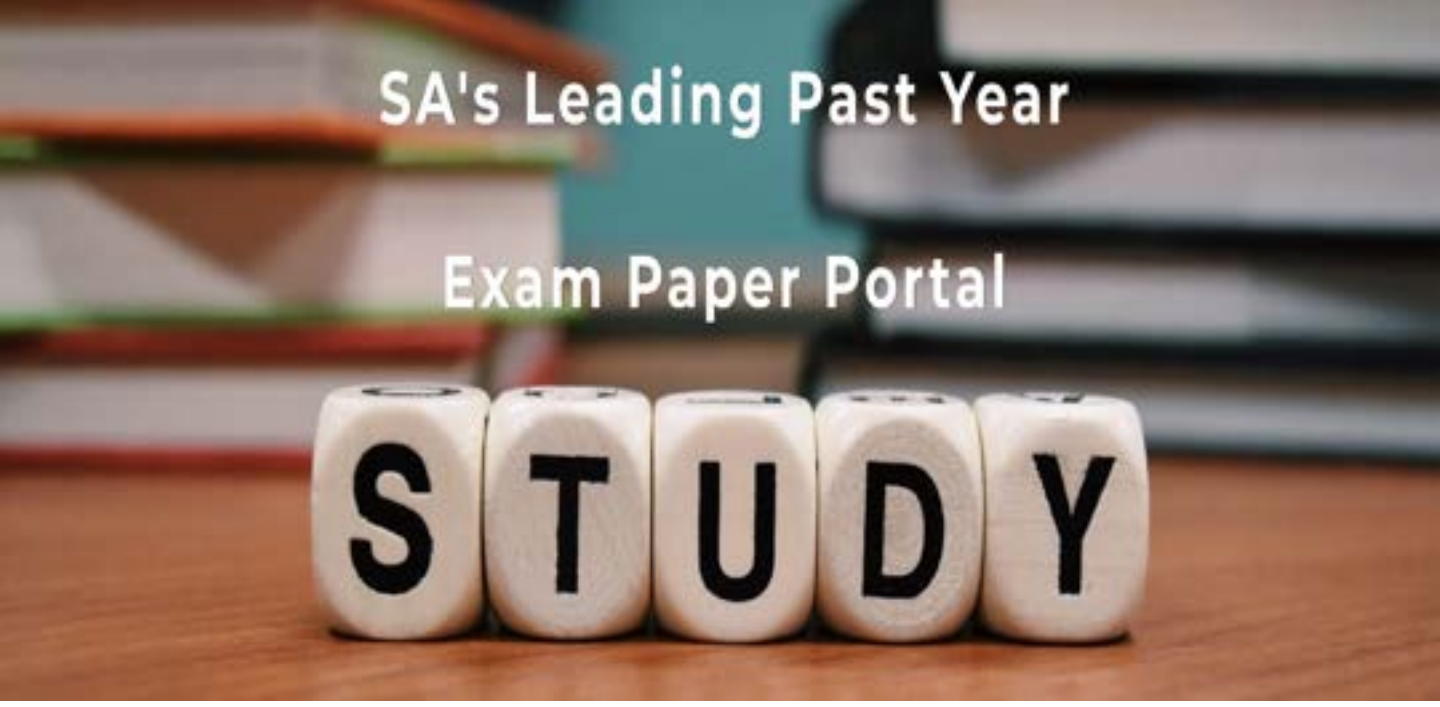

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GAUTENG DEPARTMENT OF EDUCATION

JOHANNESBURG NORTH DISTRICT

2022
GRADE 12
CONTROL TEST

MATHEMATICS TERM 1

TIME : 2 hours

This questions paper consist of 14 pages

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.
3. Clearly show ALL calculations, diagrams, graphs, etc. which was 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. Where necessary, answers should be rounded off to TWO decimal places unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. **Tear off page 11 till page 14 . AND SUBMIT theses with your answer scripts .**
9. An **information sheet** is on page 10 of the questir.
10. Number the questions correctly according to the numbering used in the question paper.
11. Write neatly and legibly.

QUESTION 1

1.1 Solve for x:

1.1.1 $x^2 - 7x + 10 = 0$ (2)

1.1.2 $3x^2 + 2x + 6 = 10$ (correct to two decimal places) (4)

1.1.3 $x^{\frac{1}{2}} + 3x^{\frac{1}{4}} - 28 = 0$ (4)

1.1.4 $\sqrt{2-x} = x - 2$ (5)

1.2 Given: $3x^2 + kx - 3x - k = 0$.

For which values of k will the equation have real roots? (4)

1.3 Solve for x and y:

$3y + x = 5$ and $x^2 + y^2 = 100 + 5y$ (6)

[25]

QUESTION 2

2.1 Consider the sequence: 4; 11; 22; 37;....

2.1.1 Calculate the n^{th} term. (4)

2.1.2 Which term in the sequence has a value of 407? (4)

2.2 How many terms are there in the following arithmetic sequence.

40; 46; 52; 58;.....202 (3)

[11]

QUESTION 3

3.1 The 4^{th} term of an arithmetic sequence is -3 and the 20^{th} term is -35.

Determine the common difference and the first term. (5)

3.2 Evaluate : $\sum_{k=1}^{20} 3^{k-2}$ (4)

3.3 The following sequence forms a convergent geometric sequence:

$$\frac{3}{(x-1)^2} + \frac{1}{(x-1)} + \frac{1}{3} + \frac{(x-1)}{9} + \dots$$

3.3.1 Determine the possible values of x. (3)

3.3.2 If $x = 2$, calculate S_∞. (2)

[14]

QUESTION 4

4.1 Given $sin24° = m$ and $cos35° = n$. Determine the following in terms of m or n.

4.1.1 $tan66°$ (3)

4.1.2 $sin70°$ (3)

4.2 Prove that: $sin(45° + x) \cdot sin(45° - x) = \frac{cos2x}{2}$ (5)

4.3 Given $cos(x + 42°) = sin2x$. Solve for x if $x \in [-180°, 180°]$. (6)

[17]

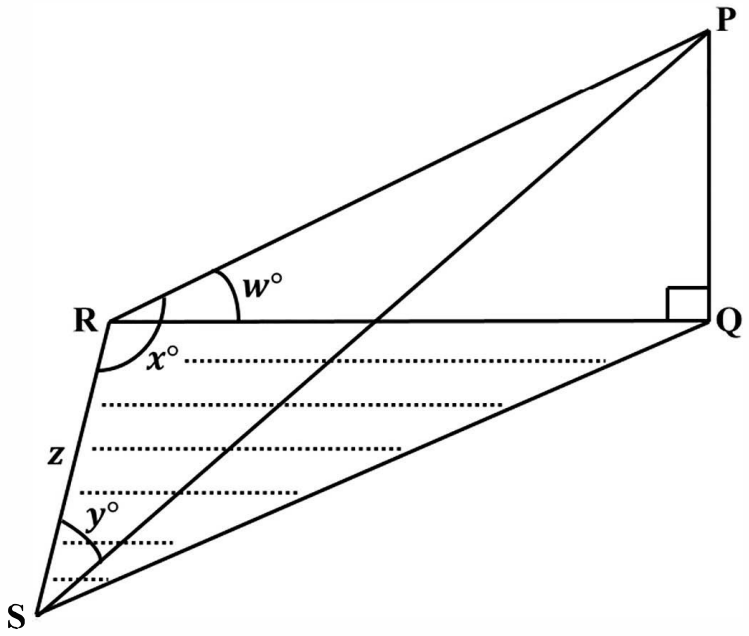
QUESTION 5

A mountain climber wants to determine the height PQ of a mountain. The climber is standing at R on a flat ground. R and S are in the same horizontal plane as the foot of the mountain Q.

From R, he measures the following angles:

- The angle of elevation of the top of the mountain P is $w°$.
- $P\hat{R}S$ is $x°$

He then walks z metres to point S and measures $R\hat{S}P$ which is $y°$



5.1 Show that $PQ = \dfrac{z\,siny\,.\,sinw}{sin(x+y)}$ (4)

5.2 Determine PQ, if $z = 1000m$, $w = 90° - x$ and $x = y$ (4)

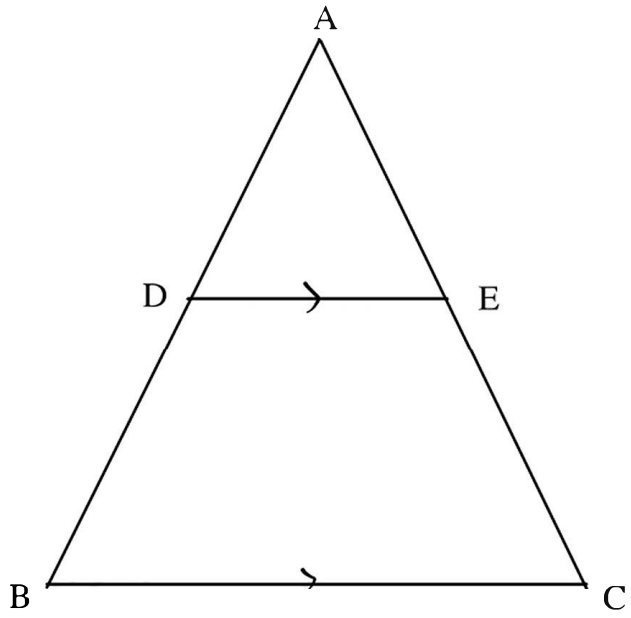
[8]

Give reasons for your statements in Question 6, 7 and 8.

Use the Annexure A provided to answer Question 6, 7 and 8

QUESTION 6

Given $\triangle ABC$ with $DE \parallel BC$ as shown in the figure below:



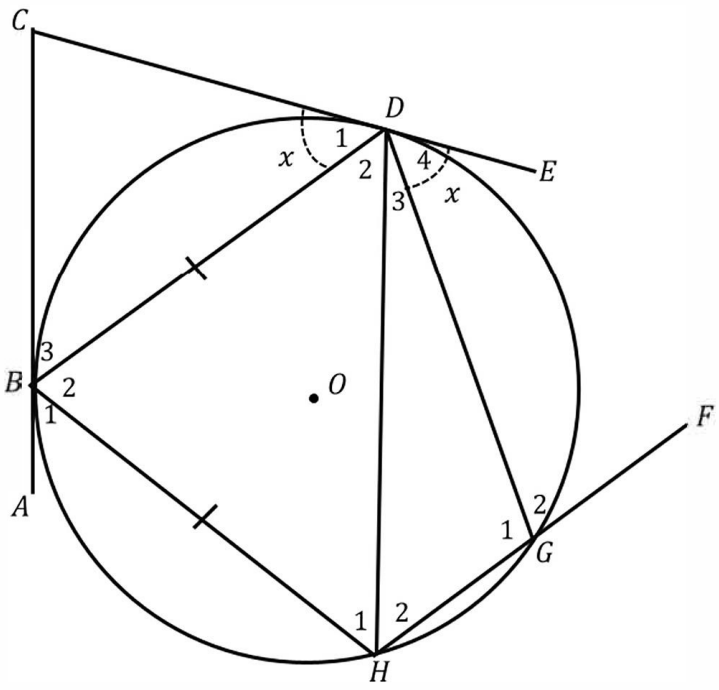
Prove that: $\frac{AD}{DB} = \frac{AE}{EC}$ [5]

QUESTION 7

In the diagram below, AC and CE are tangents to the circle with centre O.

B, D, G and H are points on the circumference of the circle.

HG is produced to F . BD = BH $\hat{D}_1 = \hat{D}_4 = x$.



7.1 Find four other angles equal to x. (4)

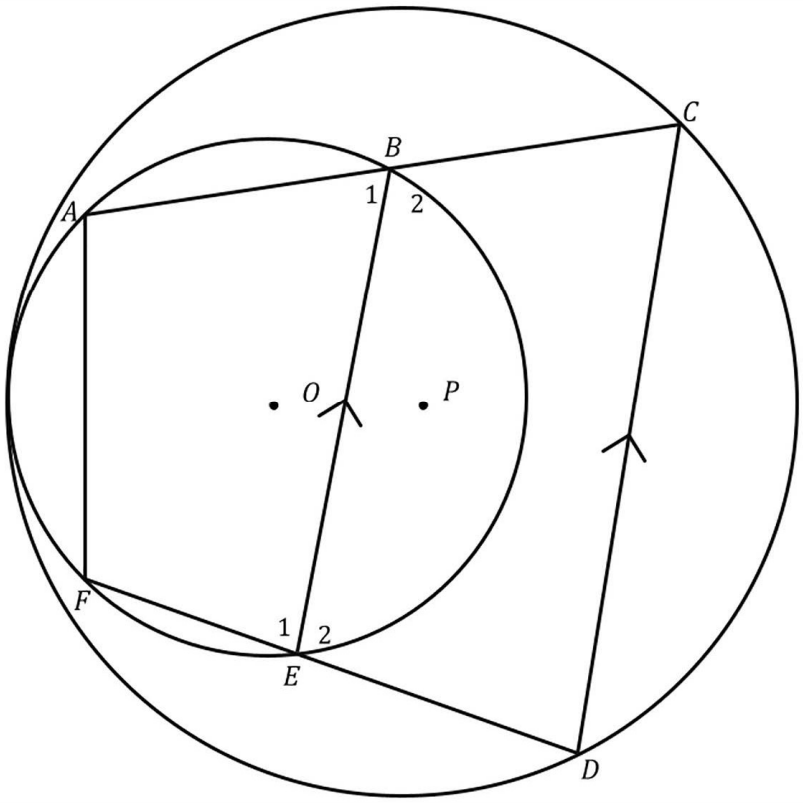
7.2 Hence or otherwise prove that BD || HG. (2)

7.3 Show that $\hat{G}_2 = 180° - 2x$. (2)

[8]

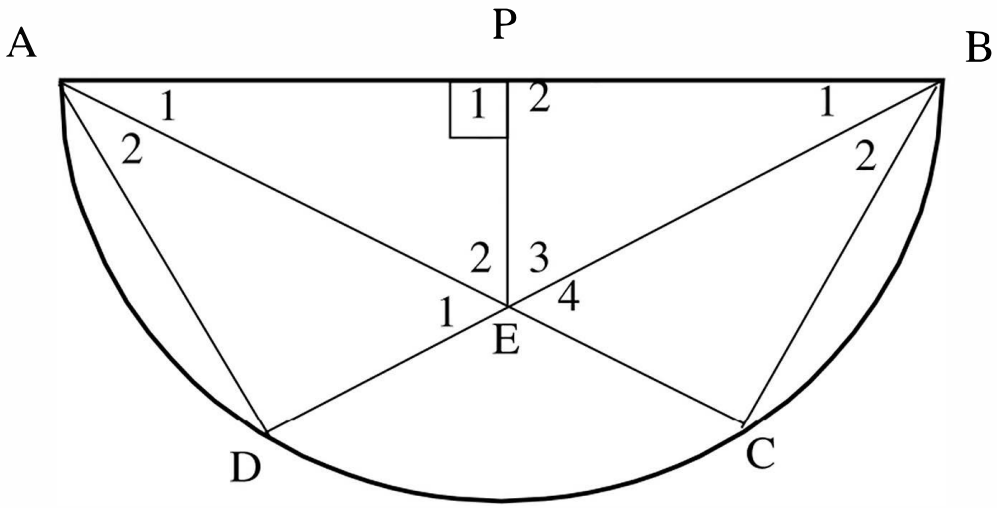
QUESTION 8

8.1 In the diagram below, AB lies on circle with centre O, and is produced to C which lies on circle with centre P. Similarly, FE is produced to D.. $BE \parallel CD$.



Prove that ACDF is a cyclic quadrilateral. (4)

8.2 In the diagram below, AB is the diameter of circle with centre P. $EP \perp AB$.



8.2.1 Prove that $\triangle BPE /// \triangle BDA$ (4)

8.2.2 Hence, prove that $BE = \dfrac{PE^2 . BA . BD}{BP}$ (4)

[12]

TOTAL 100

INFORMATION SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni) \qquad A = P(1 - ni) \qquad A = P(1 - i)^n \qquad A = P(1 + i)^n$$

$$\sum_{i=1}^{n} 1 = n \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2} \qquad T_n = a + (n-1)d \qquad S_n = \frac{n}{2}(2a + (n-1)d)$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r - 1} \;\; ; \; r \neq 1 \qquad S_\infty = \frac{a}{1 - r} \;\; ; \; -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i} \qquad P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

In ΔABC:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A \qquad area\Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$(x; y) \to (x\cos\theta - y\sin\theta \,; y\cos\theta + x\sin\theta)$$

$$\bar{x} = \frac{\sum fx}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

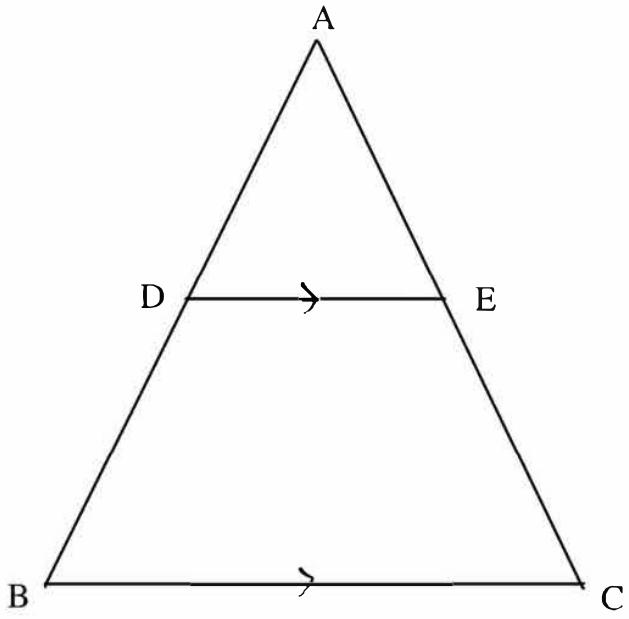
$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

Name: _____ **Class:**_____

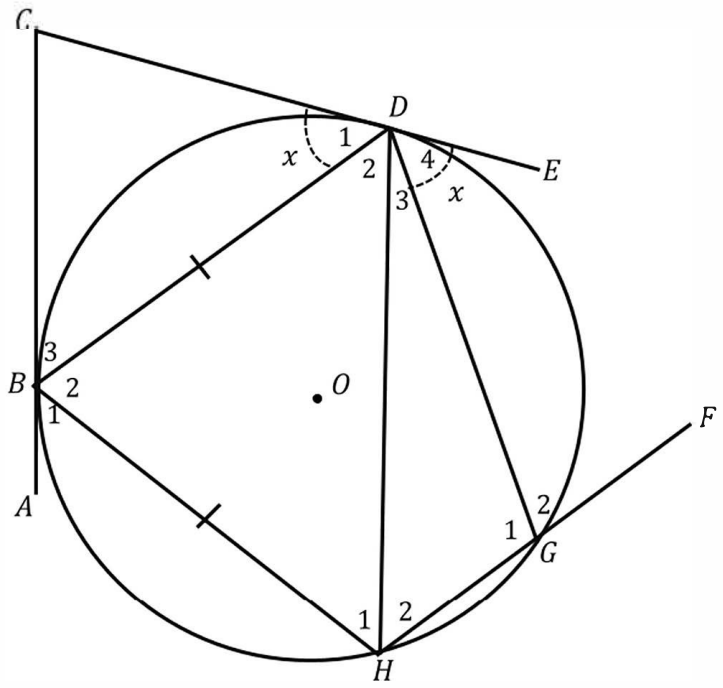
ANNEXTURE A

QUESTION 6



(5)

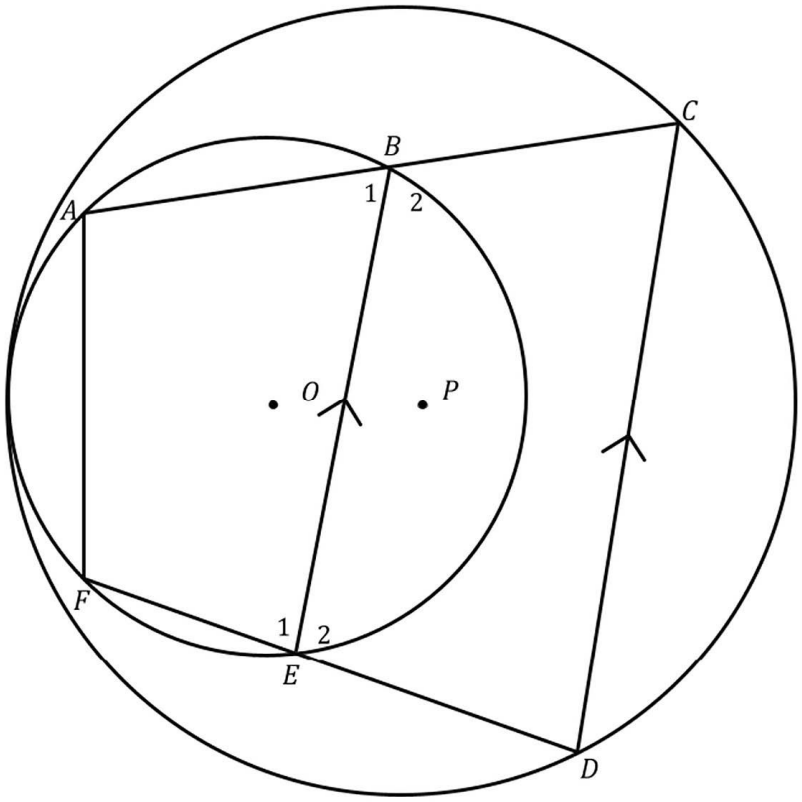
QUESTION 7

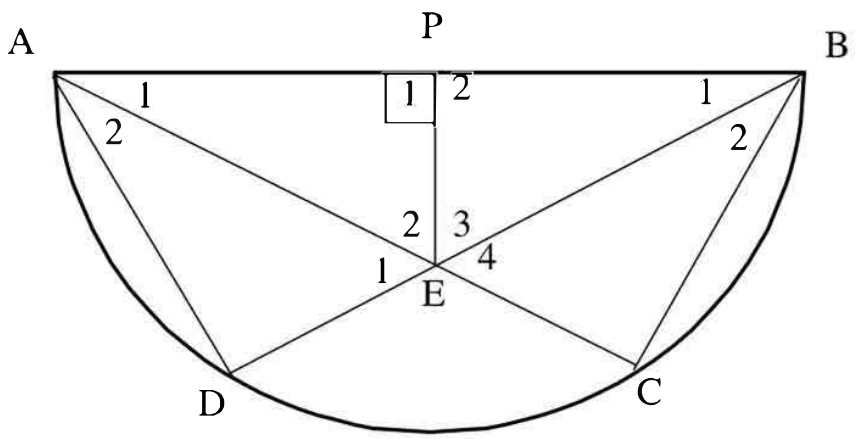


7.1		(4)
7.2		(2)
7.3		(2)

QUESTION 8

8.1 (4)



8.2		
8.2.1		(4)
8.2.2		(4)