DBE NOV 2025 PAPER 2

STATISTICS [20]

1.1 **A** $\simeq$ 331 397,20 ; **B** $\simeq$ –22 988,32

$\therefore$ **y = 331 397,20 – 22 988,32x** ◄

The eqn: **y = A + Bx**

1.2 Predicted selling price: Subst $x = 5$

R216 455,60 ◄

1.3 **r $\simeq$ –0,95** ◄

The prediction is valid because the correlation coefficient is strong.

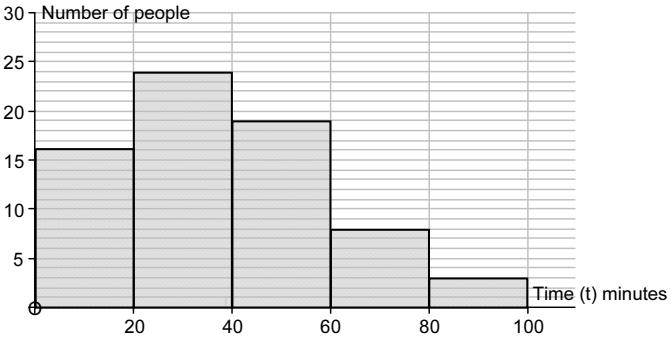
1.4 The estimated average yearly change $= \frac{dy}{dx} =$ –R22 988,32

$\therefore$ The estimated average yearly decrease = **R22 988,32** ◄

2.1.1 **70 people** ◄

2.1.2 67 – 40 = **27** ◄

2.1.3



2.1.4 **The data is right (positively) skewed.** ◄

2.2 Total number of points (9 players) = 108

Total number of points scored by 8 players

= 11 + 14 + 19 + ... + 14

= 98

$\therefore$ The 9th player scores 10 points . . . *108 – 98*

The mean, $\bar{x} = 12$ & the std deviation, $\sigma \simeq 5{,}23$

The number of players who score

either less than $\bar{x} - \sigma$, 6,77, so 6 and less

or more than $\bar{x} + \sigma$, 17,23, so 18 or more

$\therefore$ i.e. those who scored 2, 19 and 20

$\therefore$ **3 Players** ◄

ANALYTICAL GEOMETRY [39]

3.1 $QR^2 = (12 + 4)^2 + (2 + 6)^2$

$= 256 + 64$

$= 320$

$\therefore QR = \sqrt{320} = \sqrt{64 \times 5} =$ **$8\sqrt{5}$ units** ◄

3.2 $m_{QR} = \frac{2+6}{12+4} = \frac{8}{16} = \mathbf{\frac{1}{2}}$ ◄ . . . *= tan θ*

3.3 $\therefore \theta \simeq$ **26,57°** ◄

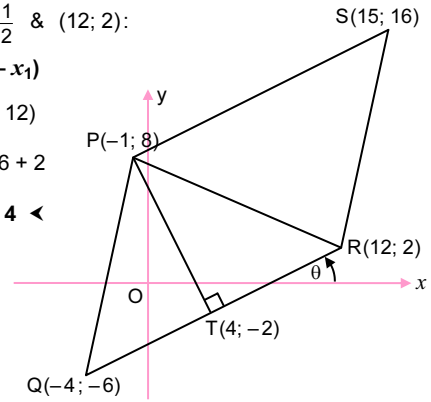
3.4 Subst. $m_{QR} = \frac{1}{2}$ & (12; 2):

$\mathbf{y - y_1 = m(x - x_1)}$

$\therefore y - 2 = \frac{1}{2}(x - 12)$

$\therefore y = \frac{1}{2}x - 6 + 2$

$\therefore$ **$y = \frac{1}{2}x - 4$** ◄



3.5 By inspection: **S(15; 16)** ◄

3.6 Eqn of QR: $y = \frac{1}{2}x - 4$

Eqn of PT: m = –2 & pt (–1; 8)

$\therefore y - 8 = -2(x + 1)$

$\therefore y = -2x + 6$

At T: $\frac{1}{2}x - 4 = -2x + 6$

$\therefore \frac{5}{2}x = 10$

$\left(\times \frac{2}{5}\right) \therefore x = 4$

& $y = \frac{1}{2}(4) - 4 = -2$

$\therefore$ **T(4; –2)** ◄

Note: It so happens that T is the midpoint of QR! (But, it won't be correct to use the midpoint formula)

3.7 Area of $||^m$ PQRS = QR × PT

$PT^2 = (4 + 1)^2 + (-2 - 8)^2$

$= 25 + 100$

$\therefore PT = \sqrt{125} = 5\sqrt{5}$ units

$\therefore$ Area of $||^m = 8\sqrt{5} \times 5\sqrt{5}$

= **200 units²** ◄

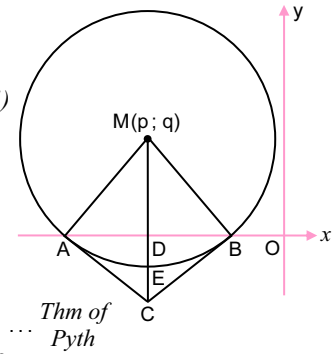
(OR: Find the area of ΔPQR, and double it.)

4.1 **p = –6** ◄

4.2 DE = 1 unit . . . *pt E(6; –1)*

$\therefore$ ME = q + 1

$\therefore$ MA = q + 1 . . . *equal radii*



In rt ∠d ΔMDA:

$MA^2 = AD^2 + MD^2$ . . . *Thm of Pyth*

$\therefore (q + 1)^2 = (q - 1)^2 + q^2$

$\therefore \cancel{q^2} + 2q + \cancel{1} = q^2 - 2q + \cancel{1} + \cancel{q^2}$

$\therefore 0 = q^2 - 4q$

$\therefore q(q - 4) = 0$

$\therefore$ (q = 0 or) **q = 4** ◄

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4.3 Centre (a; b) is (–6; 4)
& radius = q + 1 = 5
∴ Eqn of ⊙M: $(x+6)^2 + (y-4)^2 = \mathbf{25}$ ◄

4.4 The radius, r = 5 units
& M is 6 units from the y-axis . . . $p = x_E = -6$
∴ Currently, the distance = 1 unit
∴ **If translated, the minimum distance = 3 units** ◄

4.5 At A & B, y = 0
& Eqn. of ⊙M:
$(x+6)^2 + 16 = 25$
∴ $(x+6)^2 = 9$
∴ $x + 6 = \pm 3$
∴ $x = -3$ or -9
∴ **A(–9; 0) & B(–3; 0)** ◄

OR:
AD = q – 1 = 4 – 1 = 3
and MD ⊥ AB
∴ AD = DB
MC: $x = -6$ . . . *MC || y-axis*
∴ 3 left of –6 is –9
∴ A(–9; 0)
& 3 right of –6 is –3
∴ B(–3; 0)

4.6 $m_{MB} = \frac{0-4}{-3+6}$ M(–6; 4) & B(–3; 0)
$= -\frac{4}{3}$
∴ $m_{BC} = +\frac{3}{4}$ . . . *tang BC ⊥ rad MB*
& pt B(–3; 0):
∴ Eqn of BC: $y - 0 = \frac{3}{4}(x+3)$
∴ $\mathbf{y = \frac{3}{4}x + \frac{9}{4}}$ ◄

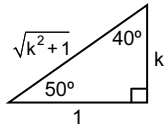
4.7 $\mathbf{C\left(-6; -\frac{9}{4}\right)}$ ◄ . . . $x_E = -6$
& $y_C = \frac{3}{4}(-6) + \frac{9}{4} = -\frac{9}{2} + \frac{9}{4} = -\frac{9}{4}$

4.8 In ΔDBC: DB = 3 & DC = $\frac{9}{4}$ units
∴ $\tan D\hat{C}B = \frac{3}{\frac{9}{4}}$
$= \frac{4}{3}$
∴ $D\hat{C}B = 53{,}13°$
∴ $A\hat{C}B = \mathbf{106{,}26°}$ ◄

There are several possible methods.

TRIGONOMETRY [50]

5.1 $\tan 50° = \frac{k}{1}$



5.1.1 $\cos 40° = \mathbf{\frac{k}{\sqrt{k^2+1}}}$ ◄

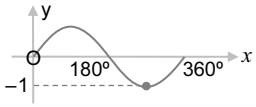
5.1.2 $\frac{2\sin 25° \cos 25°}{-2 + 4\sin^2 25°}$
$= \frac{\sin 2(25°)}{-2(1 - 2\sin^2 25°)}$ . . . $\sin 2A = 2\sin A \cos A$
$= \frac{\sin(50°)}{-2\cos 2(25°)}$ . . . $\cos 2A = \cos^2 A - \sin^2 A$
$= 1 - 2\sin^2 A$
$= -\frac{1}{2} \cdot \frac{\sin 50°}{\cos 50°}$
$= -\frac{1}{2}\tan 50° = \mathbf{-\frac{1}{2}k}$ ◄

5.1.3 $\sin 10° = \sin(50° - 40°)$
$= \sin 50° \cos 40° - \cos 50° \sin 40°$
$= \sin 50° \sin 50° - \cos 50° \cos 50°$
$= \sin^2 50° - \cos^2 50°$
$= \left(\frac{k}{\sqrt{k^2+1}}\right)^2 - \left(\frac{1}{\sqrt{k^2+1}}\right)^2$
$= \frac{k^2}{k^2+1} - \frac{1}{k^2+1}$
$= \mathbf{\frac{k^2-1}{k^2+1}}$ ◄

5.2.1 $\frac{\sin(540° + x) \cdot \cos(90° + x)}{\sin(-x)}$
$= \frac{\sin(180° + x) \cdot \cancel{(-\sin x)}}{\cancel{(-\sin x)}}$
$= \mathbf{-\sin x}$ ◄

5.2.2 Consider when $\sqrt{-\sin x}$ will be real (See 5.2.1):
When $0 < -\sin x \leq 1$
$\times(-1)$ ∴ $0 > \sin x \geq -1$
i.e. $-1 \leq \sin x < 0$
∴ $\mathbf{180° < x < 360°}$ ◄

$-\sin x \neq 0$ because it is in the denominator

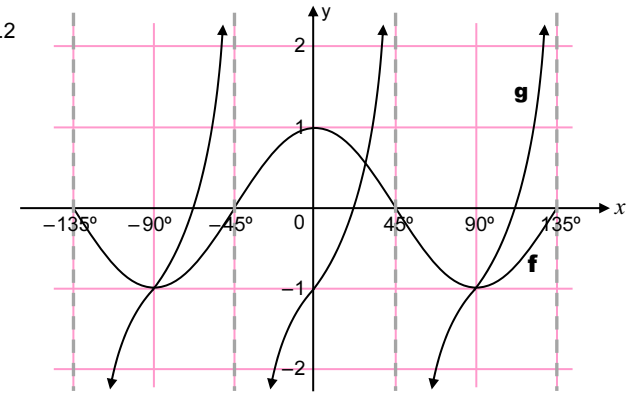


6.1 **LHS**
$= [\tan(180° - x)](1 - \cos^2 x) + \cos^2 x = \frac{(\sin x - \cos x)(1 + \sin x \cdot \cos x)}{-\cos x}$
$= (-\tan x)(\sin^2 x) + \cos^2 x$
$= -\frac{\sin x}{\cos x}(\sin^2 x) + \cos^2 x$
$= \frac{-\sin^3 x + \cos^3 x}{\cos x}$
$= \frac{-(\sin^3 x - \cos^3 x)}{\cos x}$
$= \frac{(\sin x - \cos x)(\sin^2 x + \sin x \cos x + \cos^2 x)}{-\cos x}$
$= \frac{(\sin x - \cos x)(1 + \sin x \cos x)}{-\cos x}$
= **RHS** ◄

6.2 $\cos^2 x - \sin^2 x = \frac{1}{2}\sin 2x - \cos^2 x$ . . . *= d, the common difference*
∴ $2\cos^2 x - \sin^2 x = \frac{1}{2}(2\sin x \cos x)$
∴ $2\cos^2 x - \sin^2 x = \sin x \cos x$
∴ $2\cos^2 x - \sin x \cos x - \sin^2 x = 0$
∴ $(2\cos x + \sin x)(\cos x - \sin x) = 0$
∴ $2\cos x = -\sin x$ or $\cos x = \sin x$
(÷ cos x) ∴ $2 = -\tan x$ But the constant difference = 0
∴ $\tan x = -2$ ∴ not applicable
∴ $\mathbf{x = 116{,}57° + n(180°), n \in \mathbb{Z}}$ ◄

7.1 **180°** ◄

7.2



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7.3 $f(x) = \cos 2x$

$\therefore h(x) = \cos 2(x + 45^\circ)$

$\therefore h(x) = \cos(2x + 90^\circ)$

$\therefore$ **$h(x) = -\sin 2x$** ◄

7.4 **$y \in [-1; 1]$ or $-1 \le y \le 1$** ◄

7.5 $(1 - \tan 2x)(\cos 2x) \ge 0$

$\therefore (\tan 2x - 1)(\cos 2x) \le 0$

$\therefore g(x).f(x) \le 0$

$\therefore$ **$0^\circ \le x \le 22\frac{1}{2}^\circ$ or $112{,}5^\circ \le x < 135^\circ$** ◄

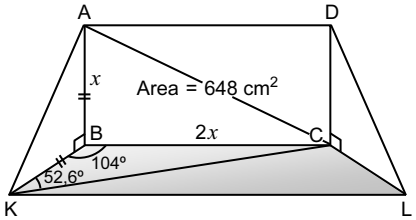
8.1 Let AB = x cm; then BC = $2x$ cm

Area of ABCD = $x \times 2x$ = 648 cm^2

$\therefore x^2$ = 324 cm^2

$\therefore$ **AB = x = 18 cm** ◄

A = b × ℓ



8.2 In ΔABC: $AC^2 = 18^2 + 36^2 = 1\,620$ . . . *(Pyth)*

$\therefore$ **AC $\simeq$ 40,25 cm** ◄

8.3 In ΔBKC: $\dfrac{KC}{\sin 104^\circ} = \dfrac{36}{\sin 52{,}6^\circ}$

$\therefore KC = \dfrac{36 \sin 104^\circ}{\sin 52{,}6^\circ}$

$\simeq$ **43,97 cm** ◄

8.4 In rt $\angle^d$ ΔABK: $AK^2 = AB^2 + BK^2$ . . . *(Pyth)*

$= 18^2 + 18^2$ . . . *BK = AB = 18*

$= 648$

$\therefore$ In ΔAKC: $KC^2 = AK^2 + AC^2 - 2AK.AC \cos K\hat{A}C$

$\therefore 43{,}97^2 = 648 + 1\,620 - 2.\sqrt{648}\sqrt{1\,620} \cos K\hat{A}C$

$\therefore 2\sqrt{648 \times 1\,620} \cos K\hat{A}C = 334{,}6391$

$= 0{,}1633\ldots$

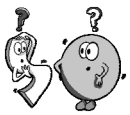
$\therefore$ **$K\hat{A}C = 80{,}60^\circ$** ◄

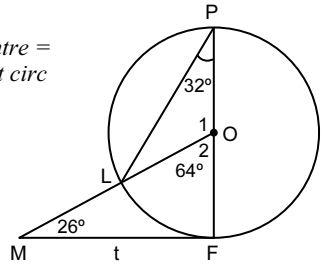
EUCLIDEAN GEOMETRY [41]

9.1 Theorem

9.2.1 $\hat{O}_2 = 2\hat{P}$ . . . *∠ at centre = 2 × ∠ at circ*

$= 64^\circ$ ◄





9.2.2 $O\hat{F}M = 90^\circ$ . . . *diam ⊥ tang*

$\therefore$ **$\hat{M} = 26^\circ$** ◄ . . . *sum of ∠^{s} of Δ*

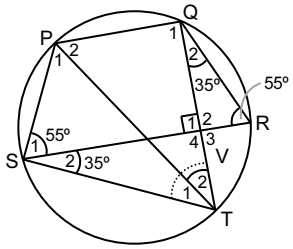
10.1 $V_2 = 90^\circ$ . . . *QT ⊥ SR*

$Q\hat{R}S$ = **55°** ◄ . . . *sum of ∠^{s} in Δ*

$\therefore Q\hat{T}S$ = **55°** ◄ . . . *∠^{s} in the same seg.*

10.2 $\hat{S}_1 = \hat{R} = 55^\circ$

& $P\hat{Q}R = 125^\circ$ . . . *opp ∠^{s} of c.q.*



10.3 $\hat{Q}_1 = 125^\circ - 35^\circ = 90^\circ$

$\therefore$ **PT is a diameter of the circle** ◄ . . . *conv. ∠ in semi-⊙*

11.1.1 In ΔCDA: $\dfrac{FD}{CF} = \dfrac{GA}{CG}$ . . . *prop thm; AD || GF*

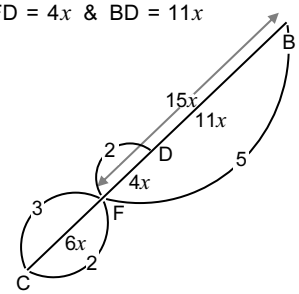
$= \dfrac{2}{3}$ ◄

11.1.2 In ΔBEF: $\dfrac{BA}{EA} = \dfrac{BD}{FD}$ . . . *prop thm; AD || EF*

Let CF = $6x$; then FD = $4x$ & BD = $11x$

$\therefore \dfrac{BA}{EA} = \dfrac{11x}{4x}$

$= \dfrac{11}{4}$ ◄



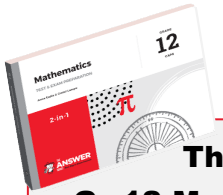
11.1.3 $\dfrac{\text{Area of } \Delta GCF}{\text{Area of } \Delta ACD} = \dfrac{\frac{1}{2}GC.CF \sin C}{\frac{1}{2}AC.CD \sin C}$

$= \dfrac{GC}{AC} \cdot \dfrac{CF}{CD}$

$= \dfrac{3}{5} \cdot \dfrac{3}{5}$

$= \dfrac{9}{25}$

$\therefore \dfrac{\text{Area of } \Delta GCF}{\text{Area of GFDA}} = \dfrac{9}{25 - 9} = \dfrac{9}{16}$ ◄



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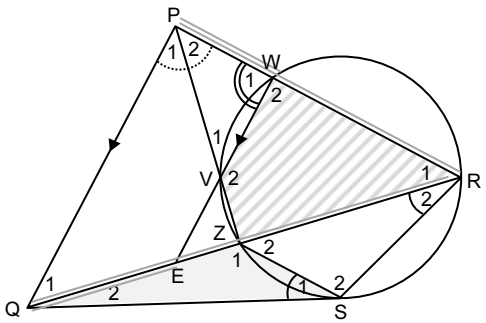
11.2.1

Note: Mark the 4 sides on the figure; it will be clear what to do . . .

In ΔRPQ

$\frac{PR}{PW} = \frac{QR}{QE}$ . . . *prop thm; WE || PQ*

$\therefore$ **PR = $\frac{PW.QR}{QE}$** ◄



11.2.2 ΔPQZ ||| ΔRQP

➡ $\frac{PQ}{RQ} = \frac{QZ}{PQ} \left(= \frac{PZ}{PR}\right)$ . . . *sides in proportion*

$\therefore$ **PQ^2 = RQ.QZ** ◄

11.2.3 In Δ^s QSZ & QRS

(1) $\hat{Q}_2$ is common

(2) $\hat{S}_1 = \hat{R}_2$ . . . *tan chord thm*

$\therefore$ **ΔQSZ ||| ΔQRS** . . . ∠∠∠ ◄

11.2.4 From 11.2.2: $PQ^2 = RQ.QZ$ . . . ❶

& From 11.2.3: $\frac{QS}{QR} = \frac{QZ}{QS}$ . . . *prop sides*

$\therefore QS^2 = QR.QZ$ . . . ❷

❶ & ❷ $\therefore PQ^2 = QS^2$

$\therefore$ **PQ = QS** ◄

11.2.5 Derived from 11.2.1: $\frac{PW.QR}{QE} = PR$

$\therefore PW = \frac{QE.PR}{QR}$ . . . ❶

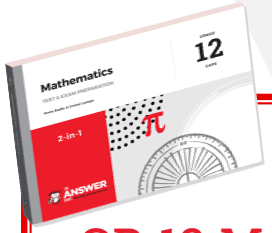
From similar Δ^s in 11.2.2: $\frac{PR}{QR} = \frac{PZ}{PQ}$ . . . ❷

❷ in ❶: $\therefore PW = \frac{QE.PZ}{PQ}$

From 11.2.2: $PQ^2 = QR.QZ$

$\therefore PQ = \sqrt{QR.QZ}$

$\therefore PW = \frac{QE.PZ}{\sqrt{QR.QZ}}$ ◄



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