

- 1(a)  $\frac{2p^3}{3r^2}$
- (b)(i)  $a = -10$   
(ii)  $b = \frac{5a-4c}{3+a}$
- (c)(i)  $-3.25 + (-3.5 + x)^2$   
(ii)  $(3.5, -3.25)$
- (d)  $x = 5$  or  $x = 2\frac{1}{2}$
- 2(a) 3.90 cm  
(b)  $52.3^\circ$   
(c)  $21.1 \text{ cm}^2$
- 3(a) \$50.69  
(b) \$835  
(c)(i)  $9.2 \times 10^5$   
(ii)  $52\frac{136}{157}\%$  or  $52.9\%$   
(iii) 5.64
- 4(a)  $p = -3.8$   
(c)  $x > 3.75$   
(d)(iii)  $x = -2.7$  or  $-0.6$  or  $3.25$
- 5(a)(i)  $t(t+18)$   
(ii)  $(t+6)(t+12) - t(t+18) = 72$  (shown)  
(iii) 99
- (b)(i)  $8n+12$   
(ii)  $8n+12 = 4(2n+3)$   
This means that all terms are multiples of 4.
- 6(a)(i)  $67^\circ$   
(ii)  $25^\circ$
- (b)(i) 1.8 radians  
(ii)  $59.2 \text{ cm}^2$
- 7(a)(i)  $\begin{pmatrix} -9 \\ 4 \end{pmatrix}$   
(ii)  $h = -9.5, k = 1.5$
- (b)(i)  $\vec{AC} = \frac{5}{2}\vec{b} - \vec{a}$   
(ii)  $\vec{XB} = \frac{2}{3}(\vec{b} - \vec{a})$   
(iii)  $\vec{XY} = \frac{2}{3}(\frac{5}{2}\vec{b} - \vec{a})$
- 8(a)  $1990 \text{ m}^3$   
(b)  $410 \text{ m}^2$   
(c)  $13.6^\circ$
- 9(a)(i) 71.5  
(ii) 43  
(iii)  $58\frac{1}{3}\%$  or  $58.3\%$  (2s.f)  
(iv) There are more students getting merit in Group B than in Group A.  
There are more students getting distinction in Group A than in Group B.
- (b)(i) Shen calculated with replacement of blue counters  
(ii)  $\frac{12}{25}$
- 10(a)  $100 \text{ km} \rightarrow 6.3 \text{ L}$   
 $1 \text{ km} \rightarrow \frac{6.3 \text{ L}}{100 \text{ km}}$   
 $92 \text{ km} \rightarrow \frac{6.3 \text{ L}}{100 \text{ km}} \times 92 \text{ km}$   
 $= 5.8 \text{ L}$  (shown)
- (b) 2.68 L  
(c) \$10.52 (by bank transfer to Leila)

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2019 O level E-Math (4048) - Paper 2 Suggested Answer

Q1.  
(a)  $\frac{4p^2r}{3} \div \frac{2r^3}{p} = \frac{4p^2r}{3} \times \frac{p}{2r^3}$   
 $= \frac{2p^3}{3r^2}$  #

(b)(i)  $a = \frac{3(b) + 4(-2)}{5-6}$   
 $= -10$  #

(ii)  $a = \frac{3b+4c}{5-b}$

$5a-ab = 3b+4c$

$5a-4c = 3b+ab$

$b = \frac{5a-4c}{3+a}$  #

(d)  $\frac{1}{x-3} + \frac{6}{x-1} = 2$

$\frac{x-1+6x-18}{(x-3)(x-1)} = 2$

$\frac{7x-19}{x^2-4x+3} = 2$

$2x^2-15x+25=0$

$\therefore x=5 \text{ or } x=2\frac{1}{2}$  #

(c)(i)  $x^2 - 7x + 9 = (x-3.5)^2 + 9 - (-3.5)^2$   
 $= -3.25 + (-3.5+x)^2$  #

(ii)  $\therefore (3.5, -3.25)$  #

Q2.  
(a)  $CX = \sqrt{6.4^2 + 8.3^2 - 2(6.4)(8.3)\cos 27}$   
 $= 3.897$   
 $= 3.90 \text{ cm (3 s.f.)}$  #

(b)  $\frac{7.5}{\sin 112^\circ} = \frac{6.4}{\sin \angle XAB}$   
 $\angle XAB = \sin^{-1}\left(\frac{6.4 \sin 112^\circ}{7.5}\right)$   
 $= 52.297$   
 $= 52.3^\circ \text{ (1 d.p.)}$  #

(c)  $180^\circ - 52.297^\circ - 112^\circ = 15.703^\circ$   
 $15.703^\circ + 27^\circ = 42.703^\circ$   
 $\therefore \frac{1}{2}(8.3)(7.5)\sin 42.703^\circ$   
 $= 21.108$   
 $= 21.1^\circ \text{ (1 d.p.)}$  #

Q3.  
(a)  $\$1 = \text{£}0.58$   
 $\$x = \text{£}389$   
 $\$x = \$670.689$   
 $\therefore \$670.689 - \$620 = \$50.689$   
 $= \$50.69 \text{ (2 d.p.)}$  #

(b)  $94\% \rightarrow \$785$   
 $100\% \rightarrow x$   
 $x = 835.10$   
 $= \$835$  #

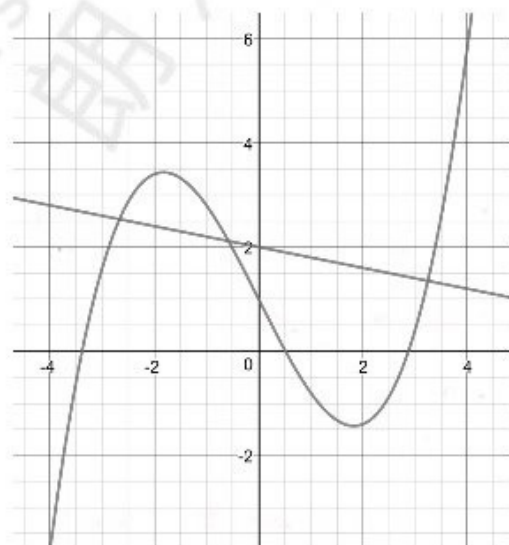
(c)(i)  $9.2 \times 10^5$  #

(ii)  $52.9\%$  #

(iii)  $5.64$  #

Q4.  
(a)  $p = \frac{(-4)^3}{5} - 2(-4) + 1$   
 $= -3.8$

(b)



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Q4.

(c)  $x > 3.75$  #

(d)(iii)  $5y + x = 10$

$$y = \frac{10-x}{5}$$

$$\frac{10}{5} - \frac{x}{5} = \frac{x^3}{5} - 2x + 1$$

$$10 - x = x^3 - 10x + 5$$

$$x^3 - 9x - 5 = 0 \text{ (shown) } \#$$

$$\therefore x = -2.7 \text{ or } -0.6 \text{ or } 3.25 \#$$

Q5.

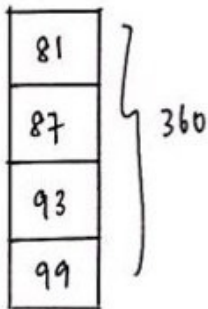
(a)(i)  $t(t+18)$

(ii)  $(t+6)(t+12) - t(t+18)$

$$= t^2 + 6t + 12t + 72 - t^2 - 18t$$

$$= 72 \text{ (shown) } \#$$

(iii)



$$\therefore 99 \#$$

(b)(i)  $60 - 36 = 24$

$$24 \div 3 = 8$$

$$20, 28, 36, 44, 52, 60$$

$$\therefore 8n + 12 \#$$

(ii)  $8n + 12 = 4(2n + 3)$

$\therefore$  This shows that all terms are multiples of 4.

Q6.

(a)(i)  $\angle ADO = 23^\circ$  (base of isos.  $\Delta$ )

$$\therefore \angle AOD = 180^\circ - 23^\circ - 23^\circ$$

$$= 134^\circ \text{ (}\angle \text{ sum of } \Delta \text{)}$$

$$\therefore \angle AOD = 134^\circ \div 2$$

$$= 67^\circ \text{ (}\angle \text{ at centre, twice } \angle \text{ at circumference) } \#$$

Q6.

(a)(i)  $\angle AED = 180^\circ - 67^\circ$   
 $= 113^\circ$  (opp.  $\angle$  are supplementary in cyclic quad)

$$\therefore \angle EAD = 180^\circ - 113^\circ - 42^\circ$$

$$= 25^\circ \text{ (}\angle \text{ sum of } \Delta \text{)}$$

(b)(i)  $r\theta + r + r = 15.2$

$$4\theta + 4 + 4 = 15.2$$

$$\theta = 1.8 \text{ rad } \#$$

(ii)  $\frac{1}{2}(4)^2(1.8) + \left[ \pi(6)^2 - \pi(4)^2 \right] - \left[ \frac{1}{2}(6)^2(1.8) - \frac{1}{2}(4)^2(1.8) \right]$

$$= 59.2318 \text{ cm}^2$$

$$= 59.2 \text{ cm}^2 \text{ (3 s.f.) } \#$$

Q7.

(a)(i)  $\vec{p}\vec{q} = \vec{OQ} - \vec{OP}$   
 $= \begin{pmatrix} -5 \\ 1 \end{pmatrix} - \begin{pmatrix} 4 \\ -3 \end{pmatrix}$   
 $= \begin{pmatrix} -9 \\ 4 \end{pmatrix} \#$

(ii)  $\vec{PR} = k\vec{p}\vec{q}$

$$\vec{OR} - \vec{OP} = \begin{pmatrix} -9k \\ 4k \end{pmatrix}$$

$$\begin{pmatrix} h \\ 3 \end{pmatrix} - \begin{pmatrix} 4 \\ -3 \end{pmatrix} = \begin{pmatrix} -9k \\ 4k \end{pmatrix}$$

$$\therefore h - 4 = -9k$$

$$b = 4k$$

$$k = 1.5 \#$$

$$\therefore h - 4 = -9(1.5)$$

$$h = -9.5 \#$$

(b)(i)  $\vec{OC} = \frac{b}{2} \div 2 \times 5$

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

$$\vec{AC} = \vec{OC} - \vec{OA}$$

$$= \frac{5}{2}b - a \#$$

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Q7.  
(b)(i)

$$\vec{AB} \Rightarrow 3u$$

$$\vec{AX} \Rightarrow 1u$$

$$\therefore \vec{AB} = k - a$$

$$\vec{AX} = \frac{1}{3}(k - a)$$

$$\vec{AX} = \vec{OX} - \vec{OA}$$

$$\vec{AX} + \vec{OA} = \vec{OX}$$

$$\vec{OX} = \frac{1}{3}(k - a) + a$$

$$= \frac{1}{3}k - \frac{1}{3}a + a$$

$$= \frac{1}{3}k + \frac{2}{3}a$$

$$\vec{XB} = \vec{OB} - \vec{OX}$$

$$= k - \left(\frac{1}{3}k + \frac{2}{3}a\right)$$

$$= \frac{2}{3}(k - a)$$

(iii)  $\frac{3}{2} = \frac{\frac{5}{2}k - a}{XY}$

$$\vec{XY} = \frac{2}{3}\left(\frac{5}{2}k - a\right)$$

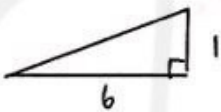
Q8.

(a)  $\left\{ \left[ \frac{1}{2} \times (4+5) \times 6 \right] \times 25 \right\} + \left\{ \left[ \frac{1}{2} \times (6.5+4) \times 10 \right] \times 25 \right\}$

$$= 1987.5 \text{ m}^3$$

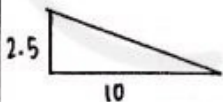
$$= 1990 \text{ m}^3 \text{ (3 s.f.)}$$

(b)



$$\sqrt{6^2 + 1^2} = 6.0827 \text{ m}$$

$$6.0827 \times 25 = 152.069$$



$$\sqrt{2.5^2 + 10^2} = 10.3077$$

$$10.3077 \times 25 = 257.6925$$

$$\therefore 257.6925 + 152.069 = 409.76$$

$$= 410 \text{ m}^2 \text{ (3 s.f.)}$$

Q8.

(c)  $\sqrt{10^2 + 25^2} = 26.925$   
 $\angle PDX = \tan^{-1}\left(\frac{6.5}{26.925}\right)$   
 $= 13.572$   
 $= 13.6 \text{ (1 d.p.)}$   
 #

Q9.

(a)(i) 71.5 #

(ii)  $93 - 50 = 43$  #

(iii)  $\frac{14}{24} \times 100\% = 58.333\%$   
 $= 58.3\% \text{ (3 s.f.)}$

(M) There are more students getting merit in Group B than in Group A.

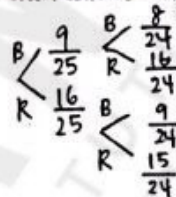
There are more students getting distinction in Group A than in Group B.

(b)(i)  $\frac{9}{25} \times \frac{8}{24} = \frac{3}{25} \checkmark$

$$\frac{9}{25} \times \frac{9}{25} = \frac{81}{625} \times$$

$\therefore$  Sheh calculated with replacement of blue counters.

(ii)



(ii)  $\left(\frac{9}{25} \times \frac{16}{24}\right) + \left(\frac{16}{25} \times \frac{9}{24}\right) = \frac{12}{25} \#$

Q10.

(a)  $6.3 \text{ l} \rightarrow 100 \text{ km}$        $\frac{6.3 \times 92}{100} = x$   
 $x \text{ l} \rightarrow 92 \text{ km}$

$$x = 5.796$$

$$\approx 5.8 \text{ l (shown) \#}$$

(b)

$4.2 \text{ l} \rightarrow 100 \text{ km}$   
 $y \text{ l} \rightarrow 63\frac{3}{4} \text{ km}$

$$\therefore y = \frac{63\frac{3}{4} \times 4.2}{100}$$

$$y = 2.6775$$

$$= 2.68 \text{ l (3 s.f.)}$$

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Q10.  
(c)

$$\frac{x}{60} + \frac{x-25}{75} = 3\frac{1}{4}$$

$$75x + 60x - 1500 = 14625$$

$$135x = 16125$$

$$x = 119\frac{4}{9} \text{ km}$$

$$\begin{aligned} \text{Total distance} &= 119\frac{4}{9} + 119\frac{4}{9} - 25 \\ &= 213\frac{8}{9} \text{ km} \end{aligned}$$

$$5 \text{ l} \rightarrow 100 \text{ km}$$

$$x \text{ l} \rightarrow 213\frac{8}{9} \text{ km}$$

$$\begin{aligned} x &= \frac{213\frac{8}{9} \times 5}{100} \\ &= 10\frac{25}{36} \text{ l} \end{aligned}$$

$$\therefore \$2.07 \rightarrow 1 \text{ l}$$

$$\$22.1375 \rightarrow 10\frac{25}{36} \text{ l}$$

$$\frac{95}{100} \times \$22.1375 = \$21.0306$$

$$\begin{aligned} \$21.0306 \div 2 &= \$10.515 \\ &= \$10.52 \text{ (by bank transfer to Leila)} \end{aligned}$$

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