frac{1}{3}\pi r^2(2x+3)$ <p>Using similar triangles,</p> $\frac{r}{2x+3} = \frac{4}{8}$ $r = \frac{1}{2}(2x+3)$ <p>Volume of the liquid = $\frac{1}{3}\pi\left[\frac{1}{2}(2x+3)\right]^2(2x+3)$</p> $= \frac{1}{12}\pi(2x+3)^3$	<p>1A+1M</p> <p>2A</p> <p>1M+1A</p>	<p>do not <i>pp</i> for not defining r</p> <p>1A for the volume of the ice-cream balls 1M for equating the volumes (provided that 1A is awarded)</p>
<p><u>Alternatively,</u></p> $\frac{\text{Volume of the liquid}}{\frac{1}{3}\pi(4^2)(8)} = \left(\frac{2x+3}{8}\right)^3$ $\text{Volume of the liquid} = \frac{1}{3}\pi(4^2)(8)\left(\frac{2x+3}{8}\right)^3$ $= \frac{1}{12}\pi(2x+3)^3$	<p>1A+1M+1A</p> <p>1A</p>	<p>1A for the ratio in length 1M for the ratio in volume 1A for the volume of the cone</p>
<p>Hence $\frac{4}{3}\pi(2^3) + \frac{4}{3}\pi x^3 = \frac{1}{12}\pi(2x+3)^3$</p> $16(8+x^3) = (2x+3)^3$ $128+16x^3 = 8x^3+36x^2+54x+27$ $8x^3-36x^2-54x+101=0$	<p>$\frac{1}{(7)}$</p>	
<p>(b) From (a), $8x^3-36x^2-54x+101=0$</p> $4(2x^3-9x^2)-54x+101=0$ $4y-54x+101=0 \quad \left(\text{or } y = \frac{27}{2}x - \frac{101}{4}\right)$ <p>Adding the line in Figure 9.2, we have</p> $x \approx 1.2$	<p>2A</p> <p>1A</p> <p>$\frac{1A}{(4)}$</p>	<p>for the graph (± 1 grid at margin)</p>

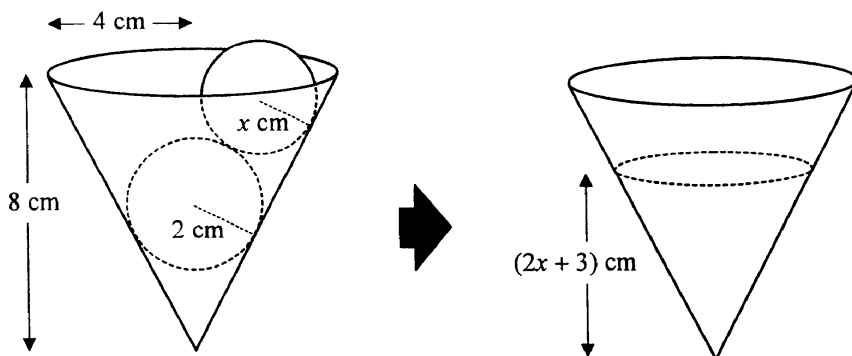
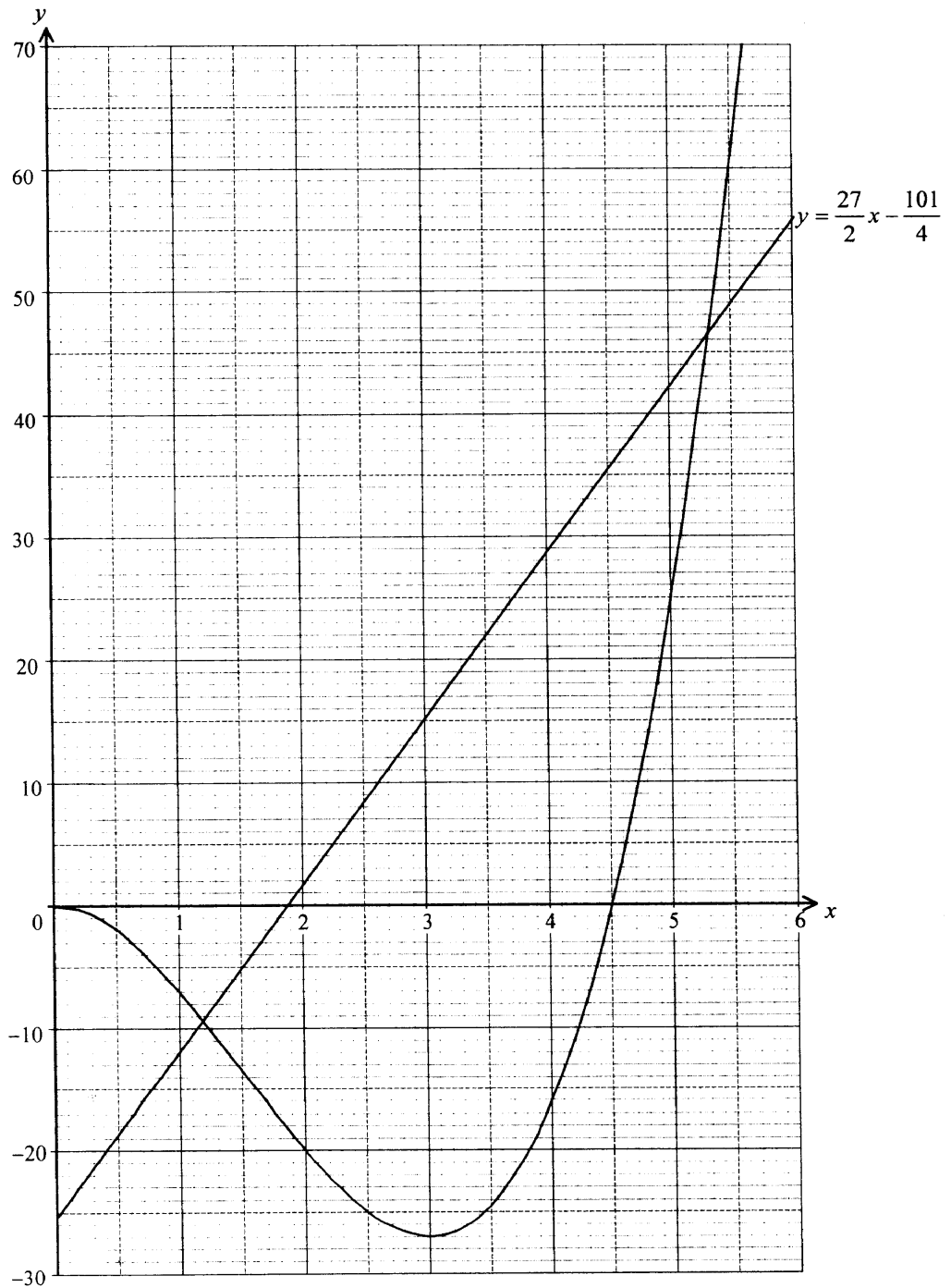


Figure 9.1



Solution	Marks	Remarks
17. (a) $AF = 4 \sin 72^\circ$ (m)	1A	accept $\sin 72^\circ = \frac{AF}{4}$
≈ 3.80423 (m)	1A	r.t. 3.80 (withhold 1A for 3.8)
≈ 3.80 m		
$FD \approx \frac{3.80423}{\tan 35^\circ}$ (m)	1M	accept $\tan 35^\circ = \frac{3.80}{FD}$
≈ 5.43300 (m)		
≈ 5.43 m	<u>1A</u>	r.t. 5.43
	(4)	

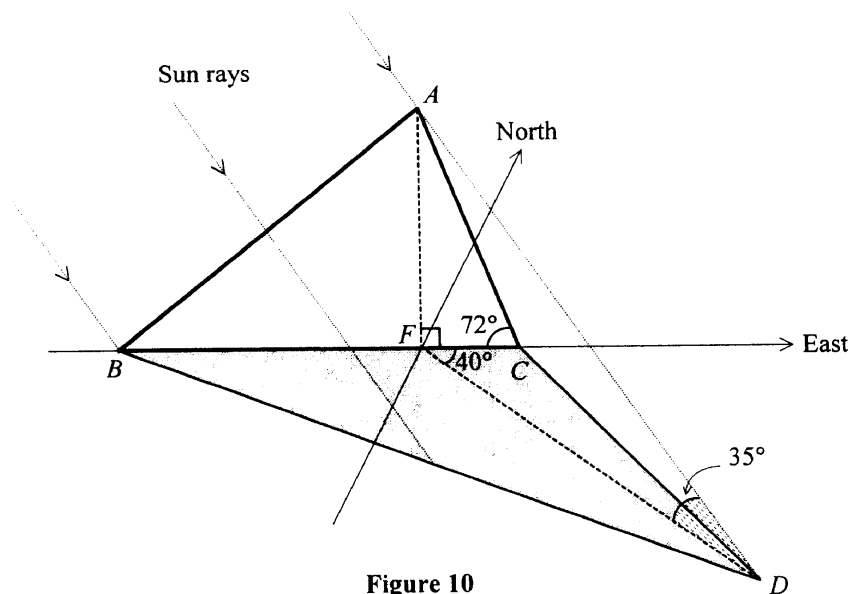


Figure 10

(b) $CF = 4 \cos 72^\circ$ (m) (or $\sqrt{4^2 - 3.80423^2}$)

≈ 1.23607 (m)

Area of $\triangle DBC = \text{Area of } \triangle BFD + \text{Area of } \triangle FCD$

$$\approx \left[\frac{1}{2} (6 - 1.23607) (5.43300) \sin 140^\circ + \frac{1}{2} (1.23607) (5.43300) \sin 40^\circ \right] \text{ (m}^2\text{)}$$

$\approx 10.5 \text{ m}^2$

1A

accept $\cos 72^\circ = \frac{CF}{4}$

1M+1M

2A

r.t. 10.5

Alternatively,

Let h m be the height of $\triangle DBC$ with BC as the base.

$$h \approx 5.43300 \sin 40^\circ$$

$$\approx 3.49227$$

$$\text{Area of } \triangle DBC \approx \frac{6 \times 3.49227}{2} \text{ (m}^2\text{)}$$

$$\approx 10.5 \text{ m}^2$$

1M+1A

accept $\sin 40^\circ = \frac{h}{5.43}$

1M

2A

r.t. 10.5

Solution	Marks	Remarks
<p>Alternatively,</p> $CF = 4 \cos 72^\circ \text{ (m)}$ $\approx 1.23607 \text{ (m)}$ $CD^2 \approx [(1.23607)^2 + (5.43300)^2 - 2(1.23607)(5.43300) \cos 40^\circ] \text{ (m}^2\text{)}$ $CD \approx 4.55593 \text{ (m)}$ <p>In $\triangle DCF$, $\frac{\sin \angle DCF}{5.43300} \approx \frac{\sin 40^\circ}{4.55593}$</p> $\sin \angle DCF \approx 0.76653$ $\text{Area of } \triangle DBC \approx \frac{1}{2} \times 6 \times 4.55593 \times 0.76653 \text{ (m}^2\text{)}$ $\approx 10.5 \text{ m}^2$	<p>1A</p> <p>1M</p> <p>1M</p> <p>2A</p>	<p>accept $\cos 72^\circ = \frac{CF}{4}$</p> <p>for applying cosine rule</p> <p>r.t. 10.5</p>
<p>(c) Area of the shadow = $\frac{1}{2} \times BC \times FD \sin \angle CFD$</p> <p>If $50 < x < 90$, $\angle CFD$ will be smaller (or less than 40°).</p> <p>$\therefore BC, FD$ remain unchanged and $\sin \angle CFD$ is smaller</p> <p>\therefore The area of the shadow will be smaller than the area obtained in (b).</p>	<p>(5)</p> <p>1A</p> <p>$\frac{1}{(2)}$</p>	<p>or $\sin \angle CFD$ will be smaller</p>

Solution	Marks	Remarks
18. (a) The inequalities representing the constraints for x and y : $0.32x + 0.28y \leq 4.48$ ($8x + 7y \leq 112$) $0.24x + 0.36y \leq 4.32$ ($2x + 3y \leq 36$) $2x + 10y \leq 100$ ($x + 5y \leq 50$) $x \geq 0, y \geq 0$	1A 1A 1A	deduct 1 mark for any strict inequality sign
Drawing the 3 straight lines.	1A+1A+1A	optional
Shading the region R .	$\frac{1A}{(7)}$	$\pm \frac{1}{2}$ grid accept marking all lattice points
(b) Let $\$P$ be the profit. $P = 90x + 120y$ $= 30(3x + 4y)$	1A	
On the graph paper, draw the line $3x + 4y = c$ for some constant c . From the graph, the maximum possible profit is obtained at $(6, 8)$. The maximum possible profit = $\$(90 \times 6 + 120 \times 8)$ $= \$1500$	1M+1A 1A	1M for +/- slope
Alternatively, $\therefore P(0,10) = 1200, P(4,9) = 1440, P(6,8) = 1500$ and $P(14,0) = 1260$ \therefore The maximum profit is $\$1500$.	1M+1A 1A (4)	1M for testing these 4 points

