

# NATIONAL SENIOR CERTIFICATE

**GRADE 12** 

# **MATHEMATICS P2 (FINAL)**

**JUNE 2024** 

**MARKS: 150** 

TIME: 3 HOURS

#### INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

- 1. The question paper consists of 10 questions.
- 2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
- 3. Clearly show ALL calculations, diagrams, graphs, etc. 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 answers to TWO decimal places, unless stated otherwise.
- 7. Diagrams are NOT necessarily drawn to scale.
- 8. Write neatly and legibly.

Nine learners wrote a test out of 30 their marks are as follows

7	9	9	13	17	21	24	26	27
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1.1 Write down the five number summary of the data. (4)

1.2 Draw a box and whisker diagram to represent the data. (3)

1.3 Comment on the skewness of the data. (1)

1.4 If a learner's mark lies below one standard deviation from the mean, the learner must attend an intervention class. How many learners will not attend the intervention class.

(2)

1.5 The teacher omitted a question with a total of two marks. Determine the actual

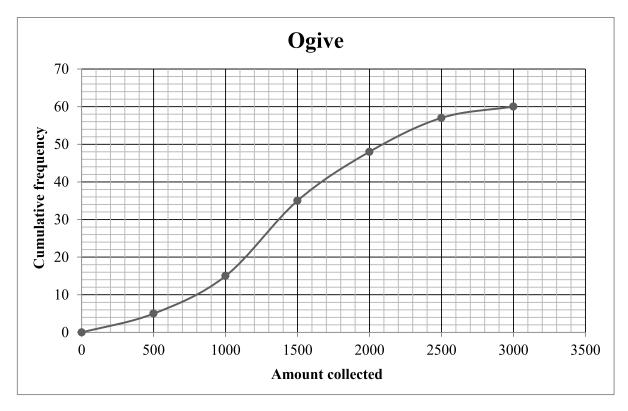
1.5.1 Standard deviation (1)

1.5.2 Mean (1)

1.5.3 Upper quartile (1)

[13]

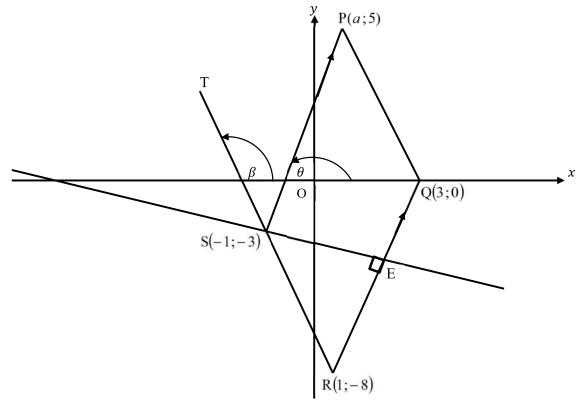
The ogive below shows the money collected by parents during a fundraising event at a school.



- 2.1 How many parents were present. (1)
- 2.2 Write down the modal class. (1)
- 2.3 Estimate the number of parents that can contribute R1 900. (2)
- 2.4 Estimate the semi-interquartile range. (3) [7]

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In the diagram below, PQRS is parallelogram with SP  $\parallel$  QR and vertices P(a;5), Q(3;0), R(1;-8) and S(-1;-3). SE  $\perp$  QR.



3.1 Determine the length of QR. (2)

3.2 Determine the gradient of QR. (2)

3.3 Determine the equation of SE (3)

3.4 Determine the equation of a circle passing through SER (3)

3.5 Calculate the value of a. (3)

3.6 Calculate the value of:

 $3.6.1 \quad \theta$  (2)

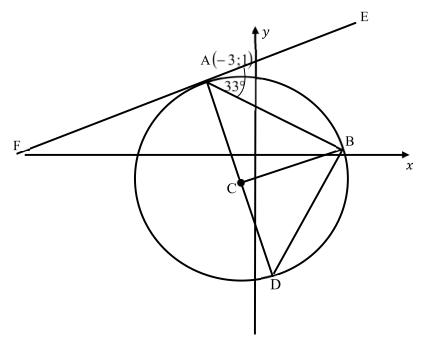
 $3.6.2 \quad \widehat{SRQ} \tag{5}$ 

3.7 Determine the area of PSRQ (3)

[23]

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A circle with equation  $x^2 + 2x + y^2 + 2y = 4$  has centre C. FAE is a tangent to the circle at A(-3;1) with  $\hat{EAB} = 33^{\circ}$ 



- 4.1 Determine the coordinates of C. (2)
- 4.2 Determine the equation of the tangent to the circle at A. (5)
- 4.3 Determine the value of k if y = x + k will be a secant to the circle. (3)
- 4.4 Calculate the size of AĈB. (4)
- 4.5 Another circle with equation  $(x+3)^2 + (y+2)^2 = 4$  is drawn, will the two circles intersect

[18]

5.1 Given  $\cos 11^\circ = k$ . Determine the following in terms of k, without using a calculator.

$$5.1.1 \sin 11^{\circ}$$
 (2)

$$5.1.2 \sin 22^{\circ}$$
 (2)

$$5.1.3 \cos 19^{\circ}$$
 (3)

$$5.1.4 \cos 5.5^{\circ}$$
 (3)

5.2 Simplify the following expression without a calculator:

$$\frac{\sin 25^{\circ} \cos(x - 180^{\circ}) \sin 2x}{\sin^{2}(90 + x) \cos 65^{\circ}}$$
 (5)

5.3 Given:  $\frac{\sin x - \cos x}{\sin x + \cos x} - \frac{\sin x + \cos x}{\cos x - \sin x} = 2 \tan 2x$ 

5.3.2 For which values of 
$$x$$
 will  $\frac{\sin x - \cos x}{\sin x + \cos x} - \frac{\sin x + \cos x}{\cos x - \sin x}$  be undefined? (4)

[24]

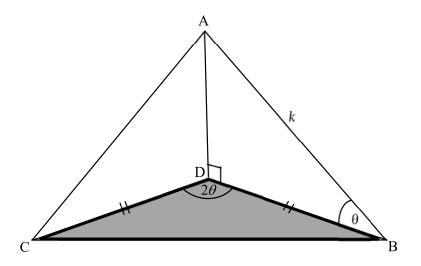
Consider the functions:  $f(x) = \cos 2x$  and  $g(x) = \sin(x - 45^\circ)$ , where  $x \in [-90^\circ; 180^\circ]$ 

- 6.1 On the same set of axis sketch the graphs of f and g (5)
- 6.2 Determine the general solution of f(x) = g(x). (4)
- 6.3 Determine the x-value(x) in the interval  $x \in [0^{\circ}; 180^{\circ}]$  for which:

6.3.1 
$$f(x) > g(x)$$
 (2)

6.3.2 
$$x f(x).g(x) > 0$$
 (2) [13]

AD represents a vertical tower, with A at the top and D at the foot of the tower. D is a point on the tower below A. On the same horizontal level as C is point B, AB = k metres.  $C\hat{D}B = 2\theta$  and  $A\hat{B}D = \theta$ .



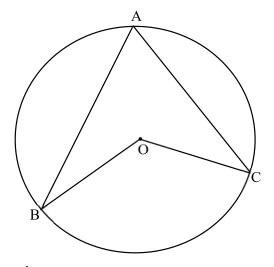
7.1 Show that  $CB = k \cdot \sin 2\theta$  (7)

7.2 If k = 10 units and  $\theta = 30^{\circ}$  calculate the area of  $\Delta CBD$  (4) [11]

# Give reasons for your statements in QUESTIONS 8, 9 and 10.

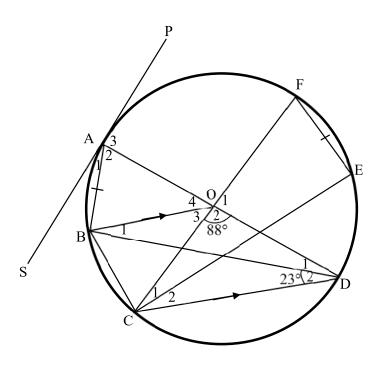
## **QUESTION 8**

## 8.1 In the diagram below O is the centre of the circle



Prove that  $B\hat{O}C = 2B\hat{A}C$  (5)

8.2 In the diagram below O is a centre of the circle with FE = AB and BO || CD.  $\hat{O}_2 = 88^{\circ}$  and  $\hat{D}_2 = 23^{\circ}$ . Tangent PAS touches the circle at A.



Determine with reasons the size of the following angles:

8.2.1 
$$\hat{O}_3$$
 (2)

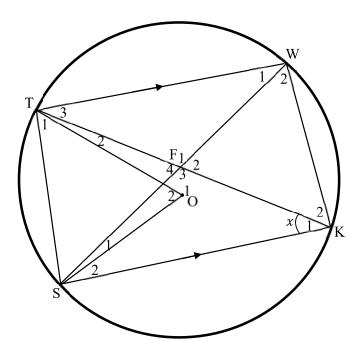
8.2.2 
$$\hat{D}_1$$
 (3)

8.2.3 
$$\hat{A}_1$$
 (2)

8.2.4 
$$\hat{C}_1$$
 (2)

8.2.5 
$$\hat{C}_2$$
 (2) [16]

In the diagram below TWSK lies on the the circumference of the circle, such that TW  $\parallel$  SK with O the centre on the circle.  $K_1 = x$ 

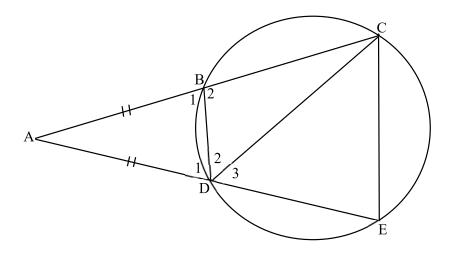


9.1 Determine with reasons, THREE other angles equal to x. (4)

9.2 Prove that SOFT is a cyclic quadrilateral (4)

9.3 Prove that  $ST = 2SO.\sin x$  (4) [12]

In the diagram below BCED is a cyclic quadrilateral with AB = AD, AB = 2 cm, BC = 3 cm and BD = 4 cm.



10.1 Prove that BD  $\parallel$  CE (3)

10.2 Calculate the length of DE (2)

10.3 Prove that  $\triangle ADB \parallel \triangle AEC$  (3)

10.4 Calculate the length of EC (2)

10.5 Calculate the value of  $\frac{\text{Area of }\Delta ECD}{\text{Area of }\Delta ABD}$  (3)

[13]

**TOTAL: 150** 

#### FORMULA SHEET

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

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

$$T_n = a + (n - 1)d \qquad S_n = \frac{n}{2}[2a + (n - 1)d]$$

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$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_{\infty} = \frac{1}{a} - r - 1 < r < 1$$

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

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

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \tan \theta$$

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

$$In \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$area \triangle ABC = \frac{1}{2}ab \cdot \sin C$$

$$\sin(a + \beta) = \sin a \cdot \cos \beta + \cos a \cdot \sin \beta \qquad \sin(a - \beta) = \sin a \cdot \cos \beta - \cos a \cdot \sin \beta$$

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