education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MATH.3

MATHEMATICS P3

FEBRUARY/MARCH 2010

MARKS: 100

TIME: 2 hours

This question paper consists of 10 pages, an information sheet and 3 diagram sheets.

AFTERNOON SESSION

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions. Answer ALL the questions.

2. Clearly show ALL calculations, diagrams, graphs, et cetera, which you have used in determining the answers.

3. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.

4. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.

5. Diagrams are NOT necessarily drawn to scale.

6. THREE diagram sheets for answering QUESTION 7.1, QUESTION 7.3, QUESTION 8, QUESTION 9.2, QUESTION 10 and QUESTION 11 are attached at the end of this question paper. Write your centre number and examination number on these sheets in the spaces provided and hand them in together with your ANSWER BOOK.

7. Number the answers correctly according to the numbering system used in this question paper.

8 It is in your own interest to write legibly and to present the work neatly.

QUESTION 1

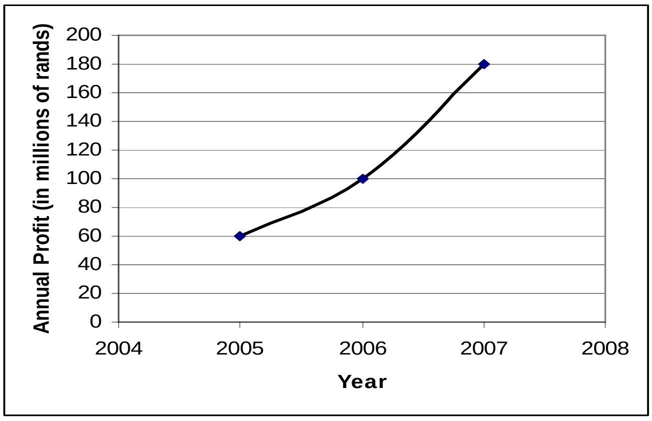
Consider the following sequence: 3 ; 13 ; 33 ; 73 ; 153 ; …

1.1 Write down the next TWO terms in the sequence. (2)

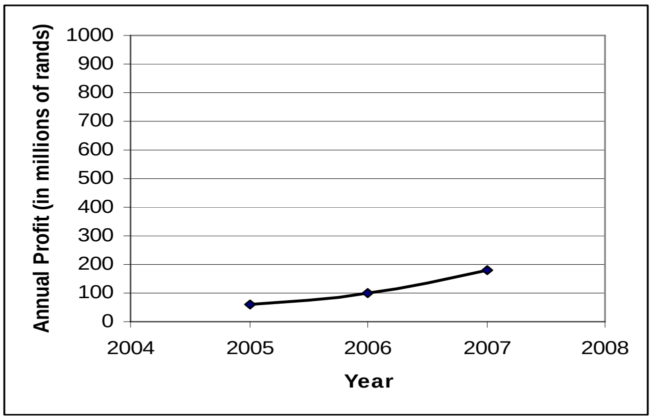
1.2 Write down a recursive formula for the sequence. (3)
[5]

QUESTION 2

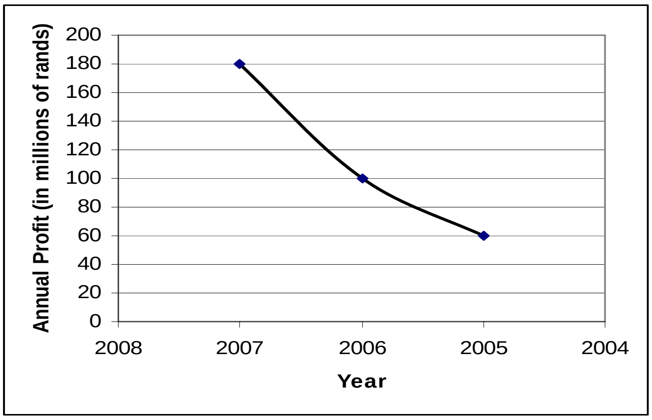
The graphs below represent the annual profits of a company. Answer the questions that follow with reference to the graphs.



Graph 1



Graph 2



Graph 3

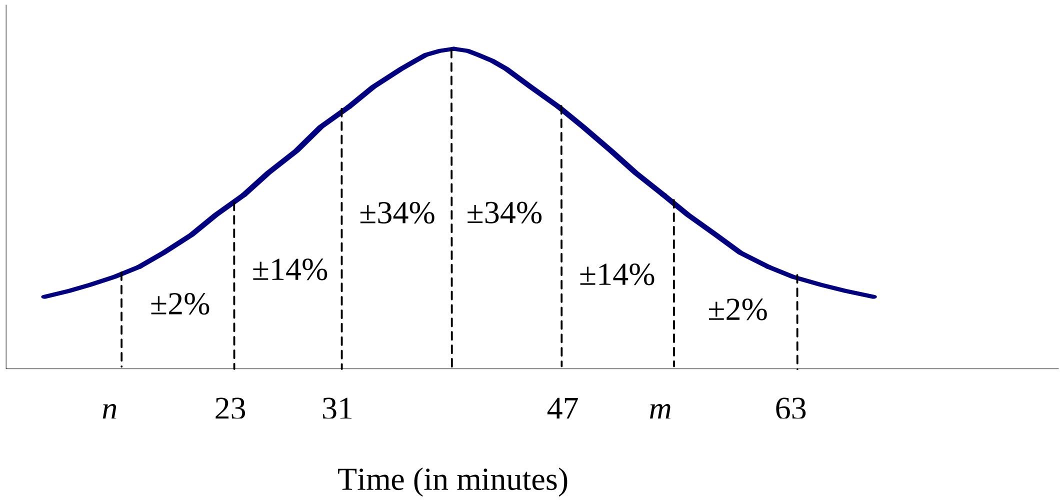
2.1 Do the graphs display the same information? Justify your answer. (2)

2.2 Explain the impression created by graphs 2 and 3 when compared to graph 1. (2)

2.3 Which graph would you recommend for the managing director to use in the Annual Report for the company? Explain your answer. (2)
[6]

QUESTION 3

The time, in minutes, that each learner spent in the library on one afternoon was recorded. It was observed that the times followed a normal distribution. The normal curve for these times are drawn as shown below.



3.1 What was the average time that learners spent in the library? (1)

3.2 Determine the value of m and n. (2)

3.3 Of all the learners who spent time in the library, 20 stayed longer than 47 minutes. How many learners were at the library that afternoon? (2)

3.4 The school management would like to employ a library assistant to work in the library in the afternoons. Before employing this person, the management observed the times spent by learners in the library in the afternoons over the period of one month. They found the distribution of the time spent to be the same as the distribution shown above. For how long should the school employ the assistant every afternoon to keep the cost to a minimum? Justify your answer. (2)

[7]

QUESTION 4

P(A) = 0,3 and P(B) = 0,5.

Calculate P(A or B) if:

4.1 A and B are mutually exclusive events (2)

4.2 A and B are independent events (3)

[5]

QUESTION 5

At a school for boys there are 240 learners in Grade 12. The following information was gathered about participation in school sport.

122 boys play rugby (R)
58 boys play basketball (B)
96 boys play cricket (C)
16 boys play all three sports
22 boys play rugby and basketball
26 boys play cricket and basketball
26 boys do not play any of these sports

Let the number of learners who play rugby and cricket only be x.

5.1 Draw a Venn diagram to represent the above information. (4)

5.2 Determine the number of boys who play rugby and cricket. (3)

5.3 Determine the probability that a learner in Grade 12 selected at random:
(Leave your answer correct to THREE decimal places.)

5.3.1 only plays basketball. (2)

5.3.2 does not play cricket. (2)

5.3.3 participates in at least two of these sports. (2)
[13]

QUESTION 6

A South African band is planning a concert tour with performances in Durban, East London, Port Elizabeth, Cape Town, Bloemfontein, Johannesburg and Polokwane.

In how many different ways can they arrange their itinerary if:

6.1 There are no restrictions (2)

6.2 The first performance must be in Cape Town and the last performance must be in Polokwane (3)

6.3 The performances in the four coastal cities (the cities close to the sea or ocean) must be grouped together? (4)
[9]

QUESTION 7

The term *latitude* refers to how far a place is from the equator. Latitude in the Northern Hemisphere range from 0° at the equator to 90° N at the north pole.

Below are the latitudes of several cities in the Northern Hemisphere together with the mean maximum temperature for April in degrees Celsius.

City	Northern Latitude	Mean maximum temperature for April
Lagos, Nigeria	6	32
London, England	52	13
Calcutta, India	23	36
Rome, Italy	42	20
Moscow, Russia	56	8
Cairo, Egypt	30	28
San Juan, Puerto Rico	18	29
Copenhagen, Denmark	56	10
Tokyo, Japan	35	17

7.1 Draw a scatter plot for the above information on DIAGRAM SHEET 1. (3)

7.2 Determine the equation of the least squares regression line. (4)

7.3 Draw the least squares regression line on your scatter plot, on DIAGRAM SHEET 1. (2)

7.4 What information does the y-intercept of this line represent? (1)

7.5 The city of Madrid has a latitude of 40°N. Determine the mean maximum temperature for April for this city. (2)

7.6 Calculate the correlation coefficient of the data. (2)

7.7 Explain the correlation between latitude and the mean maximum temperature for April. (1)

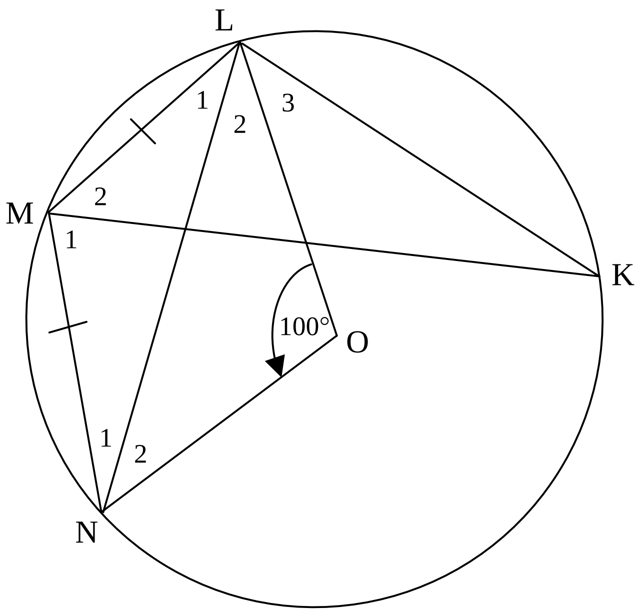
[15]

QUESTION 8

8.1 Complete the statement:

The sum of the angles around a point is ... (1)

8.2 In the figure below, O is the centre of the circle. K, L, M and N are points on the circumference of the circle such that LM = MN. $L\hat{O}N = 100°$.



Determine, with reasons, the values of the following:

8.2.1 $L\hat{M}N$ (3)

8.2.2 $L\hat{K}M$ (3)
[7]

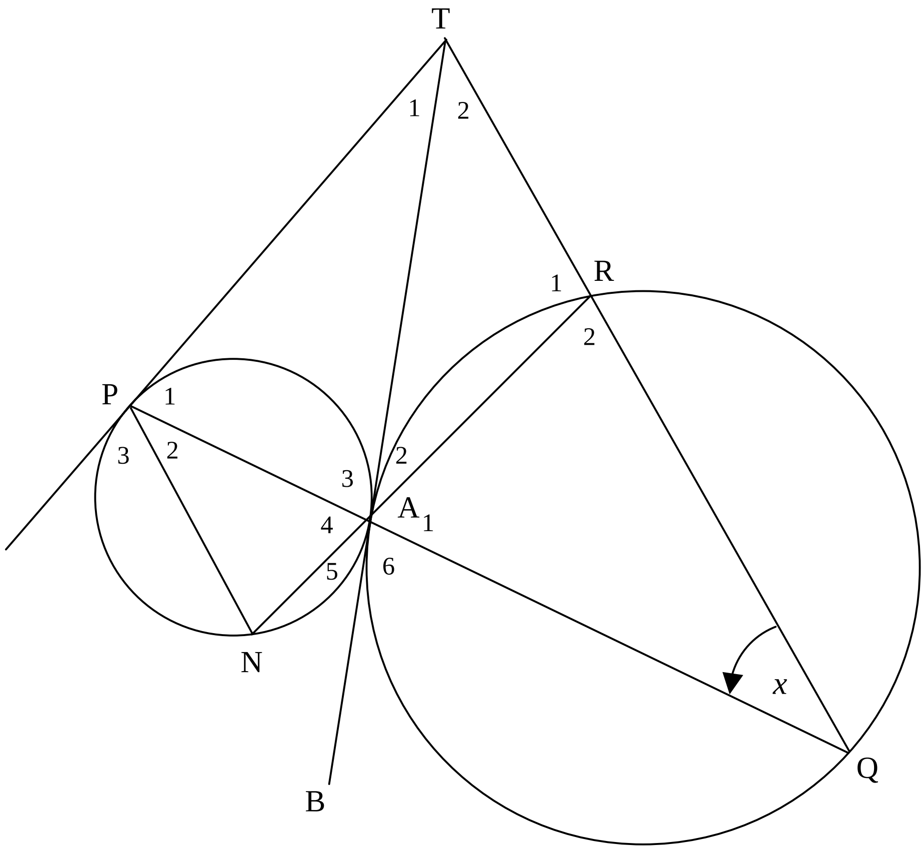
QUESTION 9

9.1 Complete the following statement:

The angle between the tangent and the chord … (1)

9.2 In the diagram below, two circles have a common tangent TAB. PT is a tangent to the smaller circle. PAQ, QRT and NAR are straight lines.

Let $\hat{Q} = x$.

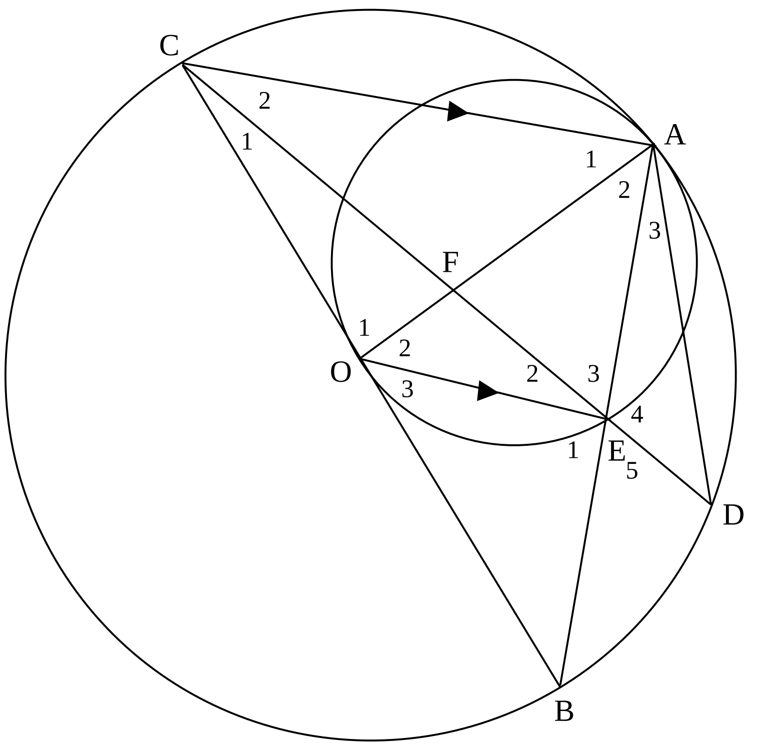


9.2.1 Name, with reasons, THREE other angles equal to x. (5)

9.2.2 Prove that APTR is a cyclic quadrilateral. (5)
[11]

QUESTION 10

Two circles touch each other at point A. The smaller circle passes through O, the centre of the larger circle. Point E is on the circumference of the smaller circle. A, D, B and C are points on the circumference of the larger circle.
OE || CA.



10.1 Prove, with reasons, that AE = BE. (2)

10.2 Prove that ΔAED ||| ΔCEB. (3)

10.3 Hence, or otherwise, show that $AE^2 = DE.CE$. (2)

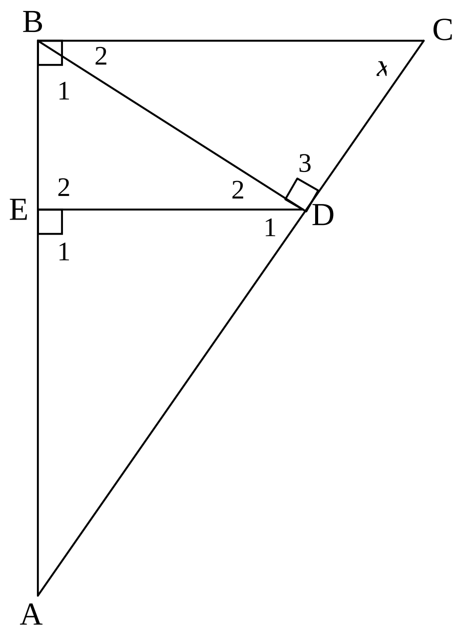
10.4 If $AE.EB = EF.EC$, show that E is the midpoint of DF. (3)

[10]

QUESTION 11

ΔABC is a right-angled triangle with $\hat{B} = 90°$. D is a point on AC such that BD $\perp$ AC and E is a point on AB such that DE $\perp$ AB. E and D are joined.

AD : DC = 3 : 2.
AD = 15 cm.



11.1	Prove that ΔBDA ||| ΔCDB.	(3)
11.2	Calculate BD (Leave your answer in surd form).	(3)
11.3	Calculate AE (Leave your answer in surd form).	(6) **[12]**

TOTAL: 100

INLIGTINGSBLAD: WISKUNDE
INFORMATION SHEET: MATHEMATICS

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

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

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

$$\mathrm{S}_n = \frac{n}{2}\left(2a + (n-1)d\right)$$

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

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

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

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

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

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

In ΔABC:

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

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

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

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

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

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

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

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

CENTRE NUMBER:

EXAMINATION NUMBER:

DIAGRAM SHEET 1

QUESTION 7.1 AND 7.3

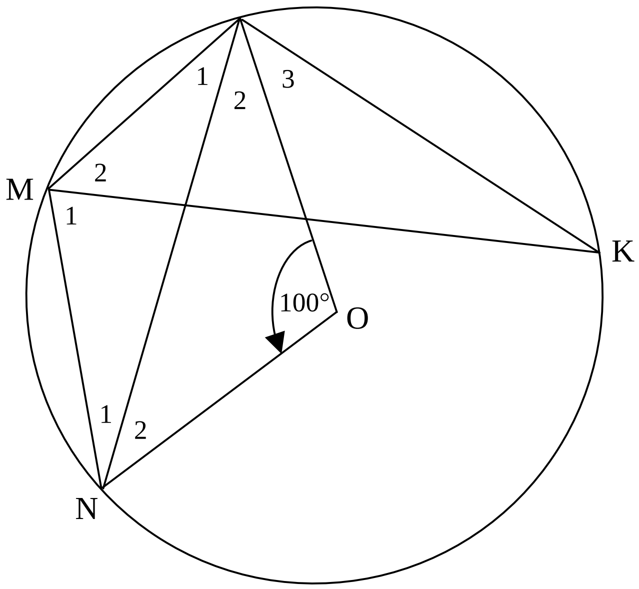
NB.: PLEASE HAND IN TOGETHER WITH YOUR ANSWER BOOK.

CENTRE NUMBER:

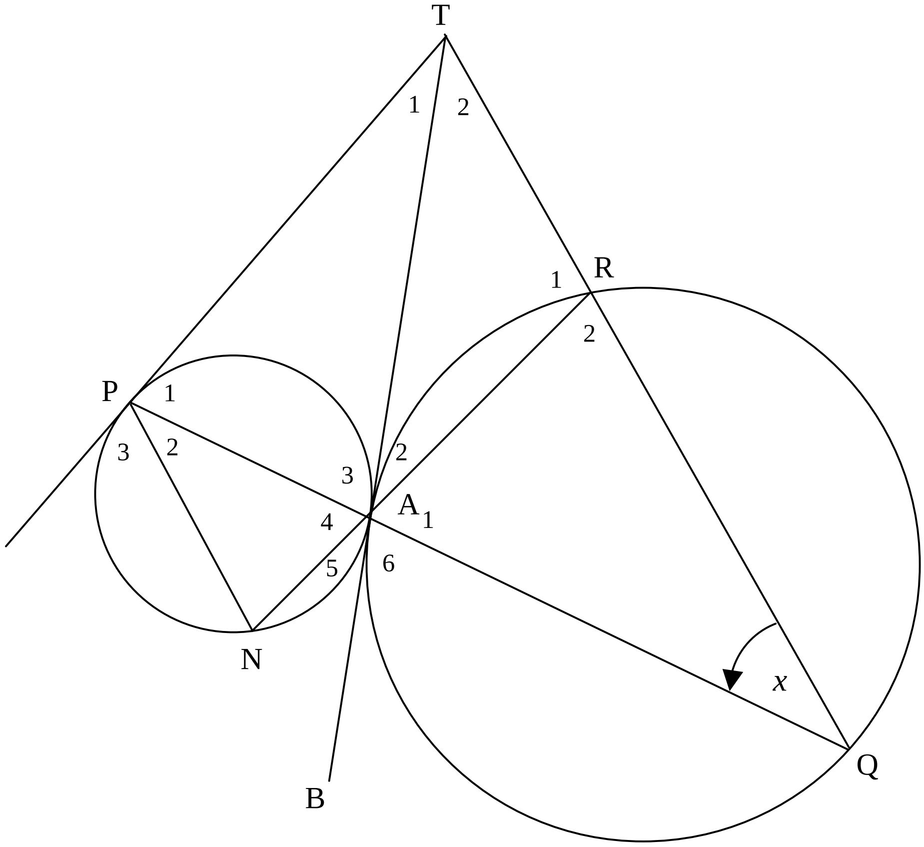
EXAMINATION NUMBER:

DIAGRAM SHEET 2

QUESTION 8



QUESTION 9.2

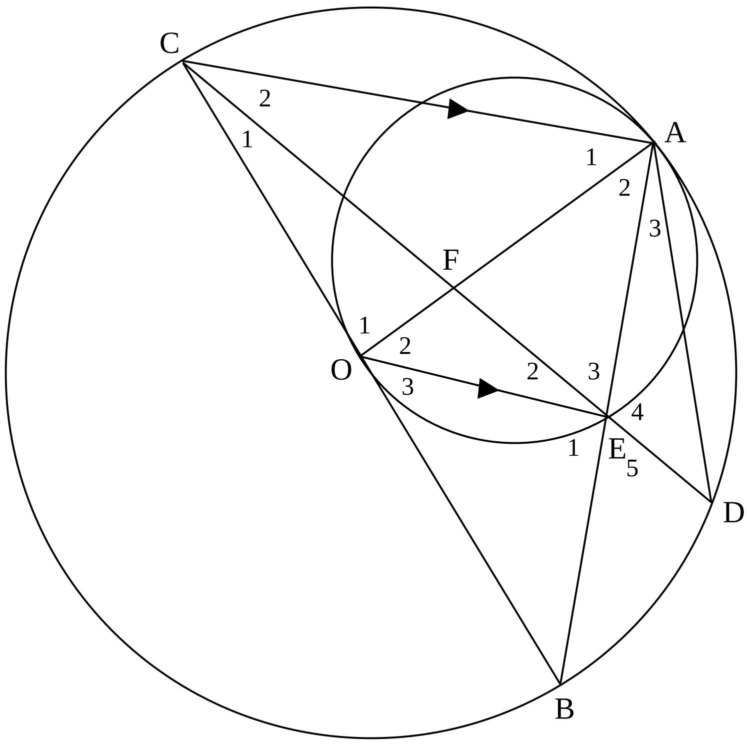


CENTRE NUMBER:

EXAMINATION NUMBER:

DIAGRAM SHEET 3

QUESTION 10



QUESTION 11