education

Department:
Education
PROVINCE OF KWAZULU-NATAL

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P2

COMMON TEST

JUNE 2018

MARKS: 125

TIME: 2½ hours

This question paper consists of 6 pages and 1 information sheet.

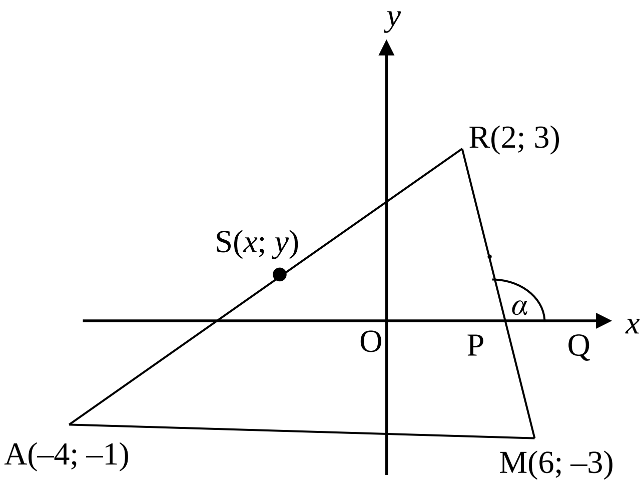
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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

QUESTION 1

In the diagram alongside, A(–4; –1) R(2; 3) and M (6; –3) are vertices of ΔARM. S(x; y) is the midpoint of RA.
$R\hat{P}Q = \alpha$



1.1 Calculate the co ordinates of S, the midpoint of RA. (2)

1.2 Determine the equation of the straight line RM. (5)

1.3 Calculate the co ordinates of P. (3)

1.4 Calculate the length of RA, rounded off to one decimal digit. (3)

1.5 Show that ΔARM is right-angled. (4)

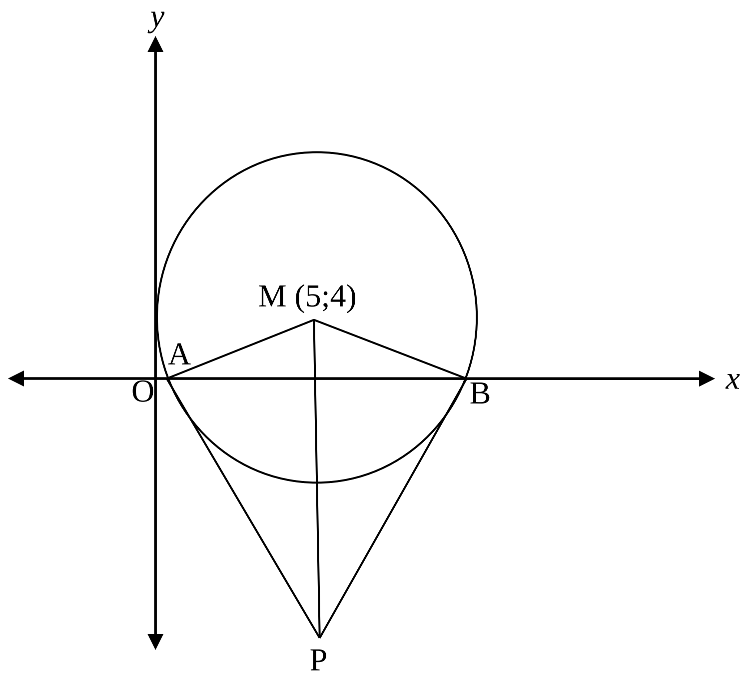
1.6 Calculate the value of α rounded off to one decimal place. (4)

1.7 Calculate the area of ΔARM. (3)

[24]

QUESTION 2

In the diagram below, a circle with centre M(5;4) and radii AM and MB cut the x-axis at A and B, with A the point closest to the origin.



2.1 Determine the equation of the circle. (3)

2.2 Determine the co-ordinates of A and B. (4)

2.3 Determine the equations of tangents to the circle from a point P with points of contact A and B. (6)

2.4 Calculate the co-ordinates of P. (5)

2.5 Calculate the size of $A\hat{M}B$. (6)
[24]

QUESTION 3

3.1

3.1.1 Show that cos (P + Q) + cos (P – Q) = 2cos P cos Q. (2)

3.1.2 Hence evaluate cos 70° + cos 50° without using a calculator if cos 10° = 0,984. (7)

3.2 If sin 54° = m, express the following in terms of m, without using a calculator:

3.2.1 sin 594° (3)

3.2.2 cos 18° (5)
[17]

QUESTION 4

4.1 If $\sin 2\theta = \frac{2\sqrt{6}}{5}$ where $\theta \in [45^\circ ; 360^\circ]$ determine, with the aid of a diagram and without using a calculator the value of $\sin \theta$. (6)

4.2 Simplify without using a calculator:

$$\frac{\sin 104^\circ (2\cos^2 15^\circ - 1)}{\tan 38^\circ . \sin 412^\circ}$$ (6)

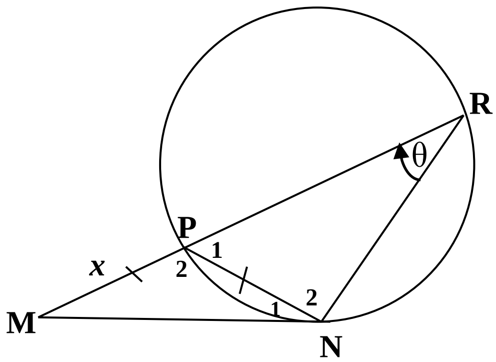
4.3 Prove the identity:

$$\frac{\cos 2x + 1}{\cos 2x . \cos^2 x} = \frac{1}{\left(\cos^2 x - \frac{1}{2}\right)}$$ (5)

4.4 Determine the solution of:

$$\sin x + \cos x = 1, \ for \ \ 0^\circ \le x \le 360^\circ$$ (6)

4.5 In the figure alongside, RP is a diameter of the circle. RPM is a straight line and PM = PN = x, $P\hat{R}N = \theta$.



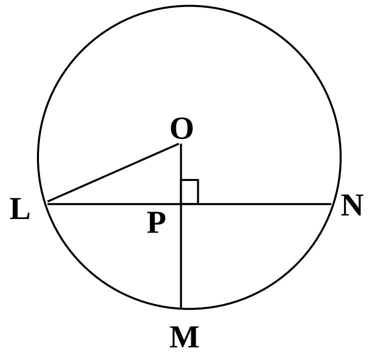
4.5.1 Show that:
$MN^2 = 2x^2(1 + \sin \theta)$ (5)

4.5.2 If $MN = \sqrt{12}$ units and $x = 2$ units, Show, without using a calculator, that $\theta = 30^\circ$ and RP = 4 units. (4)

[32]

QUESTION 5

In the accompanying diagram alongside, LN is a chord of the circle with centre O. OP is drawn perpendicularly onto LN and meets the circle in M.

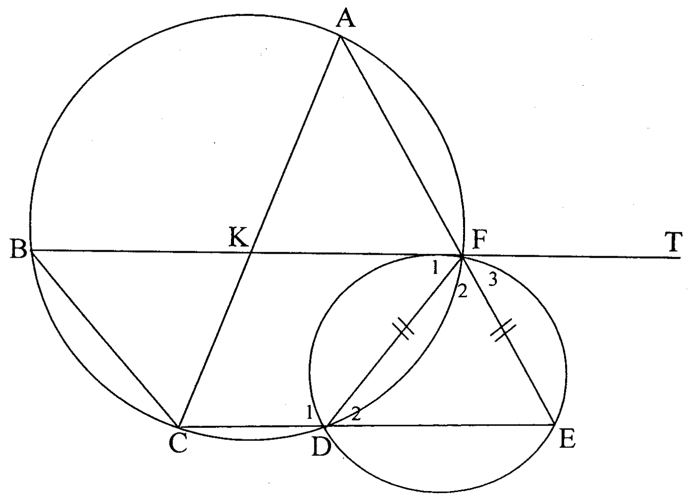


5.1 Prove that $MN^2 = 2\ OM.PM$. (4)

5.2 If OL = 9 units and OP = 1 unit, calculate the length of MN. (2)
[6]

QUESTION 6

In the figure below, two circles cut in points F and D. BFT is a tangent to the smaller circle at F. Straight line AFE is drawn so that FE = FD. CDE is a straight line and chords AC and BF cut at K.



Prove that:

6.1 BT || CE. (4)

6.2 BCEF is a parallelogram. (5)

6.3 AC = BF. (6)

6.4 BF is a diameter if it is given that AF = FE. (7)
[22]

TOTAL MARKS: 125

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

InΔABC: $\quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

$$area\ \Delta ABC = \frac{1}{2}ab.\sin C$$

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

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

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

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

$\mathrm{P(A)} = \frac{n(\mathrm{A})}{n(\mathrm{S})}$ $\quad$ P(A or B) = P(A) + P(B) – P(A and B)

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