| Solution | Marks | Remarks |
| --- | --- | --- |
| 1. $mx = 2(m+c)$ | | |
| $mx = 2m + 2c$ | | |
| $mx - 2m = 2c$ | 1M | for putting $m$ on one side |
| $m(x-2) = 2c$ | 1M | for factorization |
| $m = \frac{2c}{x-2}$ | 1A | |
| | ---------(3) | |
| 2. For $\frac{3-5x}{4} \ge 2-x$ , we have | | |
| $3-5x \ge 4(2-x)$ | | |
| $3-5x \ge 8-4x$ | | |
| $4x-5x \ge 8-3$ | 1M | for putting $x$ on one side |
| $-x \ge 5$ | | |
| $x \le -5$ | 1A | |
| For $x+8>0$ , we have | | |
| $x > -8$ | | |
| So, the required solution is | | |
| $x > -8$ and $x \le -5$ . | 1A | do not accept graphical solution |
| Thus, the required solution is | | |
| $-8 < x \le -5$ . | | |
| | ---------(3) | |
| 3. (a) $x^2 - (y-z)^2$ | | |
| $= (x+(y-z))(x-(y-z))$ | | |
| $= (x+y-z)(x-y+z)$ | 1A | |
| (b) $ab - ad - bc + cd$ | | |
| $= a(b-d) - c(b-d)$    [ $b(a-c) - d(a-c)$ ] | 1M | for taking out common factors |
| $= (a-c)(b-d)$ | 1A | |
| | ---------(3) | |
| 4. $4^{x+1} = 8$ | | |
| $2^{2(x+1)} = 2^3$ | 1M | for same base (2, 4 or 8 only) |
| $2^{2x+2} = 2^3$ | | |
| $2x+2 = 3$ | 1M | for equating the powers |
| $2x = 1$ | | |
| $x = \frac{1}{2}$ | 1A | |
| [ $4^{x+1} = 8$ | | |
| $\log(4^{x+1}) = \log 8$ | 1M | for taking log |
| $(x+1)\log 4 = \log 8$ | | |
| $x+1 = \frac{\log 8}{\log 4}$ | 1M | for putting log on one side |
| $x+1 = \frac{3}{2}$ | | |
| $x = \frac{1}{2}$ ] | 1A | |
| | ---------(3) | |

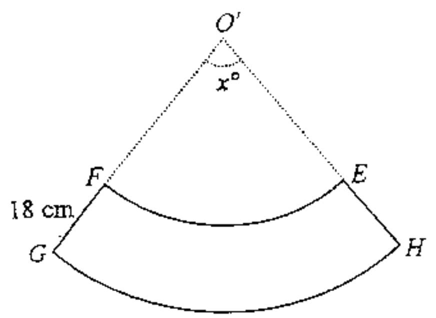
| Solution | Marks | Remarks |
|---|---|---|
| 5. (a) The selling price of the handbag | | |
| $= 400(1+20\%)(0.75)$    [ $400(1+20\%)(1-25\%)$ ] | 1A | |
| $= \$360$ | 1A | u–1 for missing unit |
| (b) Percentage loss | | |
| $= \dfrac{400-360}{400} \times 100\%$ | 1M | accept without 100% |
| $= 10\%$ | 1A | |
| | ——(4) | |
| 6. Let $x$ be the number of first-class tickets sold. Then, the number of economy-class tickets sold is $3x$. Therefore, we have | | |
| $x + 3x = 600$ | | |
| $4x = 600$ | 1A | |
| $x = 150$ | 1A | can be absorbed |
| The sum of money for the tickets sold | | |
| $= (150)(850) + (3)(150)(500)$ | 1M | |
| $= \$352\,500$ | 1A | u–1 for missing unit r.t. \$353 000 |
| [Alternative] The number of first-class tickets sold $= (600)\left(\dfrac{1}{1+3}\right)$ $= 150$ | 1A | |
| The number of economy-class tickets sold $= 600 - 150$ $= 450$ | 1A | for either one and can be absorbed |
| The sum of money for the tickets sold | | |
| $= (150)(850) + (450)(500)$ | 1M | |
| $= \$352\,500$ | 1A | u–1 for missing unit r.t. \$353 000 |
| | ——(4) | |
| 7. (a) Common difference | | |
| $= 5 - 2$ | | |
| $= 3$ | 1A | |
| The 10th term | | |
| $= 2 + (10-1)(3)$ | | |
| $= 29$ | 1A | |
| (b) The sum of the first 10 terms | | |
| $= \dfrac{10}{2}(2+29)$    [ $\dfrac{10}{2}((2)(2)+(10-1)(3))$ ] | 1M | for $\dfrac{10}{2}(2+(a))$ |
| $= 155$ | 1A | |
| [Alternative] (a) Note that the arithmetic sequence is 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, … . | 1A | |
| The 10th term $= 29$ | 1A | |
| (b) The sum of the first 10 terms | | |
| $= 2+5+8+11+14+17+20+23+26+29$ | 1M | for $2+\cdots+(a)$ |
| $= 155$ | 1A | |
| | ——(4) | |

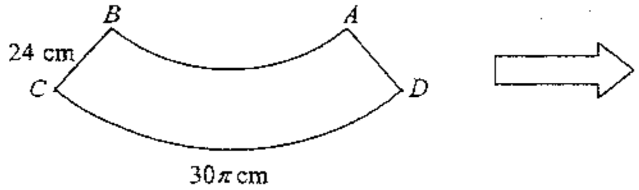
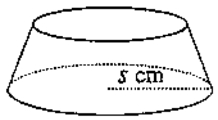
| Solution | Marks | Remarks |
|---|---|---|
| 8. (a) In $\Delta ABC$ and $\Delta CDA$ , | | |
| $\angle CAB = \angle ACD$ ( alternate $\angle$s, $AB \parallel DC$ ) | | [ (內)錯角，$AB \parallel DC$ ] |
| $\angle ACB = \angle CAD$ ( alternate $\angle$s, $BC \parallel AD$ ) | | [ (內)錯角，$BC \parallel AD$ ] |
| $AC = CA$ ( common side ) | | [ 公共邊 ] |
| $\therefore$ $\Delta ABC \cong \Delta CDA$ ( ASA ) | | |
| **Marking Scheme :** | | |
| **Case 1** Any correct proof with correct reasons. | 2 | |
| **Case 2** Any correct proof without reasons. | 1 | |
| (b) $\Delta ABD \cong \Delta CDB$ | | |
| $\Delta ABE \cong \Delta CDE$ | | |
| $\Delta AED \cong \Delta CEB$ | | |
| **Marking Scheme :** | | |
| **Case 1** There are exactly three pairs of triangles and all of them are correct. | 2 | |
| **Case 2** Any one pair is correct. | 1 | |
| | ----------(4) | |
| 9. (a) The shortest distance | | |
| $= 100 \sin 60°$ | 1M | |
| $= 50\sqrt{3}$ | | |
| ~~$\approx 86.60254038$~~ | | |
| $\approx 87$ km | 1A | u−1 for missing unit |
| (b) The distance travelled by $S$ between 1:00 a.m. and when it is nearest to $L$ | | |
| $= 100 \cos 60°$ | 1M | accept $\dfrac{87}{\tan 60°}$ |
| $= 50$ km | | |
| The distance travelled by $S$ between 1:00 a.m. and when it is nearest to $L$ | | |
| $= \sqrt{100^2 - (50\sqrt{3})^2}$ | 1M | for $\sqrt{100^2 - (a)^2}$ |
| $= \sqrt{2500}$ | | |
| $= 50$ km | | |
| The time taken | | |
| $= \dfrac{50}{20}$ | 1M | |
| $= 2.5$ hours | | |
| Therefore, $S$ will be nearest to $L$ at 3:30 a.m. . | 1A | do not accept 2.5 hours after 1:00 a.m. |
| | ----------(5) | |

| Solution | Marks | Remarks |
|---|---|---|
| 10. (a) Let $V = aL^2 + bL$, where $a$ and $b$ are constants. | 1A | |
| When $L = 10$, $V = 30$, so we have<br>$100a + 10b = 30$<br>$10a + b = 3$ ............ (1)<br>When $L = 15$, $V = 75$, so we have<br>$225a + 15b = 75$<br>$15a + b = 5$ ............ (2) | 1M | for substitution (either one) |
| Solving (1) and (2), we have<br>$\begin{cases} a = \frac{2}{5} \\ b = -1 \end{cases}$ | 1A | for both correct |
| $\therefore \quad V = \frac{2}{5}L^2 - L$ | ----------(3) | |
| (b) When $V \ge 30$, we have $\frac{2}{5}L^2 - L \ge 30$ (by(a)). Therefore, we have | 1M | for putting the result of (a) into $V \ge 30$ |
| $2L^2 - 5L - 150 \ge 0$ | 1M | in the form $k_1L^2 + k_2L + k_3 \ge 0$ |
| $(2L+15)(L-10) \ge 0$ | | |
| $L \ge 10$ or $L \le -7.5$ | 1A | |
| Since $5 \le L \le 25$, we have<br>$10 \le L \le 25$ . | 1A | accept '$L \ge 10$ and $L \le 25$' but do not accept graphical solution |
| | ----------(4) | |

| Solution | Marks | Remarks |
|---|---|---|
| 11. (a) (i) The mode | | |
| $= 10$ | 1A | |
| (ii) The median | | |
| $= \frac{11+12}{2}$ | | |
| $= 11.5$ | 1A | |
| (iii) The mean | | |
| $= \frac{10+10+11+12+13+16}{6}$ | | |
| $= 12$ | 1A | |
| (iv) The range | | |
| $= 16-10$ | | |
| $= 6$ | 1A | |
| | ----------(4) | |
| (b) (i) The median will be the least when the four unknown data are at most equal to 10 . | | |
| The least possible value of the median | | |
| $= \frac{10+10}{2}$ | | |
| $= 10$ | 1A | |
| The median will be the greatest when the four unknown data are at least equal to 16 . | | |
| The greatest possible value of the median | | |
| $= \frac{13+16}{2}$ | | |
| $= 14.5$ | 1A | |
| (ii) The required mean | | |
| $= \frac{(12)(6)+(11)(4)}{6+4}$ | 1M | for $(11)(4)$ = sum of the four unknown data |
| $= 11.6$ | 1A | |
| | ----------(4) | |

| Solution | Marks | Remarks |
|---|---|---|
| 12. (a) The slope of $BC$ | | |
| $= \frac{3-0}{0-2}$ | | |
| $= \frac{-3}{2}$ | 1A | accept $-1.5$ or $-1\frac{1}{2}$ |
| | ---(1) | |
| (b) The slope of $AP$ | | |
| $= \frac{-1}{-1.5}$ | 1M | can be absorbed |
| $= \frac{2}{3}$ | | |
| The equation of $AP$ is: | | |
| $\frac{y-0}{x-(-1)} = \frac{2}{3}$ | 1M | for point-slope form |
| $2x-3y+2=0$ | 1A | accept $y = \frac{2x}{3} + \frac{2}{3}$ |
| | ---(3) | |
| (c) (i) Let the coordinates of $H$ be $(0, h)$. | | |
| Then, by (b), $2(0)-3h+2=0$ | 1M | for putting $x=0$ into (b) |
| $h = \frac{2}{3}$ | 1A | |
| Thus, the coordinates of $H$ are $(0, \frac{2}{3})$. | | |
| (ii) The slope of $AC = \frac{3-0}{0-(-1)} = 3$ | 1A | |
| Suppose the altitude from $B$ to $AC$ cuts $AC$ at $Q$. | | |
| The slope of $BQ = \frac{-1}{3}$ | 1M | |
| The equation of $BQ$ is: $\frac{y-0}{x-2} = \frac{-1}{3}$ | | or, the slope of $BH = \frac{0-\frac{2}{3}}{2-0} = \frac{-1}{3}$ |
| $x+3y-2=0$ | | |
| Note that $0+(3)(\frac{2}{3})-2 = 2-2 = 0$ | | |
| Hence, the three altitudes pass through the same point $H$. | 1 | |
| Note that the slope of $BH = \frac{0-\frac{2}{3}}{2-0} = \frac{-1}{3}$ | 1M | |
| and the slope of $AC = \frac{3-0}{0-(-1)} = 3$ | 1A | |
| $\because$ (the slope of $BH$)(the slope of $AC$) $= (\frac{-1}{3})(3) = -1$ | | |
| $\therefore$ $BH \perp AC$ | | |
| Hence, the three altitudes pass through the same point $H$. | 1 | |
| | ---(5) | |

| Solution | Marks | Remarks |
|---|---|---|
| 13. (a) (i) $\frac{x}{360}=\frac{30\pi}{(2\pi)(56+24)}$ | 1M | for $\frac{x}{360}=\frac{30\pi}{2\pi r}$ |
| $x=67.5$ | 1A | u−1 for having unit |
| $30\pi=(56+24)(\frac{x\pi}{180})$ | 1M | for $30\pi=r\left(\frac{x\pi}{180}\right)$ |
| $x=67.5$ | 1A | u−1 for having unit |
| (ii) The required area<br>= area of sector $ODC$ − area of sector $OAB$<br>$=\left(\frac{67.5}{360}\right)((56+24)^2\pi)-\left(\frac{67.5}{360}\right)(56^2\pi)$ | 1M | for either one |
| $=1200\pi-588\pi$<br>$=612\pi\ \text{cm}^2$ | 1A | u−1 for missing unit |
| The required area<br>= area of sector $ODC$ − area of sector $OAB$<br>$=\frac{1}{2}(56+24)^2\left(\frac{67.5\pi}{180}\right)-\frac{1}{2}(56^2)\left(\frac{67.5\pi}{180}\right)$ | 1M | for either one |
| $=1200\pi-588\pi$<br>$=612\pi\ \text{cm}^2$ | 1A | u−1 for missing unit |
| | ----------(4) | |
| (b) (i) The required area<br>$=(612\pi)(\frac{18}{24})^2$ | 1M | for $((a)(ii))(\frac{18}{24})^2$ |
| $=\frac{1377}{4}\pi\ \text{cm}^2$ | 1A | accept $344.25\pi\ \text{cm}^2$ or $344\frac{1}{4}\pi\ \text{cm}^2$<br>u−1 for missing unit |
| <br><br>$\because \frac{FO'}{BO}=\frac{FG}{BC}$<br>$\therefore \frac{FO'}{56}=\frac{18}{24}$<br>Hence, $FO'=42$ cm | | |
| The required area<br>$=\frac{1}{2}(42+18)^2\left(\frac{67.5\pi}{180}\right)-\frac{1}{2}(42^2)\left(\frac{67.5\pi}{180}\right)$ | 1M | |
| $=\frac{1377}{4}\pi\ \text{cm}^2$ | 1A | accept $344.25\pi\ \text{cm}^2$ or $344\frac{1}{4}\pi\ \text{cm}^2$<br>u−1 for missing unit |

| Solution | Marks | Remarks |
|---|---|---|
| (ii) $2\pi r = \left(\frac{18}{24}\right)(30\pi)$ | 1M+1M | 1M for $\left(\frac{18}{24}\right)(30\pi)$ + 1M for equating $2\pi r$ |
| $2\pi r = 22.5\pi$ | | |
| $r = \frac{45}{4}$ | 1A | accept 11.25<br>r.t. 11.3 |
| <br> | | <br> |
| $\because \ 2\pi s = 30\pi$ | 1M | for equating $2\pi s$ |
| $\therefore \ s = 15$ | | |
| $\because \ r = \left(\frac{FG}{BC}\right)s$ | | |
| $\therefore \ r = \left(\frac{18}{24}\right)(15)$ | 1M | |
| Thus, $r = \frac{45}{4}$ | 1A | accept 11.25<br>r.t. 11.3 |
| | ----------(5) | |

| Solution | Marks | Remarks |
|---|---|---|
| 14. (a) By cosine formula, we have | | |
| $\cos\angle OAC = \dfrac{3^2+6^2-4^2}{(2)(3)(6)}$ | 1A | |
| $\angle OAC \approx 36.33605751°$ | | |
| $\angle OAC \approx 36.3°$ | 1A | u−1 for missing unit |
| | -----(2) | |
| (b) (i) $\tan 40° = \dfrac{BC}{4}$ <br> $BC = 4\tan 40°$ } | 1A | for either one correct |
| $BC \approx 3.356398525$ | | |
| $BC \approx 3.36$ m | | |
| $\tan 30° = \dfrac{4\tan 40°}{CD}$ | 1M | accept $\tan 30° \approx \dfrac{3.36}{CD}$ |
| $CD \approx 5.813452775$ | | |
| $CD \approx 5.81$ m | 1A | u−1 for missing unit <br> r.t. 5.81 |
| (ii) By cosine formula, we have | | |
| $\cos\angle CAD = \dfrac{6^2+8^2-CD^2}{(2)(8)(6)}$ | 1M | with $CD$ substituted |
| $\cos\angle CAD \approx 0.689622571$ | | |
| $\angle CAD \approx 46.39976047°$ | | |
| $\angle CAD \approx 46.4°$ | 1A | u−1 for missing unit <br> r.t. 46.4° |
| (iii) By sine formula, we have | | |
| $\dfrac{CE}{\sin\angle EAC} = \dfrac{6}{\sin\theta}$ and $\dfrac{ED}{\sin\angle EAD} = \dfrac{8}{\sin(180°-\theta)}$ | 1M | for either one with angle substituted |
| So, $\dfrac{6\sin 36.33605751°}{\sin\theta} + \dfrac{8\sin 10.06370296°}{\sin(180°-\theta)} \approx CD$ | 1M | with $CD$ substituted |
| $\dfrac{3.5551215}{\sin\theta} + \dfrac{1.397944043}{\sin\theta} \approx 5.813452775$ | | |
| $\sin\theta \approx 0.85200065$ | 1M | for making $\sin\theta$ the subject |
| $\theta \approx 58.42994248°$ | | |
| $\theta \approx 58.4°$ ($\because \theta$ is acute) | 1A | u−1 for missing unit <br> r.t. 58.4° |
| By cosine formula, we have | | |
| $\cos\angle ACD = \dfrac{6^2+CD^2-8^2}{(2)(6)(CD)}$ | 2M | with $CD$ substituted |
| $\cos\angle ACD \approx 0.083086497$ | | |
| $\angle ACD \approx 85.23400001°$ | | |
| $\because$ $\angle EAC + \angle ACD + \theta = 180°$ ($\angle$ sum of $\Delta$) <br> $36.33605751° + 85.23400001° + \theta = 180°$ | 1M | |
| $\therefore$ $\theta \approx 58.42994248°$ | | |
| Thus, $\theta \approx 58.4°$ | 1A | u−1 for missing unit <br> r.t. 58.4° |
| | -----(9) | |

| Solution | Marks | Remarks |
|---|---|---|
| 15. (a) (i) The required area $= \frac{1}{2}k(1-k)\sin 60°$ | 1M | for $\frac{1}{2}ab\sin 60°$ |
| $= \frac{\sqrt{3}}{4}k(1-k)$ m$^2$ | 1A | u−1 for missing unit |
| (ii) By cosine formula, we have | | |
| $x^2 = k^2 + (1-k)^2 - 2k(1-k)\cos 60°$ | 1M | for $x^2 = a^2 + b^2 - 2ab\cos 60°$ |
| $x^2 = 3k^2 - 3k + 1$ | | |
| $x = \sqrt{3k^2 - 3k + 1}$ | 1A | |
| (iii) By symmetry, $A_1B_1 = B_1C_1 = C_1A_1 = x$ m . | | |
| Thus, $A_1B_1C_1$ is an equilateral triangle. | 1 | |
| | ----------(5) | |
| (b) (i) $\because \frac{A_2B_1}{A_1B_0} = \frac{x(1-k)}{1-k} = x = \frac{xk}{k} = \frac{B_2B_1}{B_1B_0}$ | | |
| $\angle A_2B_1B_2 = 60° = \angle A_1B_0B_1$ | | |
| $\therefore \Delta A_1B_0B_1 \sim \Delta A_2B_1B_2$ (ratio of 2 sides, inc.∠) | | [兩邊成比例且夾角相等] |
| **Marking Scheme :** | | |
| **Case 1** Any correct proof with correct reasons. | 2 | |
| **Case 2** Any correct proof without reasons. | 1 | |
| (ii) $\because \Delta A_1B_0B_1 \sim \Delta A_2B_1B_2 \sim \Delta A_3B_2B_3 \sim \dots$ | | |
| $\therefore$ their areas form a geometric sequence with a common ratio $x^2$. | 1A | can be absorbed |
| So, the total area | | |
| $= \frac{\sqrt{3}}{4}k(1-k) + \frac{\sqrt{3}}{4}k(1-k)x^2 + \frac{\sqrt{3}}{4}k(1-k)x^4 + \cdots$ | | |
| $= \dfrac{\frac{\sqrt{3}}{4}k(1-k)}{1-x^2}$ | 1M | for $\frac{\text{(a)(i)}}{1-r}$ |
| $= \dfrac{\frac{\sqrt{3}}{4}k(1-k)}{3k-3k^2}$ (by (a)(ii)) | 1M | |
| $= \frac{\sqrt{3}}{12}$ m$^2$ | 1A | u−1 for missing unit |
| | ----------(6) | |

| Solution | Marks | Remarks |
|---|---|---|
| 16. (a) The required probability $= \left(1-\frac{1}{10}\right)\left(\frac{1}{2}\right)$ | 1M | for $\left(1-\frac{1}{10}\right)P_1$, where $0 < P_1 < 1$ |
| $= \frac{9}{20}$ | 1A | 0.45 |
| | ----------(2) | |
| (b) (i) The required probability $= \left(1-\frac{2}{25}\right)\left(\frac{1}{2}\right)$ | 1M | for $\left(1-\frac{2}{25}\right)P_2$, where $0 < P_2 < 1$ |
| $= \frac{23}{50}$ | 1A | 0.46 |
| (ii) (1) The required probability $= \left(\frac{2}{3}\right)\left(\frac{9}{20}\right)+\left(\frac{1}{3}\right)\left(\frac{23}{50}\right)$ | 1M+1M+1A | 1M for $\left(\frac{2}{3}\right)$(a) + <br> 1M for $\left(\frac{1}{3}\right)$((b)(i)) |
| $= \frac{34}{75}$ | 1A | r.t. 0.453 |

(2)

| Transportation | Transportation Cost | Transportation Cost + $15 Lunch |
|---|---|---|
| Bus and Train | $12 | $27 |
| Train and Train | $15 | $30 |

| Solution | Marks | Remarks |
|---|---|---|
| The required probability <br> $= 1-\frac{34}{75}$ | 2M | for $1-$(b)(ii)(1) |
| $= \frac{41}{75}$ | 1A | r.t. 0.547 |

| Solution | Marks | Remarks |
|---|---|---|
| The required probability <br> = P(John will spend more than a total of $30) <br> = P(John will spend more than a total of $22.5 for the morning trip and lunch) <br> $= \left(\frac{2}{3}\right)\left(\frac{1}{10}+\left(1-\frac{1}{10}\right)\left(\frac{1}{2}\right)\right)+\left(\frac{1}{3}\right)\left(\frac{2}{25}+\left(1-\frac{2}{25}\right)\left(\frac{1}{2}\right)\right)$ | | |
| $= \frac{1}{15}+\frac{3}{10}+\frac{2}{75}+\frac{23}{150}$ | 1A+1A | 1A for either one correct + <br> 1A for all correct |
| $= \frac{41}{75}$ | 1A | r.t. 0.547 |

| Solution | Marks | Remarks |
|---|---|---|
| The required probability <br> = P(John will spend more than a total of $30) <br> = P(John will spend more than a total of $22.5 for the morning trip and lunch) <br> $= \left(\frac{2}{3}\right)\left(\frac{1}{10}\right)\left(\frac{1}{2}\right)+\left(\frac{2}{3}\right)\left(\frac{1}{10}\right)\left(\frac{1}{2}\right)+\left(\frac{2}{3}\right)\left(\frac{9}{10}\right)\left(\frac{1}{2}\right)+$ <br> $\left(\frac{1}{3}\right)\left(\frac{2}{25}\right)\left(\frac{1}{2}\right)+\left(\frac{1}{3}\right)\left(\frac{2}{25}\right)\left(\frac{1}{2}\right)+\left(\frac{1}{3}\right)\left(\frac{23}{25}\right)\left(\frac{1}{2}\right)$ | | |
| $= \frac{1}{30}+\frac{1}{30}+\frac{3}{10}+\frac{1}{75}+\frac{1}{75}+\frac{23}{150}$ | 1A+1A | 1A for either one correct + <br> 1A for all correct |
| $= \frac{41}{75}$ | 1A | r.t. 0.547 |
| | ----------(9) | |

| Solution | Marks | Remarks |
|---|---|---|
| 17. (a) (i) In $\Delta NPM$ and $\Delta NKP$, | | |
| $\angle NPM = \angle NKP$ ( $\angle$ in alt. segment ) | | [交錯弓形的圓周角]、[弦切角定理] |
| $\angle MNP = \angle PNK$ ( common angle ) | | [公共角] |
| $\angle NMP = \angle NPK$ ( $\angle$ sum of $\Delta$ ) | | [△內角和] |
| $\therefore \Delta NPM \sim \Delta NKP$ ( AAA ) | | [等角] (AA) (equiangular) |
| So, $\dfrac{NP}{NK} = \dfrac{NM}{NP}$ | | |
| Thus, we can conclude that $NP^2 = NK \cdot NM$. | | |
| **Marking Scheme :** | | |
| **Case 1** Any correct proof with correct reasons. | 3 | |
| **Case 2** Any correct proof without reasons. | 2 | |
| **Case 3** Any one line except the first line and the conclusion. | 1 | |
| (ii) $\because NP^2 = NK \cdot NM$ and $ON^2 = NK \cdot NM$ ( by (a)(i) ) | | |
| $\therefore NP^2 = ON^2$ | | |
| $\therefore NP = ON$ | 1 | |
| $\because RS \,//\, OP$ | | |
| $\therefore \Delta KRM \sim \Delta KON$ ( AAA ) and $\Delta KMS \sim \Delta KNP$ ( AAA ) | | |
| $\therefore \dfrac{RM}{ON} = \dfrac{KM}{KN}$ and $\dfrac{MS}{NP} = \dfrac{KM}{KN}$ | | |
| $\therefore \dfrac{RM}{ON} = \dfrac{MS}{NP}$ | 1 | |
| $\therefore RM = MS$ | ----------(5) | |
| (b) (i) $\because FM = 2a$, $MG = 2(p-a)$ | 1A | for either one correct |
| $\therefore FG = 2a + 2(p-a)$ $= 2p$ | 1A | |
| $\because$ $x$-coordinate of $F$ $= -a$; $x$-coordinate of $G$ $= a + 2(p-a)$ $= 2p - a$ | 1A | for either one correct |
| $\therefore FG = (2p-a) - (-a)$ $= 2p$ | 1A | |
| (ii) $F = (-a, b)$ | 1A | |
| $\because FG = 2OP$ ( by (b)(i) ) and $FG \,//\, OP$ ( given ) | | |
| $\therefore O$ is the mid-point of $F$ and $Q$. | | |
| Thus, $Q = (a, -b)$ | 1A | |
| (iii) $\because$ $x$-coordinate of $Q$ $= a =$ $x$-coordinate of $M$ | | |
| $\therefore MQ \perp RS$ | 1 | |
| $\therefore RM = MS$ ( by (a)(ii) ) | | |
| $\therefore \Delta QMR \cong \Delta QMS$ ( SAS ) | | |
| Thus, $QR = QS$ | | |
| Hence, $\Delta QRS$ is an isosceles triangle. | 1 | |
| | ----------(6) | |