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GRADE 11

## 2020 MATHEMATICS PACKAGE

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This question paper consist of --- pages and -----data sheet

**Test: Algebra: Equations and inequalities [50 marks]****Question 1**

1. Solve for  $x$  in each of the following;

1.1.  $7 - 5x = x^2$  (5)

1.2.  $1 + \frac{x+1}{x-2} + \frac{2}{x-1} = 0$  (6)

1.3.  $x^2 - 6 < -5x$  (5)

1.4.  $-x(x - 9) \leq 14$  (5)

[21]

**Question 2**

2.1 Solve for both  $x$  and  $y$  in the system of equations below.

$$xy + 6 = 0 \quad \text{and} \quad x + 3y + 3 = 0 \quad (6)$$

2.2 Consider the equation  $x^2 + 5xy + 6y^2 = 0$

2.2.1 calculate the values of the ratio  $\frac{x}{y}$  (3)

2.2.2 hence calculate the values of  $x$  and  $y$  if  $x + y = 8$  (4)

[13]

**Question 3**

3.1 Determine the nature of the roots of:

3.1.1  $2x^2 + 3x - 4 = 0$  (2)

3.1.2  $4x^2 - 12x + 9 = 0$  (2)

3.2 For which values of  $p$  are the roots of  $x(2x + p) = -3$  non real (3)

3.3 For which values of  $k$  will the roots of  $\frac{4x-3}{(x-1)^2} = k$  be real (3)

3.4 Show that the roots of  $x^2 - 2(p - 1)x - 4p = 0$  are rational for all rational values of  $p$ . (3)

3.5 Show that the roots of  $ax(x + 1) + 2x(x - 1) = x + 5$  are real for all real values of  $a$ . (3)

[16]

**Test 2: Exponents and surds [51]****Question 1**

1.1 Simplify each of the following

2.1.1  $\frac{(3x)^{-2}}{3x^{-3}}$  (3)

2.1.2  $\frac{x^{-1} + y^{-1}}{x^{-1}y - y^{-1}x}$  (5)

2.1.3  $\sqrt{108x^{12}} + \sqrt{243x^{12}}$  (3)

2.2 Solve for  $x$ :  $2^{3x-6} = \sqrt{8}$  (3)

1.3 Solve for  $x$  if

1.3.1  $9^{x^2+x} = 27^{x+1}$  (5)

1.3.2  $2^{x+1} + 2^{x+2} = 48$  (5)

1.3.3  $3^{2x} - 3 \cdot 3^x = -2$  (5)

[29]

**Question 2**

2.1 Simplify each of the following:

2.1.1  $\frac{x^{\frac{1}{3}} \cdot x^{\frac{1}{4}}}{x^{\frac{1}{6}}}$  (3)

2.1.2  $\sqrt{128x^6} + \sqrt{98x^6}$  (3)

2.1.3 Show that  $\frac{\sqrt{x}}{x} + \frac{y}{\sqrt{x}}$  can be written as  $\frac{\sqrt{x}(1+y)}{x}$  (4)

2.2 Simplify:

2.2.1  $\frac{3\sqrt{18}-\sqrt{50}}{2\sqrt{72}}$  (4)

2.2.2  $\frac{2\sqrt{18}-\sqrt{32}}{\sqrt{8}+\sqrt{2}}$  (4)

2.2.3  $\frac{\sqrt{75}-\sqrt{18}}{\sqrt{12}}$  (4)

[22]

**Test 3: Functions and Graphs [100]****Question 1**

- 1.1 Draw a sketch graph of  $y = ax^2 + bx + c$  where  $a < 0, b < 0$  and  $c < 0$  and  $ax^2 + bx + c - 0$  has only one solution. (4)
- 1.2 Given the functions  $y = f(x) = -\frac{1}{2}(x+1)^2 + 2$  and  $y = g(x) = -2x - 6$ :
- 1.2.1 Write down the co-ordinates of the turning point of  $f$ . (2)
- 1.2.2 Calculate the roots of the equation  $f(x) = 0$ . (4)
- 1.2.3 Write down the equation of the axis of symmetry of  $f$ . (1)
- 1.2.4 Sketch the graphs of  $y = f(x)$  and  $y = g(x)$  on the same system of axes. (4)
- 1.2.5 Determine the values of  $x$  for which  $f(x) \geq g(x)$ . (4)
- 1.2.6 Describe in words the difference between shape of  $y = f(x)$  and  $y = 2f(x)$ . (2)
- 1.2.7 If the graph of  $f$  is shifted 4 units to the right, and 3 units down, write down the new equation of  $f$ . (2)
- 1.2.3 If  $g$  is shifted 3 units to the left and 5 units up, write down the new equation of  $g$ . (2)
- [25]

**Question 2**

Consider the function  $f(x) = \frac{-6}{x-3} - 1$

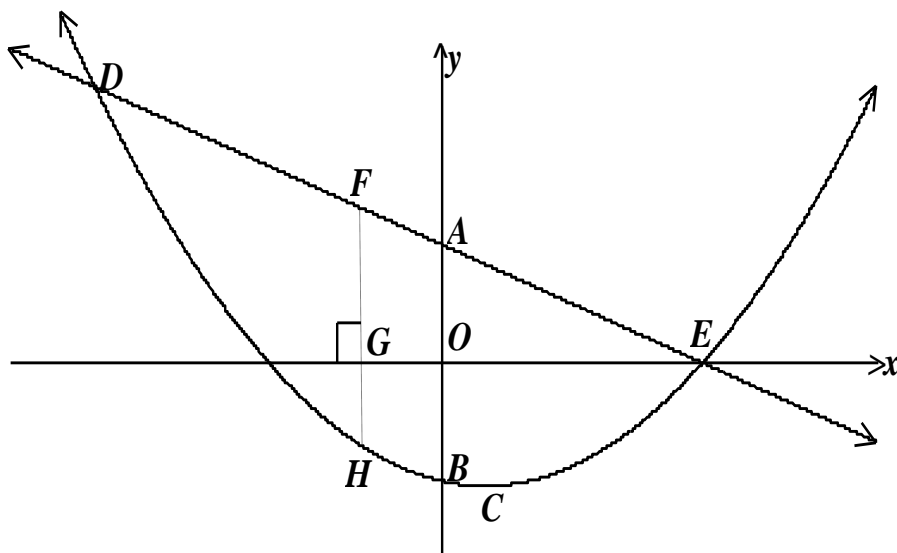
- 2.1 Write down the asymptotes of  $f$ . (4)
- 2.2 Write down the axes of symmetry of  $f$ . (4)
- 2.3 Draw a sketch graph of  $f$ . Clearly indicates all intercepts as well as the axes of symmetry. (5)
- 2.4 For which values of  $x$  will  $f(x) > 0$ . (2)
- 2.5 Calculate the average gradient between the points where  $x = -2$  and  $x = 0$ . (5)
- [20]

**Question 3**

Consider the graph of the functions:

$$p(x) = 2x^2 - x - 3$$

$$q(x) = -2x + 3$$



- 3.1 Calculate the distance AB. (2)
  - 3.2 Determine the co-ordinates of C, the turning point of the parabola. (4)
  - 3.3 Calculate the co-ordinates of D and E, the points of intersection of the two graphs. (6)
  - 3.4 Calculate the length of FH if G is the point (-2;0) (3).
- [15]

**Question 4**

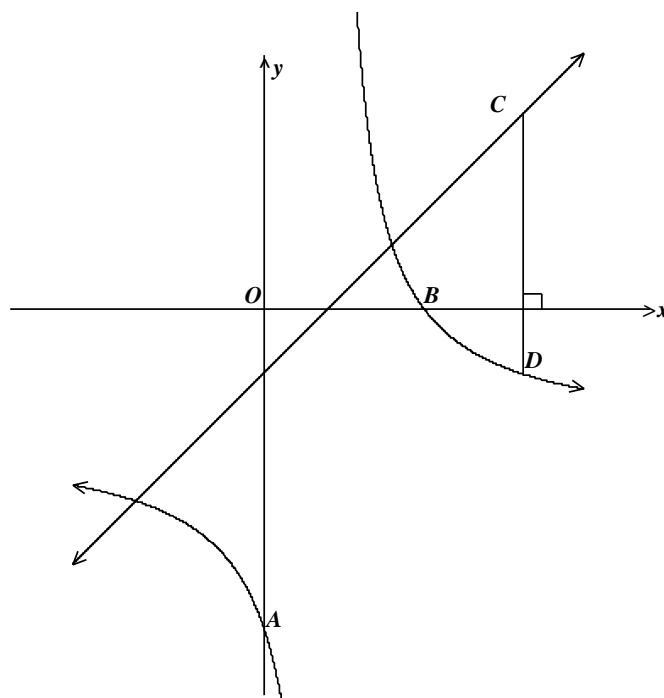
Given  $h(x) = \left(\frac{1}{4}\right)^{x-1} - 2$

- 4.1 Write down the equation of the asymptote of  $h$  (2)
- 4.2 Determine the coordinates of the intercepts of  $h$  with the  $x$  and  $y$  axes (6)
- 4.3 Draw the graph of  $h$  showing all the intercepts with the axes and any asymptotes (3)
- 4.4 Write down the equation of the reflection of  $h(x) = \left(\frac{1}{4}\right)^{x-1} - 2$  in the  $y$  axis. (2)
- 4.5 Write down the equation of the reflection of  $h(x) = \left(\frac{1}{4}\right)^{x-1} - 2$  in the  $x$ -axis. (2)

[15]

**Question 5**

Sketched below are the graphs of  $p(x) = \frac{3}{x-1} - 2$  and  $q(x) = x - 1$

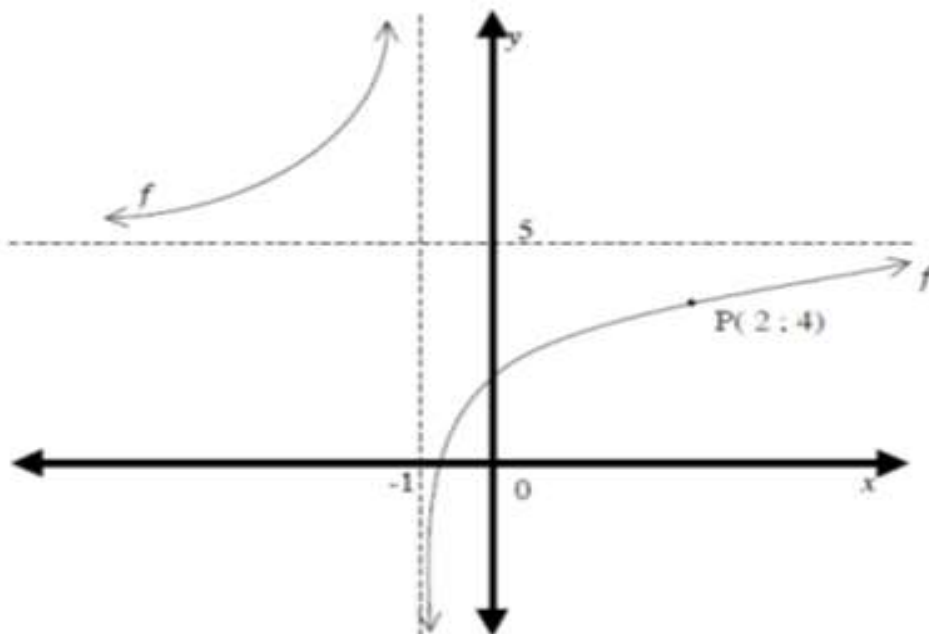


- 5.1 Calculate the co-ordinates of A and B. (4)
- 5.2 Write down the equation of the horizontal asymptote of  $p(x)$  (2)
- 5.3 Write down the domain of  $p(x)$  (2)
- 5.4 Show that  $p(-2) = q(-2)$  and state the significance of this fact to the sketch. (3)
- 5.5 Determine the co-ordinates of D if  $CD = 4$  where  $CD$  is perpendicular to the  $x$ -axis. (4)

**[15]**

**Question 6**

**6.1** The diagram below represents the graph of  $f(x) = \frac{a}{x-p} + q$ .  $P(2; 4)$  is a point on the Graph.



- 6.1.1 Write down the values of  $a$ ,  $p$  and  $q$  (4)
- 6.1.2 Write down the range of  $f(x)$  (2)
- 6.1.3 Write down the equations of the asymptotes of  $f(x) + 1$  (2)
- 6.2 Determine the point where the axes of asymptotes of  $f(x) = \frac{-2}{x+1} - 3$  will intersect each other (2)
- [10]





- 1.4 A quadratic pattern has a second term equal to 1 and a third term equal to -6 and a fifth term equal to -14.
- 1.4.1 calculate the second differences of this quadratic pattern (5)
- 1.4.2 hence, or otherwise, calculate the first term of the pattern (2)
- 1.5 The sequence 4; 9; The pattern 4; 9;  $x$ ; 37; .... is a quadratic pattern
- 1.5.1 Calculate the value of  $x$ . (3)
- 1.5.2 hence or otherwise determine the general term of this pattern. (4)
- 1.6 Consider the sequence: 3 ;  $p$  ; 10 ;  $q$  ; 21. The sequence has a constant second difference of 1. Determine the values of  $p$  and  $q$ . (4)

**Test 5: Financial Mathematics[50]****Question 1**

- 1.1 In each of the following, calculate the value of the investment at the end of one year and the total amount of interest earned.
- 1.1.1 R12 000 invested at 4,5% per annum simple interest. (2)
- 1.1.2 R12 000 invested at 4,5% per annum compound. (2)
- 1.1.3 R12 000 invested at 4,5% per annum compounded monthly. (2)
- 1.1.4 R12 000 invested at 4,5% per annum compounded quarterly. (2)
- 1.2 Based on your calculations above, comment on which is type of interest gives the best return on your investment. (1)
- [9]

**Question 2**

- 2.1 Calculate approximately how long it will take for an investment of R20 000 to double in the following situations: (Work correct to a whole compounding period.)
- 2.1.1 9,5% interest per annum, compound. (3)
- 2.1.2 5,5% simple interest, calculated six monthly. (3)
- 2.1.3 8% interest per annum, compounded monthly. (3)
- 2.2 Which is the better investment offer: 10,28% p.a. compounded daily (use 365 days in a year) or 10,3% p.a. compounded monthly? (5)
- 2.3 Thandi invests R120 000. She is quoted a nominal rate of 7,2% per annum, compounded monthly.
- 2.3.1 calculate the effective rate per annum ( correct to 3 decimal places) (2)
- 2.3.2 Use the effective rate to calculate the value of her investment after 3 years. (2)
- 3.3.3 Suppose she invests her money for a total of 4 years, but after 18 months she withdraws R20 000, how much will she receive at the end of the 4 years. (5)
- [23]

**Question 3**

- 3.1 Nthabi is running a small business. She has just bought equipment for R 500 000
- 3.1.1 She decides to depreciate the equipment at 20% p.a. on the straight line basis. When will she write the equipment off? (2)
- 3.1.2 Nthabi changes her mind and depreciates the equipment at 25% p.a. on the reducing balance. Calculate the value of the equipment after 5 years. Give your answer correct to the nearest Rand. (4)
- 3.2 After just 2 years, a laptop computer is one third it's original value. Assuming reducing balance depreciation, what was the annual rate of depreciation? (5)
- 3.3 Byron deposits R2500 into a bank account and makes no withdrawals for 8 years. At the end of the fifth year he deposits an additional R1200. If the interest rate for the first 4 years is 8% p.a compounded quarterly and 9,5% p.a compounded semi-annually for the remaining four years, what will have accrued in the account at the end of the eighth year. (7)

[18]

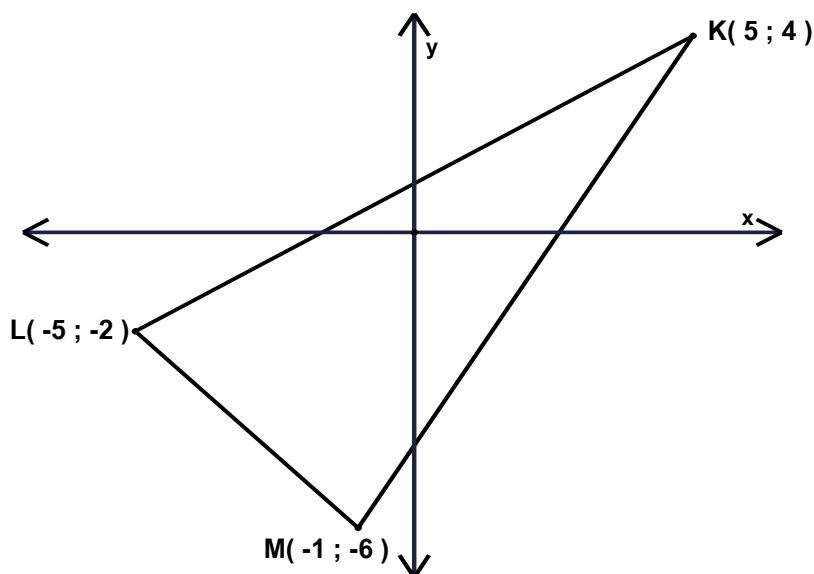
**Test 6: Analytical geometry[50]**

**Question 1**

- 1.1 P is the point  $(-5; 2)$  and Q is the point  $(3; 6)$ . Calculate the:
- 1.1.1 length of the line segment PQ (3)
  - 1.1.2 coordinates of the midpoint M of the line segment PQ; (2)
  - 1.1.3 equation of the line through P and Q; (4)
  - 1.1.4 equation of the perpendicular bisector of PQ. (4)
- 1.2 Determine the values of  $x$  and  $y$  if;
- 1.2.1  $(1, 3)$  is the midpoint of the line segment joining  $(4, 5)$  and  $(x; y)$  (3)
  - 1.2.2  $(-1, y)$  is the midpoint of the line segment joining  $(0, -2)$  and  $(x; 8)$  (2)
  - 1.2.3  $(x; 3)$  is the centre of a circle with diameter MN where M is the point  $(5; -2)$  and N is the point  $(-7; y)$  (2)
- [20]

**Question 2**

- 1.1 In the diagram below,  $L(-5; -2)$ ,  $M(-1; -6)$  and  $K(5; 4)$  are the vertices of  $\triangle KLM$  in a Cartesian plane.

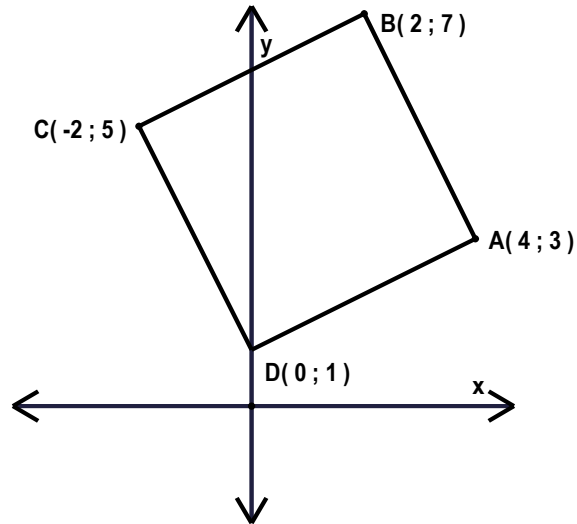


Determine:

- 1.1.1 Q, the midpoint of MK (3)
  - 1.1.2 the gradient of LM (3)
  - 1.1.3 the inclination of LM (3)
  - 1.1.4 The length of LM (3)
  - 1.1.5 the equation of the line parallel to LM passing through N. (3)
  - 1.1.6 Show that the line in question 1.5 passes through the point QP the midpoint of KL (4)
  - 1.1.7 Show that  $LM = 2PQ$  (4)
- [19]

**Question 3**

In the diagram below,  $A(4 ; 3)$ ,  $B(2 ; 7)$ ,  $C(-2 ; 5)$  and  $D(0 ; 1)$  are four points in a Cartesian plane.



- 3.1 Show that  $AC \perp BD$  (5)  
3.2 Show that AC bisects BD (4)  
3.3 State, giving a reason, which type of quadrilateral ABCD is. (2)

[11]

**Test 7: Trigonometry[50]****Question 1**

- 1.1 If  $\cos \theta = -\frac{2}{\sqrt{13}}$  and  $180^\circ \leq \theta \leq 360^\circ$ , use a sketch to determine the value of  $\tan \theta$  (3)
- 1.2 If  $4 + 3 \tan \theta = 0$  and  $\sin \theta > 0$ , then determine by making use of a diagram and without the use of a calculator the value of  $\sin \theta + \cos \theta$  (4)
- 1.3 If  $x = 87,6^\circ$  and  $y = 240,2^\circ$ , use a calculator to evaluate the following expression correct to two decimal places:  $\frac{\sin y}{\cos x} + 3 \tan 2x$  (2)
- 1.4 Evaluate without using a calculator:  $\frac{\tan 315^\circ + \cos 300^\circ}{\sin 150^\circ + \tan 135^\circ}$  (5)
- 1.5 Prove that:  $\sin 240^\circ \tan 300^\circ + \cos 330^\circ = \frac{1}{2}(3 + \sqrt{3})$  (4)  
[18]

**Question 2**

2.1 Simplify the following expressions and show ALL the calculations without using a calculator

$$2.1.1 \frac{\cos(180^\circ - x)\sin(x - 90^\circ) - 1}{\tan^2(540^\circ + x)\sin(90^\circ + x)\cos(-x)} \quad (6)$$

$$2.1.2 \frac{\sin 63^\circ \cdot \cos^2 135^\circ \cdot \tan 315^\circ}{\sin 240^\circ \cdot \tan 150^\circ \cdot \cos 27^\circ} \quad (7)$$

[13]

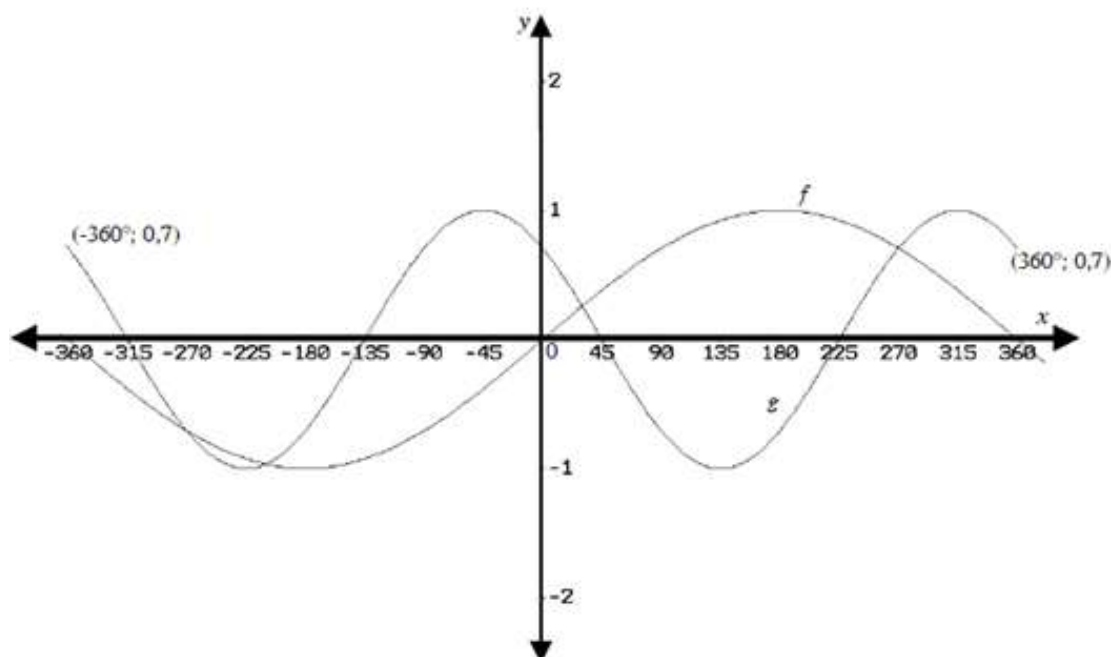
**Question 3**

- 3.1 Determine the solution to the following equation for  $180^\circ \leq \theta \leq 360^\circ$ . Give answer(s) correct to two decimal places  $3 - \tan \theta = 2,4$  (2)
- 3.2 Determine the general solution of the equation:  $4 \sin^2 x - 3 = 0$ . (6)
- 3.3 Prove the following identities and state for which values of  $x$  the identity will not be valid:
- 3.3.1  $1 - \frac{\sin^2 x}{1 + \cos x} = \cos x$  (5)
- 3.3.2  $\frac{\cos x}{1 + \sin x} + \tan x = \frac{1}{\cos x}$  (6)  
[19]

**Test 8 : Trig functions[50]**

**Question 1**

- 1.1 Given:  $f(x) = 2\cos x$  and  $g(x) = \tan 2x$
- 1.1.1 Write down the amplitude and the period of  $f$  and  $g$ . (4)
- 1.1.2 Sketch the graphs of  $f$  and  $g$  on the same system of axes for the interval  $-90^\circ \leq x \leq 90^\circ$  (8)
- 1.1.3 Write down the period of  $f\left(\frac{x}{2}\right)$  (2)
- 1.1.4 Determine the asymptotes of  $g(x - 25^\circ)$  (2)
  
- 1.2 The diagram shows the graphs of  $f(x) = a \cdot \sin bx$  and  $g(x) = \cos(x + p)$



- 1.2.1 Determine the values of  $a$ ,  $b$  and  $p$  (6)
  - 1.2.2 Write down the period of  $f$ . (2)
  - 1.2.3 Write down the range of  $h(x)$  if  $h(x) = g(x) - 1$  (2)
- [26]

**Question 2**

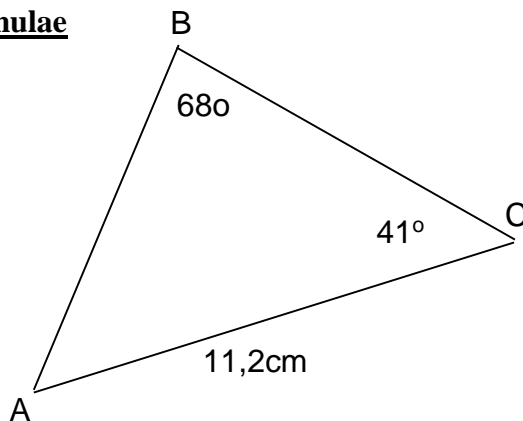
- 2.1 Draw the graphs of  $f(x) = \sin(2x - 90^\circ)$  and  $g(x) = -\tan x$ , for  $x \in [-180^\circ; 180^\circ]$  on the same system of axes (6)
- 2.2 Given the functions:  $f(x) = \cos 2x$  and  $g(x) = \sin(x + 30^\circ)$
- 2.2.1 Solve the equation  $\cos 2x = \sin(x + 30^\circ)$  for  $x \in [-180^\circ; 180^\circ]$  (6)
- 2.2.2 Sketch graphs of  $f(x) = \cos 2x$  and  $g(x) = \sin(x + 30^\circ)$  on the same system of axes for  $x \in [-180^\circ; 180^\circ]$ . Show the co-ordinates of all points of intersection with the axes, all turning points and all points at which  $f(x) = g(x)$  (8)
- 2.2.3 State the range of  $f$  if the graph of  $f$  undergoes a positive, vertical shift of 1 unit. (2)
- 2.2.3 Write down the new equation of  $g$  if it is shifted  $60^\circ$  horizontally to the left. (2)

[24]

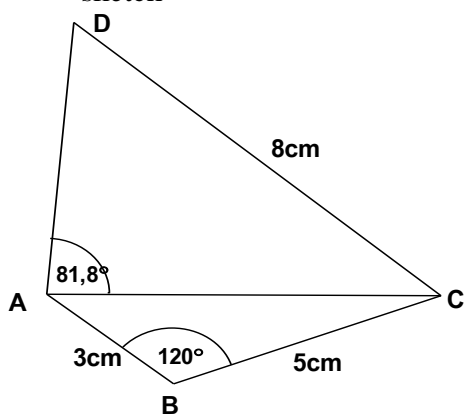
**Test 9: Trig formulae**

**Question 1**

- 1.1 Refer to the diagram alongside
- 1.1.1 Calculate the measurement of AB (correct to two decimal places. (3)
- 1.1.2 Calculate the area of the triangle. (2)



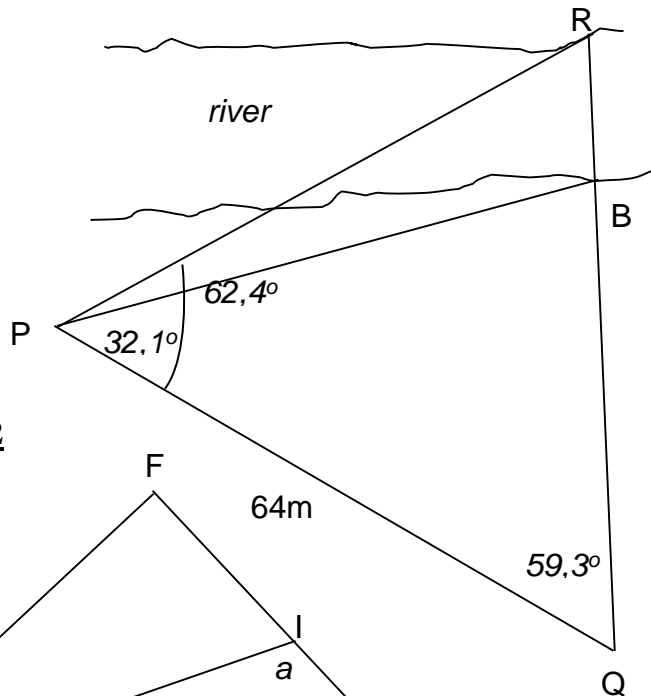
- 1.2 In the diagram below, ABCD is a quadrilateral with dimensions as shown in the sketch



Calculate:

- 1.2.1 AC (3)
- 1.2.2  $\hat{D}$  correct to 1 decimal place. (3)
- 1.2.3 The area of  $\Delta ACD$  (2)

- 1.3 A surveyor is calculating the width of a river that is to have a bridge built across it. He takes measurements as follows: The distance from point P to point Q, on the same side of the river, is 64 metres.  
 $\hat{R}PQ = 62,4^\circ$ ,  $\hat{B}PQ = 32,1^\circ$  and  $\hat{Q} = 59,3^\circ$   
 Calculate the width of the river. (6)

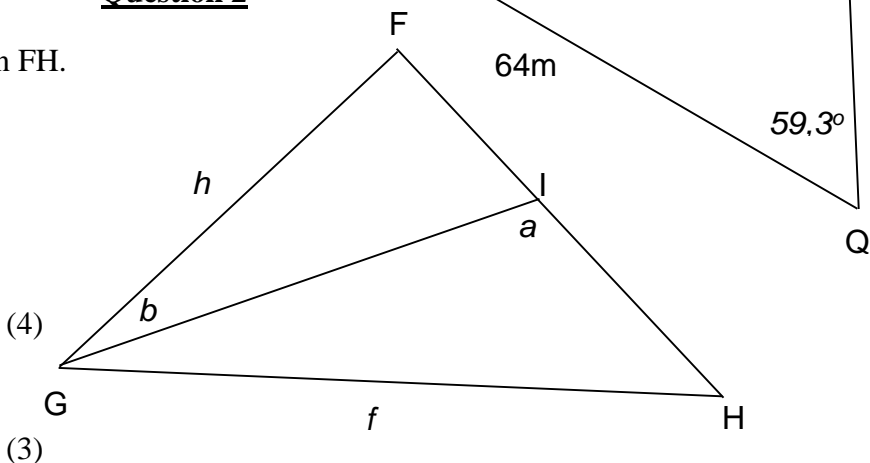


**Question 2**

- 2.1 In  $\Delta FGH$ , I is a point on FH.  
 $\hat{GHI} = a$ ,  $\hat{FGI} = b$ ,  
 $GH = f$  and  $FG = h$ .  
 Show that:

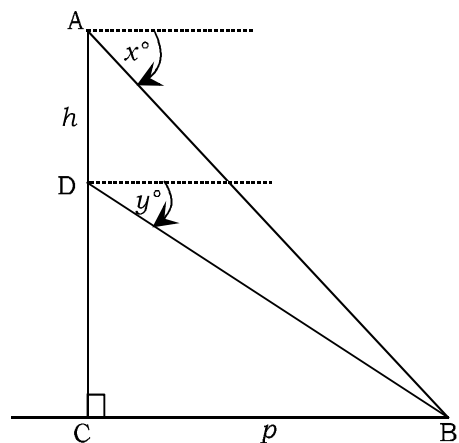
2.1.1  $\sin H = \frac{h \sin(a-b)}{f}$  (4)

2.1.2  $GI = \frac{h \sin(a-b)}{\sin a}$  (3)



2.1.3  $Area \Delta FGI = \frac{h^2 \sin(a-b) \sin b}{2 \sin a}$   
(5)

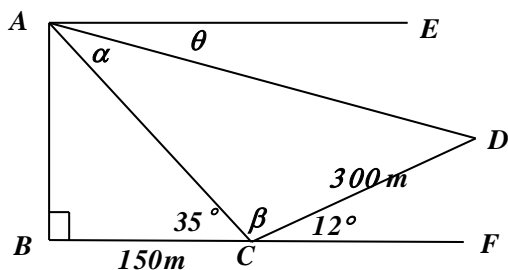
2.2 AC represents a vertical tower, with A at the top and C at the foot of the tower. D is a point on the tower  $h$  metres below A. On the same horizontal level as C is point B,  $p$  metres from C. The angles of depression of A and D to B are  $x^\circ$  and  $y^\circ$  respectively.



2.2.1 Prove that  $p = \frac{h \cos x \cdot \cos y}{\sin(x-y)}$ . (6)

2.2.2 Now calculate the value of  $p$  if  $h = 50$  m;  $x = 32,3^\circ$  and  $y = 25,8^\circ$ .  
Give the answer to one decimal place. (3)

2.3 Standing at C, 150 m from the bottom, B, of a vertical tower AB, Thabo observes that the angle of elevation of A, the top of the tower, is  $35^\circ$ . He then walks 300 m to the point D, up a slope inclined at  $12^\circ$  to the horizontal. A, B, C, D and E are in the same vertical plane.



- Calculate
- 2.3.1 the size of  $\beta$  (1)
  - 2.3.2 the distance AC (2)
  - 2.3.4 the distance AD (2)
  - 2.3.5 the angle of depression, of D ( $\theta$ ) from A, the top of the tower. (4)

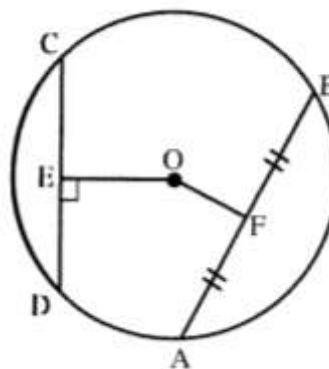
[31]



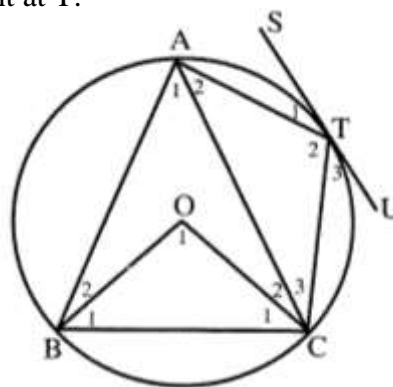
**Test 10: Euclidean Geometry [50]**

**Question 1**

- 1.1 AB and CD are two chords of the circle with centre O.  $OE \perp CD$ ,  $AF = FB$ ,  $OE = 4$  cm,  $OF = 3$  cm and  $AB = 8$  cm. Calculate the length of CD. [8]



- 1.2 O is the centre of the circle. STU is a tangent at T.  $BC = CT$ ,  $\hat{A}TC = 105^\circ$  and  $\hat{C}TU = 40^\circ$ . Calculate, giving reasons, the size of:
- 1.2.1  $\hat{A}_2$  (2)
  - 1.2.2  $\hat{A}_1$  (2)
  - 1.2.3  $\hat{B}$  (3)
  - 1.2.4  $\hat{C}_2$  (6)



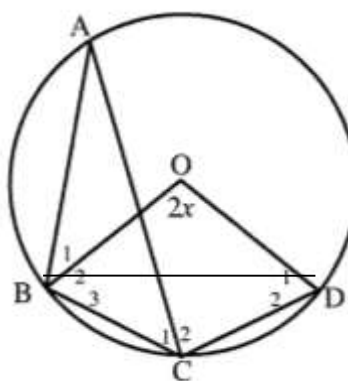
[21]

**Question 2**

- 2.1 O is the centre of the circle.  $BC = CD$

Express the following in terms of  $x$ :

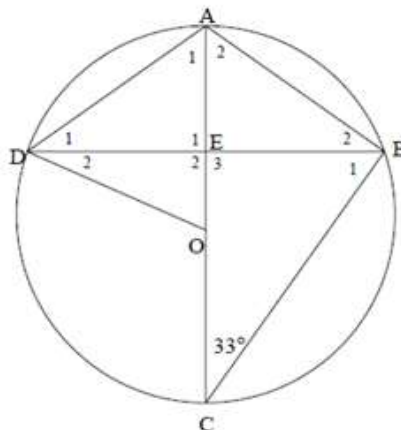
- 2.1.1  $\hat{B}_2$  (2)
- 2.1.2  $\hat{BCD}$  (3)
- 2.1.3  $\hat{A}$  (4)



2.2 In the diagram below, AC is a diameter of the circle with centre O. AC and BD intersect at E.

AB, BC and AD are also chords of the circle.

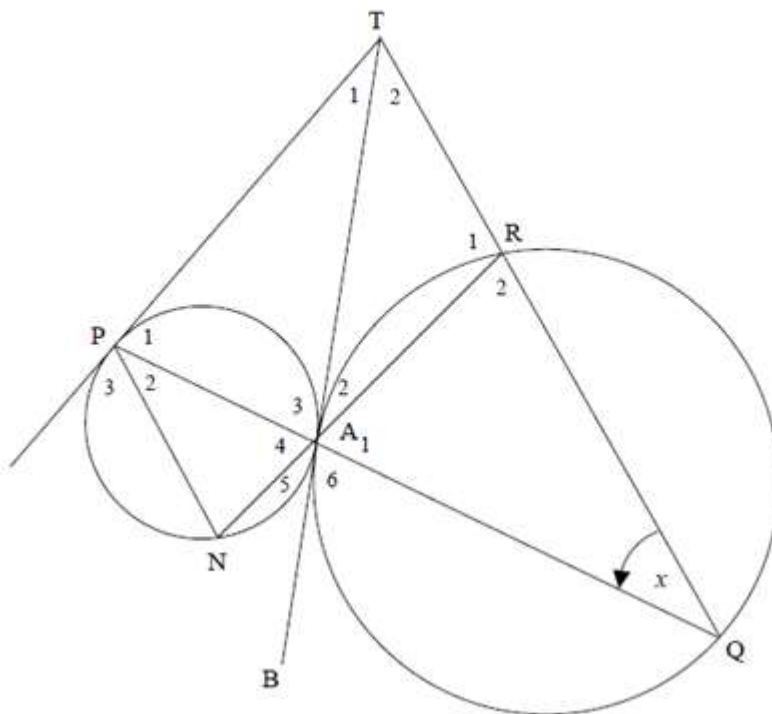
AD is joined.  $AE \perp BD$



If  $\angle ACB = 33^\circ$ , calculate with reasons the size of:

- 2.2.1  $\angle DAO$  (3)
- 2.2.2  $\angle BDO$  (2)
- 2.2.3 Show that AE bisects  $\angle DAB$  (3)

2.3 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  $\angle Q_1 = x$ .

- 2.3.1 Name with reasons THREE other angles equal to  $x$ . (6)
- 2.3.2 Prove that APTR is a cyclic quadrilateral. (6)

[29]

**Tests 11[50]: Statistics**

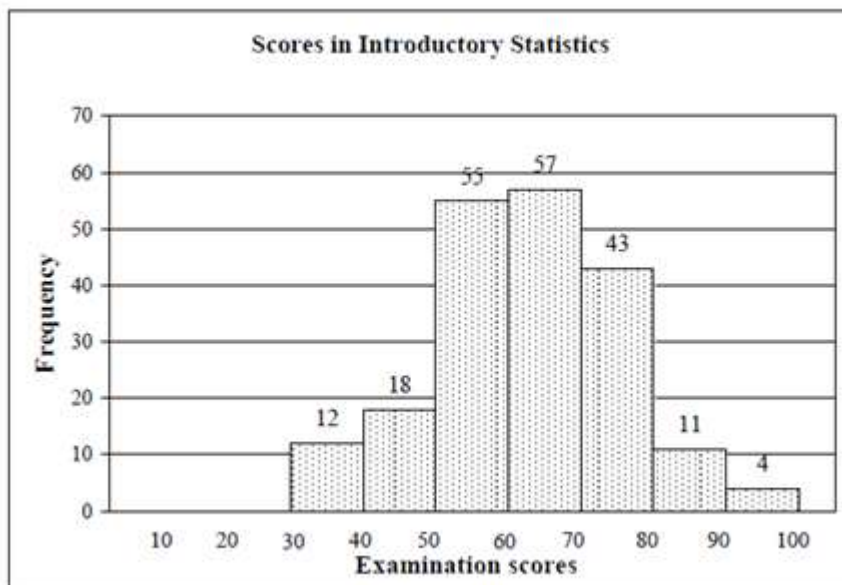
**Question 1**

1.1 Below are the percentage scores that 15 learners obtained in a Physical Science Examination

72    57    63    81    60    51    96    66  
 78    54    39    69    90    30    39

- 1.1.1 Determine the median for the above data? (2)
- 1.1.2 Determine the upper and lower quartiles. (4)
- 1.1.3 Draw a box and whisker diagram for the data. (3)
- 1.1.4 Determine the inter quartile range (1)
- 1.1.4 Use a calculator to determine the standard deviation for this data (3)
- 1.1.5 How many learners fall within one standard deviation from the mean (2)
- 1.1.7 determine whether the data set contains any outliers (4)

1.2 The histogram below shows the distribution of examination scores ( in percentages) for 200 learners in a statistics test



- 1.2.1 Construct a cumulative frequency table using the data from the histogram (7)
- 1.2.2 Hence draw an ogive to represent the data. (4)
- 1.2.3 Use the ogive to determine:
  - (a) The inter-quartile range (3)
  - (b) How many learners scored above 75% in the test. (2)

[35]

**Question 2**

The traffic department investigated where it would be most appropriate to install speed cameras. As part of their investigation a survey was done of the different speeds of vehicles on a stretch of a national road. The following table shows the results of the survey:

| <b>SPEED<br/>(in km/h)</b> | <b>FREQUENCY<br/>(Of vehicles)</b> | <b>CUMULATIVE<br/>FREQUENCY</b> |
|----------------------------|------------------------------------|---------------------------------|
| $40 < d \leq 60$           | 49                                 |                                 |
| $60 < d \leq 80$           | 92                                 |                                 |
| $80 < d \leq 100$          | 134                                |                                 |
| $100 < d \leq 120$         | 158                                |                                 |
| $120 < d \leq 140$         | 49                                 |                                 |
| $140 < d \leq 160$         | 17                                 |                                 |
| $160 < d \leq 180$         | 1                                  |                                 |

- 2.1 How many vehicles were observed in the survey? (2)
- 2.2 Complete the cumulative frequency column. (6)
- 2.3 Represent the information in the table by drawing an ogive. (4)
- 2.4 Use your graph to determine the median speed. Indicate on your graph using the letter T where you would read off your answer. (3)
- [15]

**Test 12: Probability [50]****Question 1**

- 1.1. Two dice are rolled simultaneously.
- 1.1.1 Write down the sample space (3)
- 1.1.2 Determine the probability that :
- (a) the number 2 is obtained (2)
- (b) the sum of the numbers equals 8 (2)
- (c) one of the numbers is an odd number (2)
- (d) both of the numbers are factors of 6 (2)
- 1.2. A and B are two mutually exclusive events
- 1.2.1. Write down the sum rule for mutually exclusive events (1)
- 1.2.2. If  $P(A) = 0,28$  and  $P(A \text{ or } B) = 0,43$ , determine  $P(B)$  (3)
- 1.3. Given two events A and B. Determine whether A and B are mutually exclusive and/or independent if given that  $P(A) = 0,7$ ,  $P(B) = 0,3$  and  $P(A \text{ and } B) = 0,21$ . Explain how you determined your answers (5)
- 1.4. Let A and B be two events in a sample space. Suppose that  $P(A) = 0,4$ ;  $P(A \text{ or } B) = 0,7$  and  $P(B) = k$ .
- 1.4.1 For what value of  $k$  are A and B mutually exclusive? (2)
- 1.4.2 For what value of  $k$  are A and B independent? (4)

[25]

**Question 2**

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  $x$ .

- 2.1 Draw a Venn diagram to represent the above information. (4)
- 2.2 Determine the number of boys who play rugby and cricket. (3)
- 2.3 Determine the probability that a learner in Grade 12 selected at random: (Leave your answer correct to THREE decimal places.)
- 2.3.1 only plays basketball. (2)
- 2.3.2 does not play cricket. (2)
- 2.3.3 participates in at least two of these sports. (2)

[13]

**Question 3**

In a survey 1 530 skydivers were asked if they had broken a limb. The results of the survey were as follows:

|               | <b>Broken a limb</b> | <b>Not broken a limb</b> | <b>TOTAL</b> |
|---------------|----------------------|--------------------------|--------------|
| <b>Male</b>   | 463                  | <i>b</i>                 | 782          |
| <b>Female</b> | <i>A</i>             | <i>c</i>                 | <i>d</i>     |
| <b>TOTAL</b>  | 913                  | 617                      | 1 530        |

- 3.1 Calculate the values of *a*, *b*, *c* and *d*. (4)
  - 3.2 Calculate the probability of choosing at random in the survey, a female skydiver who has not broken a limb. (2)
  - 3.2 Is being a female skydiver and having broken a limb independent? Use calculations, correct to 3 decimal places, to justify your answer. (4)
- [10]

**Question 4**

Figures obtained from a city’s police department seem to indicate that all of the motor vehicles stolen, 70% were stolen by syndicates to be sold off and 30% by individual persons for their own use.

Of those vehicles presumed stolen by syndicates:

- 10% were recovered within 24 hours
- 30% were recovered after 24 hours
- 60% were never recovered

Of those vehicles presumed stolen by individual persons:

- 30% were recovered within 24 hours
- 40% were recovered after 24 hours
- 30% were never recovered

- 4.1 Draw a tree diagram for the above information (6)
  - 4.2. Calculate the probability that if a vehicle were stolen in this city, it would be stolen by a syndicate and recovered within 24 hours (2)
  - 4.3 Calculate the probability that a vehicle stolen in this city will not be recovered (2)
- [10]