education

Department:
Education
PROVINCE OF KWAZULU-NATAL

HARRY GWALA DISTRICT
MATHEMATICS
GRADE 10

CURRICULUM GRADES 10 – 12 DIRECTORATE
TERM 2 – 2018

This document has been compiled by HARRY GWALA Subject Advisors. It seeks to unpack the content and give more guidance to the teachers. Please note that this document is intended to supplement the Text book and not replace it!

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FUNCTIONS AND GRAPHS

DATES	CURRICULUM STATEMENT	% COM-PLETED
10/04 – 17/04 (6 days)	**1.The concept of a function, where a certain quantity (output value) uniquely depends on another quantity (input value).** **Work with relationships between variables using tables, graphs, words and formulae. Convert flexibly between these representations.** **Note that the graph defined by y = x should be known from Grade 9.**	41%
18/04 – 25/04 (6 days)	**2.Point by point plotting of basic graphs defined by** $y = x^2$, $y = \frac{1}{x}$ **and** $y = b^x$; $b > 0$ **and** $b \neq 1$ **to discover shape, domain (input values), range (output values), asymptotes, axes of symmetry, turning points and intercepts on the axes. (where applicable).** **3. Investigate the effect of** a **and** q **on the graphs defined by** $y = a.f(x) + q$, **where** $f(x) = x$, $f(x) = x^2$, $f(x) = \frac{1}{x}$ **an** $f(x) = b^x$, $b > 0$ **and** $b \neq 1$	47%
26/04– 08/05 (6 days)	**4.Sketch graphs, find the equations of given graphs and interpret graphs.** **Note: Sketching of the graphs must be based on the observation of number 3.**	51%

JUNE COMMON TEST WEIGHTING

Functions and Graphs	**25±3 marks out of 100 marks**

CAPS EXAM GUIDELINE WEIGHTING FOR FINAL EXAMINATION

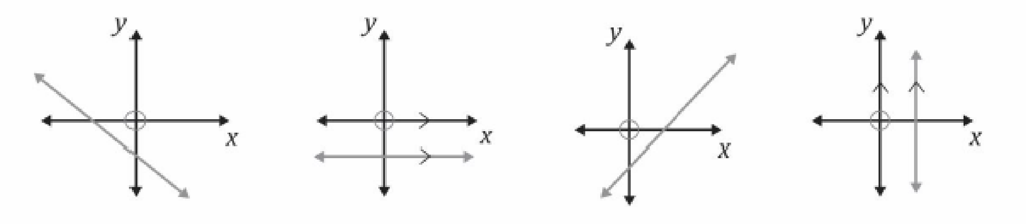
Functions and Graphs	**30 ± 3 marks in P1**

A. STRAIGHT LINE

General representation or equation

$y = ax + q$ or $y = mx + x$. a or m is the gradient and q or c is the $y-$intercept

Also note the shape of the following linear functions



$a < 0$	$a = 0$	$a > 0$	a is undefined
$q < 0$	$y = q$	$q < 0$	there is no q-value

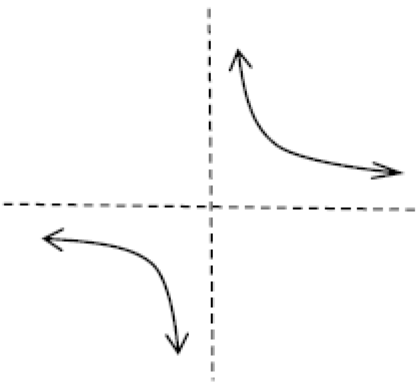
Domain and range is $x \in \Re$ and $y \in \Re$ respectively

B. HYPERBOLA

General representation or equation

$y = \frac{a}{x}$ or $xy = a$ $\qquad y = \frac{a}{x} + q$

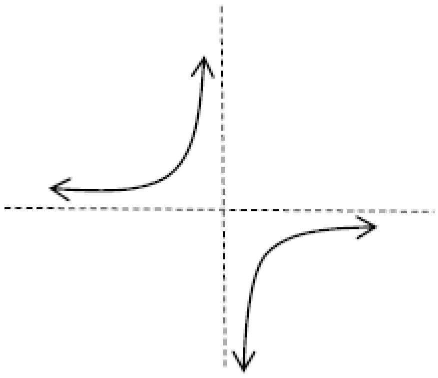
$a > 0$



Dotted lines are asymptotes

- q is the vertical translation
- p is the horizontal translation

$a < 0$



Dotted lines are asymptotes

- For $y = \frac{a}{x}$, $p = 0$ and $q = 0$. The **vertical** asymptote is $x = 0$ and the **horizontal** asymptote is $y = 0$. The **axis of symmetry** are $y = x$ (Positive) and $y = -x$ (Negative)

  Domain is $x \neq 0, x \in \Re$ and **Range** is $y \neq 0,\ y \in \Re$

- For $y = \frac{a}{x} + q$, $p = 0$. The **vertical** asymptote is $x = 0$ and the **horizontal** asymptote is $y = q$. The **axis of symmetry** are $y = x + q$ (Positive) and $y = -x + q$ (Negative).

  Domain is $x \neq 0,\ x \in \Re$ and **Range**, $y \neq q,\ y \in \Re$

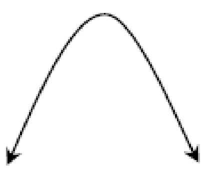
C. PARABOLA

General representation or Equation

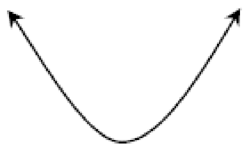
$y = ax^2$ or $y = ax^2 + q$

Important Deductions

for $a < 0$



for $a > 0$



- For $y = ax^2$, $p = 0$ and $q = 0$, the **turning point** is $(0;0)$ and **y-intercept** is

  $y = 0$

  The **domain** is $x \in \mathbb{R}$ and the **range** is $y \geq 0; y \in \mathbb{R}$ if $a > 0$ or $y \leq 0; y \in \mathbb{R}$ if $a < 0$

- For $y = ax^2 + q$, $p = 0$, the **turning point** is $(0;q)$ and **y-intercept** is $y = q$

The **domain** is $x \in \mathbb{R}$ and the **range** is $y \geq q; y \in \mathbb{R}$ if $a > 0$ or $y \leq 0; y \in \mathbb{R}$ if $a < 0$

D. EXPONENTIAL

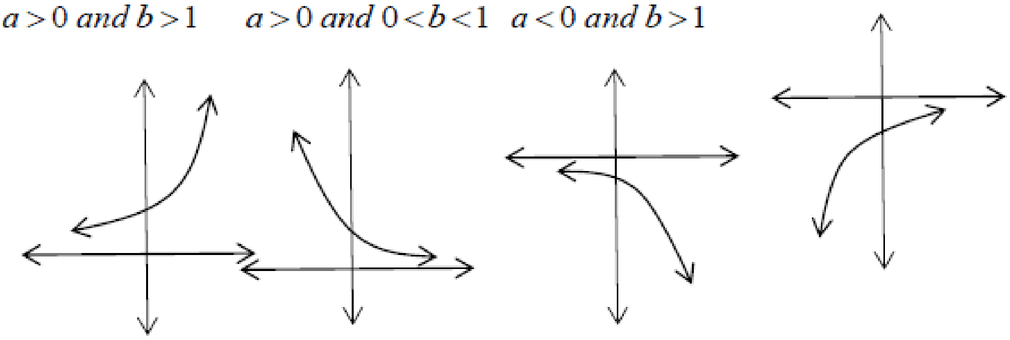
General representation or Equation:

$y = ab^x$ or $y = ab^x + q$

The restriction is $b > 0; b \neq 1$

Important Deductions

for $a > 0 \text{ and } b > 1$ | for $a > 0 \text{ and } 0 < b < 1$ | for $a < 0 \text{ and } b > 1$ | for $a < 0 \text{ and } 0 < b < 1$



- For $y = ab^x$, the **asymptote** is $y = 0$ and the **y-intercept** is $y = a$
- For $y = ab^x + q$, the **asymptote** is $y = q$ and **y-intercept** is $y = a + q$

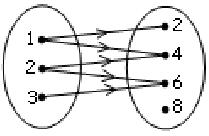
A. Basic Function concepts

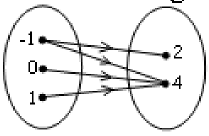
Relations and functions

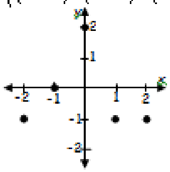
1 For each of the following relations, state the domain and the range:

1.1.1 $\{(10;9);(8;7);(7;6);(6;5);(5;6)\}$ 1.1.2 $\{(0;2);(0;3);(0;4)\}$

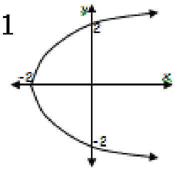
1.2 List the relation and state the domain and range:

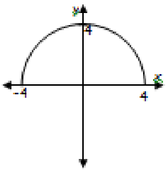
1.2.1


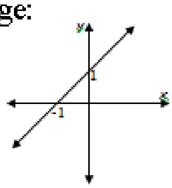
1.2.2


1.2.3


1.3 In each of the following cases determine the domain and range:

1.3.1


1.3.2


1.3.3


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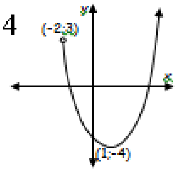
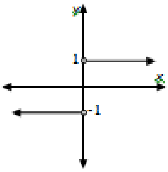
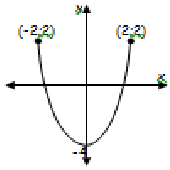
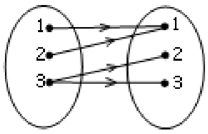


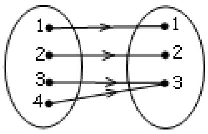
1.3.5


1.3.6


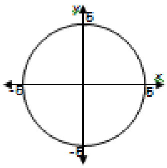
2 Determine whether each of the following is a function or not:

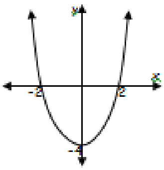
2.1 $\{(2;1);(2;2);(2;3)\}$ 2.2 $\{(1;2);(2;2);(3;2)\}$ 2.3 $\{(1;1);(2;2);(3;1);(3;2)\}$

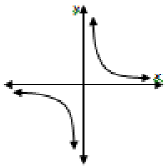
2.4


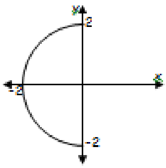
2.5


2.6 $\{(x;y): y = x+1\}$

2.7


2.8


2.9


2.10


3 3.1 If $f(x) = 3x+3$, determine: 3.1.1 $f(-2)$ 3.1.2 $f(a)$ 3.1.3 m if $f(m) = 0$

3.2 Given that $g(x) = 4 - x^2$, determine: 3.2.1 $g(2)$ 3.2.2 $g(0)$ 3.2.3 k if $g(k) = 0$

3.3 If $p = \{(-1;2);(2;-1);(3;2);(-3;1);(5;6)\}$ determine:

3.3.1 $p(3)$ 3.3.2 $p(-1)$ 3.3.3 m if $p(m) = -1$ 3.3.4 m if $p(m) = 6$

3.4 If $j(x) = 2 + x$, determine:

3.4.1 $j(2)$ 3.4.2 $j(-4)$ 3.4.3 $2j(2) - j(-4)$

3.5 If $k(x) = x^2$, determine:

3.5.1 $k(-1)$ 3.5.2 $k(3)$ 3.5.3 $k(a+1)$ 3.5.4 p if $k(p) = 0$

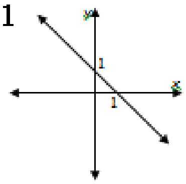
3.6 If $f(x) = 3x+4$, determine:

3.6.1 $f(\frac{1}{2})$ 3.6.2 $f(a)$ 3.6.3 $f(a+1)$ 3.6.4 x if $f(x) = -2$

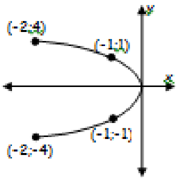
4 4.1 For each of the following determine:

- whether the relation is a function or not
- the domain
- the range

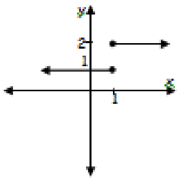
4.1.1



4.4.2



4.4.3



G.QUESTIONS FROM PAST EXAMINATION PAPERS

QUESTION 1

Consider the following functions: $f(x) = -\frac{3}{x} + 1$ and $g(x) = 2^x - 1$.

1.1 Sketch the graphs of f **and** g **.**
Show all intercepts with the axes and asymptotes where applicable. **(6)**

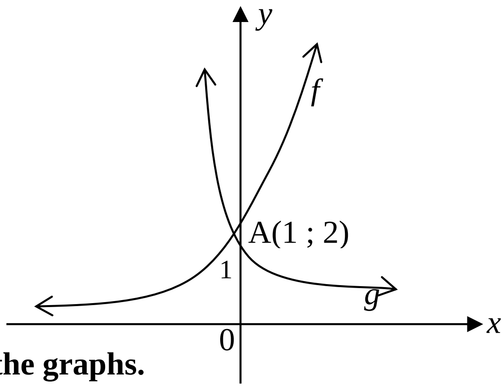
1.2 Determine $f(-2)$.
(1)

1.3 Solve for x **if** $g(x) = 7$. **(3)**
[10]

QUESTION 2

2.1 **The graph of** $f(x) = 2^x$ **and** $g(x) = \frac{k}{x}$ **are represented alongside.**

The graphs intersect at A.



Answer the following questions by using the graphs.

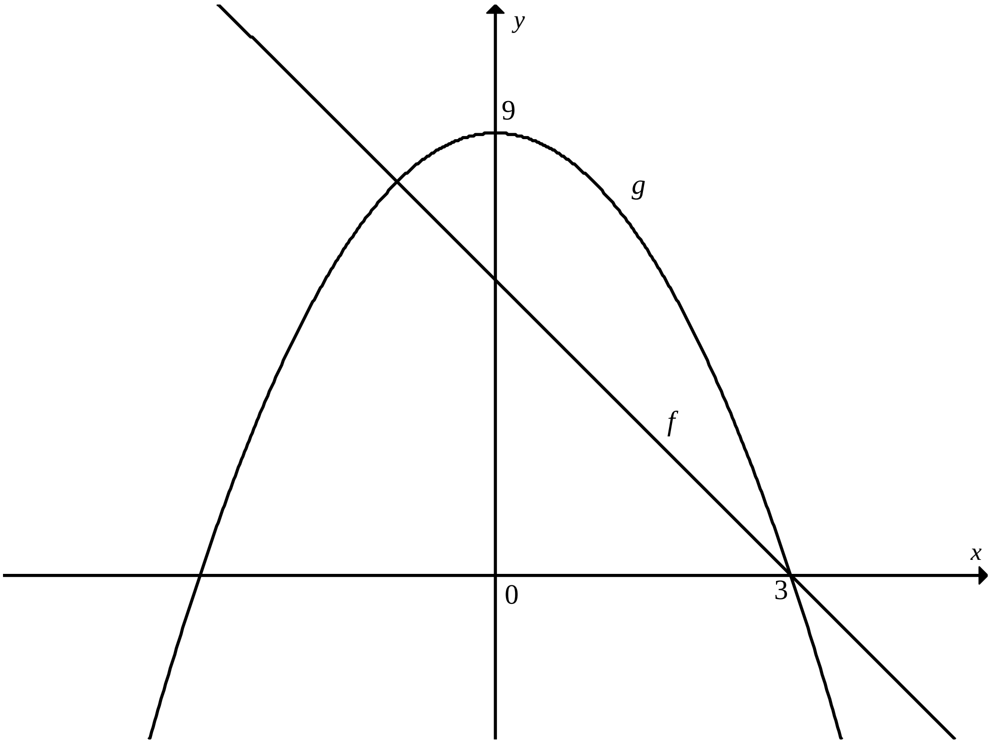
2.1.1 **What is the domain of** f **?** **(1)**

2.1.2 **Give the equation of the asymptote of the graph of** $y = 2^x - 2$. **(2)**

2.1.3 **What is the value of** k **?** **(1)**

QUESTION 3

Sketched below are the graphs of $f(x) = -2x + 6$ **and** $g(x) = ax^2 + q$.



3.1 **Determine the values of *a* and *q*.** **(3)**

3.2 **Calculate the values of *x* for which** $f(x) = g(x)$. **(5)**

3.3 **Hence or otherwise, write down the values of *x* for which** $g(x) > f(x)$. **(2)**

3.4 **Write down the coordinates of the turning point of *h* if** $h(x) = g(x) - 4$**.** **(2)**
[12]

QUESTION 4

4.1 **Given the functions:** $f(x) = -x^2 + 4$ **and** $g(x) = 2x + 4$

4.1.1 **Draw** f **and** g **on the same system of axes.** **(6)**

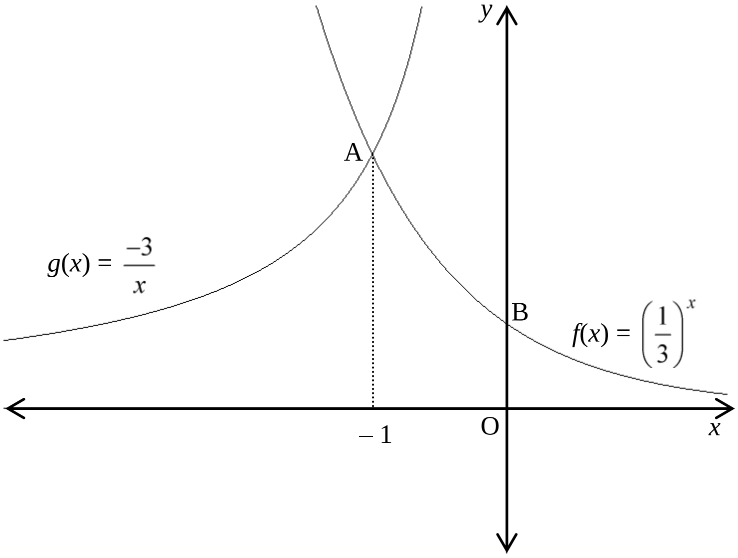
4.1.2 **Use your graphs to solve for *x* if:**

$f(x) \leq g(x)$ (3)

4.1.3 **Give the equation of *p*, the reflection of *f* in the *x*-axis.** **(2)**

QUESTION 5

The graphs of $f(x) = \left(\frac{1}{3}\right)^x$ and $g(x) = \frac{-3}{x}$ where $x < 0$ are represented below:



Answer the following questions by using the graphs:

5.1 Write down the co-ordinates of A and B. **(2)**

5.2 Write down the domain of $f(x)$. **(1)**

5.3 Write down the equation of the reflection of f in the y-axis. **(2)**

5.4 Give the equation of the asymptote of the graph of $y = g(x) + 2$. **(2)**
[18]

QUESTION 6

Given functions $f(x) = -x^2 + 9$ and $g(x) = 3x + 9$

6.1 Draw f and g on the same system of axes. **(6)**

6.2 Use your graphs to solve for x if:

6.2.1 $f(x) = g(x)$ **(2)**

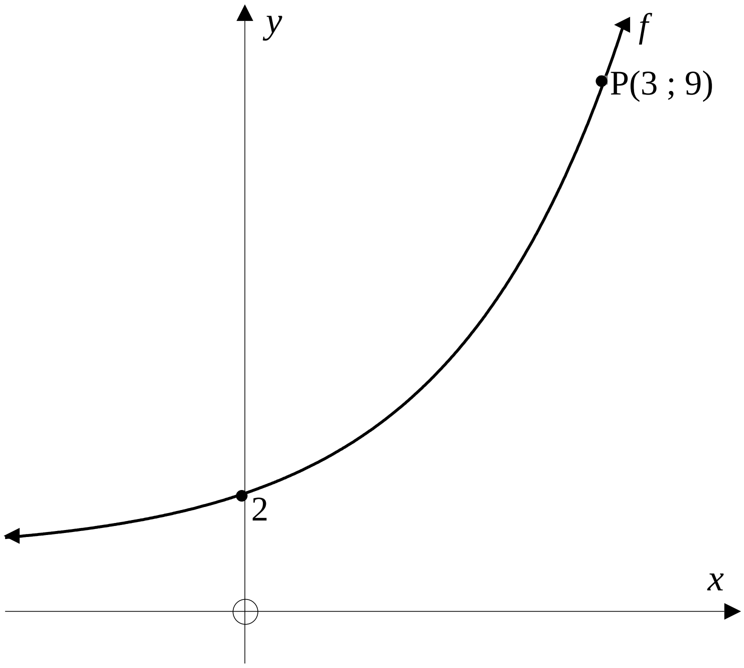
6.2.2 $f(x) > 0$ **(2)**

6.3 How does the graph of $h(x) = -x^2 - 9$ compare with the graph of $f(x)$? **(2)**

6.4 Give the equation of the reflection of f in the x–axis. **(2)**
[14]

QUESTION 7

In the sketch below, f is the graph of the function $y = a^x + q$.



7.1 **Calculate the value of a and q if the point P(3; 9) lies on the graph.** **(5)**

7.2 **Write down the equation of the asymptote of f.** **(1)**

7.3 **Write down the equation of $h(x)$ if:**

7.3.1 **h is the reflection of f in the y-axis.** **(2)**

7.3.2 **h is the reflection of f in the x-axis.** **(2)**

7.4 **For which value(s) of x will $f(x) = 1\frac{1}{16}$?** **(3)**

QUESTION 8

Given: $p(x) = \frac{4}{x} - 3$

8.1 **Write down the equations of the asymptotes of p.** **(2)**

8.2 **Write down the domain of p.** **(2)**

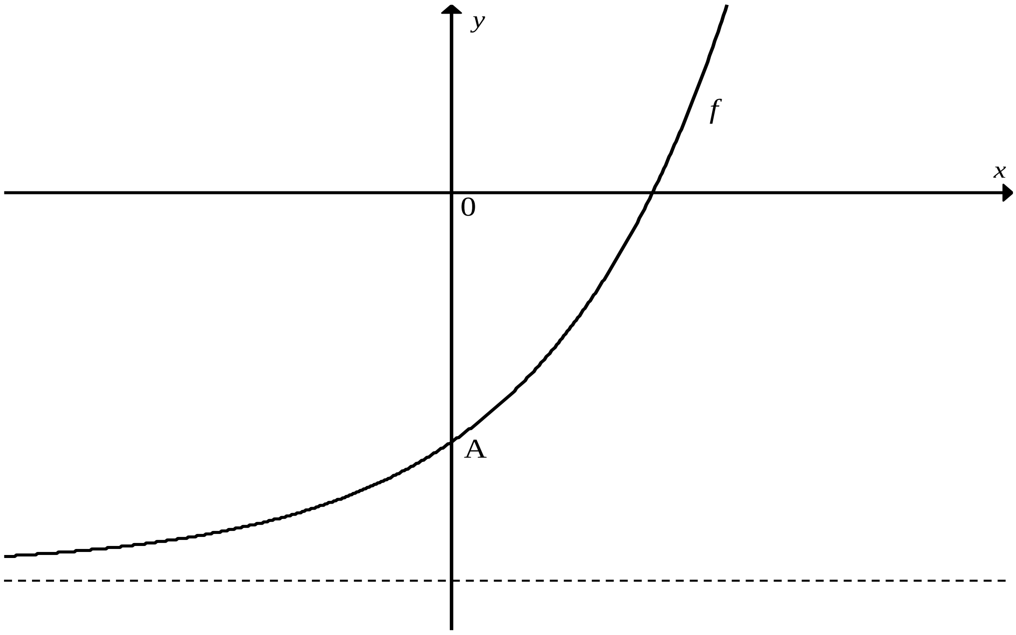
8.3 **Calculate the x-intercepts of the graph of p.** **(3)**

8.4 **Draw a neat sketch of p, showing clearly all intercepts with the axes and asymptotes.** **(4)**

[11]

QUESTION 9

The graph of $f(x) = 3^x - 3$ **is sketched below.**



9.1 **Write down the coordinates of A.** **(2)**

9.2 **Write down the range of *h* if** $h(x) = -f(x)$. **(2)**

9.3 **Write down the asymptote of *g* if** $g(x) = f(-x)$. **(1)**
[5]

QUESTION 10

The following functions are given: $f(x) = \left(\frac{1}{3}\right)^x$ **where** $x \in \mathbf{R}$ and $g(x) = -\frac{3}{x}$ **where** $x < 0$

10.1 **Sketch the graphs of** f **and** g **on the same set of axes.**
Show all intercepts with the axes and asymptotes where applicable. **(5)**

10.2 **Write down the range of** k **if** $k(x) = f(x) - 2$. **(2)**

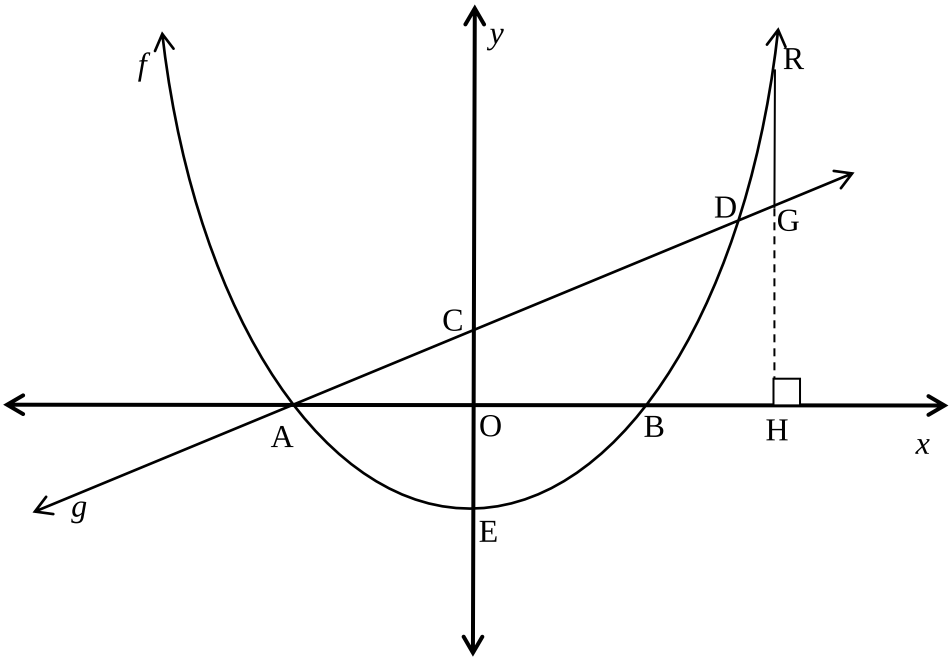
10.3 **Write down the equations of the asymptotes of** h **if** $h(x) = g(x) + 3$. **(2)**

10.4 **Write down the values of** x **for which** $f(x) \le g(x)$. **(2)**
[11

QUESTION 11

Sketched below are the graphs of $f(x) = x^2 - 1$ and $g(x) = x + 1$.

The graph of f intersects the x-axis at A and B and the y-axis at E. The graph of g intersects the x-axis at A and the y-axis at C. f and g intersect at D.



Use the graphs and the information above to determine the following:

11.1	**The coordinates of A and B.**	**(3)**
11.2	**The coordinates of C.**	**(1)**
11.3	**The coordinates of D.**	**(5)**
11.4	**The range of *f*.**	**(2)**
11.5	**The length of RG if OH is 6 units and F lies on f and G lies on g.**	**(3)**
11.6	The value(s) of x for which $g(x) > f(x)$.	**(2)**
		[16]

QUESTION 12

12.1 **Draw a sketch graph of** $y = \frac{4}{x} + 2$ **. Clearly indicate the asymptote(s) and the intercept(s) with the axes.** **(3)**

12.2 **Given the two functions** $f(x) = -x^2 + 9$ **and** $g(x) = -x + 3$**:**

3.2.1 **Sketch the graph of** f **and** g **on the same axes , showing the Co-ordinates of all the intercepts with the axes.** **(6)**

3.2.2 **Calculate the co-ordinates of the points at which** $f(x) = g(x)$ **(4)**

3.2.3 **Use your graph to write down the values of** x **for which** $f(x) > 0$ **(2)**

3.2.4 **Draw a dotted line on your graph, showing the graph of** $y = \frac{1}{2} f(x)$. **The intercepts on the axes must be shown.** **(3)**

12.3 **Determine the equation of a linear function** $f(x) = mx + c$**, if** $f(0) = -7$ **and** $f(2) = 0$**.** **(3)**

TRIGONOMETRY

DATES	CURRICULUM STATEMENT	% COM-PLETED
09/05-15/05 (5 days)	4. Point by point plotting of basic graphs defined by $y = \sin\theta$, $y = \cos\theta$ and $y = \tan\theta$ for $\theta \in [0^\circ;360^\circ]$. 5. Study the effect of a and q on the graphs defined by $y = a\sin\theta + q$; $y = a\cos\theta + q$; and $y = a\tan\theta + q$, for $\theta \in [0^\circ;360^\circ]$. 6. Sketch graphs, find the equations of given graphs and interpret graphs. **Note**: Sketching of the graphs must be based on the observation of number 3 and 5.	62%

JUNE EXAMINATION

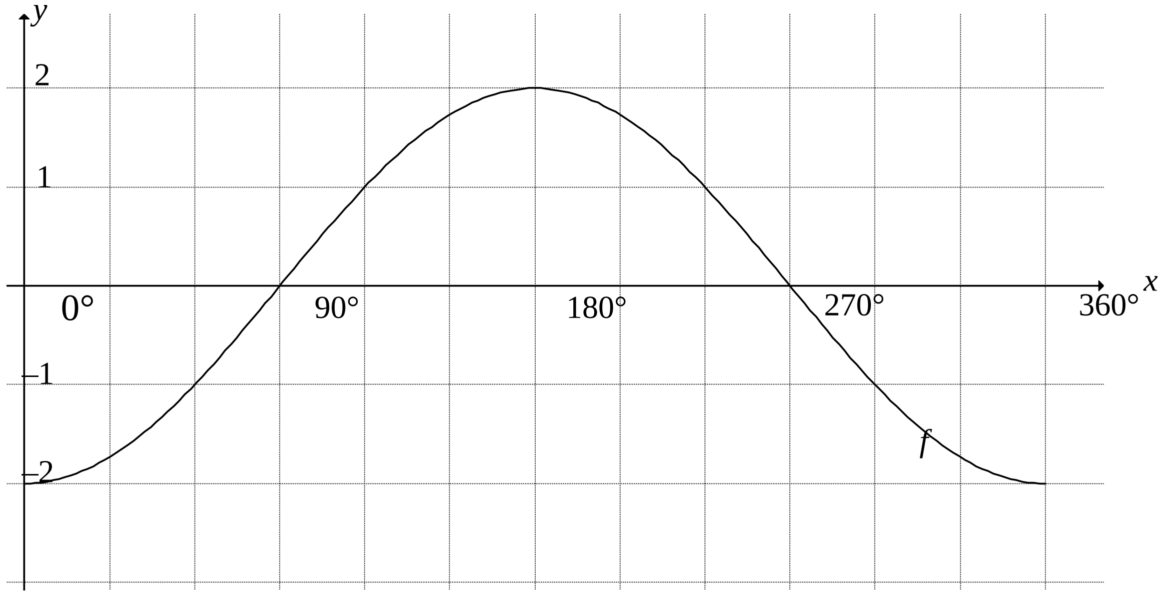
TRIGONOMETRY (PART 1 AND PART 2)	35 ±3 marks out of 100 marks

CAPS EXAM GUIDELINE WEIGHTING FOR FINAL EXAMINATION

TRIGONOMETRY	40± 3 marks out of 100 marks in P2

QUESTION 1

In the diagram below, the graph of $f(x) = -2\cos x$ is drawn for the interval $0^\circ \le x \le 360^\circ$.



1.1 Write down the amplitude of *f*. (1)

1.2 Write down the minimum value of $f(x)+3$. (1)

3.3 On the same system of axes, draw the graph of *g*, where $g(x) = \sin x + 1$ for the interval $0^\circ \le x \le 360^\circ$. (3)

1.4 Use the graphs to determine:

1.4.1 the value of $f(180^\circ) - g(180^\circ)$. (2)

1.4.2 for which value(s) of *x* will $f(x).g(x) > 0$? (2)

1.5 The graph of *f* is reflected about the *x*-axis and then moved 3 units downwards to form the graph of *h*. Determine:

1.5.1 the equation of *h*. (2)

1.5.2 the range of *h* for which the interval is $0^\circ \le x \le 360^\circ$. (2)

QUESTION 2

Given: $f(x) = 2\sin x$ and $g(x) = \cos x - 1$

2.1 Sketch the graphs of f and g for $x \in [0° ; 360°]$. (5)

2.2 Write down the range of f. (2)

2.3 For which value of x is $f(x) - g(x) = 3$? (1)

2.4 Describe the transformation of f to h if $h(x) = -2\sin x$. (2)

[10]

QUESTION 3

3.1 Draw the graphs of $f(x) = 2\sin x$ and $g(x) = \cos x + 1$, $x \in [-90° ; 360°]$. Clearly label your graphs and indicate the turning points as well as the intercepts with the axes. (6)

3.2 Use the graphs to answer the following questions:

3.2.1 Write down the range of g. (2)

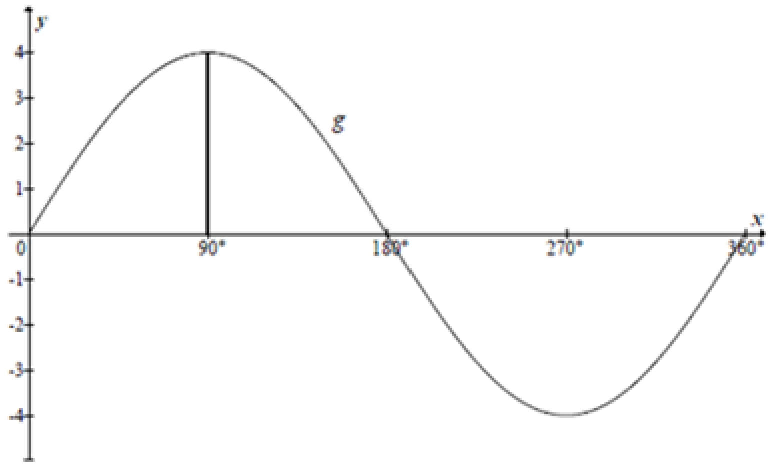
3.2.2 Determine the value(s) of x, $x \in [-90° ; 360°]$ for which $f(x) < 0$. (3)

QUESTION 4

. .Consider the function y = tan 2x .

4.1 Make a neat sketch of y = tan 2x for $0^0 \leq x \leq 360^0$.Clearly indicate the intercepts with the axes as well as the asymptotes. (4)

4.2 The diagram below shows the graph of g(x) = asinx for $0^0 \leq x \leq 360^0$.



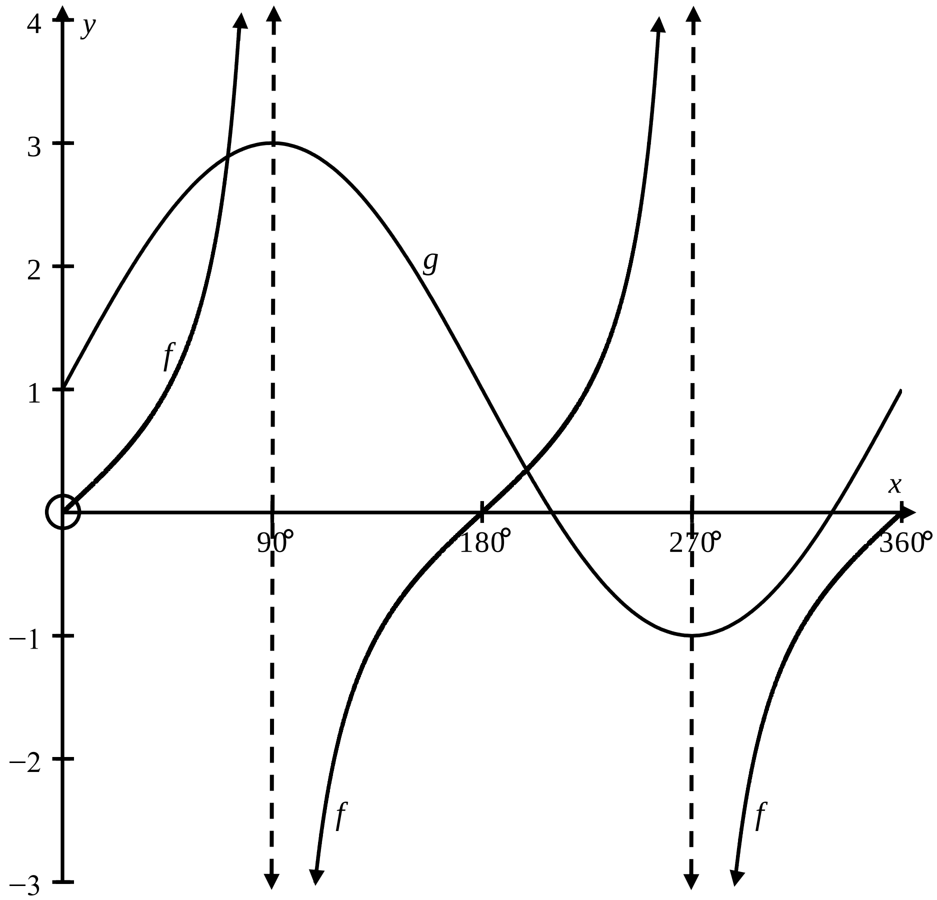
4.2.1 Determine the value of a. (1)

4.2.2 If the graph of g is translated 2 units upwards to obtain a new graph *h*.,write down the range of *h* (2)

QUESTION 5

The following graphs have been drawn below for $x \in [0°\,;360°]$:

$f(x) = \tan x$ and $g(x) = a\sin x + q$



Use the graphs to answer the following questions for $x \in [0°\,;360°]$:

5.1 Determine the value of a and q. (2)

5.2 Write down the period of f. (1)

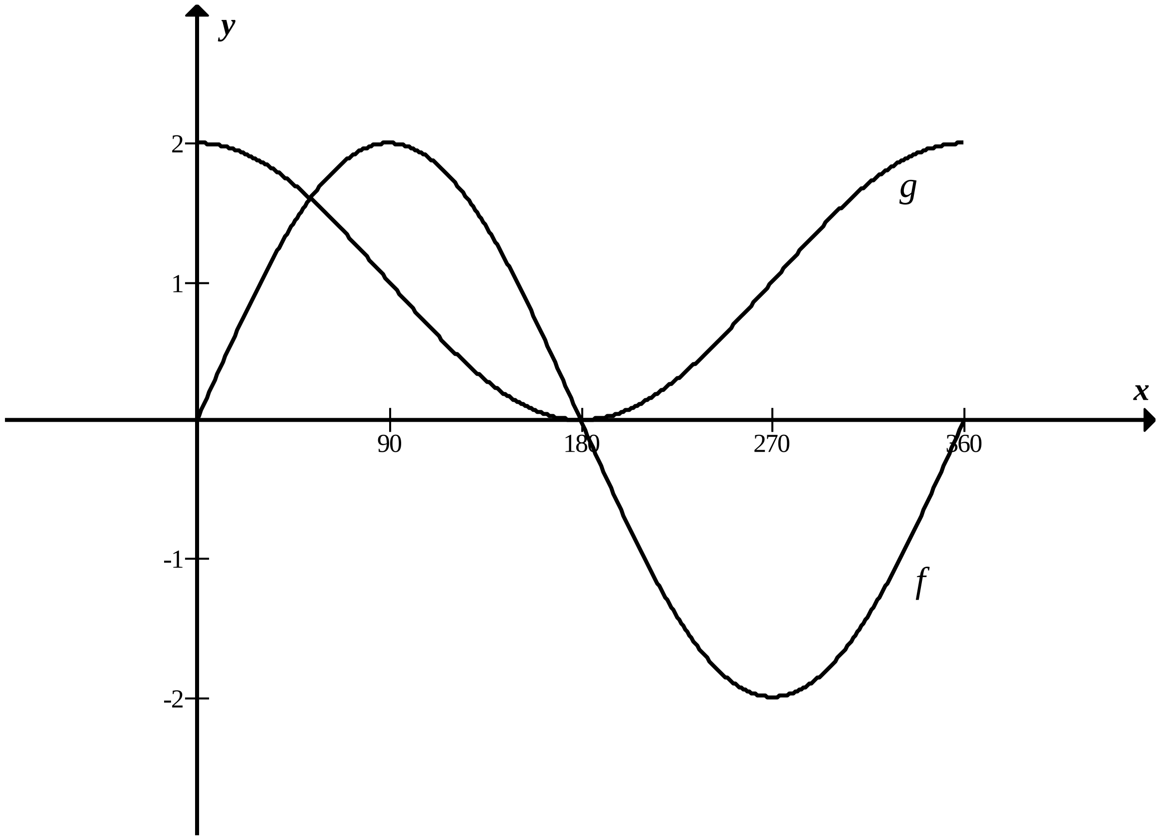
5.3 Write down the range of g. (2)

5.4 Write down the values of x for which f is undefined. (2)

5.5 Determine the values of g for which $g(x) = 1$. (3)

QUESTION 6

Sketched below are the graphs of $f(x) = \cos x + 1$ and $g(x) = 2\sin x$ for $x \in [0° ; 360°]$



6.1 Write down the amplitude of the following:

6.1.1 g (1)

6.1.2 f (1)

6.2 For which values of x is f decreasing for $x \in [0° ; 360°]$? (3)

[5]

EUCLIDEAN GEOMETRY

DATES	CURRICULUM STATEMENT	% COM-PLETED
16/05 –23/05 (6 days)	1. Revise basic results established in earlier grades regarding lines, angles and triangles, especially the similarity and congruence of triangles. 2. Investigate line segments joining the midpoints of two sides of a triangle.	65%
24/05 –01/06 (7 days)	3. Define the following special quadrilaterals: the kite, parallelogram, rectangle, rhombus, square and trapezium. Investigate and make conjectures about the properties of the sides, angles, diagonals and areas of these quadrilaterals. Prove these conjectures.	69%

JUNE COMMON TEST WEIGHTING

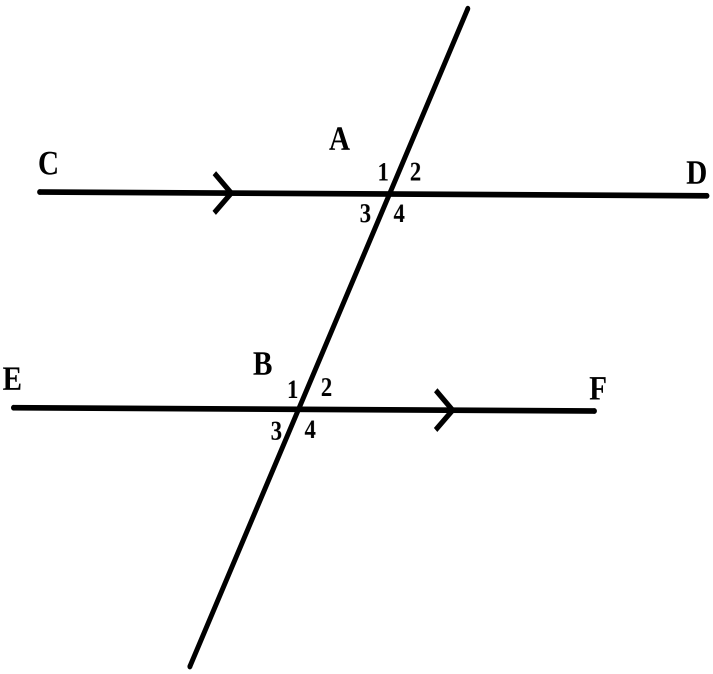
Euclidean Geometry	15 ±3 marks out of 100 marks

CAPS EXAM GUIDELINE WEIGHTING FOR FINAL EXAMINATION

Euclidean Geometry & Measurement	40 ± 3 marks out of 100 marks in P2

A. REVISION OF EUCLIDEAN GEOMETRY FROM GET GRADES

PARALLEL LINES

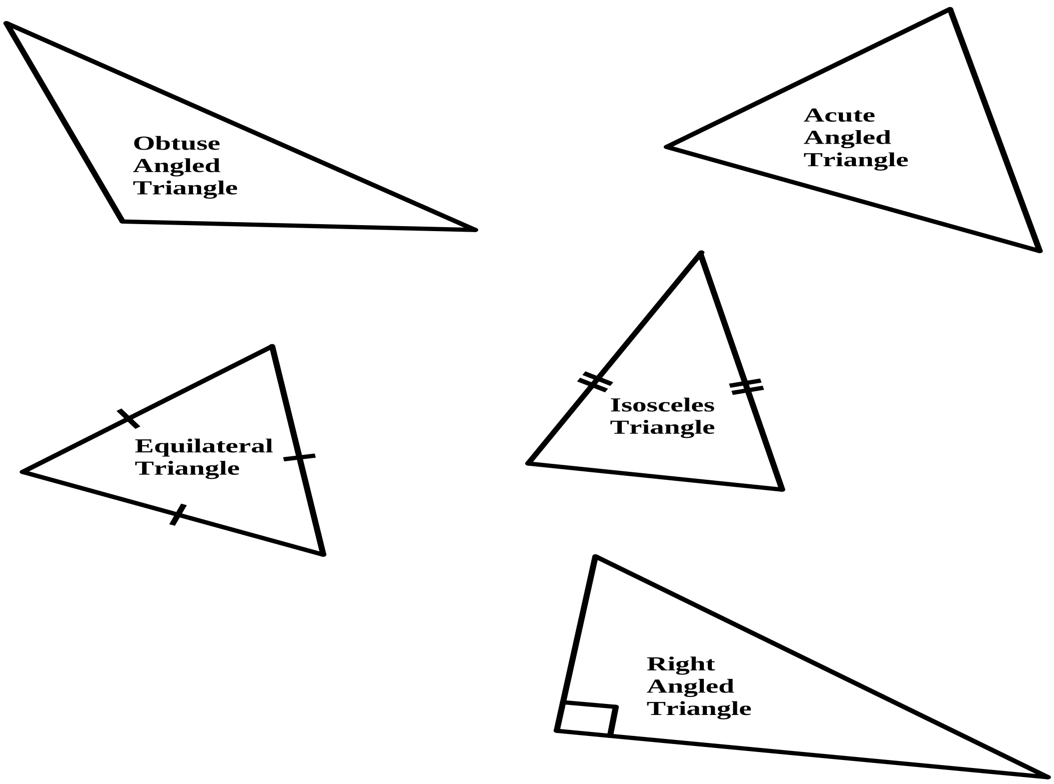
<table>
<tr><td rowspan="3">
</td><td>Corresponding Angles are Equal

$\hat{A}_1 = \hat{B}_1$
$\hat{A}_2 = \hat{B}_2$
$\hat{A}_3 = \hat{B}_3$
$\hat{A}_4 = \hat{B}_4$</td></tr>
<tr><td>Alternate Angles are Equal

$\hat{A}_3 = \hat{B}_2$
$\hat{A}_4 = \hat{B}_1$</td></tr>
<tr><td>Co-interior Angles are Supplementary

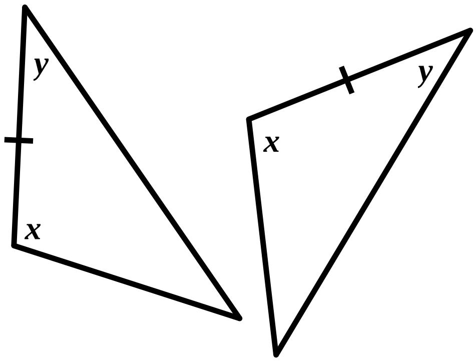
$\hat{A}_3 + \hat{B}_1 = 180°$
$\hat{A}_4 + \hat{B}_2 = 180°$</td></tr>
</table>

Types of Triangles

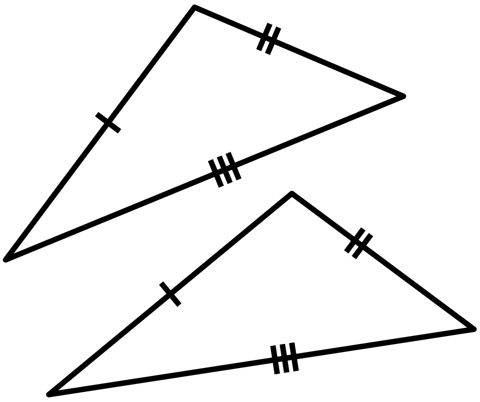


B. Cases of Congruency

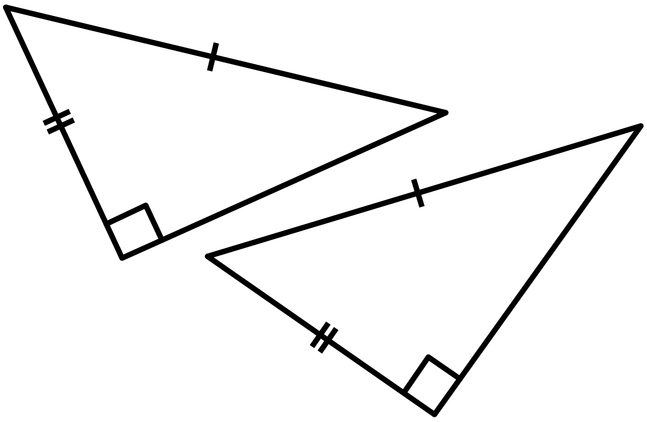
Angle / Side / Angle



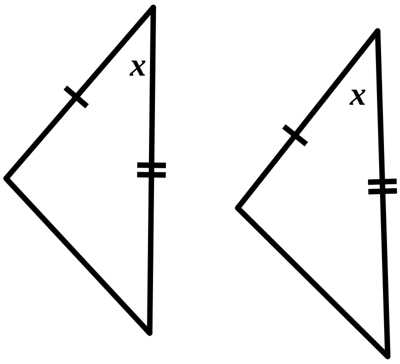
Side / Side / Side



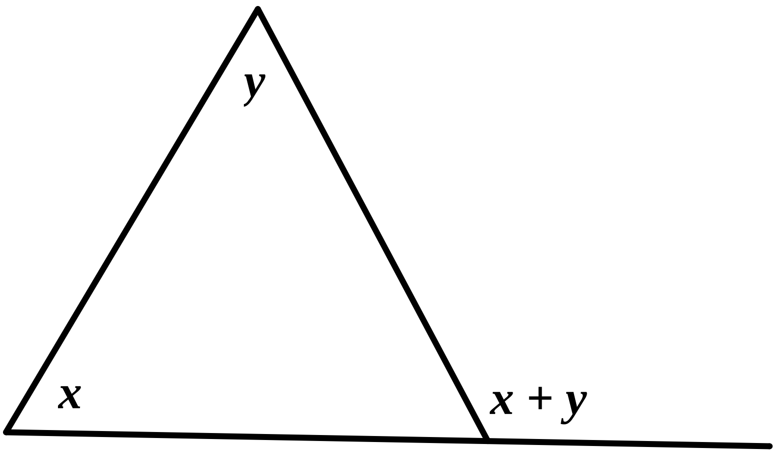
90° / Hypoteneus / Side



Side / Angle / Side

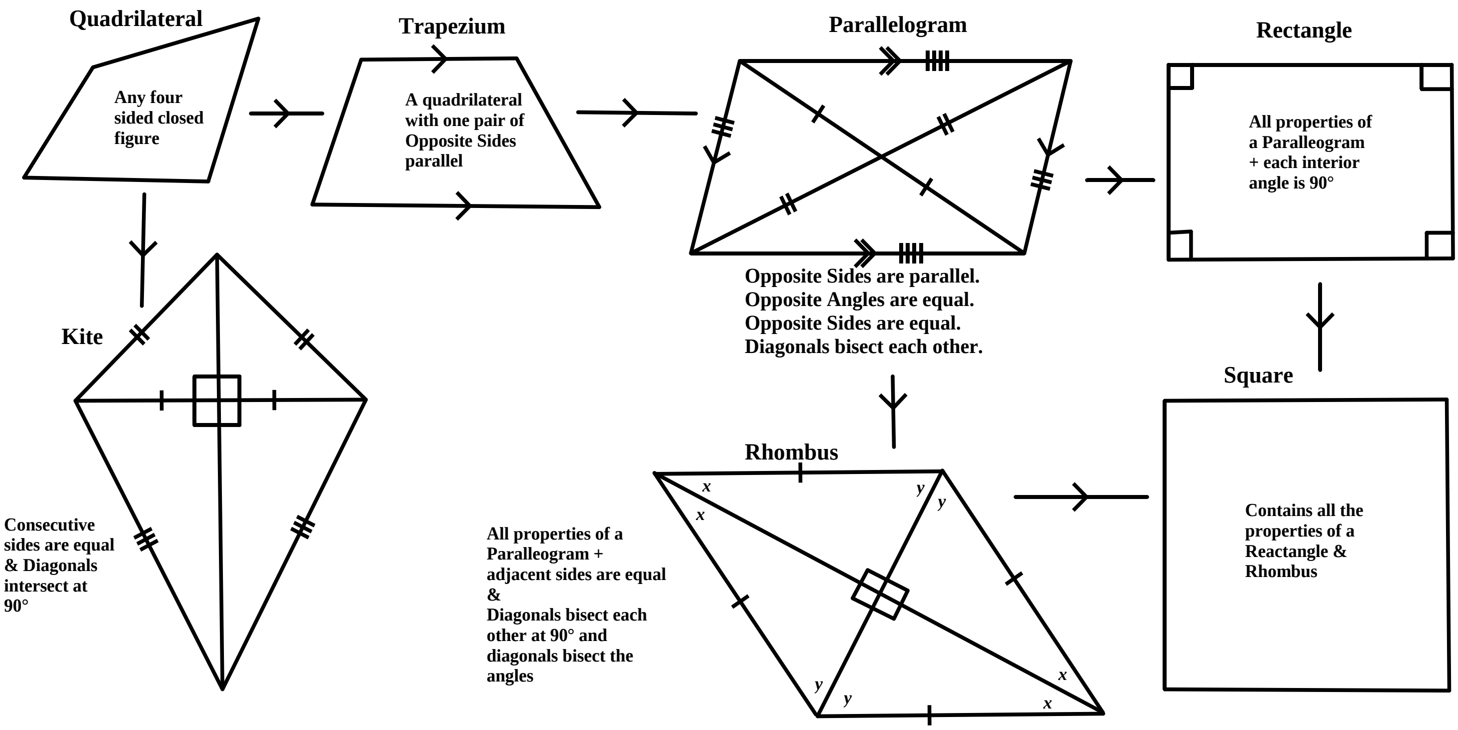


C. The exterior angle of a triangle



The exterior angle of a triangle equals the sum of its interior opposite angles

C. GRADE 10 EUCLIDEAN GEOMETRY SUMMARY

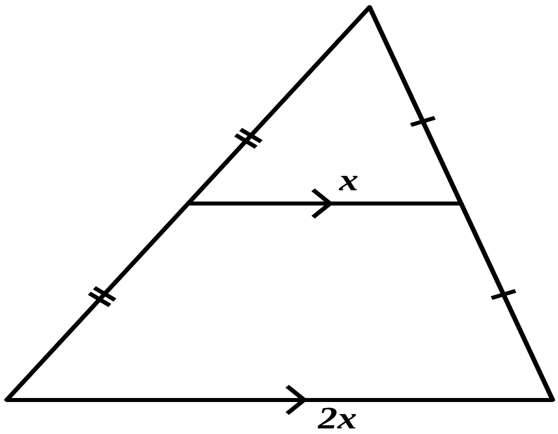


How to Prove a Quadrilateral is a Parallelogram?

1. Prove that the opposite sides are parallel (definition) **<u>or</u>**
2. Prove that the opposite sides are equal. **<u>or</u>**
3. Prove that the opposite angles are equal. **<u>or</u>**
4. Prove that the diagonals bisect each other. **<u>or</u>**
5. Prove that one pair of opposite sides is equal and parallel

Midpoint Theorem

The line joining the midpoints of two sides of a triangle is parallel to the third side and equal to half the length of the third side.



D. ACCEPTABLE REASONS WHEN WRITING PROOFS

THEOREM STATEMENT	ACCEPTABLE REASON(S)
LINES	
The adjacent angles on a straight line are supplementary.	∠s on a str line
If the adjacent angles are supplementary, the outer arms of these angles form a straight line.	adj ∠s supp
The adjacent angles in a revolution add up to 360°.	∠s round a pt **OR** ∠s in a rev
Vertically opposite angles are equal.	vert opp ∠s =
If AB || CD, then the alternate angles are equal.	alt ∠s; AB || CD
If AB || CD, then the corresponding angles are equal.	corresp ∠s; AB || CD
If AB || CD, then the co-interior angles are supplementary.	co-int ∠s; AB || CD
If the alternate angles between two lines are equal, then the lines are parallel.	alt ∠s =
If the corresponding angles between two lines are equal, then the lines are parallel.	corresp ∠s =
If the co interior angles between two lines are supplementary, then the lines are parallel.	coint ∠s supp

TRIANGLES

The interior angles of a triangle are supplementary.	∠ sum in Δ **OR** sum of ∠s in Δ **OR** Int ∠s Δ
The exterior angle of a triangle is equal to the sum of the interior opposite angles.	ext ∠ of Δ
The angles opposite the equal sides in an isosceles triangle are equal.	∠s opp equal sides
The sides opposite the equal angles in an isosceles triangle are equal.	sides opp equal ∠s
In a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.	Pythagoras OR Theorem of Pythagoras
If the square of the longest side in a triangle is equal to the sum of the squares of the other two sides then the triangle is right-angled.	Converse Pythagoras **OR** Converse Theorem of Pythagoras
If three sides of one triangle are respectively equal to three sides of another triangle, the triangles are congruent.	SSS
If two sides and an included angle of one triangle are respectively equal to two sides and an included angle of another triangle, the triangles are congruent.	SAS **OR** S∠S
If two angles and one side of one triangle are respectively equal to two angles and the corresponding side in another triangle, the triangles are congruent.	AAS OR ∠∠S
If in. two right angled triangles, the hypotenuse and one side of one triangle are respectively equal to the hypotenuse and one side of the other, the triangles are congruent	RHS **OR** 90°HS
The line segment joining the midpoints of two sides of a triangle is parallel to the third side and equal to half the length of the third side	Midpt Theorem
The line drawn from the midpoint of one side of a triangle, parallel to another side, bisects the third side.	line through midpt || to 2nd side

A line drawn parallel to one side of a triangle divides the other two sides proportionally.	**line || one side of Δ** **OR** **prop theorem; name || lines**
If a line divides two sides of a triangle in the same proportion, then the line is parallel to the third side.	**line divides two sides of Δ in prop**
If two triangles are equiangular, then the corresponding sides are in proportion (and consequently the triangles are similar).	**||| Δs OR equiangular Δs**
If the corresponding sides of two triangles are proportional, then the triangles are equiangular (and consequently the triangles are similar).	**Sides of Δ in prop**
If triangles (or parallelograms) are on the same base (or on bases of equal length) and between the same parallel lines, then the triangles (or parallelograms) have equal areas.	**same base; same height** **OR** **equal bases; equal height**

QUADRILATERALS

The interior angles of a quadrilateral add up to 360°.	**sum of ∠s in quad**
The opposite sides of a parallelogram are parallel.	**opp sides of ||m**
If the opposite sides of a quadrilateral are parallel, then the quadrilateral is a parallelogram.	**opp sides of quad are ||**
The opposite sides of a parallelogram are equal in length.	**opp sides of ||m**
If the opposite sides of a quadrilateral are equal , then the quadrilateral is a parallelogram.	**opp sides of quad are =** **OR** **converse opp sides of a parm**
The opposite angles of a parallelogram are equal.	**opp ∠s of ||m**
If the opposite angles of a quadrilateral are equal then the quadrilateral is a parallelogram.	**opp ∠s of quad are = OR converse opp angles of a parm**
The diagonals of a parallelogram bisect each other.	**diag of ||m**
If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.	**diags of quad bisect each other** **OR** **converse diags of a parm**
If one pair of opposite sides of a quadrilateral are equal and parallel, then the quadrilateral is a parallelogram.	**pair of opp sides = and ||**
The diagonals of a parallelogram bisect its area.	**diag bisect area of ||m**
The diagonals of a rhombus bisect at right angles.	**diags of rhombus**
The diagonals of a rhombus bisect the interior angles.	**diags of rhombus**

All four sides of a rhombus are equal in length.	**sides of rhombus**
All four sides of a square are equal in length.	**sides of square**
The diagonals of a rectangle are equal in length.	**diags of rect**
The diagonals of a kite intersect at right-angles.	**diags of kite**
A diagonal of a kite bisects the other diagonal.	**diag of kite**
A diagonal of a kite bisects the opposite angles	**diag of kite**

E. HOW TO GO ABOUT SOLVING A GEOMETRY RIDER

1. What knowledge must you have?

- **Know all terminology associated with Euclidean Geometry relevant to the School Curriculum.**
- **Be able to state ALL Theorems/ Converses of Theorems/ Axioms and Corollaries AND be able to draw a rough diagram to describe every statement. Pages 2 to 5 of this supplement indicate the important theorems and corollaries that must be learnt and illustrations that should be remembered.**
- **Know how to write reasons in abbreviated form for the formal writing of proofs. Approved reasons are found in the Examination Guideline.**

2. What approach to use?

- **When you see the Diagram and see the information provided use what I call the "Doctor Cape Town" Method. That is look for Diameter/ Radius/ Cyclic Quadrilaterals/ Parallel Lines/ Tangents in other words DRCPT (Doctor Cape Town ☺) This will help you identify all the key aspects in the diagram and make problem solving easier!**
- **Use Colour Pencils (Maximum of 3 colours). This is particularly important when proving triangles similar.**
- **Always remember the order of questions is critical. Invariably what is done in a preceding question is vital to solve following questions.**
- **Remember correct writing of the solution is as important as solving the question itself.**

3. How to Prove..........

1) That lines are Parallel:

Prove: Alternate angles equal or

Corresponding angles equal or

Co-interior angles supplementary.

4. That two triangles are congruent:

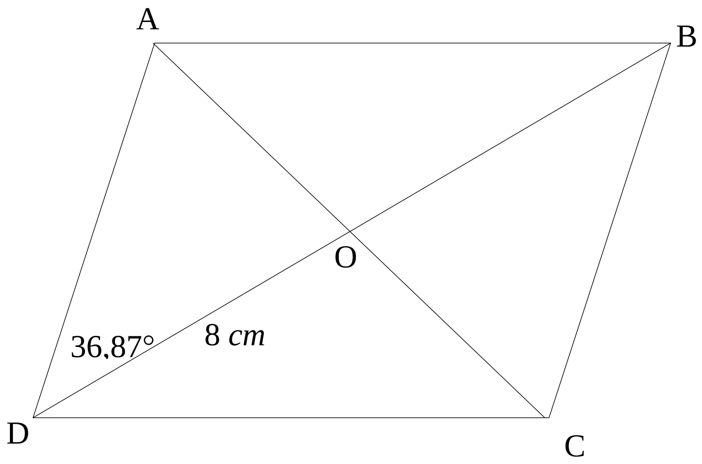
Prove: A case of ....(Side/Side/Side) or (Side/Angle/Side)

or (Angle/Side/Angle) or (90°/Hypotenuse/Side)

F. LEARNER ACTIVITIES INCORPORATING ALL THEOREMS AND COROLLARIES

QUESTION 1

In the diagram, ABCD is a rhombus having diagonals AC and BD intersecting in O.
$A\hat{D}O = 36{,}87°$ and DO = 8 *cm*.



1.1 Write down the size of the following angles:

1.1.1 $C\hat{D}O$ (1)

1.1.2 $A\hat{O}D$ (1)

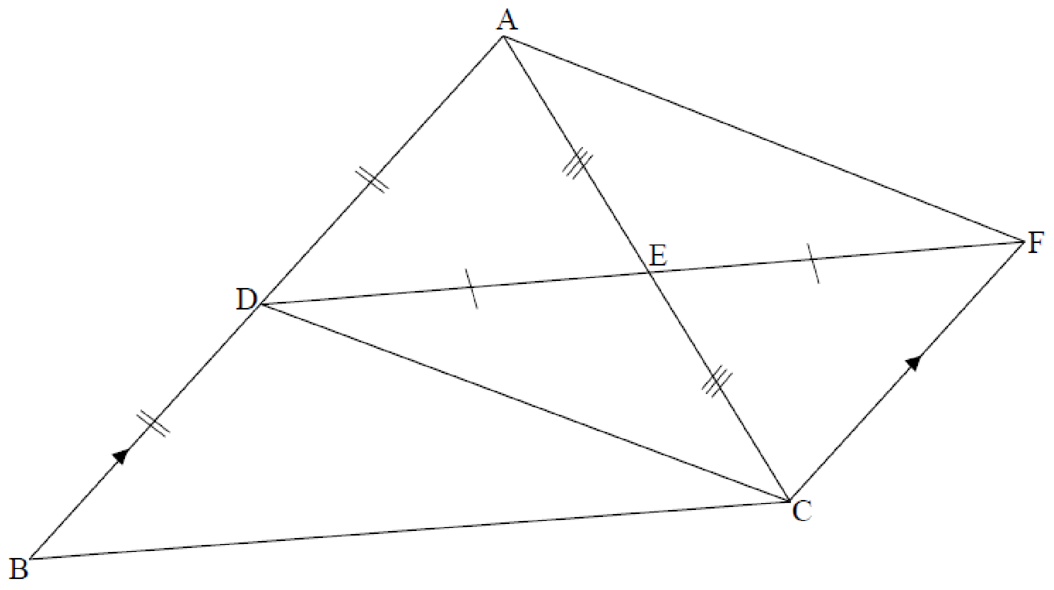
1.2 Calculate the length of AO. (2)

1.3 If E is a point on AB such that OE | | AD, calculate the length of OE. (4)

[8]

Question 2

In the diagram below, D is the midpoint of side AB of ΔABC. E is the midpoint. of AC. DE is produced to F such t

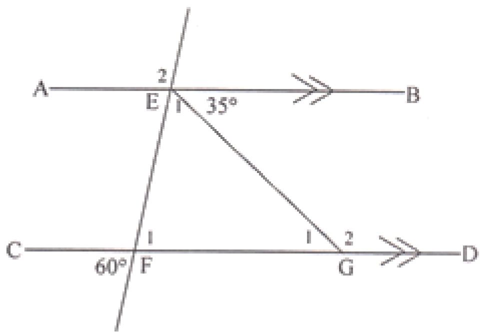


2.1 Write down a reason why ΔADE ≡ ΔCFE. **(1)**

2.2 Write down a reason why DBCF is a parallelogram. **(1)**

2.3 Hence, prove the theorem which states that $DE = \frac{1}{2}BC$. **(4)**

QUESTION 3



In the sketch above AB//CD .Write down the value of the following angles with reasons:

3.1 $\hat{F}_1$ (2)

3.2 $\hat{G}_1$ (2)

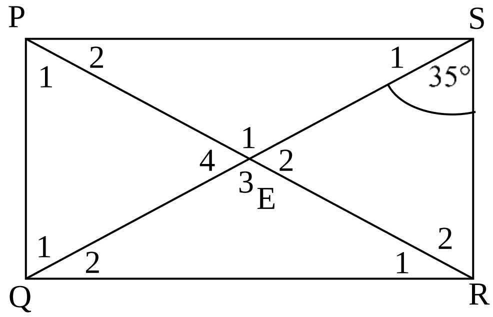
3.3 $\hat{E}_1$ (2)

3.4 $\hat{G}_2$ (2)

3.5 $\hat{E}_2$ (2)

QUESTION 4

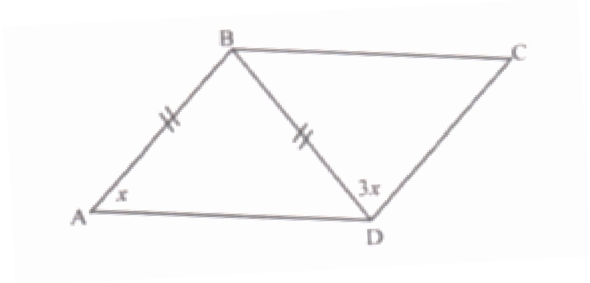
In the diagram below, PQRS is a rectangle with E being the point of intersection of the diagonals. $Q\hat{S}R = 35°$. Calculate the size of $R\hat{P}S$ i.e. $\hat{P}_2$.



(4)

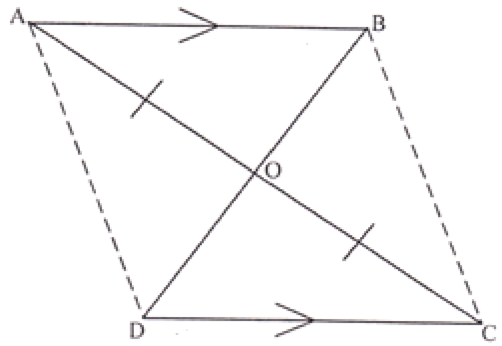
QUESTION 5

In the diagram below , ABCD is a parallelogram. It is also given that AB =BD, $\hat{A} = x$ and $B\hat{D}C$ =3x. Calculate with reasons, the value of x. (4)



QUESTION 6

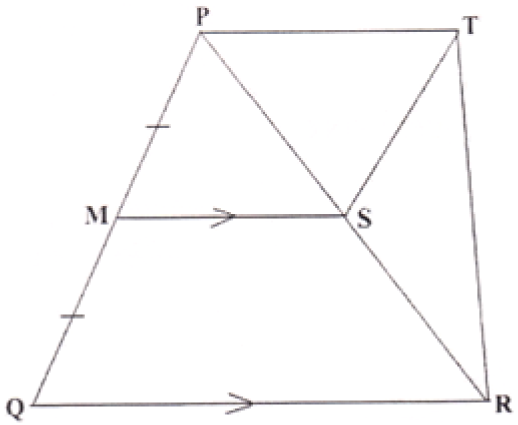
In this question,you must give a reason to justify each of your statements
In the diagram below AC and BD are straight lines,AO=OC and AB//CD.



6.1 Prove using congruency,that AB =DC **(4)**
6.2 Explain why quadrilateral ABCD is a parallelogram. **(2)**

QUESTION 7

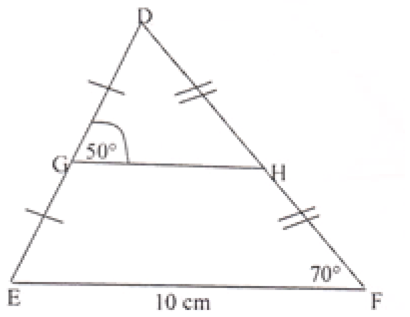
In the diagram below ΔPQR is drawn such that PM=MQ and MS//QR.It is also given that ΔPST is an equilateral triangle.



Prove that ΔTSR is an isosceles triangle **(4)**

QUESTION 8

In the diagram below,ΔDEF is drawn such that G is the midpoint of DE and H is the midpoint of DF.



Calculate

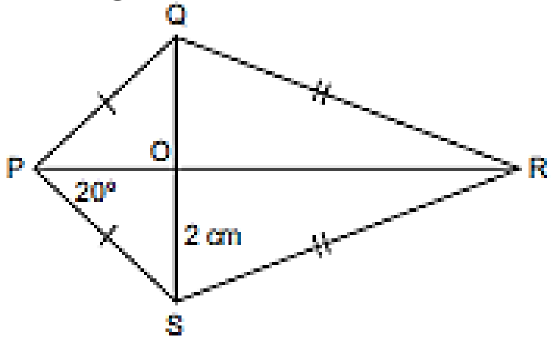
8.1 The length of GH **(2)**

8.2 The size of $\hat{E}$ **(2)**

8.3 The size of $\hat{D}$ **(2)**

QUESTION 9

PQRS is a kite such that the diagnols intersect in O. OS = 2cm and $O\hat{P}S = 20^0$.



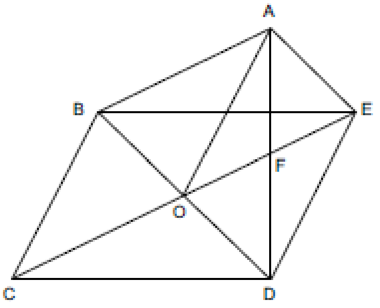
9.1 Write down the length of OQ. **(2)**

9.2 Write down the size of $P\hat{O}Q$. **(2)**

9.3 Write down the size of $Q\hat{P}S$. **(2)**

QUESTION 10

In the diagram,BCDE and AODE are parallelograms.



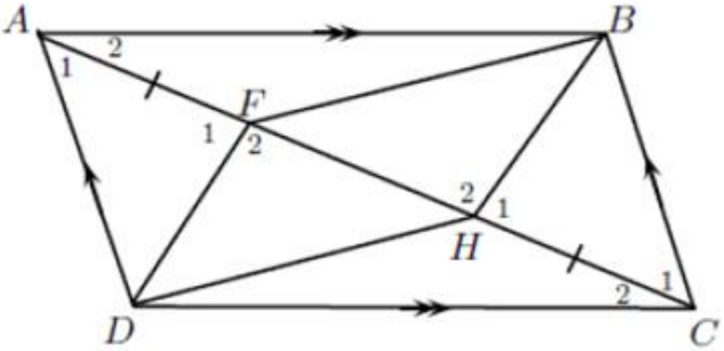
10.1 Prove that OF∥AB **(4)**

10.2 Prove that ABOE is a parallelogram. **(4)**

10.3 Prove that ΔABO ≡ ΔEOD. **(5)**

QUESTION 11

ABCD is a parallelogram with diagnol AC .Given that AF=HC , show that : ΔAFD≡ΔCHB

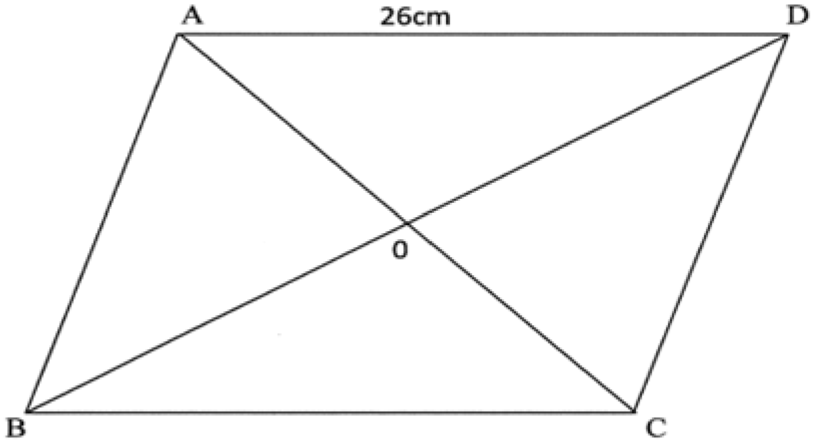


(5)

G.QUESTIONS FROM PAST YEAR EXAM PAPERS

QUESTION 1

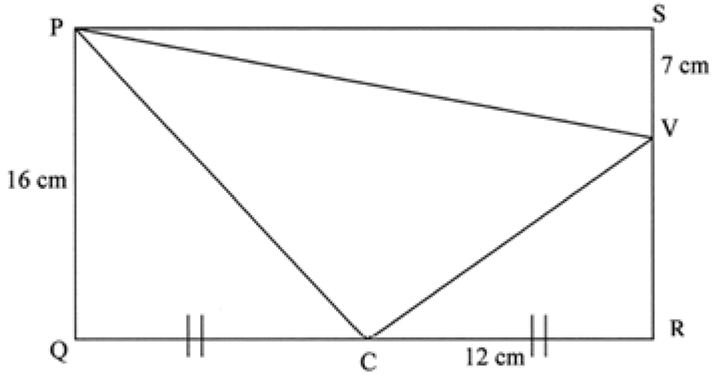
ABCD is a rhombus with AD=26 cm and diagonal BD=48cm.Calculate the length of diagonal AC.



(5)

QUESTION 2

In rectangle PQRS below,C is the midpoint of QR.CR = 12cm,SV=7cm and PQ=16cm.



Calculate the following lengths:

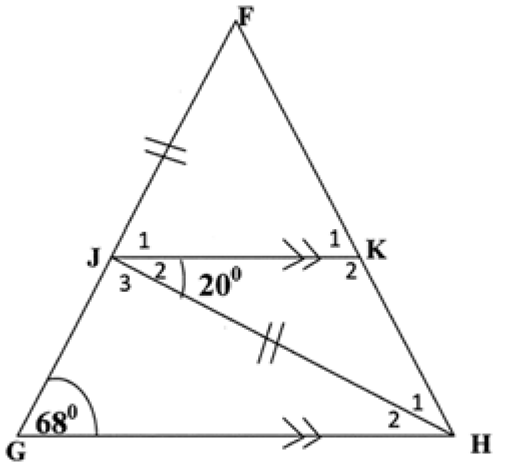
2.1 VR **(2)**

2.2 QC **(2)**

2.3 PS **(2)**

QUESTION 3

In the figure below $\hat{G} = 68^0$, $K\hat{J}H = 20^0$, $FJ = JH$ **and JK//GH.**



Calculate with appropriate reasons,the value(s) of

3.1 $\hat{H}_2$ **(1)**

3.2 $\hat{J}_3$ **(2)**

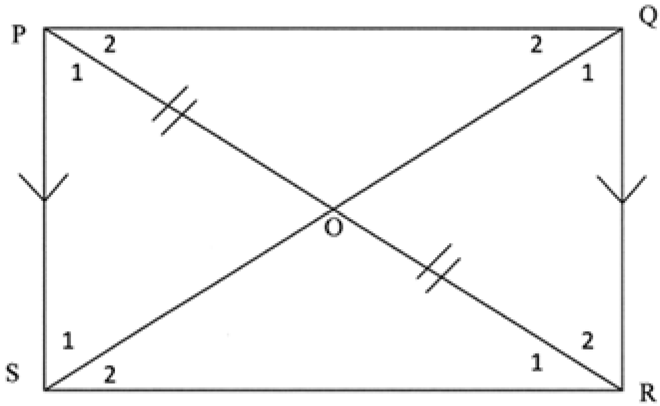
3.3 $F\hat{J}H$ **(2)**

3.4 $\hat{H}_1$ **(3)**

3.5 $\hat{K}_1$ **(2)**

QUESTION 4

In quadrilateral PQRS,PO=OR and PS//QR.



Prove the following:

4.1 ΔPOS≡ΔROQ. **(4)**

4.2 PQRS is parallelogram. **(2)**

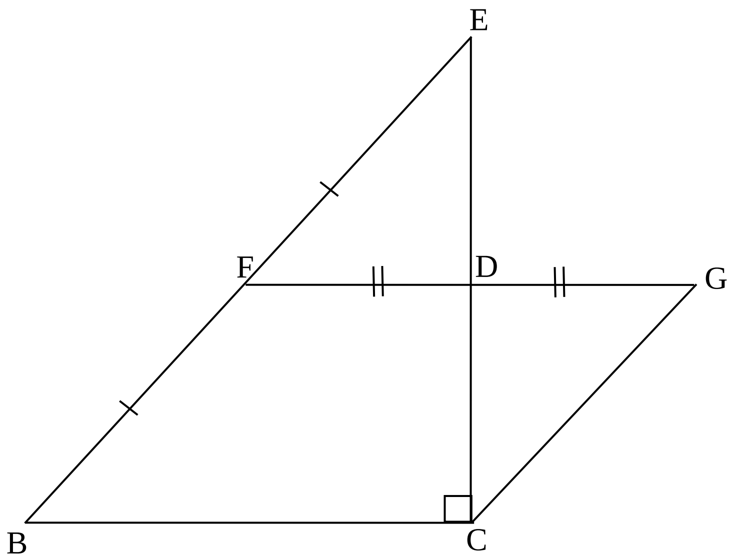
QUESTION 5

In this question, you must give a reason to justify each of your statements.

5.1 Complete the following statement:

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

5.2 In the figure below, BCE is a right-angled triangle. F is the midpoint of BE and D is a point on CE. FD is produced by its own length to G and forms parallelogram BCGF. FD = 30 mm and DE = 25 mm.



5.2.1 Why is ED = DC. **(2)**

5.2.2 **Prove that EFCG is a rhombus.** **(2)**

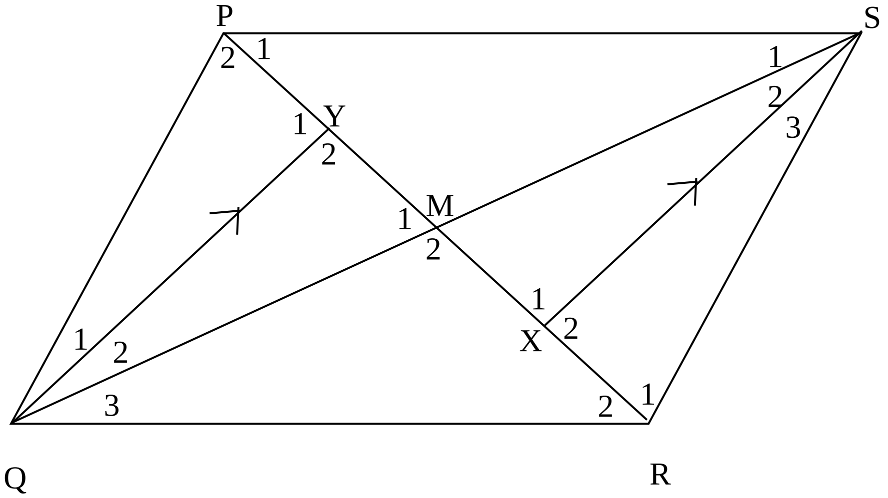
5.2.3 **Calculate the area of parallelogram BCGF.** **(2)**

5.2.4 **Prove, by calculation, that:**
the area of rhombus FCGE = the area of parallelogram BCGF. **(2)**

QUESTION 6

In this question, you must give a reason to justify each of your statements.

In the diagram below, PQRS is a parallelogram with diagonals PR and QS.
QY and XS are drawn such that QY // XS



Use the diagram to prove each of the following:

6.1 **ΔQPY ≡ ΔSRX** **(6)**

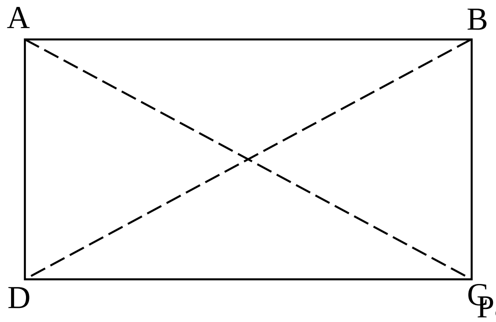
6.2 **QYSX is a parallelogram** **(3)**

6.3 **YM = MX** **(2)**

QUESTION 7

In this question, you must give a reason to justify each of your statements.

7.1 In the diagram below, ABCD is a rectangle. Use the diagram to prove the theorem which states that the diagonals of a rectangle are equal. .



(6)

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