WTS TUTORING

2022 WTS LAST DANCE CAMP

GRADE 10

CELL NO.   : 082 672 7928

EMAIL   : wtstutoring@gmail.com

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WHERE TO START
MATHS & SCIENCE TUTORING
REGISTRATION NUMBER: 149 – 892 NPO

2022 WTS LAST DANCE CAMP

SUBJECTS : MATHS / MATHS LIT& PHYSCS, ACCOUNTING, LIFE SCIENCES, BUSINESS STUDIES, EMS, EGD, TECH MATHS/ SCUENCES & NS

PROVINCE : KWAZULU NATAL

DURBAN : 03 TO 09 OCTOBER 2022

GRADE : 08 TO 12

PRICE : R2500

VENUE : MASIBUMBANE SCHOOL

TIME : 08:00 TO 23:00 DAILY

TRANSPORT ARRANGEMENTS PLEASE CONTACT 078 380 6604

ONE ON ONE LESSONS: RICHARDS BAY, MTUBA, ESKHALENI, EMPANGENI, NGWELEZANE, STANGER DURBAN & PMB

FOR MORE INFORMATION CONTACT: PROF KWV SIBIYA: 082 6727 928

Mzingazi Reserve I Richards Bay I 3900 I P. O Box 10682 I Meer en see I Website: www.wtstutor.co.za / www.wtstutoring.org Email: Facebook: WTS Maths & Science Tutoring

PAPER ONE

KWV 01

QUESTION 1

1.1   Factorise the following expressions fully:

    1.1.1 $x^4 - 81$ (2)

    1.1.2 $6x^2 y - 10xy + 15x - 25$ (3)

1.2   Simplify the following expressions fully:

    1.2.1 $\dfrac{3}{a-4} + \dfrac{2}{a+3} - \dfrac{21}{a^2 - a - 12}$ (5)

    1.2.2 $\dfrac{10^{2x+3}.4^{1-x}}{25^{2+x}}$ (4)

1.3   Consider the following numbers: $\sqrt{27}$; $\sqrt[3]{-27}$; $\sqrt{-27}$.

    Which ONE of these numbers is:

    1.3.1   Irrational   (1)

    1.3.2   Non-real   (1)

    [16]

QUESTION 2

2.1   Solve for x:

    2.1.1 $15x^2 - 8 = 14x$ (4)

    2.1.2 $5^x = \dfrac{1}{125}$ (2)

2.2   The following inequality is given: $3(x+7) < \dfrac{x}{2} + 1$

    2.2.1   Solve for x in the inequality.   (3)

    2.2.2   Represent your answer to QUESTION 2.2.1 on a number line.   (1)

2.3   Mary gave one third of her money to Nazeem and one fifth of her money to Elwethu. Elwethu received R28 less than Nazeem. How much money did Mary have originally?   (4)

    [14]

QUESTION 4

$f(x) = -2x^2 + 2$ and $g(x) = 2^x + 1$ are the defining equations of graphs f and g respectively.

4.1   Write down an equation for the asymptote of g.   (1)

4.2   Sketch the graphs of f and g on the same set of axes, clearly showing ALL intercepts with the axes, turning points and asymptotes.   (6)

4.3   Write down the range of f.   (1)

4.4   Determine the maximum value of h if $h(x) = 3^{f(x)}$.   (2)

4.5   What transformation does the graph of $y = f(x)$ undergo in order to obtain the graph of $y = 2x^2 - 2$?   (2)
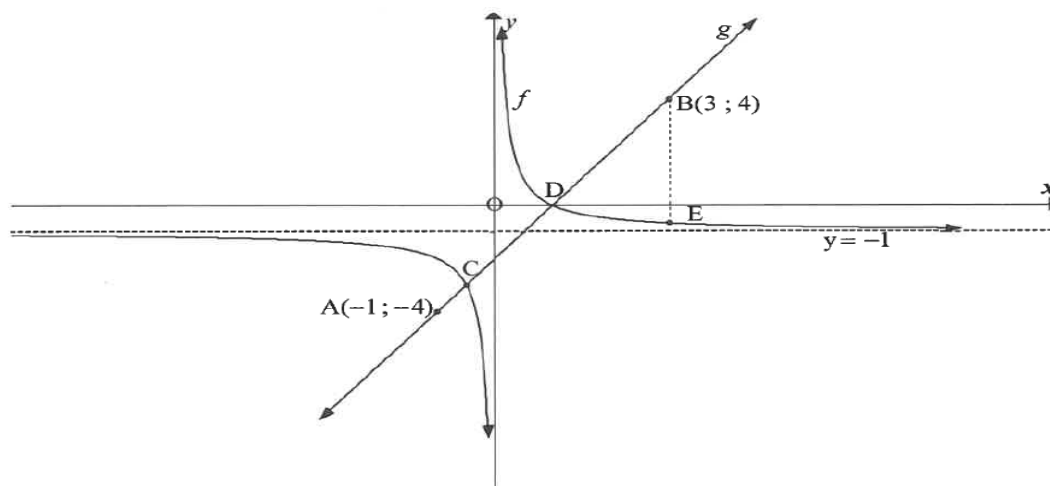   **[12]**

QUESTION 5

The sketch below shows f and g, the graphs of $f(x) = \dfrac{1}{x} - 1$ and $g(x) = ax + q$ respectively.

Points A(−1 ; −4) and B(3 ; 4) lie on the graph g.
The two graphs intersect at points C and D.
Line BE is drawn parallel to the y-axis, with E on f.

5.1   Show that $a = 2$ and $q = -2$.   (2)

5.2   Determine the values of x for which $f(x) = g(x)$.   (4)

5.3   For what values of x is $g(x) \geq f(x)$?   (3)

5.4   Calculate the length of BE.   (3)

5.5   Write down an equation of h if $h(x) = f(x) + 3$.   (1)
                                                                                        [13]

QUESTION 6

Given: $f(x) = ax^2 + c$
          f passes through the x-axis at $(d - 5)$ and $(d - 1)$, where $d \in R$.

6.1   Determine the value of d.   (2)

6.2   Determine the values of a and c if it is also given that $f(1) = -9$.   (4)
                                                                                        [6]

QUESTION 1

1.1   Factorise the following expressions fully:

      1.1.1 $x^2 - x$ (1)

      1.1.2 $3x^2 + 3px - 2mx - 2mp$ (3)

      1.1.3 $2p^2 - 2p - 12$ (3)

1.2   Simplify the following:

      1.2.1 $\dfrac{2^{a+1} - 2^{a-1}}{2^a}$ (3)

      1.2.2 $\dfrac{x^2 - x + 1}{x^3 + 1} \div \dfrac{2x}{2x + 2}$ (4)

                                                          [14]

QUESTION 2

2.1   Solve for x:

      2.1.1 $x(x - 1) = 20$ (4)

      2.1.2 $\dfrac{3x - 2}{2} = x + 1$ (3)

2.2   Given: $-4 \le -\dfrac{1}{2}m < 5$ where $m \in R$

      2.2.1   Solve for m.   (3)

      2.2.2   Write the answer to QUESTION 2.2.1 in interval notation.   (1)

2.3   Given: $4x^2 - y^2 = 171$ and $2x - y = 9$
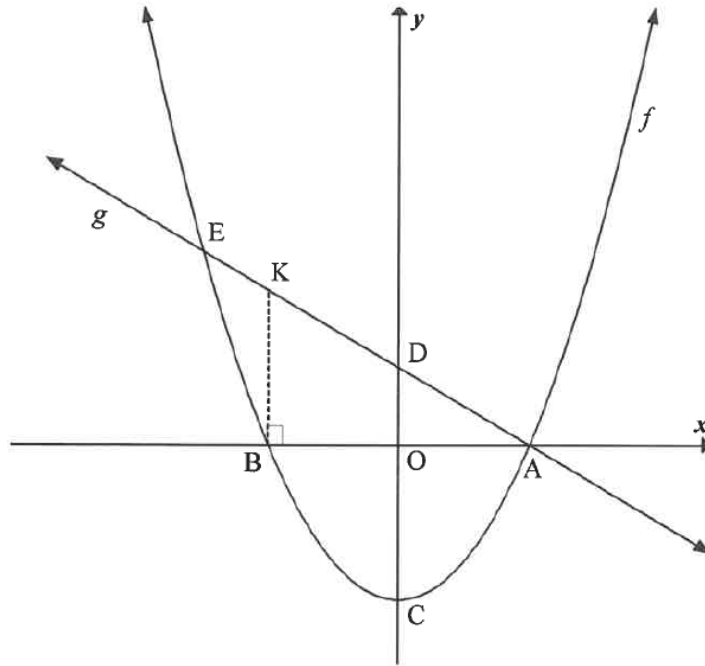
      2.3.1   Calculate the value of $2x + y$.   (2)

      2.3.2   Solve simultaneously for x and y.   (3)

                                                        [16]
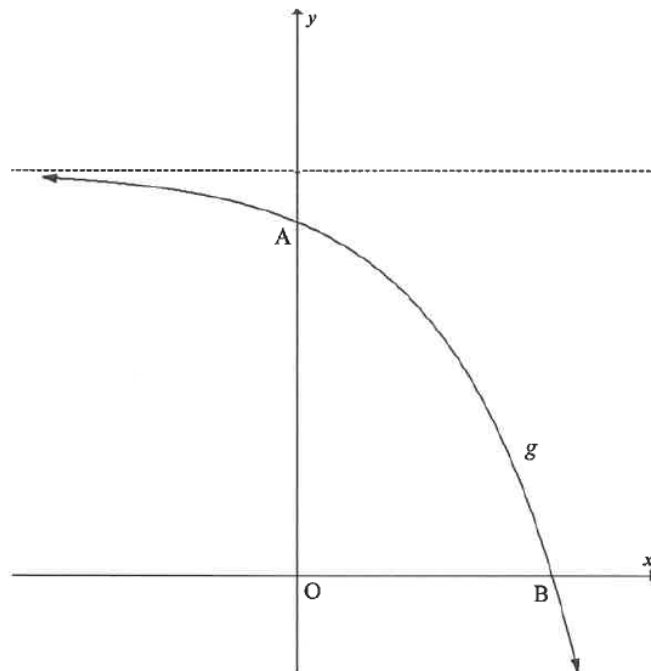
QUESTION 5

The graphs of $f(x) = x^2 - 4$ and $g(x) = -x + 2$ are sketched below. A and B are the x-intercepts of f. C and D are the y-intercepts of f and g respectively. K is a point on g such that BK $\parallel$ x-axis. f and g intersect at A and E.

5.1	Write down the coordinates of C.	(1)
5.2	Write down the coordinates of D.	(1)
5.3	Determine the length of CD.	(1)
5.4	Calculate the coordinates of B.	(3)
5.5	Determine the coordinates of E, a point of intersection of f and g.	(4)

5.6 For which values of x will:

5.6.1	$f(x) < g(x)$	(2)
5.6.2	$f(x).g(x) \geq 0$	(2)

5.7	Calculate the length of AK.	(4)
		[18]

QUESTION 6

The graph of $g(x) = -2^x + 8$ is sketched below. A and B are the y- and x-intercepts respectively of g.

6.1	Write down the range of g.	(1)
6.2	Determine the coordinates of B.	(3)
6.3	If g is reflected over the x-axis to form a new graph h, determine the equation of h.	(2)
6.4	Explain why the x-intercepts of g and h are both at B.	(2)
		[8]

QUESTION 7

A hyperbola, h, is described with the following characteristics:

- The equation of the vertical asymptote is $x = 0$
- The range of h is $(-\infty ; 3) \cup (3 ; \infty)$
- The x-intercept of h is $(2 ; 0)$

Determine the equation of h. **[4]**

QUESTION 1

1.1 Given: $q = \sqrt{b^2 - 4ac}$

    1.1.1 Determine the value of q if $a = 2$, $b = -1$ and $c = -4$. Leave your answer in simplest surd form. (2)

    1.1.2 State whether q is rational or irrational. (1)

    1.1.3 Between which TWO consecutive integers does q lie? (1)

1.2 Factorise the following expressions fully:

    1.2.1 $t^2(r - s) - r + s$ (3)

    1.2.2 $\dfrac{x^3 + 1}{x^2 - x + 1}$ (2)

1.3 Simplify the following completely:

    1.3.1 $(2y + 3)(7y^2 - 6y - 8)$ (2)

    1.3.2 $\dfrac{3}{x^2 - 9} + \dfrac{2}{(x - 3)^2}$ (3)

    1.3.3 $\dfrac{3^t - 3^{t-2}}{2.3^t - 3^t}$ (3)

[17]

QUESTION 2

2.1 Given: $4 - 2x < 16$ where $x \in R$

    2.1.1 Solve the inequality. (2)

    2.1.2 Hence, represent your answer to QUESTION 2.1.1 on a number line. (1)

2.2 Solve simultaneously for x and y:

    $-2x - y = 10$ and $3x - 4y = -4$ (4)

2.3 Solve for x:

    2.3.1 $\dfrac{x(x - 5)}{6} - 1 = 0$ (3)

    2.3.2 $c = \sqrt{a + 2x}$ (2)

2.4 Tabelo is currently four times as old as his daughter, Linda. Six years from now, Tabelo will be three times as old as Linda.
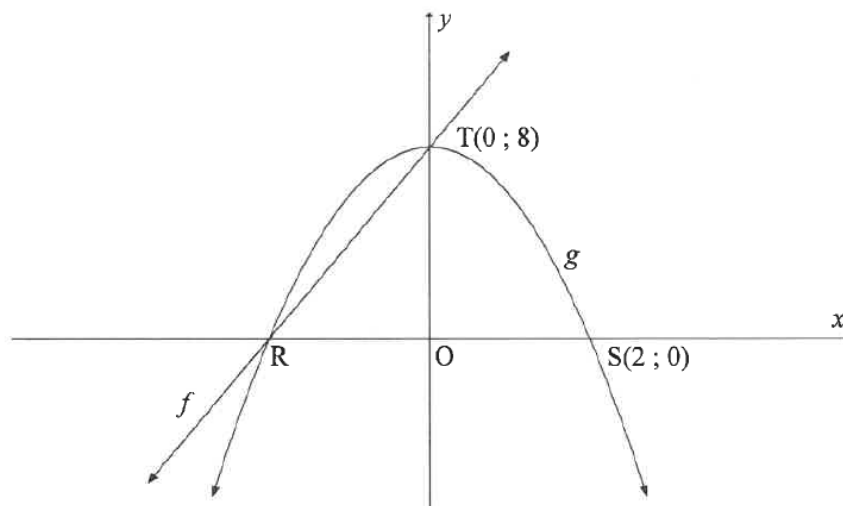
Calculate Linda's age currently. (4)

[16]

QUESTION 5

The diagram shows the graphs of $g(x) = ax^2 + q$ and $f(x) = mx + c$.
R and S(2 ; 0) are the x-intercepts of g and T(0 ; 8) is the y-intercept of g.
Graph f passes through R and T.

5.1	Write down the range of g.	(1)
5.2	Write down the x-coordinate of R.	(1)
5.3	Calculate the values of a and q.	(3)
5.4	Determine the equation of f.	(3)
5.5	Use the graphs to determine the value(s) of x for which:	
5.5.1	$f(x) = g(x)$	(2)
5.5.2	$x \cdot g(x) \leq 0$	(3)
5.6	The graph h is obtained when g is reflected along the line $y = 0$. Write down the equation of h in the form $h(x) = px^2 + k$.	(2)

[15]

QUESTION 6

6.1 The function $p(x) = k^x + q$ is described by the following properties:

- $k > 0; k \neq 1$
- x-intercept at $(2 ; 0)$
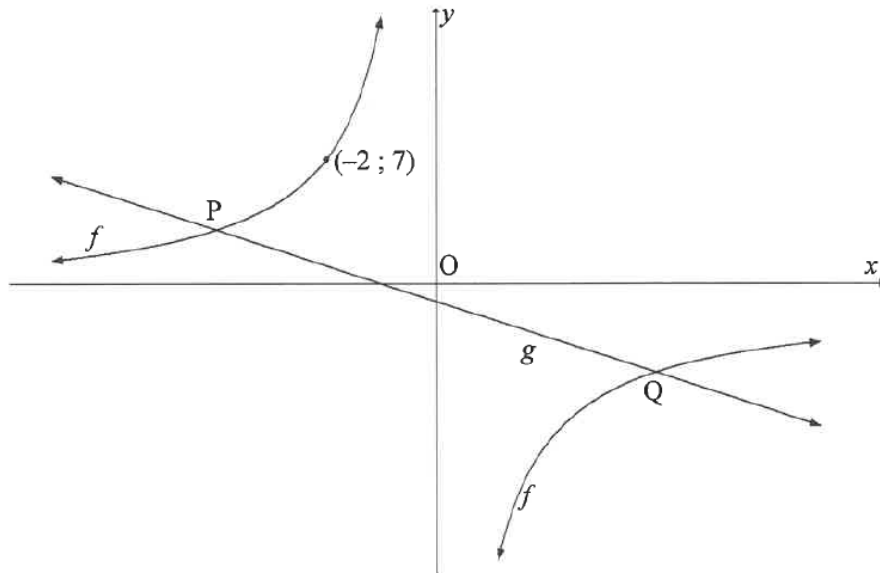- The horizontal asymptote is $y = -9$

     6.1.1   Write down the range of p.   (1)

     6.1.2   Determine the equation of p.   (3)

     6.1.3   Sketch the graph of p. Show clearly the intercepts with the axes and the asymptote.   (3)

6.2 The sketch below shows the graphs of $f(x) = \dfrac{k}{x} + w$ and $g(x) = -x - 1$.

The graph g is an axis of symmetry of f. The graphs f and g intersect at P and Q.

     6.2.1   Write down the value of w.   (1)

     6.2.2   The point $(-2 ; 7)$ lies on f. Calculate the value of k.   (2)

     6.2.3   Calculate the x-coordinates of P and Q.   (4)

     6.2.4   Write down the values of x for which $\dfrac{-16}{x} > -x$.   (2)

                                                                    [16]

QUESTION 1

1.1   Factorise the following expressions fully:

    1.1.1 $4x - x^3$ (2)

    1.1.2 $x^2 + 15x - 54$ (2)

    1.1.3 $y - xy + x - 1$ (3)

1.2   Simplify the following expressions fully:

    1.2.1 $(x + 2)(x^2 - x + 3)$ (2)

    1.2.2 $\dfrac{5}{x+3} - \dfrac{3}{2-x}$ (3)

    1.2.3 $\dfrac{25^{-x}.15^{x+1}}{3^x.5^{-x}}$ (3)

1.3   Determine the value of $(3p + q)^2$ if $9p^2 + q^2 = 12$ and $pq = -3$.   (3)

                                                                              [18]

QUESTION 2

2.1   Solve for x:

    2.1.1 $px + qx = a$ (2)

    2.1.2 $2x^2 - 5x + 2 = 0$ (3)

    2.1.3 $\left(\dfrac{1}{2}\right)^{3x+1} = 32$ (3)

2.2   Given: $-11 \le 3m - 8 < 4$

    2.2.1   Solve for m.   (2)

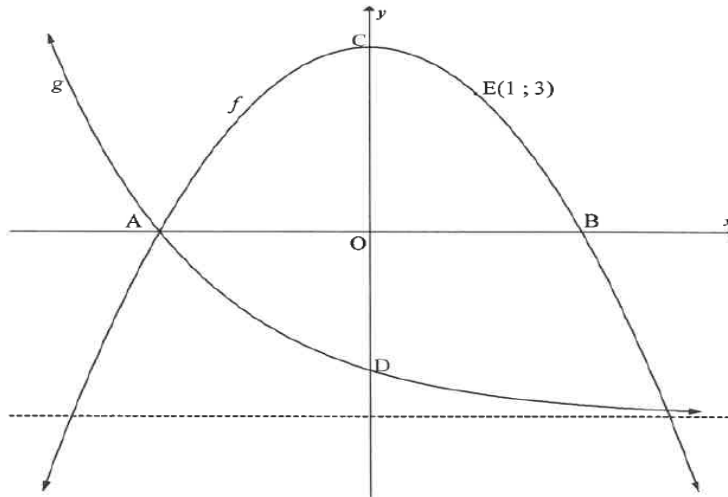   2.2.2   Hence, write down the number of integers that satisfy the inequality.   (1)

2.3   Solve simultaneously for x and y if:

          $5x + 4y = 21$ and $2x = 3 - y$ (4)

                                                                                  [15]

QUESTION 5

Sketched below are the graphs of $f(x) = ax^2 + q$ and $g(x) = \left(\dfrac{1}{2}\right)^x - 4$.

A and B are the x-intercepts of f. The graphs intersect at A and point E $(1 \, ; 3)$ lies on f.
C is the turning point of f and D is the y-intercept of g.

5.1   Write down the:

    5.1.1   Coordinates of D   (2)

    5.1.2   Range of g (1)

5.2   Calculate the:

    5.2.1   Coordinates of A   (2)

    5.2.2   Values of a and q (4)

5.3   Determine the:

    5.3.1   Length of CD   (2)

    5.3.2   Equation of a straight line through A and D   (3)

5.4   For which values of x is:

    5.4.1 $f(x) > 0$?   (2)

    5.4.2 f decreasing?   (1)
                                                                [17]

QUESTION 6

The equation of the function $g(x) = \dfrac{a}{x} + q$ passes through the point $(3 \, ; 2)$ and has a range of $y \in (-\infty \, ; 1) \cup (1 \, ; \infty)$.

6.1   Determine the:

    6.1.1   Equation of g (3)

    6.1.2   Equation of h, the axis of symmetry of g which has a positive gradient   (2)

6.2   Sketch the graphs of g and h on the same system of axes. Clearly show ALL the
    asymptotes and intercepts with axes.   (4)

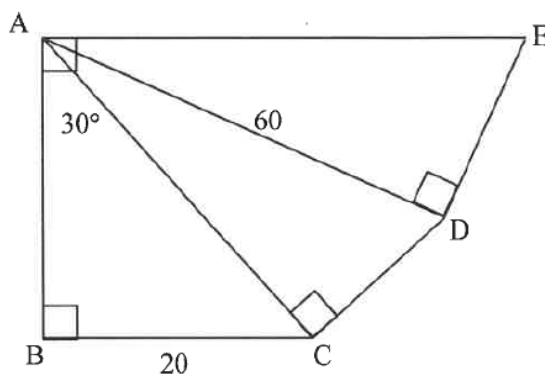6.3   Write the equations of the asymptotes of f if $f(x) = -g(x) + 5$.   (3)
                                                                [12]

QUESTION 4

4.1   In the diagram below, ABC, ACD and ADE are right-angled tirangles.
$\hat{BAE} = 90°$ and $\hat{BAC} = 30°$. BC = 20 units and AD = 60 units.

Calculate the:

4.1.1   Length of AC   (2)

4.1.2   Size of $\hat{CAD}$ (2)

4.1.3   Length of DE   (3)

4.2   Solve for x, correct to ONE decimal place, where $0° \le x \le 90°$:

4.2.1 $\tan x = 2{,}01$ (2)

4.2.2 $5\cos x + 2 = 4$ (3)

4.2.3 $\dfrac{\text{cosec } x}{2} = 3$ (3)

                                                                                                     [15]

QUESTION 5

5.1   Consider the function $f(x) = -3\tan x$.

5.1.1   Sketch, on the grid provided in the ANSWER BOOK, the graph of f for
$0° \le x \le 360°$. Clearly show ALL the intercepts and asympotes.   (3)

5.1.2   Hence, or otherwise, write down the:

(a)   Period of f (1)

(b)   Equation of h if h is the reflection of f about the x-axis   (1)

5.2   Sketched below is the graph of $g(x) = a.\cos b\theta$
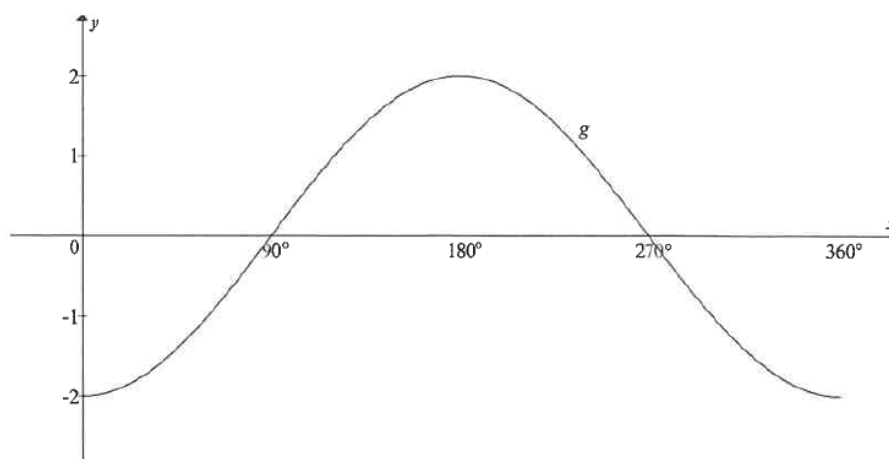
5.2.1   Write down the values of a and b.   (2)

5.2.2   Use the graph to determine the value(s) of x for which $g(x) > 0$.   (1)

5.2.3   Determine the range of h if h is the image of g if g is shifted down
        TWO units.   (2)

5.2.4   Determine, using the graph, the value of:

$$-2\left(\cos 0° + \cos 1° + \cos 2° + ... + \cos 358° + \cos 359° + \cos 360°\right)$$ (2)

                                                                                [12]

QUESTION 7

7.1   Complete the statement so that it is TRUE:

        The line drawn from the midpoint of the one side of a triangle, parallel to the second
        side, ...   (1)

7.2   ACS is a triangle. P is a point on AS and R is a point on AC such that PSRQ is
        a parallelogram. PQ intersects AC at B such that B is the midpoint of AR.
        QC is joined. Also, $CR = PS$, $\hat{C}_1 = 50°$ and $BP = 60$ mm.
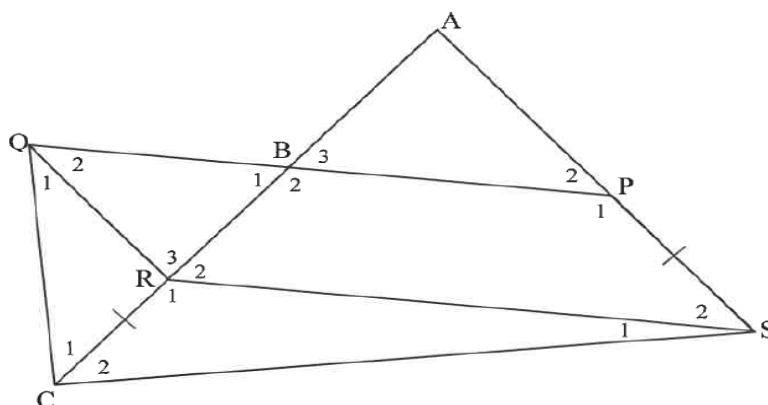
7.2.1   Calculate the size of $\hat{A}$.   (5)

7.2.2   Determine the length of QP.   (3)

                                                                                [9]

QUESTION 8

8.1 ABCD is a parallelogram. E and F are points on AB and DC respectively such that AE = CF. DE is produced to J and CJ is drawn. BF is produced to K and AK is drawn.
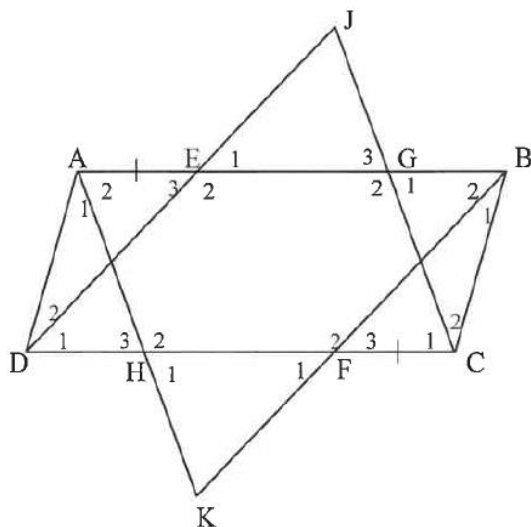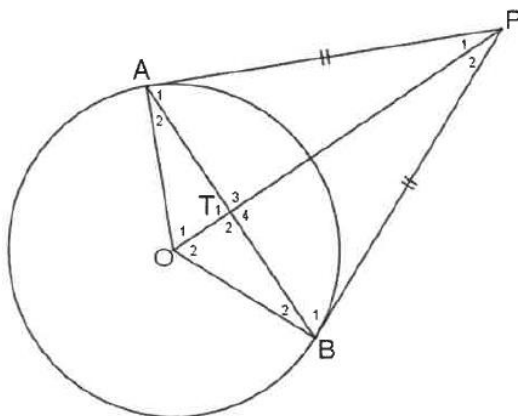

Prove that:

8.1.1 DJ ∥ BK (5)

8.1.2 $\hat{E}_1 = \hat{F}_1$ (4)

8.2 In the diagram below O is the centre of the circle. A and B lie on the circumference of the circle. AP = BP.

Prove that:

8.2.1 AT = BT (5)

8.2.2 $O\hat{T}A = 90°$ (1)

[15]

QUESTION 4

4.1   Given $4\cot\theta + 3 = 0$ and $0° < \theta < 180°$.

4.1.1   Use a sketch to determine the value of the following. DO NOT use a calculator.

(a) $\cos\theta$ (4)

(b) $\dfrac{3\sin\theta\sec\theta}{\tan\theta}$ (4)

4.1.2   Hence, show that $\sin^2\theta - 1 = -\cos^2\theta$.   (3)

4.2   Simplify the following expression WITHOUT using a calculator:

$\cos 30° \tan 60° + \csc^2 45° \sin^2 60°$ (3)

4.3   Solve for θ correct to TWO decimal places, if

$\dfrac{4}{3}\sin\theta = \cos 37°$ and $0° \le \theta \le 90°$.   (2)

[16]

QUESTION 5

Given $f(x) = \sin x - 1$ and $g(x) = 2\cos x$ for $0° \le x \le 270°$.

5.1   Sketch, on the grid provided in the ANSWER BOOK, the graph of f and g for $0° \le x \le 270°$.   (6)

5.2   Write down the following:

5.2.1   Amplitude of g (1)

5.2.2   Range of f (2)

5.3   Use your graph to determine the following:

5.3.1   Number of solutions to $f(x) = g(x)$ in the interval $0° \le x \le 270°$ (1)

5.3.2   Value(s) of x in the interval $0° \le x \le 180°$ for which $\sin x = 2 + 2\cos x$ (3)

[13]

QUESTION 6

RQ is a vertical pole. The foot of the pole, Q, is on the same horizontal plane as P and S. The pole is anchored with wire cables RS and RP. The angle of depression from the top of the pole to point P is 47°. PR is 21 m and QS is 17 m. $R\hat{P}Q = \theta$.
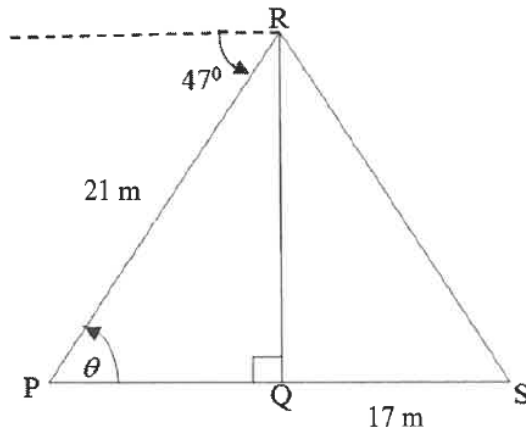
6.1	Write down the size of θ.	(1)
6.2	Calculate the length of RQ.	(3)
6.3	Hence, calculate the size of $\hat{S}$.	(2)
6.4	If P, Q and S lie in a straight line, how far apart are the anchors of the wire cables?	(4)
		[10]

QUESTION 8

8.1   KLMN is a rhombus with diagonals intersecting at O. $\hat{LKM} = 34°$.
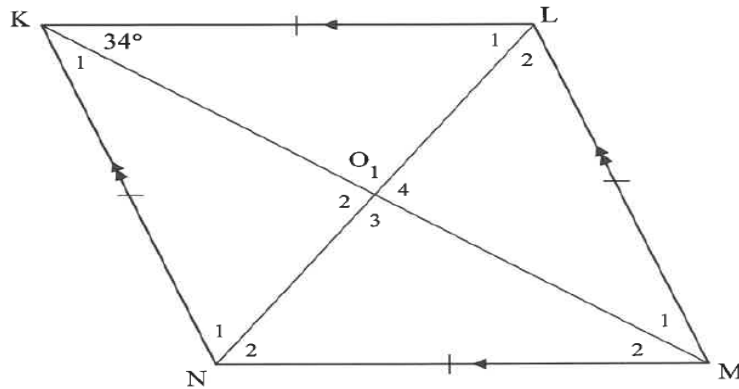
8.1.1   Write down the size of $\hat{O}_1$. (1)
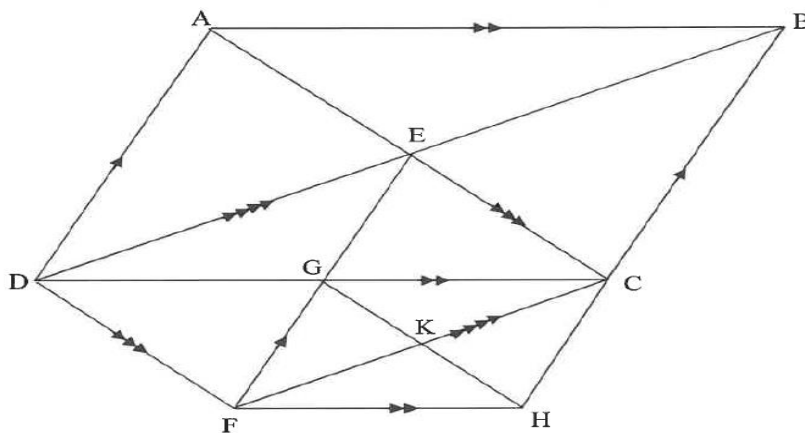
8.1.2   Calculate the size of $\hat{L}_1$. (2)

8.1.3   Calculate the size of $\hat{KNM}$. (2)

8.2   Given parallelogram PQRS with diagonals PR and QS intersecting at M.
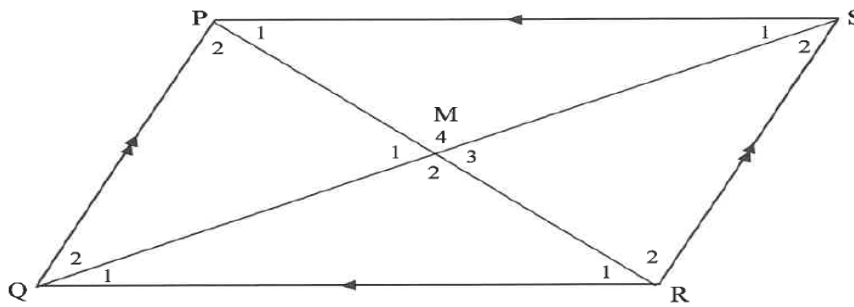
Prove that the diagonals bisect each other. (4)

8.3   In the diagram, ABCD is a parallelogram with diagonals intersecting at E. The diagonals of parallelogram DECF intersect at G. The diagonals of parallelogram FGCH intersect at K.
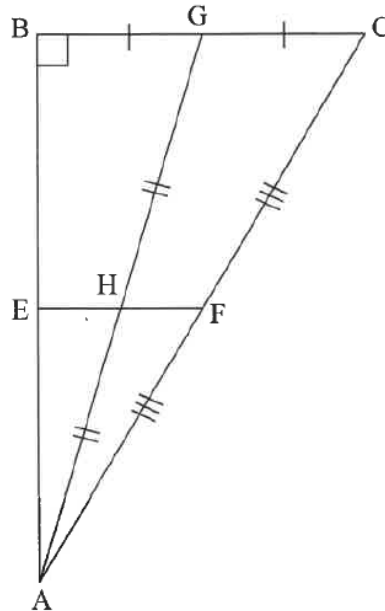

Prove that DB = 4KC. (4)

[13]

QUESTION 9

$\triangle ABC$ is right-angled at B. F and G are the midpoints of AC and BC respectively. H is the midpoint of AG. E lies on AB such that FHE is a straight line.
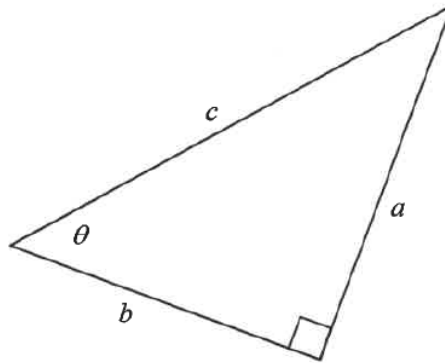

9.1   Prove that E is the midpoint of AB.   (3)

9.2   If EH = 3,5 cm and the area of $\triangle AEH = 9,5 cm^2$, calculate the length of AB.   (3)

9.3   Hence, calculate the area of $\triangle ABC$.   (3)

                                                                                                                                        [9]

QUESTION 4

4.1 A right-angled triangle has sides a, b and c and the angle θ, as shown below.

4.1.1 Write the following in terms of a, b and c:

(a) $\cos\theta$ (1)

(b) $\tan\theta$ (1)

(c) $\sin(90° - \theta)$ (2)

4.1.2 If it is given that $a = 5$ and $\theta = 50°$, calculate the numerical value of b. (2)

4.2 Given that $\hat{A} = 38,2°$ and $\hat{B} = 146,4°$.

Calculate the value of $2\mathrm{cosec}A + \cos 3B$. (3)

4.3 Simplify fully, WITHOUT the use of a calculator:

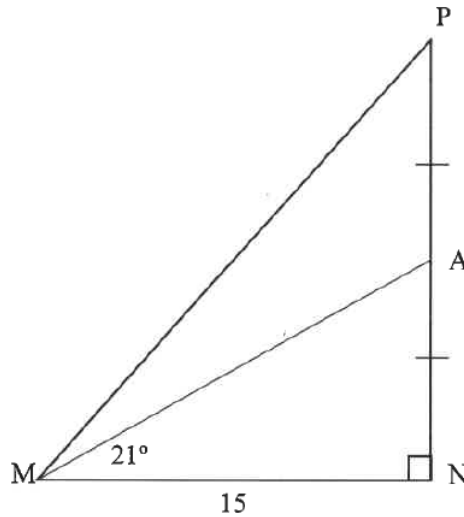$$\frac{\sin 45°. \tan^2 60°}{\cos 45°}$$ (4)

4.4 Given that $5\cos \beta - 3 = 0$ and $0° < \beta < 90°$.

If $\alpha + \beta = 90°$ and $0° < \alpha < 90°$, calculate the value of $\cot \alpha$. (4)

[17]

QUESTION 5

5.1   In the sketch below, ΔMNP is drawn having a right angle at N and MN = 15 units. A is the midpoint of PN and $A\hat{M}N = 21°$.
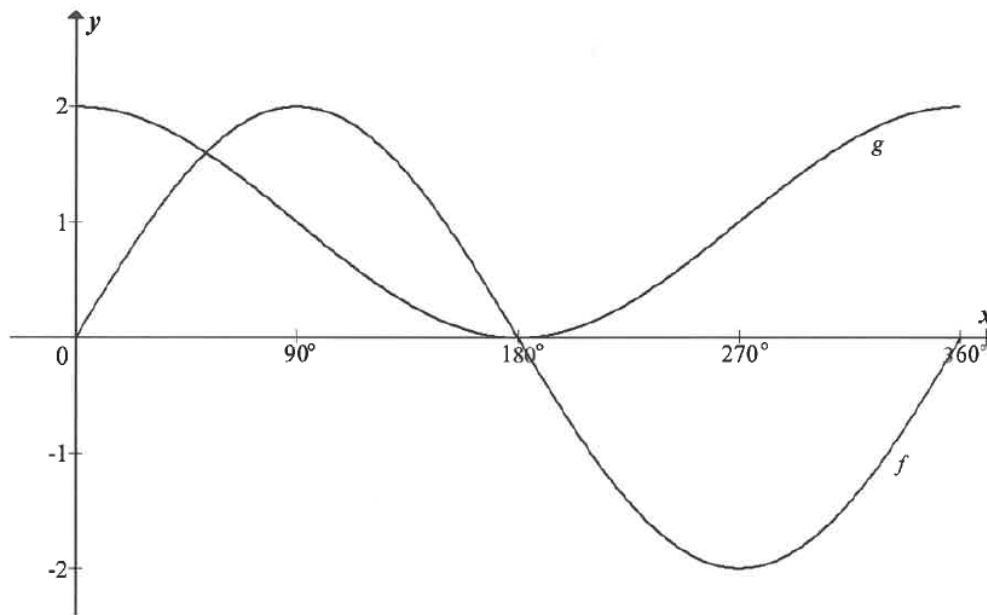

Calculate:

5.1.1   AN   (3)

5.1.2 $P\hat{M}N$ (3)

5.1.3   MP   (3)

5.2   Calculate θ if $2\sin(\theta+15°)=1,462$ and $0° \le \theta \le 90°$.   (3)

                                                                                              [12]

QUESTION 6

The graphs of $f(x) = a \sin x$ and $g(x) = \cos x + 1$ for $x \in [0 ; 360]$ are sketched below.

6.1   Write down the value of a.   (1)

6.2   Write down the period of f.   (1)

6.3   Write down the range of g.   (2)

6.4   For which values of x for $x \in [0° ; 360°]$ will $f(x).g(x) > 0$?   (2)

6.5   The graph g is reflected about the x-axis and then shifted 2 units upwards to obtain
       the graph h. Write down the equation of h.   (2)

                                                                                                         [8]

QUESTION 8
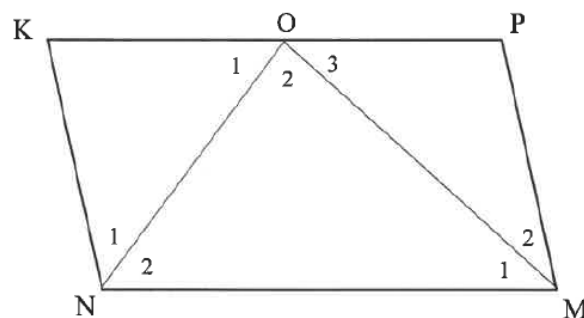
8.1 Complete the following statement:

If the opposite angles of a quadrilateral are equal, then the quadrilateral ... (1)

8.2 Use the sketch below to prove that the opposite sides of a parallelogram are equal.
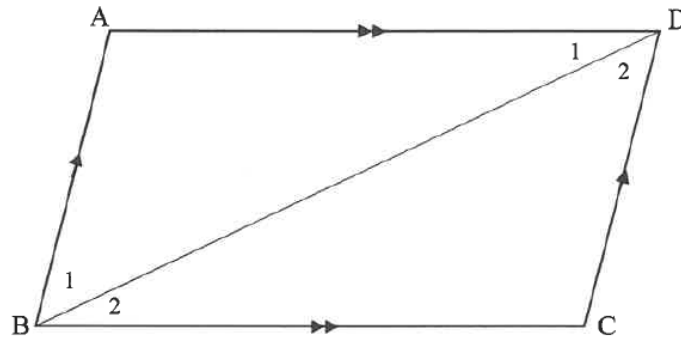
(6)

8.3 In the sketch below, KPMN is a parallelogram. ON bisects $K\hat{N}M$ and OM bisects $N\hat{M}P$.

8.3.1 Show that $N\hat{O}M = 90°$. (3)

8.3.2 Prove that O is the midpoint of KP. (6)

[16]

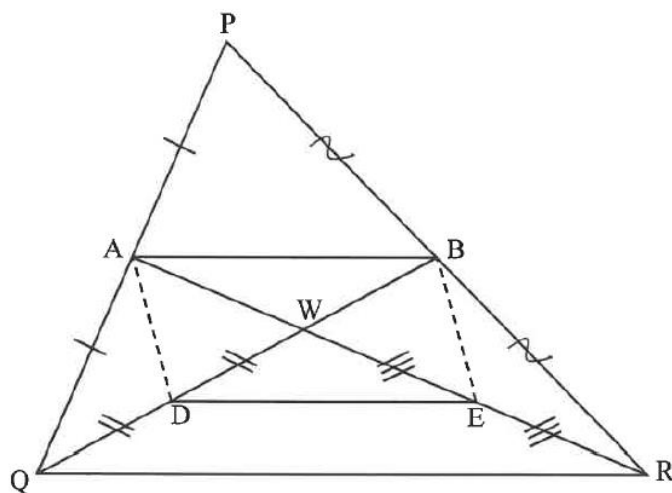## QUESTION 9

9.1 Complete the following statement:

The line through the midpoint of two sides in a triangle is parallel to and … the third side. (1)

9.2 In ΔPQR, A and B are the midpoints of sides PQ and PR respectively. AR and BQ intersect at W. D and E are points on WQ and WR respectively such that WD = DQ and WE = ER.

Prove that ADEB is a parallelogram. (5)

[6]