basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

GREENBURY SECONDARY SCHOOL

GRADE 10

MATHEMATICS

PAPER 2

MARKS: 100

TIME: 2 Hours

EXAMINER : A.D.SOOMAROO

MODERATOR: L. PILLAY

This question paper consists of 10 pages (including this page), an answer booklet and 9 questions.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining the answers.
4. Answers only will not necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
6. Round your answers off to TWO decimal places if necessary, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet, with formulae, is included at the end of this question paper.
9. Number the answers correctly according to the numbering system used in this question paper.
10. Write legibly and present your work neatly.
11. **ALL questions MUST be answered on the answer booklet provided. If additional writing material is required it must be attached to the end of the booklet**

Question 1.

The heights in cm of a group of basketball players were recorded as follows:

178; 185; 186; 192; 194; 195; 194; 197; 201; 198; 179; 190; 185

1.1. Calculate the mean height of the basketball players, correct to one decimal place. (2)

1.2. Determine :

1.2.1. the maximum and minimum heights. (2)

1.2.2. the median height. (1)

1.2.3. the lower (Q1) and upper quartiles (Q3) of the heights. (2)

1.3. Use your answers in 1.2. to draw a Box-and-Whisker diagram to represent the distribution of the heights of the given group of basketball players. (3)

[10]

Question 2.

The following frequency distribution table represents the age(in years) of 63 basketball coaches in a country :

Age	Frequency
27	3
34	7
41	12
48	19
55	12
62	7
69	3

Use the table to

2.1. calculate the mean age of the coaches. (4)

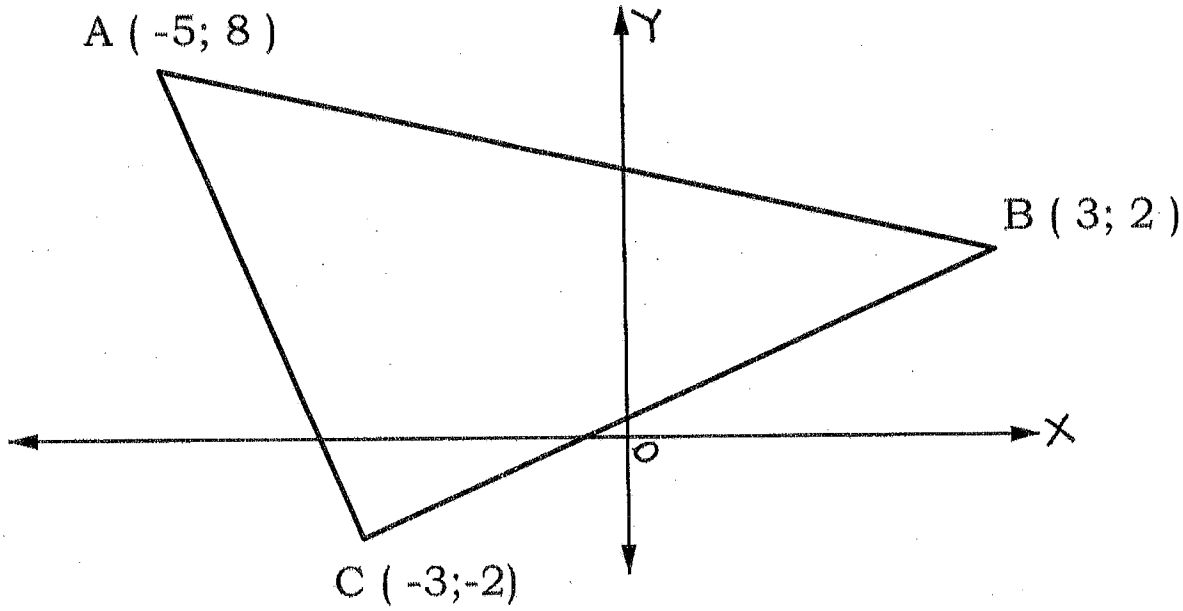
2.2. determine the median age of the coaches. (1)

2.3. determine the modal age of the coaches (1)

[6]

Question 3.

Study the diagram **(not drawn to scale)** below and answer the questions that follow.



3.1. Determine :

3.1.1. the length of AB (4)

3.1.2. the midpoint of AC (2)

3.1.3. the equation of BC (4)

3.2. Prove, analytically, that AC is NOT perpendicular to BC (3)

3.4. Determine the coordinates of point D, such that ABCD is a parallelogram. (4)

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Question 4.

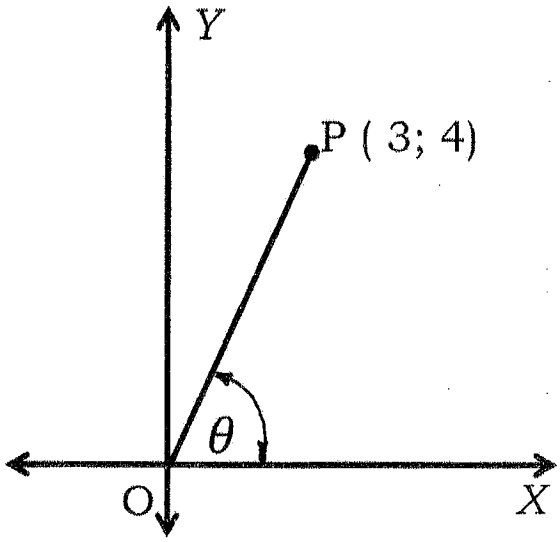
REMINDER : YOUR CALCULATOR MUST BE IN DEGREE MODE.

4.1. Refer to the diagram alongside.

$P(3;4)$ in on a cartesian plane. $X\hat{O}P = \theta$

Use the diagram to answer the following questions

Calculate :



4.1.1. OP (3)

4.1.2. $cot\theta$ (1)

4.1.3 $\cos^2\theta$ (2)

4.1.4. $1 - \sin^2\theta$ (2)

4.1.5. $4cosec\theta - 3sec\theta$ (3)

4.2. If $x = 302^0$ and $y = 137^0$, use your calculator and determine, correct to two decimal places, the answer to the following.

4.2.1. $\sin^3 x$ (2)

4.2.2. $\cos(x + y)$ (2)

4.2.3. $\cos x + cosy$ (2)

4.2.4. $sec3x$ (2)

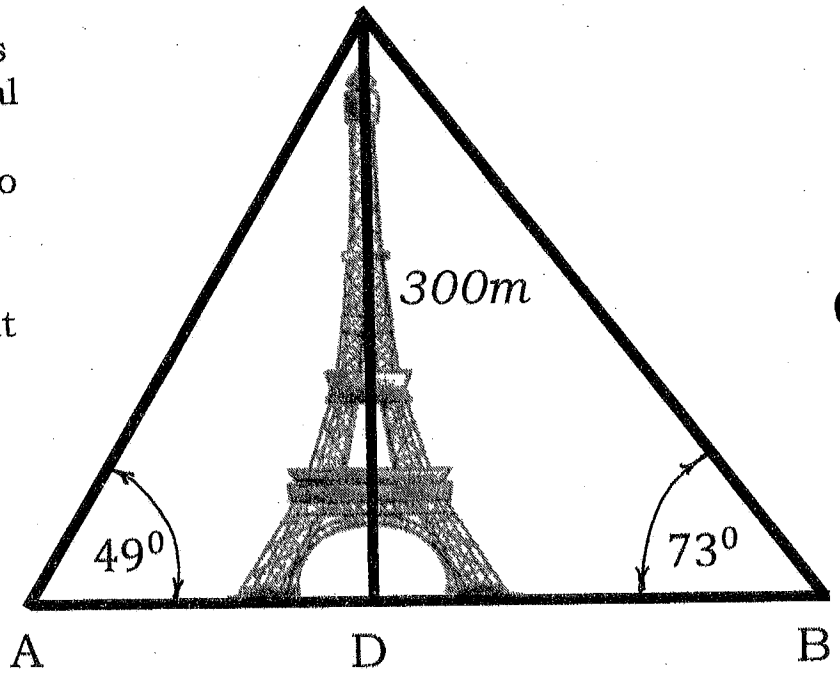
[19]

Question 5.

A tower 300m high is anchored to the ground by two steel pegs that lie directly opposite each other. The angle of elevation of peg A to the top of the tower is 49^0 and the angle of elevation of peg B to the top of the tower is 73^0.

If the tower and the pegs lie in the same horizontal plane, determine the distance between the two pegs.

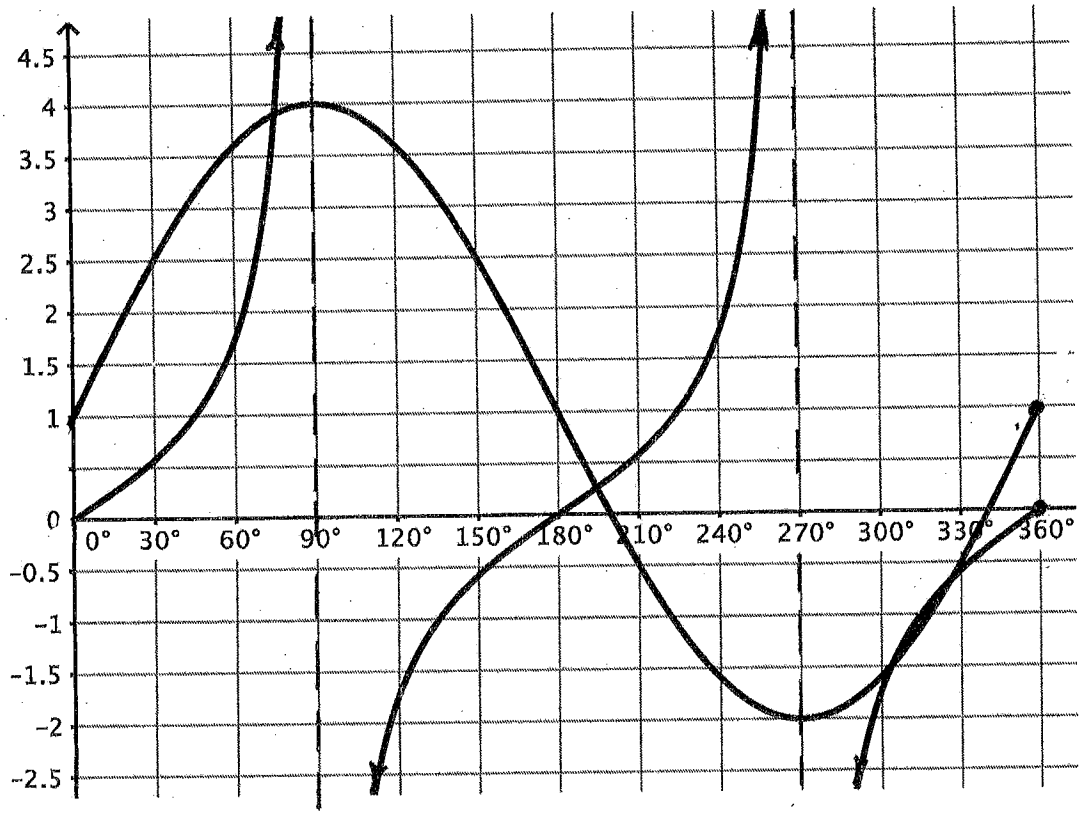
NOTE : ADB is a straight line.



[5]

Question 6.

The sketch shows the graph of $f(x) = asinx + b$ and $g(x) = tanx$, $x \in [0^0; 360^0]$



6.1. Determine the value of a and b (2)

6.2. What is the range of $f(x)$ (1)

6.3. What is the period of $g(x)$ (1)

6.4. Determine the equation of $h(x)$, if $h(x) = f(x) - 2$ (2)

6.5. Determine the amplitude of $f(x)$ (2)

6.6. State ONE set of values for which

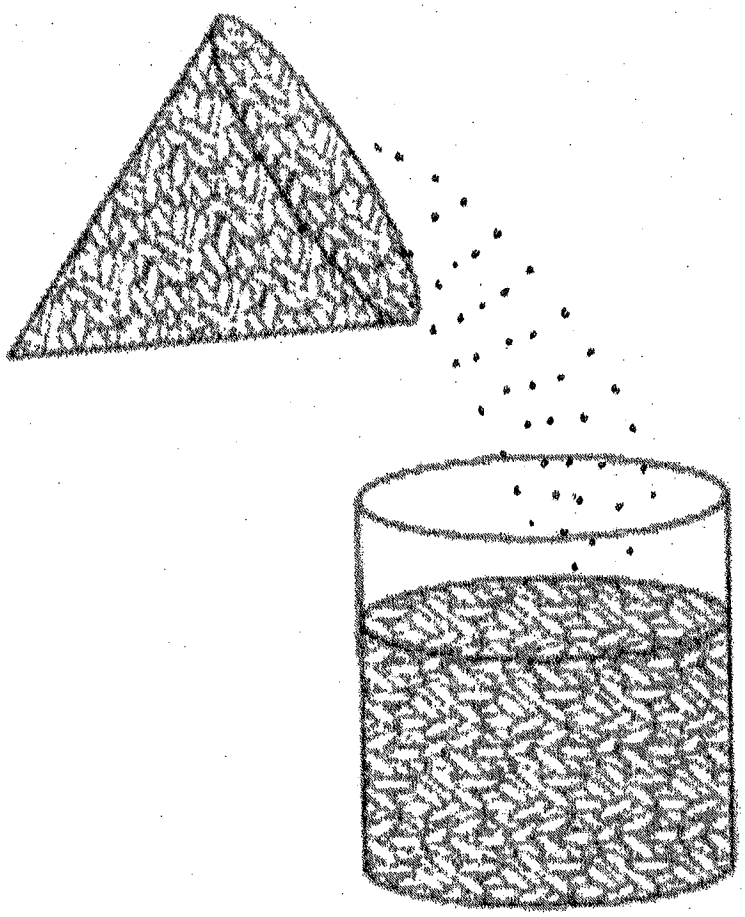
6.6.1. $f(x) \cdot g(x) \leq 0$ (2)

6.6.2. $f(x)$ decreasing, while $g(x)$ is increasing. (2)

[12]

Question 7.

A cone with a radius of 5 cm and a depth of 15 cm is filled to the brim (top) with fine beach sand. The sand from the cone is then tipped into a cylindrical tin with a diameter of 12 cm and a height of 17 cm. Calculate the height of the sand after it has been poured into the cylinder.



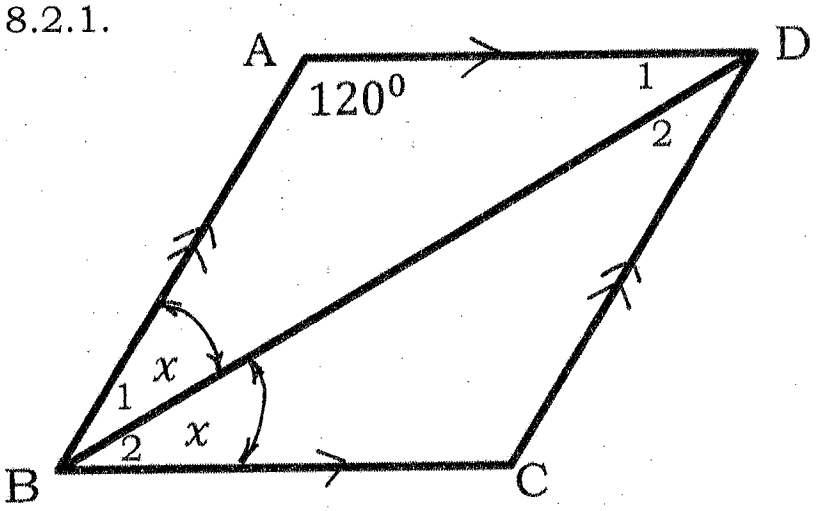
[7]

Question 8.

8.1.1. List any FOUR methods/ techniques of proving a quadrilateral a parallelogram. (4)

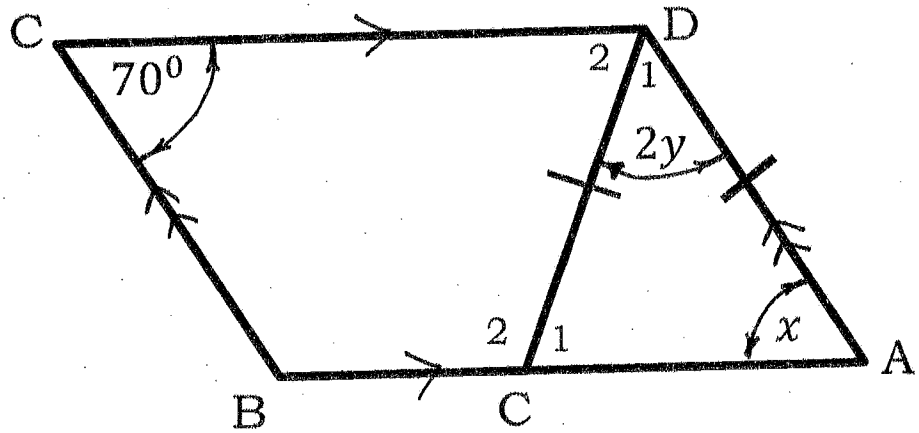
8.2. In the following diagrams ABCD is a parallelogram. Solve for x and y, giving reasons for all relevant steps.

8.2.1.



(3)

8.2.2.



(4]

[11]

Question 9.

9.1. Complete the following sentence :

A line drawn from the midpoint of one side of a triangle, parallel to the second ..... (1)

9.2. In the diagram below, PQ = QS = SR = SM.
$PS \parallel QR$. MSQ, PST and MTR are all straight lines.

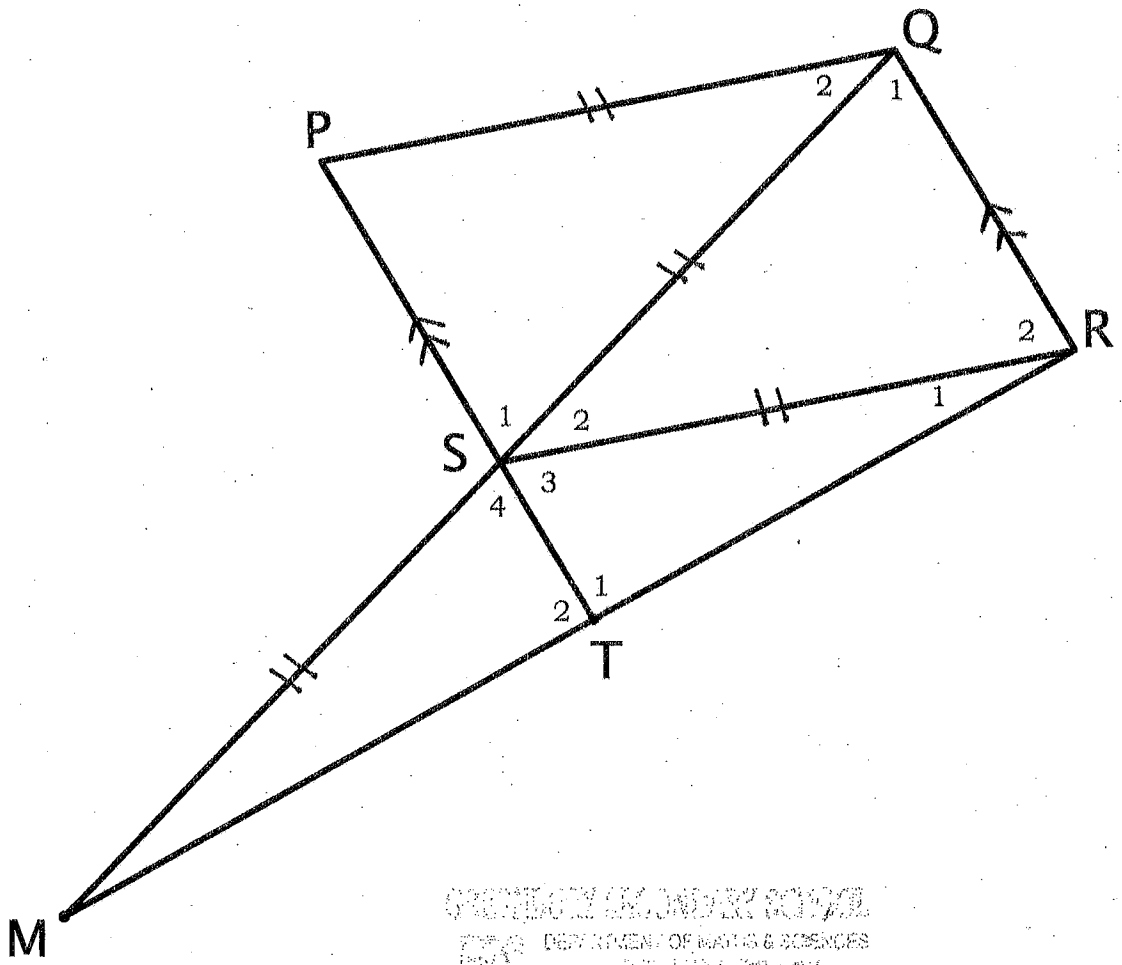
Let $\hat{R}_2 = x$

Prove that:

9.2.1. $\hat{P} = x$ (4)

9.2.2. $\Delta PSQ \equiv \Delta RQS$ (4)

9.2.3. $\hat{M} = 90^0 - x$ (4)



[13]

TOTAL MARKS 100.

MARKING MEMO ~ GRADE 10

PAPER TWO

1.1. $\bar{x} = 190,31$ ✓✓ A

1.2.1. MAX - 201 ✓ A

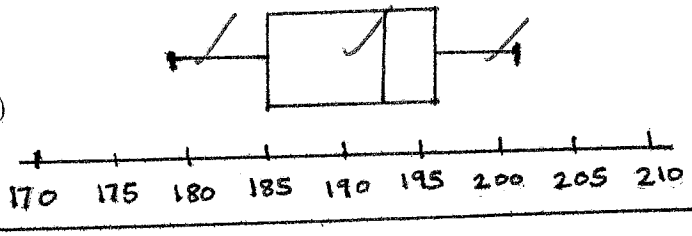
MIN - 178 ✓ A

1.2.2. $Q_2 = 192$ ✓ A

1.2.3 Q_1 - 185 ✓ A

1 Q_3 - 196 ✓ A

1.3.



QUESTION 2.

2.1. $\bar{x} = \frac{(27\times3)+(34\times7)+\ldots+(69\times3)}{63}$ ✓✓

$= \frac{3024}{63}$ A

$= 48$ ✓

2.2. MEDIAN AGE = 41 ✓ A

2.3. MODAL AGE = 48 ✓ A

QUESTION 3

3.1.1 $AB^2 = (x-x_1)^2 + (y-y_1)^2$ ✓M

$= (-5-3)^2 + (8-2)^2$ ✓

$= 64 + 36$

$= 100$ ✓ 4

$AB = 10$ UNITS ✓CA

3.1.2 $M_{AC} = \left(\frac{x+x_1}{2}; \frac{y+y_1}{2}\right)$

$= \left(\frac{-5-3}{2}; \frac{8-2}{2}\right)$ ✓✓

$= (-4; 3)$ AA

3.1.3. Gradient $= \frac{y_2-y_1}{x_2-x_1}$ ✓M

$= \frac{2+2}{3+3}$

$= \frac{4}{6}$

$= \frac{2}{3}$ ✓CA

$y - y_1 = m(x - x_1)$

$y - 2 = \frac{2}{3}(x-3)$

$y - 2 = \frac{2}{3}x - 2$ ✓ SUB of Point

$y = \frac{2}{3}x$ ✓ CA

3.2. gradient (AC) $= \frac{y_2-y_1}{x_2-x_1}$

$= \frac{8+2}{-5+3}$

$= \frac{10}{-2}$

$= -5$ ✓

$M_{AC} \times M_{BC} = (-5)\left(\frac{2}{3}\right)$

$= -\frac{10}{3}$ ✓ 3

$\neq -1$ ✓

∴ AC is not perp to BC

3.4. let D(x, y)

$-4 = \frac{x_D+3}{2}$

$-8 = x_D + 3$

$x_D = -11$ ✓CA

$3 = \frac{y_D+2}{2}$

$6 = y_D + 2$

$y_D = 4$ ✓CA

D(-11; 4) ✓✓ CA CA

QUESTION 4

4.1.1 $OP = \sqrt{(3)^2 + (4)^2}$ ✓

$= \sqrt{25}$ ✓

$= 5$ ✓

4.1.2. $\cot Q = \frac{3}{4}$ ✓

4.1.3. $\cos^2 Q = \left(\frac{3}{5}\right)^2$ ✓ CA

$= \frac{9}{25}$ ✓ CA

4.1.4. $1 - \sin^2 Q$

$= 1 - \left(\frac{4}{5}\right)^2$ ✓ CA

$= 1 - \frac{16}{25}$

$= \frac{9}{25}$ ✓ CA

4.1.5. $4\cos ec Q - 3\sec Q$

$= 4\left(\frac{5}{4}\right) - 3\left(\frac{5}{3}\right)$ ✓ CACA

$= 5 - 5$

$= 0$ ✓ CA

4.2.1 $\sin^3 x$

$= [\sin(302)]^3$

$= -0,61$ ✓✓ AA

4.2.2 $\cos(2x+y)$

$= 0,19$ ✓✓ AA

4.2.3. $\cos x + \cos y$

$= -0,2$ ✓✓ AA

4.2.4. $\sec 3x$

$= -1,01$ ✓✓ AA

QUESTION 5.

$\tan 49 = \frac{300}{AD}$ ✓ A

$AD = \frac{300}{\tan 49}$ OR $300\cot 49$

$= 260,79\ m$ ✓ CA

$\tan 73 = \frac{300}{BD}$ ✓ A

$BD = \frac{300}{\tan 73}$ OR $300\cot 73$

$= 91,72$ ✓ CA

$\therefore AB = 260,79 + 91,72$

$= 352,51\ m$ ✓ CA

QUESTION 6

6.1. $a = 3$ ✓ A

$b = 1$ ✓ A

6.2. $y \in [4; -2]$ OR

$-2 \leq y \leq 4$ ✓ A

6.3. PERIOD :- $180°$ ✓ A

6.4. $h(x) = 3\sin x - 1$ ✓ CA

6.5. AMP : 3 ✓ A

6.6.1. $90° < x \leq 180°$ ✓ A

6.6.2. $90° < x < 270°$ ✓ A

QUESTION 7

VOL. OF CONE (SAND)

$= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi(5)^2(15)$ ✓✓

$= 392,7\ cm^3$ ✓✓ CA

VOL OF CYLINDER

$\pi r^2 h = $ VOL (SAND)

$\pi(6)^2 h = 392,7$ ✓ CA

$h = 3,47\ cm$ ✓ CA

QUESTION 8.

8.1.1. * OPP SIDES // ✓

* OPP ∠'S = ✓

* DIAG. BISECT ✓

* ONE PAIR = AND //

8.2.1. RTC: x ✓A ✓A

CAL: $120° + 2x = 180°$ – co-int ∠'s

$2x = 60°$

$x = 30°$ ✓ A

8.2.2. $x = 70°$ ✓ — opp ∠'s of ||m ✓

$C_1 = x = 70°$ — base ∠'s

$2y + 70 + 70 = 180°$ — ∠'s of Δ ✓

$2y = 40°$

$y = 20°$ ✓

QUESTION 9.

9.1. --- BISECTS THE THIRD SIDE ✓

9.2.1 RTP: $\hat{P} = x$

PROOF: $\hat{Q}_1 = \hat{R}_2 = x$ ✓ — SQ = SR ✓

$\hat{Q}_1 = \hat{S}_1 = x$ — Alt ∠'s ✓

$\hat{S}_1 = \hat{P} = x$ — BASE ∠'s ✓

(PQ = SQ)

9.2.2 RTP: $\Delta PQS \equiv \Delta RSQ$

PROOF: IN ΔPQS and ΔRSQ ✓

(i) $\hat{P} = \hat{R} = x$ — PROVED ✓

(ii) $\hat{S}_1 = \hat{Q}_1$ — Alt ∠s ✓

(iii) SQ = SQ — COMMON ✓

∴ $\Delta PSQ \equiv \Delta RQS$ (AAS)

9.2.3. RTP: $\hat{M} = 90° - x$

PROOF: IN ΔSQR

$\hat{S}_2 = 180° - 2x$ ✓ — ∠'s of Δ

$\hat{M} = \hat{R}_1$ — ✓ given (MS = SR)

$\hat{M} + \hat{M} = 180° - 2x$ — EXT ∠ of Δ ✓

$2\hat{M} = 180° - 2x$

$M = 90° - x$ ✓ 4