



ST MARY'S DSG, KLOOF

MATHEMATICS

PAPER II

GRADE 11

TIME: 2½ HOURS

EXAMINER: Mrs van ROOYEN

NOVEMBER 2015

TOTAL: 124 MARKS

MODERATORS: Mrs DREW
MR NORTON

NAME:	
MATHS TEACHER:	

INSTRUCTIONS

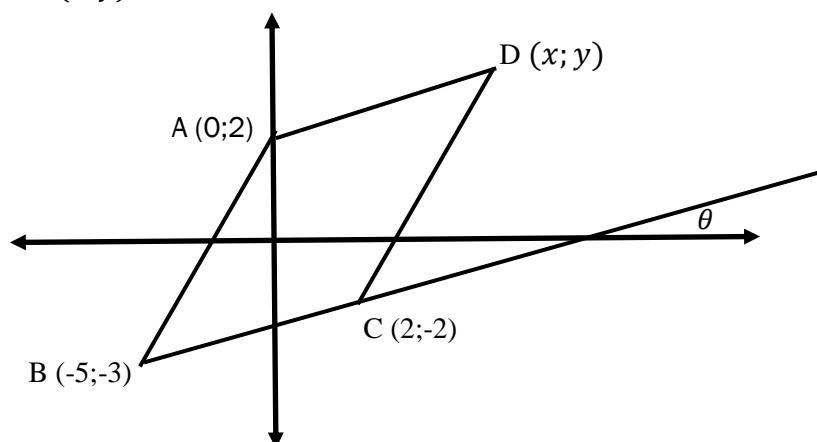
- 1) Read all instructions carefully before you begin.
- 2) This paper consists of 18 numbered pages, including this cover page. Please check that your paper is complete.
- 3) Hand in each section separately.
- 4) Write down your name and your Maths teacher's name in the space provided at the start of each section.
- 5) All questions must be answered.
- 6) Calculators may be used unless otherwise stated.
- 7) Calculators must be in degree mode.
- 8) Show all your working details.
- 9) **Reasons must be given for all geometry calculations/ proofs.**
- 10) Round off all answers to two decimal places where necessary, unless otherwise stated.
- 11) Diagrams have not been drawn to scale.

SECTION A

[34]

QUESTION 1

In the given figure the vertices of parallelogram $ABCD$ are given as $A(0;2)$ $B(-5;-3)$ $C(2;-2)$ and $D(x;y)$.



- a) Calculate the size of θ (3)

- b) Give the co-ordinates of D (2)

- c) Give the co-ordinates of E, the midpoint of AB. (2)

- d) Show that $\triangle ABC$ is isosceles (4)

- e) What type of parallelogram is $ABCD$? (1)

- f) Will the circle with centre A and radius $\sqrt{50}$ pass through B, D and C? Give a reason for your answer. (2)

[14]

QUESTION 2

The diagram shows a circle centre O. A, B and C are points on the circumference. DCO is a straight line. DA is a tangent to the circle. $\hat{D} = 36^\circ$

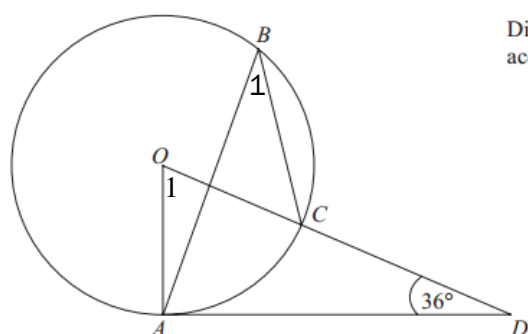


Diagram NOT
accurately drawn

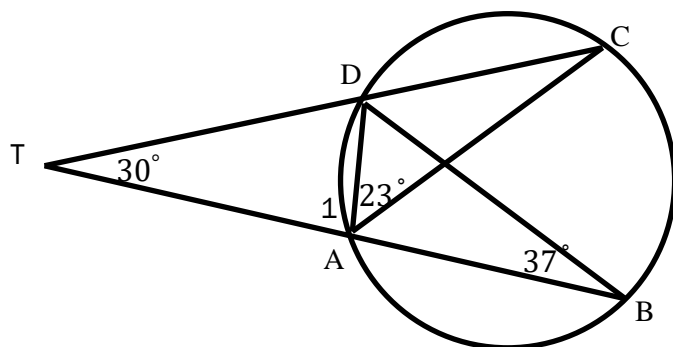
- a) Find the size of \hat{O}_1 (3)

- b) Find the size of \hat{B}_1 (2)

[5]

QUESTION 3

In the given diagram, TAB and TDC are two straight lines. A, B, C and D lie on the circumference of the circle.



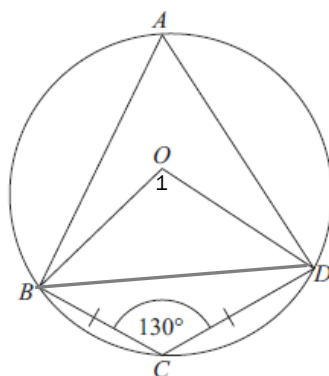
- a) Determine \hat{A}_1 (2)

- b) Is BD a diameter of the circle? Explain (2)

[4]

QUESTION 4

A, B, C and D are points on circle centre O. $BC = CD$. $\hat{C} = 130^\circ$



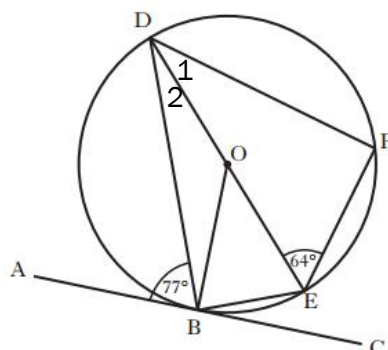
- a) Give the size of \hat{O}_1 (2)

- b) Work out the size of \hat{ODC} (3)

[5]

QUESTION 5

AC is a tangent to the circle, centre O, with point of contact B. DE is the diameter of the circle and F is a point on the circumference. $\hat{A}BD = 77^\circ$, $\hat{D}EF = 64^\circ$.



Find the sizes of the following, showing working and giving reasons:

- a) \hat{D}_1 (3)

- b) \hat{D}_2 (3)

[6]

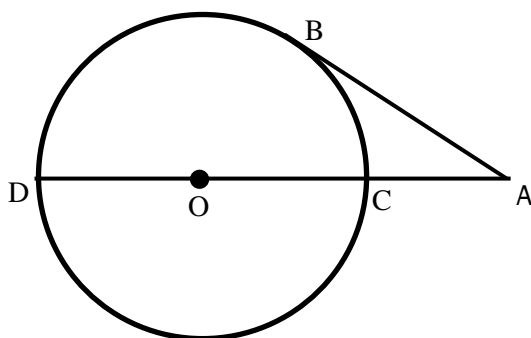
SECTION B

[27]

NAME: _____
 MATHS TEACHER: _____

QUESTION 6

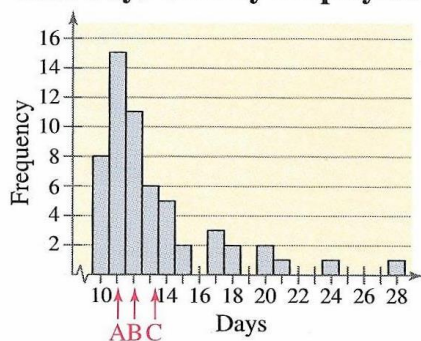
In the given diagram, O is the centre of the circle and AB is a tangent at B. If $AB = 15\text{cm}$ and $AC = 7,5\text{cm}$, calculate the radius of the circle.



[3]

QUESTION 7

Sick Days Used by Employees



In the given diagram the letters A, B and C are marked on the horizontal axis

- a) Specify which is the mean, which is the median and which is the mode. Give a reason for your choice each time. (3)

A _____

B _____

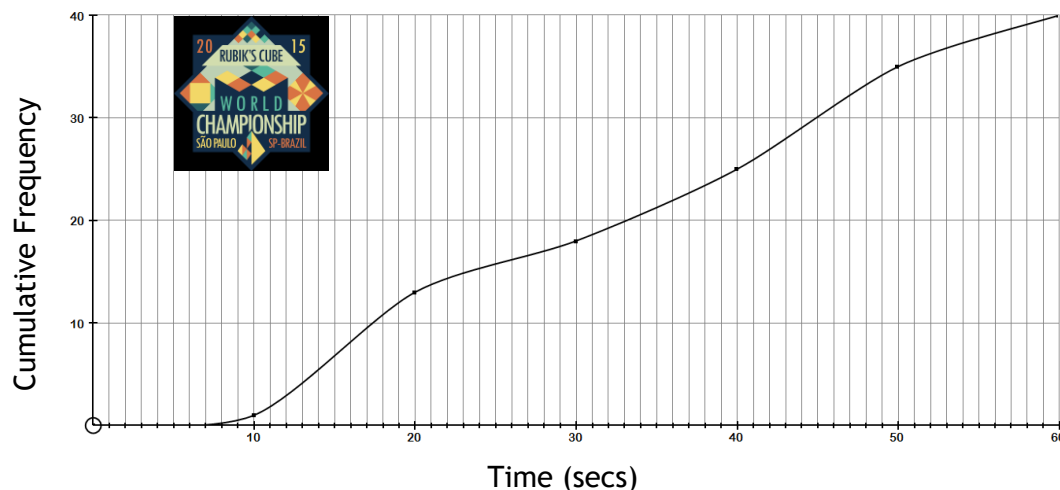
C _____

- b) How many workers are represented in the histogram? (2)

[5]

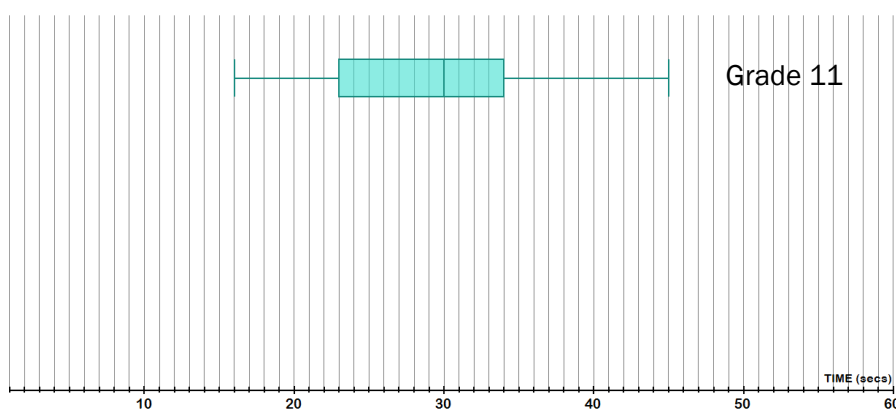
QUESTION 8

Following the 2015 Rubik's Cube championships in Brazil, 40 grade 10 Kearsney boys challenged 40 grade 11 Kearsney boys to a Rubik's Cube competition. The cumulative frequency graph given shows the times taken for the grade 10's to complete the challenge of the cube.



- a) Use the graph to estimate the median time taken by the grade 10's to complete the challenge. (1)

- b) A box and whisker plot showing information about the grade 11's times to complete the challenge is given.
 The least time taken to complete the cube by a grade 10 was 9 secs
 The longest time taken to complete the cube by a grade 10 was 57 secs
 Draw the box and whisker for the grade 10's between the grade 11's and the x axis. (3)



- c) Based on the box and whisker diagrams : (1)
 Give a way the grade 11's could argue that they were the better team.
 i) (1)
 ii) Give a way the grade 10's could argue that they were the better team. (1)

QUESTION 9

A group of students wrote a stats test and the following data was obtained:

Std deviation	σ
Mean	72
Median	64

- a) The teacher decides to add 5 marks to each person's mark. For the new set of marks, write down the:
- i) Mean (1)
-
- ii) Standard deviation (1)
-
- iii) Median (1)
-
- b) If the standard deviation of a given data set is equal to zero, what can we say about the data values included in the given data set? (1)

[4]

QUESTION 10

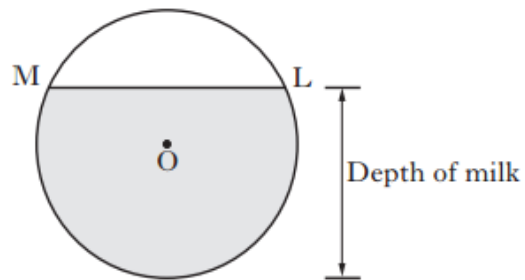
If $\cos \theta = \frac{-5}{13}$ and $\theta \in [180^\circ; 360^\circ]$, without solving for θ but using a sketch, determine

- a) $\tan \theta$ (3)
-
- b) $\sin(360^\circ - \theta)$ (2)
-
-
-

[5]

QUESTION 11

The diagram shows the circular cross-section of a milk tank. The radius of the circle, centre O , is $1,2$ m. The width of the surface of the milk in the tank (ML in the diagram) is $1,8$ m. Calculate the depth of milk in the tank.



[4]

SECTION C

[33]

NAME: _____

MATHS TEACHER: _____

QUESTION 12

Simplify without the use of a calculator:

a) $\frac{\sin(-10^\circ)}{\cos(-80^\circ)}$ (3)

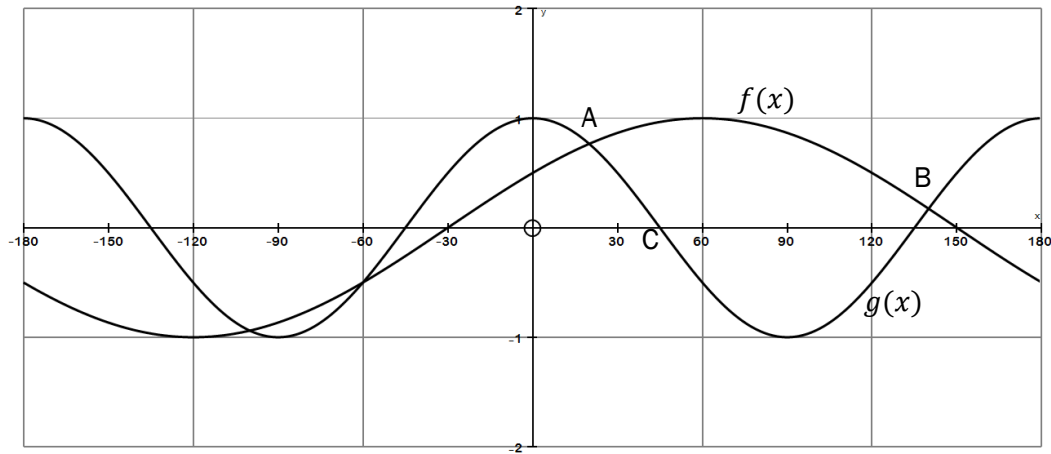
b) $\frac{\cos(180^\circ - p) \sin(p - 90^\circ) - 1}{\tan^2(540^\circ + p) \sin(90^\circ + p) \cos(-p)}$ (7)

[10]

Question 13

The graphs below represent the functions $g(x) = \cos 2x$ and $f(x) = \sin(x + 30^\circ)$.

B has co-ordinates $(140^\circ; 0,17)$.

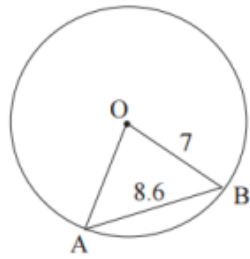


- a) Give the period of $f(x)$ (1)
-
- b) Give the co-ordinates of C. (1)
-
- c) For which values of x are $f(x)$ and $g(x)$ both increasing? (2)
-
- d) i) Using your calculator, find $g(20^\circ)$ (1)
-
- ii) Using your calculator, find $f(20^\circ)$ (1)
-
- e) For which values of x is $g(x) < f(x)$ for $x \in [0^\circ; 180^\circ]$ (2)
-
- f) If $f(x)$ is translated 30° to the left to make $h(x)$, give the equation of $h(x)$ (2)
-

[10]

QUESTION 14

- a) AB is a chord of a circle, centre O and radius 7cm. If $AB = 8,6$ cm, calculate \widehat{AOB} (3)



- b) Determine the general solution of $\sin^2\theta - 3\sin\theta = -2$ (5)

[8]

QUESTION 15

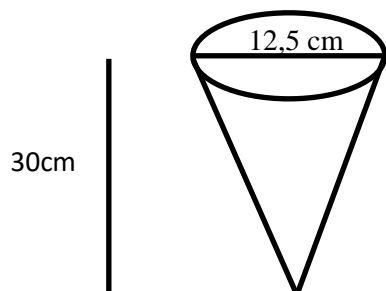
- a) The circular opening at the top of a rain-gauge has an internal diameter of 12,5 cm. The rain-gauge has a perpendicular depth of 30cm. Show that the volume of water it can hold before it overflows is 1227 cm^3 to the nearest whole number. (2)

Possible formulae

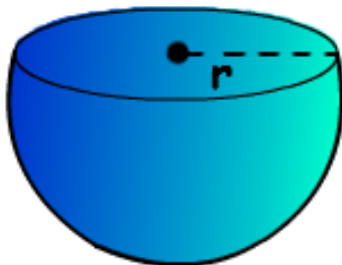
$V = \pi r^2 H$

$V = \frac{1}{3} \pi r^2 H$

$V = \frac{4}{3} \pi r^3$



- b) A hemispheric container also collects water during the rain. What is the minimum radius that the hemisphere must have to collect the same amount of water? (3)



[5]

SECTION D

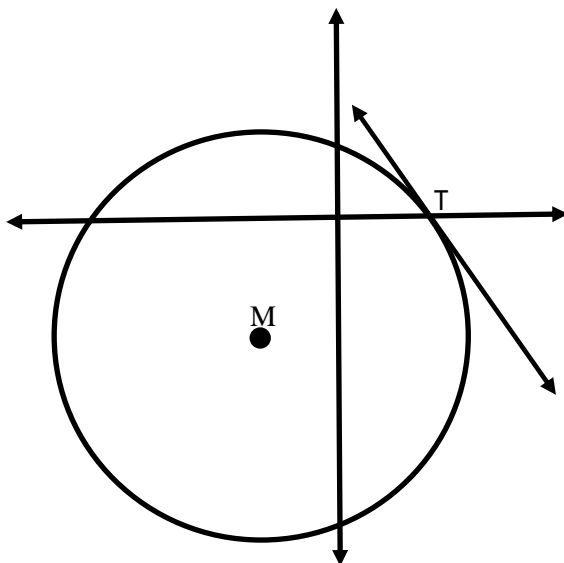
[30]

NAME: _____

MATHS TEACHER: _____

QUESTION 16

In the diagram below, the circle centre M is drawn with a tangent at $T(x; 0)$.
 The equation of the circle is $x^2 + 8x + y^2 + 16y = 20$



- a) Show that M has co-ordinates $(-4; -8)$ (5)

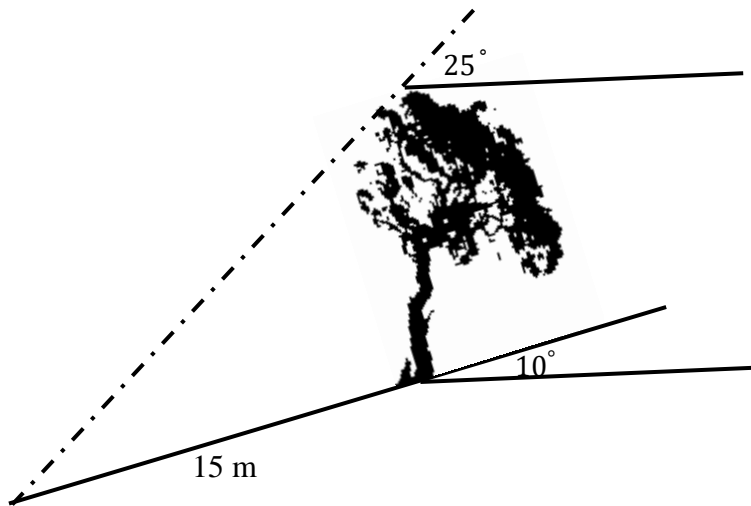
- b) Give the radius of the circle (1)

- c) Find the equation of the tangent to the circle at $T(x; 0)$. (6)

[12]

QUESTION 17

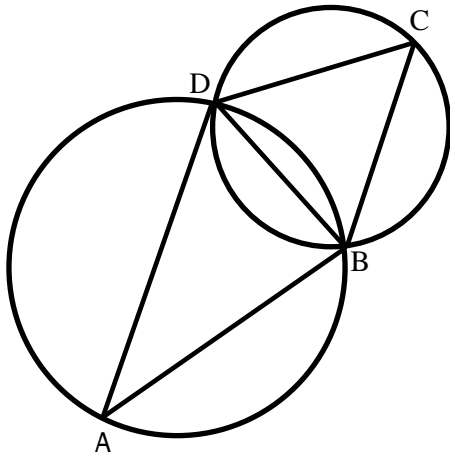
A tree grows vertically on the side of a hill. The hill has a constant upward slope of 10° . When the angle of elevation of the sun is 25° , the shadow of the tree falls 15m down the hill. How tall is the tree?



[5]

QUESTION 18

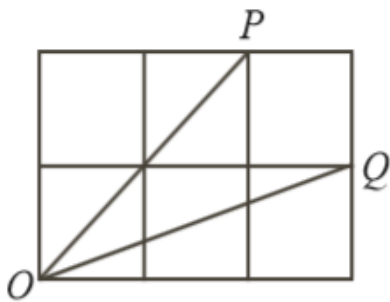
In the two circles given, BD is a common chord, the circles can be any size. What condition must be met for $\hat{A} = \hat{C}$?



[2]

QUESTION 19

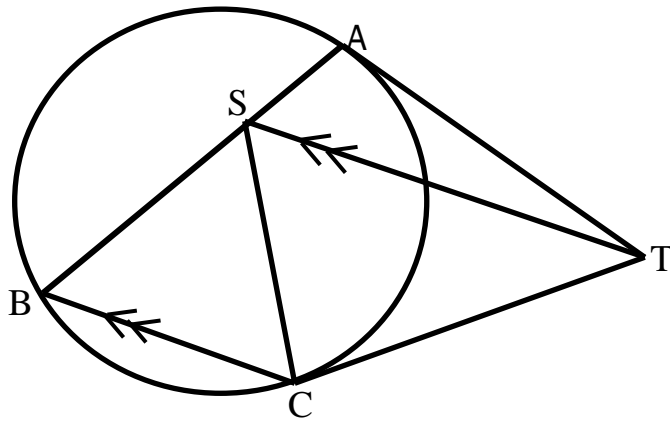
In the diagram, the six small squares all have side length 2. Lines are drawn from O to P and O to Q . Find $\hat{P}OQ$.



[4]

QUESTION 20

TA and TC are tangents. $ST \parallel BC$.



Prove that :

- a) ASCT is a cyclic quad (4)

- b) $\triangle SBC$ is isosceles (3)

[7]

