

NS Practice Paper D - Solutions

(P1)

$$1) \quad m_{AB} = \frac{-7-3}{3-(-5)}$$

$$A(3, -7)$$

$$B(-5, 3)$$

$$m_{AB} = \frac{-10}{8}$$

$$m_{AB} = -\frac{5}{4}$$

$$2) \quad \frac{2}{5} \text{ of } 3\frac{1}{2} + \frac{4}{5}$$

$$= \frac{2}{5} \times \frac{7}{2} + \frac{4}{5}$$

$$= \frac{7}{5} + \frac{4}{5}$$

$$= \frac{11}{5}$$

$$3) \quad m = \frac{9-1}{4-0}$$

$$(0, 1)$$

$$m = \frac{8}{4}$$

$$(4, 9)$$

$$m = 2 \quad ; \quad c = 1$$

$$y = 2x + 1$$

4) (a)

37 41 (43 47) 56 58 | 59 61 (66 68) 70 75

$$(i) \text{ Median} = Q_2 = \frac{58+59}{2}$$

$$\text{Median} = 58.5$$

$$(ii) Q_1 = \frac{43+47}{2} \Rightarrow Q_1 = 45$$

$$Q_3 = \frac{66+68}{2} \Rightarrow Q_3 = 67$$

$$SIQR = \frac{Q_3 - Q_1}{2}$$

$$SIQR = \frac{67 - 45}{2}$$

$$SIQR = \frac{22}{2}$$

$$SIQR = 11$$

(b)

After extra classes, average score is better,  
as  $67 > 58.5$ .

After extra classes, scores are more consistent,  
as  $7 < 11$ .

$$5) \quad 112.5\% \text{ of } x = 450g$$

$$\left( \begin{aligned} 112.5\% &= 100\% + 12.5\% \\ &= 1 + \frac{1}{8} \\ &= \frac{9}{8} \end{aligned} \right)$$

$$\therefore \frac{9}{8} \text{ of } x = 450g$$

$$\therefore x = \frac{8}{9} \text{ of } 450g$$

$$\Rightarrow x = 8 \times 50g$$

$$\Rightarrow \boxed{x = 400g}$$

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$$6) \quad \vec{RP} = \vec{RQ} + \vec{QT} + \vec{TP}$$

$$\vec{RP} = -\underline{f} + (-\underline{g}) + \underline{h}$$

$$\boxed{\vec{RP} = \underline{h} - \underline{f} - \underline{g}}$$

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$$7) \quad (a) \quad \boxed{P(-2, -16)}$$

$$(b) \quad \boxed{Q(6, -16)}$$

$$(c) \quad S(14, -16) ; \quad \boxed{y = (x-14)^2 - 16}$$

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$$\begin{aligned} 8) \quad & \frac{3}{m} + \frac{4}{m+1} \\ &= \frac{3(m+1)}{m(m+1)} + \frac{4m}{m(m+1)} \\ &= \frac{3m+3+4m}{m(m+1)} \\ &= \boxed{\frac{7m+3}{m(m+1)}} \end{aligned}$$

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$$\begin{aligned} 9) \quad & y = a \cos bx \\ & \boxed{a = 4, b = 3} \end{aligned}$$

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$$\begin{aligned} 10) \quad & 2^0 + 3^{-1} \\ &= 1 + \frac{1}{3^1} \\ &= 1 + \frac{1}{3} \\ &= \boxed{\frac{4}{3}} \end{aligned}$$

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$$\begin{aligned} 11) \quad & \sqrt{12} + 5\sqrt{3} - \sqrt{27} \\ &= \sqrt{4}\sqrt{3} + 5\sqrt{3} - \sqrt{9}\sqrt{3} \\ &= 2\sqrt{3} + 5\sqrt{3} - 3\sqrt{3} \\ &= \boxed{4\sqrt{3}} \end{aligned}$$

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$$(2) \quad C = 2\pi r = 10$$

$$r = \frac{10}{2\pi}$$

$$r = \frac{5}{\pi}$$

$$A = \pi r^2$$

$$A = \pi \left( \frac{5}{\pi} \right)^2$$

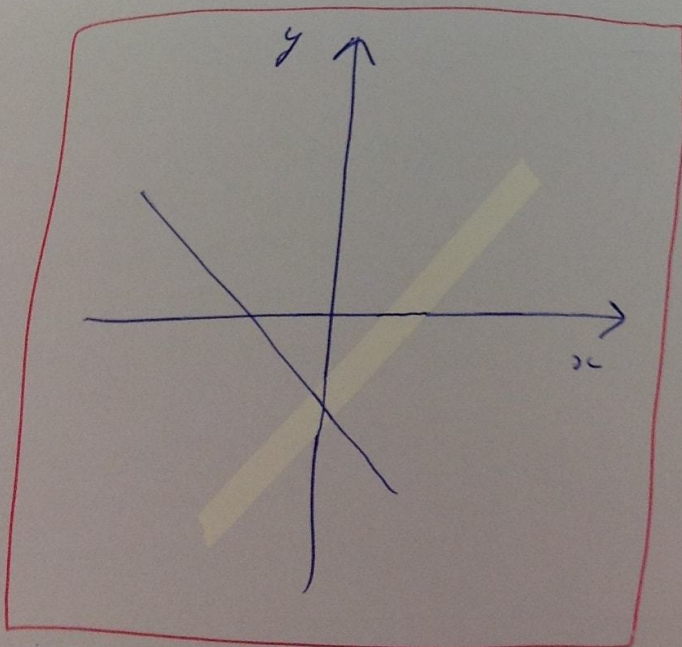
$$A = \frac{\pi}{1} \times \frac{25}{\pi^2}$$

$$A = \frac{25\pi}{\pi^2}$$

$$A = \frac{25}{\pi} \text{ square centimetres}$$

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$$(3) \quad y = ax + b, \quad a < 0, \quad b < 0$$



$$1) \quad 1\,530\,000 \times (1.025)^3 = \underline{1\,647\,641.26\dots}$$

$$\therefore \boxed{\neq 1\,650\,000 \text{ (3 s.f.)}}$$

$$2) \quad (a) \quad (i) \quad \bar{x} = \frac{(15+18+14+17+16+19)}{6}$$

$$\boxed{\bar{x} = 16.5 \text{ mm}}$$

(ii)

$x$	$(x - \bar{x})$	$(x - \bar{x})^2$
15	-1.5	2.25
18	1.5	2.25
14	-2.5	6.25
17	0.5	0.25
16	-0.5	0.25
19	2.5	6.25
		<b>17.5</b>

$$\sum (x - \bar{x})^2 = 17.5, \quad n = 6$$

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

$$s = \sqrt{\frac{17.5}{6-1}}$$

$$s = \sqrt{3.5}$$

$$s = 1.8708\dots$$

$$\boxed{s = 1.87 \text{ mm (2 d.p.)}}$$

(b) (i) Mean increases.

$$\boxed{\text{Mean} = 20.5 \text{ mm}}$$

(ii) SD is same.

$$\boxed{SD = 1.87 \text{ mm (2 d.p.)}}$$

3)

$$4 \sin \alpha + 1 = -2, \quad 0 \leq \alpha < 360$$

$$4 \sin \alpha = -3$$

$$\sin \alpha = -\frac{3}{4}$$

$$RA = \sin^{-1}\left(\frac{3}{4}\right)$$

$$RA = 48.6^\circ$$

←  
sin is -ve

S	A
$180^\circ - RA$	RA
$180^\circ + RA$	$360^\circ - RA$
T	C

✓      ✓

$$\alpha = 180^\circ + RA, \quad 360^\circ - RA$$

$$\alpha = 180^\circ + 48.6^\circ, \quad 360^\circ - 48.6^\circ$$

$$\alpha = 228.6^\circ, \quad 311.4^\circ$$

4) (a)

$$14x + 4y = 55$$

(b)

$$13x + 6y = 54.5$$

(c)

$$14x + 4y = 55 \quad (1) \quad \times 6$$

$$13x + 6y = 54.5 \quad (2) \quad \times 4$$

$$84x + 24y = 330 \quad (3)$$

$$52x + 24y = 218 \quad (4)$$

(3) - (4):

$$32x = 112$$

$$x = 3.5$$

Substitute  $x = 3.5$  into ① :

$$14(3.5) + 4y = 55$$

$$49 + 4y = 55$$

$$4y = 6$$

$$y = 1.5$$

Adult entrance fee = £3.50

Child entrance fee = £1.50

5) (a)

$$x = -3$$

(b)  $y = (x - (-3))^2 - 4$

$$y = (x + 3)^2 - 4$$

(c)

$$\underline{x = 0}$$

$$y = (0 + 3)^2 - 4$$

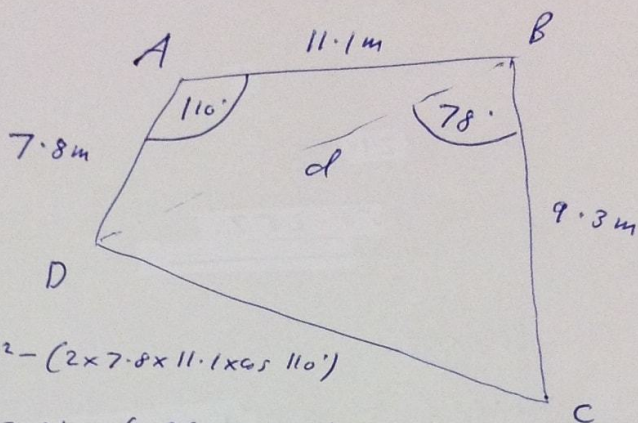
$$y = 9 - 4$$

$$\underline{y = 5}$$

∴  $c(0, 5)$



6)



$$(a) \quad d^2 = 7.8^2 + 11.1^2 - (2 \times 7.8 \times 11.1 \times \cos 110^\circ)$$

$$d^2 = 60.84 + 123.21 - (-58.229\dots)$$

$$d^2 = 243.274\dots$$

$$d = 15.5972\dots$$

$$BD = 15.60 \text{ m (2 d.p.)}$$

$$(b) \quad \text{Area} = \left(\frac{1}{2} \times 7.8 \times 11.1 \times \sin 110^\circ\right) + \left(\frac{1}{2} \times 9.3 \times 15.597\dots \times \sin 78^\circ\right)$$

$$\text{Area} = 40.679\dots + 70.9423\dots$$

$$\text{Area} = 111.621\dots$$

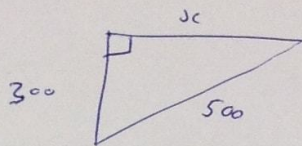
$$\text{Area of garden} = 111.62 \text{ m}^2 \text{ (2 d.p.)}$$

$$7) \quad x^2 = 500^2 - 300^2$$

$$x^2 = 250000 - 90000$$

$$x^2 = 160000$$

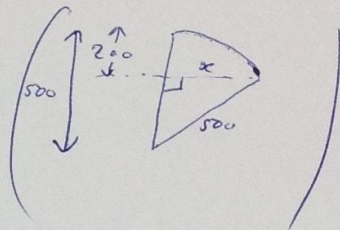
$$x = 400$$



$$\text{Width} = 2 \times x$$

$$\text{Width} = 2 \times 400$$

$$\text{Width} = 800 \text{ mm}$$



$$8) \quad 2x^2 - kx + 2 = 0$$

$$D = b^2 - 4ac$$

$$D = (-k)^2 - 4(2)(2)$$

$$D = k^2 - 16$$

$$\left( \begin{array}{l} a = 2 \\ b = -k \\ c = 2 \end{array} \right)$$

For equal roots,  $D = 0$ . So,

$$k^2 - 16 = 0$$

$$k^2 = 16$$

$$k = \pm 4$$

$$9) \text{ Area} = \frac{1}{2} \times 10 \times 10 \times \sin\left(\frac{360^\circ}{5}\right)$$

$$\text{Area} = \frac{1}{2} \times 100 \times \sin 72^\circ$$

$$\text{Area} = 47.55\dots$$

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$$V = \text{Area} \times 5 \times 8$$

$$V = 47.55\dots \times 40$$

$$V = 1902.113\dots$$

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$$V = 1902.11 \text{ cm}^3 \text{ (2 d.p.)}$$

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$$10) \frac{4}{x+3} + \frac{3}{x}$$

$$= \frac{4x}{x(x+3)} + \frac{3(x+3)}{x(x+3)}$$

$$= \frac{4x + 3x + 9}{x(x+3)}$$

$$= \frac{7x + 9}{x(x+3)}$$

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$$11) \text{ (a) Path area} = (x+1) \times (3x+2) - x(3x)$$

$$\text{Lawn area} = x \times (3x)$$

$$\text{Path area} = \text{Lawn area}$$

$$\therefore (x+1)(3x+2) - 3x^2 = 3x^2$$

$$3x^2 + 3x + 2x + 2 - 3x^2 = 3x^2$$

$$5x + 2 = 3x^2$$

$$3x^2 - 5x - 2 = 0$$

(b)

$$3x^2 - 5x - 2 = 0$$

$$(3x+1)(x-2) = 0$$

$$3x+1 = 0, x-2 = 0$$

$$x = -\frac{1}{3}, x = 2$$

$$x > 0 \text{ (length)} \Rightarrow x \neq -\frac{1}{3}. \text{ So, } \underline{x = 2.}$$

$$\text{Lawn length} = 3x$$

$$\text{Lawn length} = 3 \times 2$$

$$\text{Lawn length} = 6 \text{ m}$$