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FINALS EXAM PRACTICE 2

GRADE 12 PAPER 2 SOLUTIONS

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QUESTION 1

1.1.1 NO. OF STUDENTS = $15 + 30 + 25 + 10 = 80$

$\therefore \text{EIT. } \bar{x} = \frac{30 \times 15 + 50 \times 30 + 70 \times 25 + 90 \times 10}{80} = 57,5$

1.1.2 $[40; 60)$

1.2.1 $\bar{x}_0 = \bar{x} + k$

1.2.2 IN DATA SET D: FOR x_i WE HAVE $x_i + k - (\bar{x} + k) = x_i - \bar{x}$.
 $\therefore \sum (x_i - \bar{x})^2$ WILL REMAIN THE SAME IN THE TWO DATA SETS.
 $\therefore$ THE STANDARD DEVIATION IN BOTH DATA SETS IS IDENTICAL.

1.2.3 (i) AND (v)

1.2.4 STANDARD DEVIATION IS A MEASURE OF HOW WELL THE DATA IS CLUSTERED AROUND THE MEAN.

QUESTION 2

2.1 $Y = 0,79X + 3,97$

2.2 $6 = 0,79M + 3,97 \rightarrow M = 2,57 \rightarrow M = 3$

2.3 $r = 0,8013$ ADDITIONAL TIME IS A STRONG INDICATOR OF IMPROVING ONE'S SCORE.

QUESTION 3

3.1 $0 = \frac{n+4}{2} \rightarrow n = -4$; $-1 = \frac{m-5}{2} \rightarrow m = 3$

3.2 $m_{AB} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3+5}{4+4} = 1 \therefore \theta = 45^\circ \rightarrow \hat{D}_1 = 45^\circ$ (VERT. OPPOSITE)

$\therefore \hat{ABC} = 71,565 - 45^\circ$ (EXT. OF Δ) $\rightarrow \hat{ABC} = 26,57^\circ$

3.3 $m_{BC} = \tan 71,565 = 3 \rightarrow Y+5 = 3(X+4) \rightarrow Y = 3X+7$

3.4 $BC^2 = (x+4)^2 + (3x+7+5)^2 = (x+4)^2 + (3x+12)^2$

$\therefore 90 = x^2 + 8x + 16 + 9x^2 + 72x + 144 \rightarrow 10x^2 + 80x + 20 = 0$

$x^2 + 8x + 2 = 0 \rightarrow (x+1)(x+2) = 0 \rightarrow x = -1 \text{ OR } x = -2$

$x = -1 \rightarrow Y = -3+7 = 4 \rightarrow C(-1; 4)$

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QUESTION 5

$$5.1 \quad x^2 - 8x + 16 + y^2 + 6y + 9 = -5 + 16 + 9 \\ \therefore (x-4)^2 + (y+3)^2 = 20 \rightarrow C(4; -3) \text{ AND } r = \sqrt{20}$$

$$5.2 \quad A = \frac{1}{2} \cdot b \cdot h = \frac{1}{2} (\sqrt{29} - 2) \cdot 4 = 6,77 \text{ units}^2$$

$$5.3 \quad P: Y\text{-INT}: x=0 \rightarrow (-4)^2 + (y+3)^2 = 20 \rightarrow y = -3 \pm 2 \rightarrow P(0; -5) \\ Q: -5 - (\sqrt{29} - 2) = -3 - \sqrt{29} \rightarrow Q(0; -3 - \sqrt{29}) \\ \therefore QC^2 = (4-0)^2 + (-3+3+\sqrt{29})^2 = 16 + 29 = 45 \\ \therefore (x-4)^2 + (y+3)^2 = 45$$

$$5.4 \quad T: X\text{-INT}: y=0 \rightarrow (x-4)^2 + 3^2 = 45 \rightarrow x = 4 \pm 6 \rightarrow T(10; 0) \\ M_{CT} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0+3}{10-4} = \frac{1}{2} \rightarrow M_{TAN} = -2 \\ y - 0 = -2(x - 10) \rightarrow y = -2x + 20 \rightarrow R(0; 20) \\ RP = 20 - (-5) = 25 \rightarrow \text{AREA } \triangle RPT = \frac{1}{2} \cdot 25 \cdot 10 = 125 \text{ units}^2$$

QUESTION 6

$$6.1 \quad \frac{\cos(180+80)}{(\cos(360-50) - \sin(180+50))(\sin 40 - \sin(180-50))} \\ = \frac{-\cos 80}{(\cos 50 + \sin 50)(\sin 40 - \sin 50)} \\ = \frac{-\cos 80}{(\cos 50 + \sin 50)(\cos 50 - \sin 50)} \\ = \frac{-\cos 80}{\cos^2 50 - \sin^2 50} = \frac{-\cos 80}{\cos 100} \\ = \frac{-\cos 80}{\cos(180-80)} = \frac{-\cos 80}{-\cos 80} = 1$$

$$6.2 \quad \frac{\sin(180-27) \cdot \cos(180+63) + \tan(360-27)}{-\tan(180+27)}$$

$$= \frac{-\sin 27 \cdot \cos 63 + \tan 27}{\tan 27}$$

$$= -\sin 27 \cdot \sin 27 + 1 = 1 - \sin^2 27 = \cos^2 27$$

$$6.3 \quad LHS = \frac{\sin(2x+x) + \sin x}{2 \cos x} = \frac{\sin 2x \cdot \cos x + \cos 2x \cdot \sin x + \sin x}{2 \cos x}$$

$$= \frac{2 \sin x \cdot \cos^2 x + (2 \cos^2 x - 1) \cdot \sin x + \sin x}{2 \cos x}$$

$$= \frac{4 \sin x \cdot \cos^2 x}{2 \cos x} = 2 \sin x \cdot \cos x = \sin 2x = RHS$$

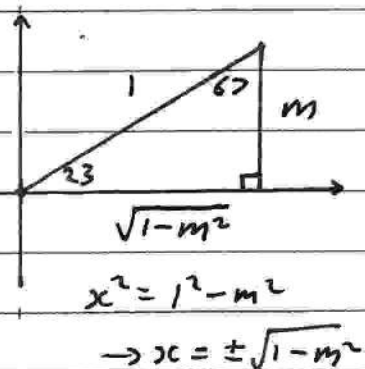
$$6.4 \quad 5 \cdot \sin A \cdot \cos A + \frac{\sin A}{\cos A} \cdot \cos^2 A = 5 \cdot \sin A \cdot \cos A + \sin A \cdot \cos A$$

$$= \frac{5}{2} \cdot 2 \sin A \cdot \cos A + \frac{1}{2} \cdot 2 \sin A \cdot \cos A = 3 \cdot \sin 2A \rightarrow MAX = 3$$

$$6.5 \quad \frac{\cos 23 \cdot \cos 67}{2 \cdot \tan(180-23)} = \frac{\cos 23 \cdot \cos 67}{-2 \cdot \tan 23}$$

$$= -\frac{1}{2} \cdot \frac{\cos^2 23 \cdot \sin 23}{\sin 23} = -\frac{1}{2} \cos^2 23$$

$$= -\frac{1}{2} (\sqrt{1-m^2})^2 = -\frac{1}{2} (1-m^2) = \frac{1}{2} (m^2-1)$$



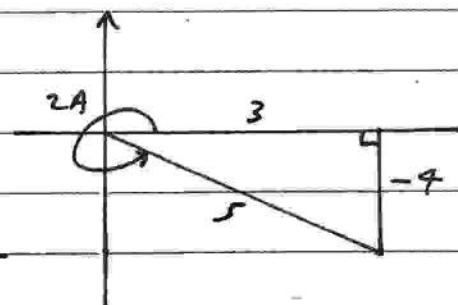
$$6.6 \quad 135^\circ < A < 180^\circ \rightarrow 270^\circ < 2A < 360^\circ$$

$$\sin -ve \rightarrow Q3/Q4 \quad \therefore Q4$$

$$\cos 2A = 1 - 2 \sin^2 A \rightarrow \sin^2 A = \frac{1 - \cos 2A}{2}$$

$$\sin^2 A = \frac{1 - \frac{3}{5}}{2} = \frac{1}{5}$$

$$\therefore \sin A = \frac{1}{\sqrt{5}} \quad (2^{nd} \text{ QUADRANT})$$



$$x^2 = 25 - 16 = 9$$

$$x = \pm 3$$

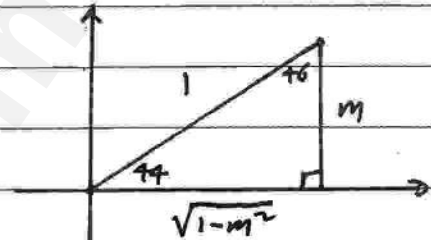
$$\cos 2A = 2 \cdot \cos^2 A - 1 \rightarrow \cos^2 A = \frac{1 + \cos 2A}{2} = \frac{1 + \frac{3}{5}}{2} = \frac{4}{5}$$

$$\therefore \cos A = \frac{-2}{\sqrt{5}} \quad (2^{\text{nd}} \text{ QUADRANT}) \quad \tan A = \frac{\sin A}{\cos A}$$

$$\therefore \tan A = \frac{1}{\sqrt{5}} \times \left(\frac{-\sqrt{5}}{2} \right) = -\frac{1}{2}$$

$$6.7.1 \quad \cos 44^\circ = \sqrt{1-m^2}$$

$$x^2 = 1-m^2 \\ \therefore x = \pm \sqrt{1-m^2}$$



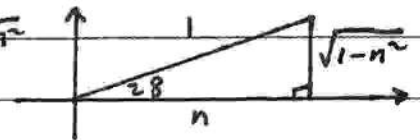
$$6.7.2 \quad \sin 16^\circ = \sin(44^\circ - 28^\circ)$$

$$y^2 = 1-n^2 \\ \therefore y = \pm \sqrt{1-n^2}$$

$$= \sin 44^\circ \cdot \cos 28^\circ - \cos 44^\circ \cdot \sin 28^\circ$$

$$= m \cdot n - \sqrt{1-m^2} \cdot \sqrt{1-n^2}$$

$$= m \cdot n - \sqrt{(1-m^2)(1-n^2)} = m \cdot n - \sqrt{1-n^2-m^2+m^2n^2}$$



$$6.8 \quad \cos 30^\circ \cdot \cos \theta - \sin 30^\circ \cdot \sin \theta = 3 (\sin 60^\circ \cdot \cos \theta + \cos 60^\circ \cdot \sin \theta) \\ \frac{\sqrt{3}}{2} \cdot \cos \theta - \frac{1}{2} \cdot \sin \theta = \frac{3\sqrt{3}}{2} \cos \theta + \frac{3}{2} \sin \theta$$

$$3 \sin \theta + \sin \theta = \sqrt{3} \cos \theta - 3\sqrt{3} \cos \theta \rightarrow 4 \sin \theta = -2\sqrt{3} \cos \theta$$

$$\therefore \tan \theta = -\frac{\sqrt{3}}{2} \rightarrow \text{RA: } 40,89^\circ$$

$$\therefore \theta = 180^\circ - 40,89^\circ + k \cdot 180^\circ \text{ OR } \theta = 360^\circ - 40,89^\circ + k \cdot 180^\circ, k \in \mathbb{Z} \\ \theta = 139,11^\circ + k \cdot 180^\circ \text{ OR } \theta = 319,11^\circ + k \cdot 180^\circ, k \in \mathbb{Z}$$

NOTE THAT THIS COVERS ALL THE SOLUTIONS

$$6.9 \quad \sin 7x - \sin x = \cos 4x \quad x \in [0^\circ; 90^\circ]$$

$$\therefore \sin(4x+3x) - \sin(4x-3x) = \cos 4x$$

$$\therefore 2 \cdot \cos 4x \cdot \sin 3x = \cos 4x \rightarrow 2 \cdot \cos 4x \cdot \sin 3x - \cos 4x = 0$$

$$\cos 4x (2 \cdot \sin 3x - 1) = 0 \rightarrow \cos 4x = 0 \text{ OR } \sin 3x = \frac{1}{2}$$

$$\cos 4x = 0 : \text{RA} = 90^\circ \quad \sin 3x = \frac{1}{2} : \text{RA} = 30^\circ$$

$$\therefore 4x = 90^\circ \text{ OR } 4x = 270^\circ \quad \therefore 3x = 30^\circ \text{ OR } 3x = 150^\circ$$

$$x = 22,5^\circ \text{ OR } x = 67,5^\circ \quad x = 10^\circ \text{ OR } x = 50^\circ$$

$$\therefore x = 22,5^\circ \text{ OR } x = 67,5^\circ \text{ OR } x = 10^\circ \text{ OR } x = 50^\circ$$

QUESTION 7

$$f(x) = m \cdot \tan\left(\frac{x}{2}\right) ; g(x) = n \cdot \cos x$$

7.1 $f: \text{SUBST}(90^\circ; 2) \rightarrow 2 = m \cdot \tan 45^\circ \rightarrow m = 2$ (OR FROM GRAPH)
 $g: \text{SUBST}(0^\circ; -2) \rightarrow -2 = n \cdot \cos 0 \rightarrow n = -2$ (OR FROM GRAPH)

7.2 OTHER X-INT OF $g: 270^\circ$.
 $0^\circ \leq x \leq 90^\circ$ OR $180^\circ < x \leq 270^\circ$ OR $x = 360^\circ$

$f(x)$	$g(x)$
+	-
-	+
0	ANY
ANY	0

7.3 $0^\circ \leq x < 180^\circ$ OR $302,94^\circ < x \leq 360^\circ$

7.4 $h(x) = -g(x+30^\circ) = 2 \cdot \cos(x+30^\circ)$
Y-INT: $x=0 \rightarrow h(0) = 2 \cdot \cos 30^\circ = \sqrt{3} \rightarrow (0; \sqrt{3})$

QUESTION 8

8.1.1 $\tan 46^\circ = \frac{60-L}{x+10} \rightarrow 60-L = x \cdot \tan 46^\circ + 10 \cdot \tan 46^\circ$ ①

$\tan 50^\circ = \frac{55-L}{x} \rightarrow 55-L = x \cdot \tan 50^\circ$ ②

$\rightarrow 60-L = x \cdot \tan 50^\circ + 5$ ③

FROM ① + ③: $x \cdot \tan 50^\circ + 5 = x \cdot \tan 46^\circ + 10 \cdot \tan 46^\circ$

$\therefore x(\tan 50^\circ - \tan 46^\circ) = 10 \cdot \tan 46^\circ - 5 \rightarrow x = \frac{10 \cdot \tan 46^\circ - 5}{\tan 50^\circ - \tan 46^\circ}$

8.1.2 FROM ②, $L = 55 - x \cdot \tan 50^\circ = 14,15 \text{ m}$

8.2 1 MINUTE = $360/60 = 6^\circ \rightarrow 8 \text{ MINUTE} = 8 \times 6^\circ = 48^\circ$ (BETWEEN 12 AND MINUTE HAND)

HOOR HAND TRAVELS $5/60 = 1/12$ MINUTE HAND. $\rightarrow 48/12 = 4^\circ$

$\therefore$ HOOR HAND TO 12: $10 \times 6^\circ - 4^\circ = 56^\circ$

$\therefore \angle \text{BETWEEN HANDS} = 56^\circ + 48^\circ = 104^\circ$

$\therefore$ DISTANCE IS: $HM^2 = 12^2 + 8^2 - 2 \cdot 12 \cdot 8 \cdot \cos 104^\circ$

$\therefore$ DISTANCE MH = 15,95 cm



QUESTION 9

9.1 $\hat{A}PB = 90^\circ$, $\angle$ in SEMI-CIRCLE.

$\hat{B}PC = x$, TAN-CHORD

$\therefore 2x + 2x + 90^\circ = 180^\circ$, $\angle$'s in $\Delta \rightarrow x + x = 45^\circ$

9.2 $\hat{P}QC = 180 - (x + x)$, $\angle$'s in $\Delta \rightarrow \hat{P}QC = 180 - 45 = 135^\circ$

$\therefore \hat{C}QB = 45^\circ$, $\angle$'s on STR. LINE

QUESTION 10

10.1 $\hat{E}AC = \frac{1}{2}(180 - x) = 90^\circ - \frac{x}{2}$, $\angle$'s opp = sides; TAN FROM A POINT.

$\therefore \hat{ADC} = 90^\circ - \frac{x}{2}$, TAN-CHORD.

$\hat{ODC} = \frac{1}{2}(180 - x) = 90^\circ - \frac{x}{2}$; $\angle$'s opp = sides; RADII

$\therefore \hat{ADO} = 90 - \frac{x}{2} - 90 + \frac{x}{2} = \frac{x - x}{2}$

10.2 $3x + 90 - \frac{x}{2} = 180^\circ$, opp $\angle$'s of cyclic quad.

$6x + 180 - x = 360 \rightarrow 5x = 180 \rightarrow x = 36^\circ$

QUESTION 11

11.1 $\hat{F}_1$, TAN-CHORD; $\hat{A}$, CORRESP $\angle$'s

11.2 IN Δ 'S ADC AND DBC

$\hat{C}$ is common; $\hat{A} = \hat{D}_2$, PROVEN (11.1)

$\therefore \hat{ADC} = \hat{B}_1$, $\angle$'s in $\Delta \rightarrow \Delta ADC \parallel \Delta DBC$, AAA

$\therefore \frac{AD}{DB} = \frac{DC}{BC} = \frac{AC}{DC}$, SIDES IN PROP.

$\therefore DC^2 = BC \cdot AC$ BUT $CF = DC$, TAN FROM POINT

$\therefore CF^2 = BC \cdot AC$

11.3 $\hat{F}_1 = 42^\circ$, PROVEN (11.1); $\hat{F}_2 = 28^\circ$, ACT $\angle$'s

$\therefore \hat{D}_1 = 28^\circ$, TAN-CHORD

$\therefore \hat{FED} = 180^\circ - (42 + 28) = 110^\circ$, $\angle$'s in Δ

QUESTION 12

$\hat{DEC} = x$, TAN-CHORD ; $\hat{CDE} = 180 - (x+y)$, $\angle$'s in Δ

$\therefore \hat{EBC} = 180 - 180 + x + y = x + y$, opp $\angle$'s of cyclic quad

$\hat{BCE} = 90^\circ$, $\angle$ in SEMI-CIRCLE.

$\therefore \hat{BEC} = 180 - 90 - x - y = 90 - x - y$, $\angle$'s in Δ

$\therefore \hat{F} = 90^\circ - x - y$, $\angle$ in SAME SEGMENT, $AB = BC$

QUESTION 13

13.1 $\frac{AD}{DB} = \frac{AE}{EC}$, PROP TH., $DE \parallel BC$ $\therefore \frac{AE}{EC} = \frac{3}{5}$

$\hat{EBC} = \hat{DEB}$, ALT $\angle$'s $\Rightarrow EC = BC$, = SIDES OP $\angle$'s

$\therefore AE = \frac{3}{5} \cdot 65 = 39$ UNITS

13.2 $AB = BC = CD = DA = 28/4 = 7$ cm ; ABCD IS A RHOMBUS.

$\frac{JH}{BC} = \frac{5}{7} \rightarrow JH = \frac{5}{7} \cdot 7 = 5$ cm

BUT $JH = BH$, MID-POINT TH. (CONVERSE) $\rightarrow BH = 5$ cm

$BF = DF$, DIAGONAL BISECT.

$\therefore EF \parallel AB$ AND $EF = \frac{1}{2} AB$, MID-POINT TH.

$\therefore EF = \frac{7}{2}$ cm $\rightarrow \frac{EF}{BH} = \frac{\frac{7}{2}}{5} = \frac{7}{10}$

$\therefore EF : BH = 7 : 10$

* SEE PAGE 8 FOR QUESTION 4 *

QUESTION 4

$$4.1.1 \quad m_{AB} = \tan 116,565^\circ = -2$$

$$\therefore m_{OP} = \frac{1}{2} \quad ; \quad \angle OPA = 90^\circ, \angle \text{ IN SEMI-CIRCLE}$$

$$OP: \therefore Y = \frac{1}{2}X$$

$$4.1.2 \quad Y\text{-INT: } x=0 \rightarrow (-2)^2 + (Y-3)^2 = 13 \rightarrow Y = 3 \pm 3 \rightarrow D(0; 6)$$

$$4.1.3 \quad Y_A = 6 \text{ SINCE } \angle OPA = 90^\circ \rightarrow (x-2)^2 = 4 \rightarrow x = 2 \pm 2$$

$$\therefore A(4; 6)$$

$$m_{OA} = m_{OC} = \frac{6}{4} = \frac{3}{2} \rightarrow m_{TAN} = -\frac{2}{3} \rightarrow Y-6 = -\frac{2}{3}(x-4)$$

$$\therefore Y = -\frac{2}{3}x + \frac{26}{3}$$

$$(*) \text{ OR: } m_{OC} = \frac{3}{2} \rightarrow OA: Y = \frac{3}{2}x \rightarrow \text{SUBST: } (x-2)^2 + \left(\frac{3}{2}x-3\right)^2 = 13$$

$$x^2 - 4x + 4 + \frac{9}{4}x^2 - 9x + 9 - 13 = 0 \rightarrow x(x-4) = 0 \rightarrow x = 0 \text{ OR } x = 4 \left. \begin{array}{l} \text{ETC.} \\ Y = 6 \end{array} \right\}$$

$$4.2.1 \quad m_{CB} = -3 \rightarrow \frac{p-1}{3-n} = -3 \rightarrow p-1 = -9+3n \rightarrow p = 3n-8$$

$$4.2.2 \quad \frac{1-0}{n-1} = \frac{1}{3} \rightarrow 3 = n-1 \rightarrow n = 4$$

$$4.2.3 \quad Y-0 = \frac{1}{3}(x-1) \rightarrow Y = \frac{1}{3}x - \frac{1}{3}$$

$$4.2.4 \quad p = 3(4) - 8 = 4 \rightarrow C(3; 4)$$

$$CB^2 = (3-4)^2 + (4-1)^2 = 1+9 = 10$$

$$\therefore (x-3)^2 + (y-4)^2 = 10$$