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GRADE 10

NOVEMBER 2018

TECHNICAL MATHEMATICS P2

MARKS: 100

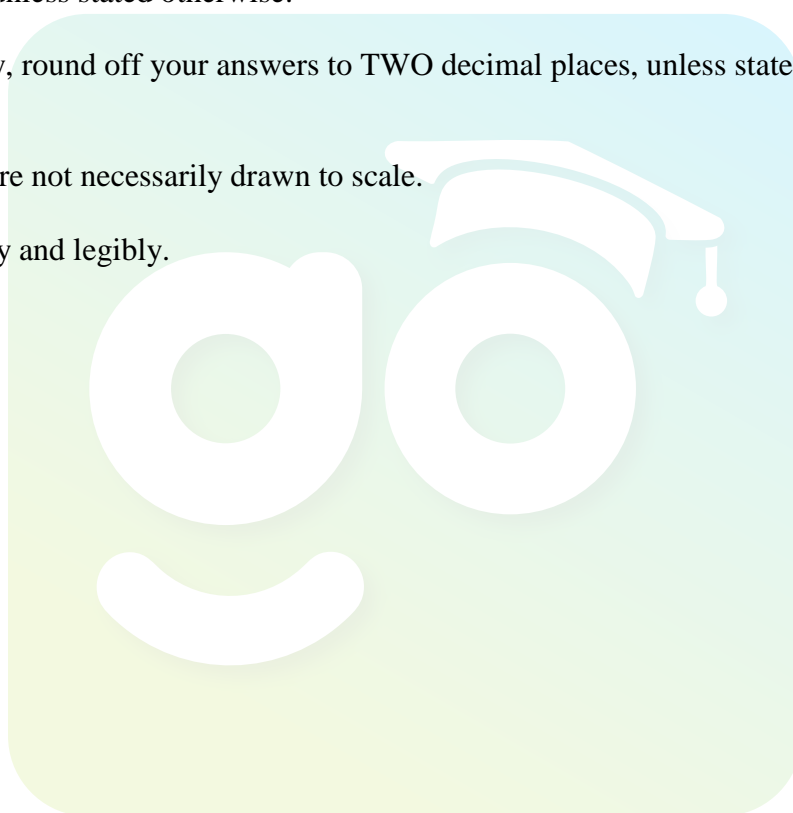
TIME: 2 hours

This question paper consists of 10 pages and a
special answer book.

INSTRUCTIONS AND INFORMATION

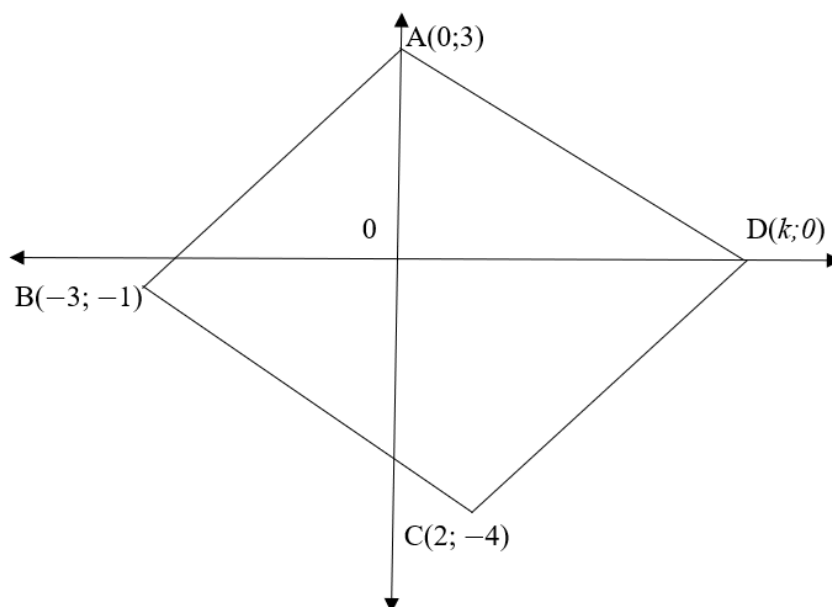
Read the following instructions carefully before answering the questions.

1. This question paper consists of 8 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, et cetera which you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical) unless stated otherwise.
6. If necessary, round off your answers to TWO decimal places, unless stated otherwise.
7. Diagrams are not necessarily drawn to scale.
8. Write neatly and legibly.



QUESTION 1

- 1.1 In the diagram below A (0; 3), B (−3; −1); C (2; −4) and D (k; 0) are the vertices of the quadrilateral ABCD.



- 1.1.1 Determine the coordinates of M, the midpoint of AC. (2)
- 1.1.2 Determine the gradient of MB. (2)
- 1.1.3 Hence, calculate the equation of the straight line passing through M and B. (3)
- 1.1.4 If the length of CD = 5, show that $k = 5$. (4)
- 1.1.5 If $AB = CD$, what type of a quadrilateral is ABCD? Justify your answer by relevant calculations. (4)

[15]

QUESTION 2

2.1 If $\hat{A} = 57^\circ$ and $\hat{B} = 39^\circ$, use a calculator to evaluate the following:

2.1.1 $\operatorname{cosec} \hat{A} + \cot \hat{B}$ (3)

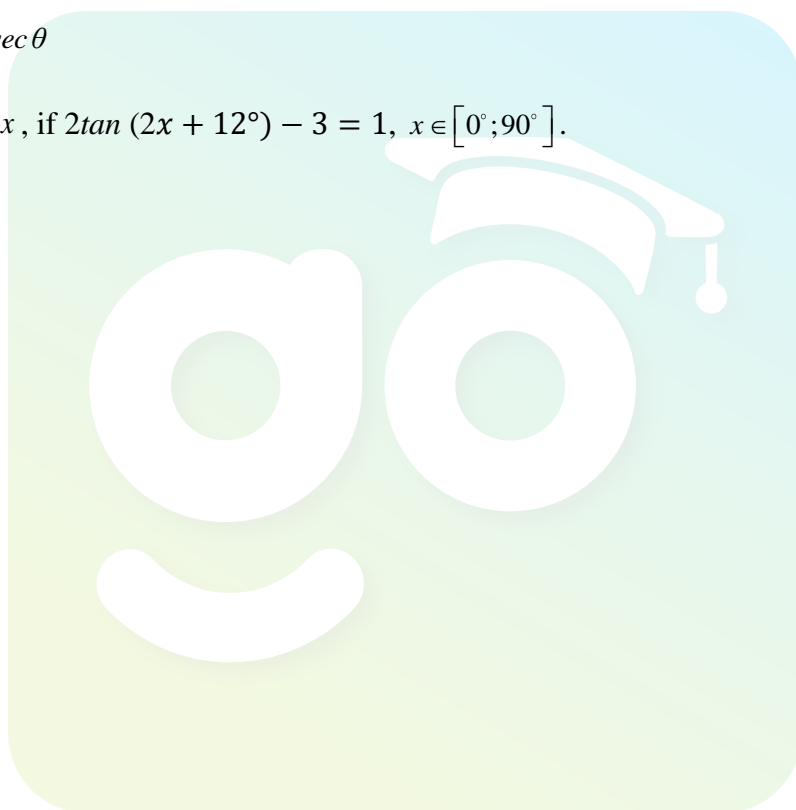
2.1.2 $2\cos\left(\frac{3\hat{A}}{2}\right)$ (2)

2.2 Given $5\cos\theta = -3$ and $180^\circ \leq \theta \leq 270^\circ$, determine the value of the following **with the aid of a sketch**:

2.2.1 $\cos\theta + \tan\theta$ (4)

2.2.2 $\sec\theta$ (3)

2.3 Solve for x , if $2\tan(2x + 12^\circ) - 3 = 1$, $x \in [0^\circ; 90^\circ]$. (5)
[17]

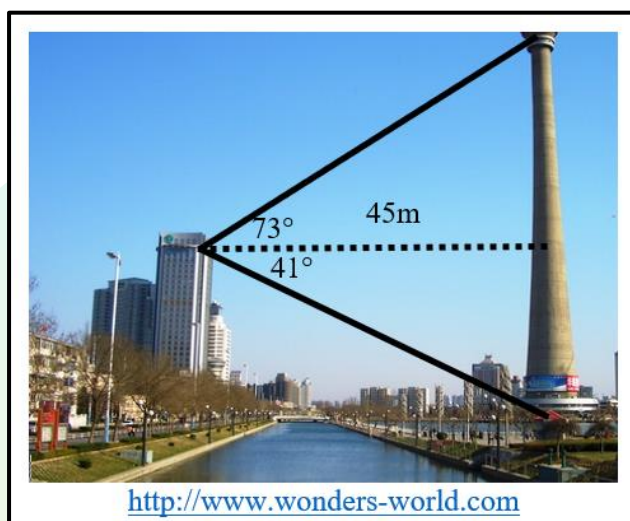


QUESTION 3

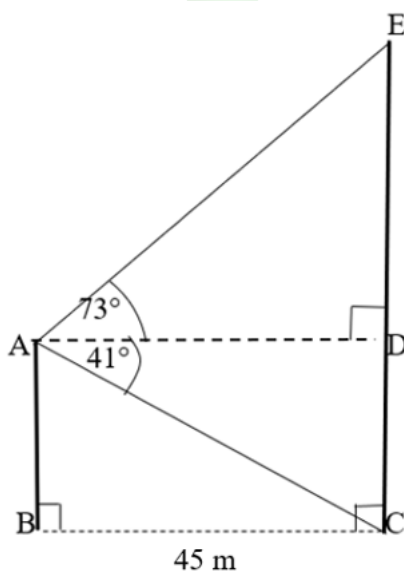
Study the picture and the diagram below.

- The foot of the tower EC and the bottom of the building AB lie on the same horizontal plane.
- The angle of elevation from the top of the building to the top of the tower is 73° and the angle of depression to the foot of the tower is 41° .
- The distance between the tower and the building is 45 m.

Answer the following questions, correct to the nearest cm.



The 2D diagram below models the building and the tower:



- 3.1 Give, with reasons, the size of angle \hat{ABC} . (2)
- 3.2 Hence, determine AB, the height of the building. (4)
- 3.3 Calculate ED. How much higher is the tower than the building? (4)
- 3.4 Determine the height of the tower. (2)

[12]

QUESTION 4

4.1 Consider the function:

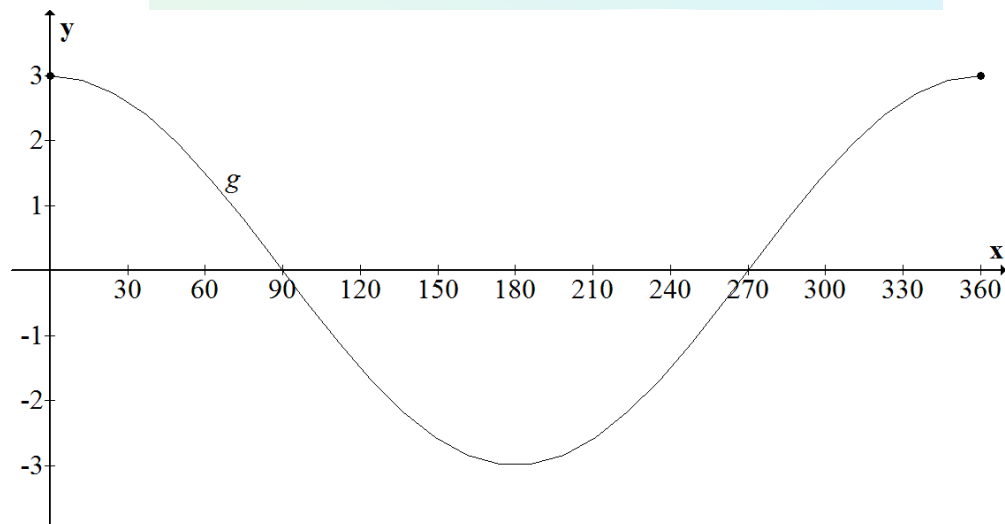
$$f(x) = 3 \tan x$$

4.1.1 Draw a neat sketch of $f(x) = 3 \tan x$ for $0^\circ \leq x \leq 360^\circ$ on the axes provided in the SPECIAL ANSWER BOOK. Clearly indicate, in your sketch, the intercepts with the axes and the asymptotes. (4)

4.1.2 Write down the period of $f(x) = 3 \tan x$. (2)

4.1.3 If the graph of $f(x) = 3 \tan x$ is reflected about the x -axis, write down the equation of the new graph, $g(x)$, obtained by this reflection. (1)

4.2 The diagram below shows the graph of $g(x) = a \cos x$ for $0^\circ \leq x \leq 360^\circ$.



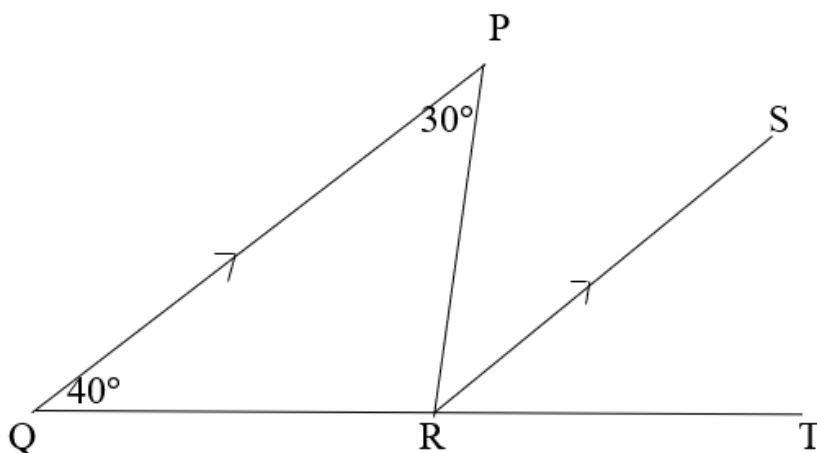
4.2.1 Determine the value of a . (2)

4.2.2 If the graph of g is translated 2 units upwards to obtain a new graph h , write down the range of h . (2)

[11]

QUESTION 5

5.1 In the figure below, $PQ \parallel RS$. $\hat{Q} = 40^\circ$ and $\hat{P} = 30^\circ$.

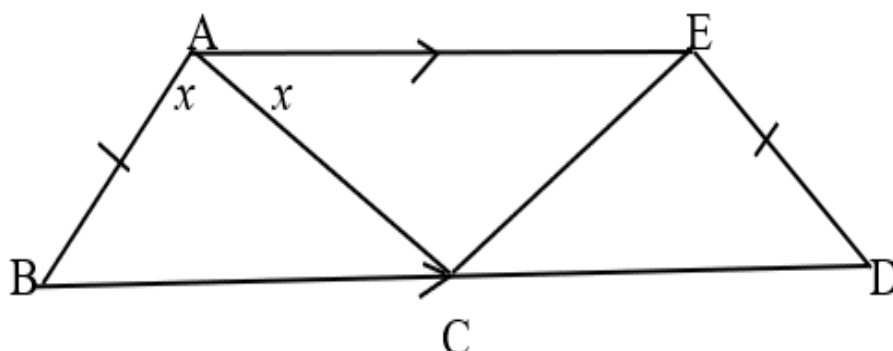


Determine the following:

- | | | |
|-------|--|------------|
| 5.1.1 | \hat{PRS} | (2) |
| 5.1.2 | \hat{TRS} | (2) |
| 5.1.3 | \hat{PRQ} | (2) |
| 5.1.4 | \hat{PRT} | (2) |
| 5.1.5 | What is the relationship between \hat{P} , \hat{Q} and \hat{PRT} ? | (1) |
| | | [9] |

QUESTION 6

Consider quadrilateral ABDE below. $BD \parallel AE$ and $BD = 2AE$. $AB = ED$ and AC bisects \widehat{BAE} . $\widehat{BAC} = \widehat{CAE} = x$.

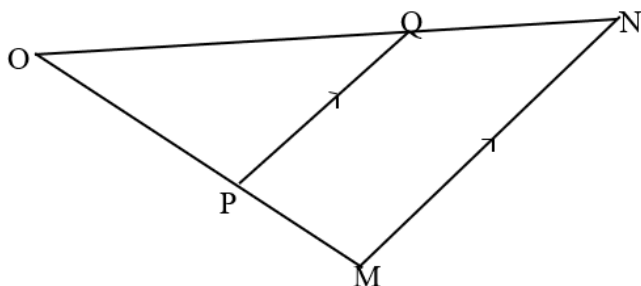


- 6.1 What type of quadrilateral is ABDE? Justify your answer. (3)
- 6.2 Give, with reasons, the size of each of the angles listed below, in terms of x :
- 6.2.1 \widehat{D} (2)
- 6.2.2 \widehat{AED} (2)
- 6.3 For which value(s) of x will ACDE be a parallelogram? Justify your answer. (2)
- 6.4 If $x = 60^\circ$:
Classify quadrilateral ABCE and justify your answer. (4)

[13]

QUESTION 7

7.1 In the diagram below, line MN is parallel to line PQ.



7.1.1 Prove that ΔPQO and ΔMNO are similar. (3)

7.1.2 Hence, give the mathematical relationship of the sides, based on the proof from QUESTION 7.1.1, above. (1)

7.2 It is also given that $MN = 9$ units and $PQ = 6$ units.

7.2.1 If $ON = 12$ units, how long is OQ ? Show ALL calculations. (3)

7.2.2 If $OP = 19$ units, how long is PM ? Show ALL calculations. (3)

[10]

QUESTION 8

8.1 Convert the following:

8.1.1 $107,5^\circ$ to degrees-minute-second (3)

8.1.2 $69^\circ 64' 89''$ to degrees (3)

8.2 What is the measure in degrees of central angle θ that intersect an arc length of 35 cm on a circle with the radius of 7 cm? (4)

8.3 Simplify, without using a calculator. Answer must be in degrees.

$$2\pi - \frac{\pi}{9} - 120^\circ \quad (3)$$

[13]

TOTAL: 100

