Mathematics Study Guide

Grade 10

CAPS

Maths 4 Africa

English

Katie Müller

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Chapter 1

Algebra

Algebra

Products:

Remember:

$$\boxed{\begin{aligned}(+)\times(+) &= +\\ (+)\times(-) &= -\\ (-)\times(-) &= +\end{aligned}}$$

Example 1

Simplify: $3x(4x^2+3x-8)$

$= 12x^3+9x^2-24x$

Example 2

Simplify: $(2x-y)(x^2+3y)$

$= 2x^3+6xy-x^2y-3y^2$

Example 3

Simplify: $(3x-2)(x^2+2x-5)$

$= 3x^3+6x^2-15x-2x^2-4x+10$

$= 3x^3+4x^2-19x+10$

Factors

1. Common Factor
2. Difference of Squares
3. Trinomial
4. Sum & Difference of two Cubes

- Four terms $\Rightarrow$ group
- Five terms $\Rightarrow$ group
- Mixed factorisation

Example 1

Common Factor

Factorise: $2x^3 - 6x^2$

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

Example 2

Difference of Squares

Factorise:

(a) $x^2 - y^2$

Both perfect squares

$\sqrt{x^2}$ $\sqrt{y^2}$

Has to be a minus *

$= (x-y)(x+y)$

One minus and one plus

(b) $4x^2 - 25$

$= (2x-5)(2x+5)$

(c) $x^2 + 16$

Has to be a minus *

Therefore difference of squares method is not applicable.

$= x^2 + 16$

Example 3

Trinomials

The examples below include more steps than are necessary. These extra steps are merely there to help you understand how to find the correct factors.

Factorise:

(a) $x^2 + x - 6$

$= 1x^2 + 1x - 6$

+1 is the coefficient of the middle term

- Write down factors of 1 and 6:

1	1
1	6

- Cross multiply:

1	1
1	6
= 1	= 6

- Can you get the middle term's coefficient by adding or subtracting the "answers" (1 and 6) to the multiplication?

- $+1 + 6 = +7 \neq 1$
- $+1 - 6 = -5 \neq 1$
- $-1 + 6 = 5 \neq 1$
- $-1 - 6 = -7 \neq 1$

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Chapter 5

Number Patterns

Number Patterns

Linear Number Patterns

$T_1 \quad T_2 \quad T_3 \quad T_4$

Eg. $5 \; ; \; 8 \; ; \; 11 \; ; \; 14 \; ; \; \ldots \; ; \; T_n$

$+3 \quad +3 \quad +3$

Constant difference

General term: $T_n = +3n + c$

For Term 1 $(n=1) \Longrightarrow T_1 = 5$

$T_n = +3n + c$

Now substitute: $5 = T_1$:

$5 = 3(1) + c$

$2 = c$

$\therefore \; T_n = 3n + 2$

Other types of patterns

- $2 \; ; \; 6 \; ; \; 18 \; ; \; 54 \; ; \ldots$

$\times 3 \quad \times 3 \quad \times 3$

$T_n = 2(3)^{n-1}$

- $2^0 ; 2^1 ; 2^2 ; 2^3 ; \ldots$

$\Rightarrow T_n = 2^{n-1}$

Check and see which exponent works.

- $1^2 ; 2^2 ; 3^2 ; \ldots$

$\Rightarrow T_n = n^2$

- $1^2+1 ; 2^2+1 ; 3^2+1 ; \ldots$

$\Rightarrow T_n = n^2+1$

- $1^3 ; 2^3 ; 3^3 ; \ldots$

$\Rightarrow T_n = n^3$

- $(1+1)^3 ; (2+1)^3 ; (3+1)^3 ; \ldots$

$\Rightarrow T_n = (n+1)^3$

Example 1

Study the following diagram and answer the questions below:

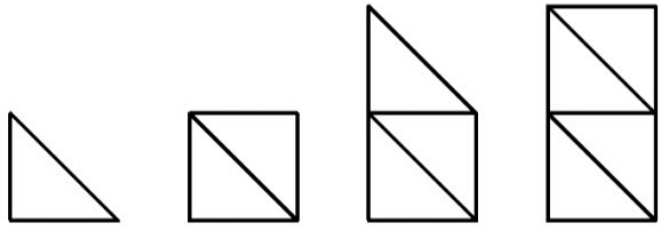

Fig. 1 Fig. 2 Fig. 3 Fig. 4

(a) How many matches are needed for figure 1?

(b) How many matches will be used in figures 5 and 6?

(c) Find the general term for the pattern in terms of the number of matches used.

(d) How many matches will be used in figure 122?

(e) In which figure will 1141 matches be used?

Solutions:

(a) 3

(b) Fig. 5 : 11 Fig. 6 : 13

(c) Pattern: $3 \underbrace{;}_{+2} 5 \underbrace{;}_{+2} 7 \underbrace{;}_{+2} 9 ; \ldots$

$T_n = 2n + c$

Now substitute: $T_1 = 3$:

substitute 3 for T_n

substitute 1 for n

$3 = 2(1) + c$

$1 = c$

$\therefore T_n = 2n + 1$

(d) $T_{122} = 2(122) + 1$

$= 245$

(e) $T_n = 2n + 1$

$1141 = 2n + 1$

$1140 = 2n$

$570 = n$

$\therefore$ Figure 570.

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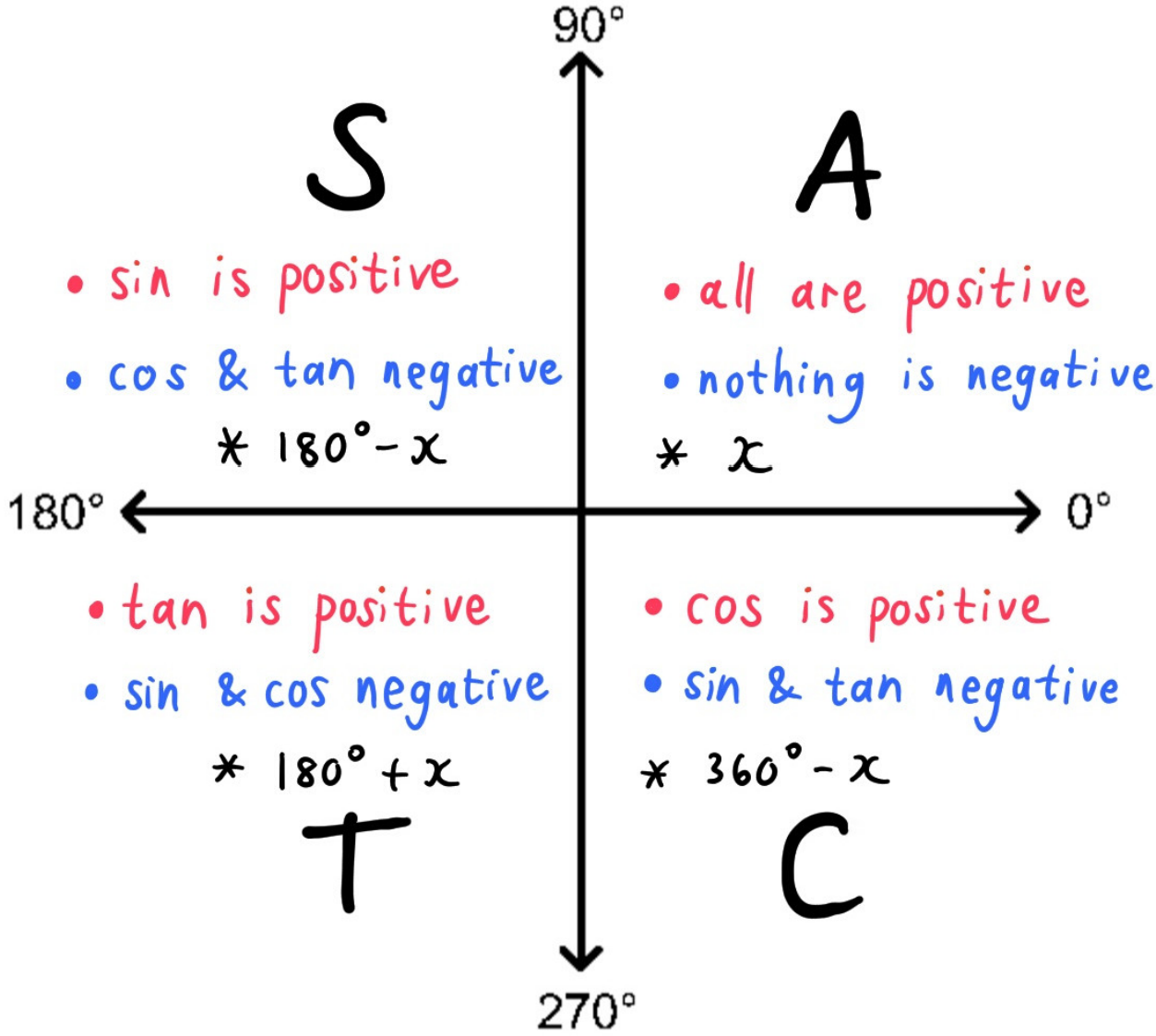
Chapter 11

Trigonometry

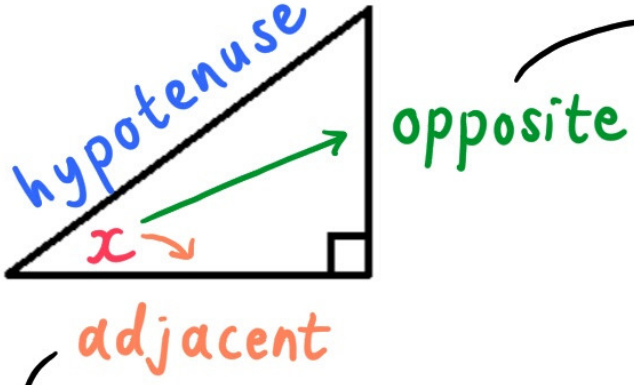
Trigonometry

Cartesian Plane:



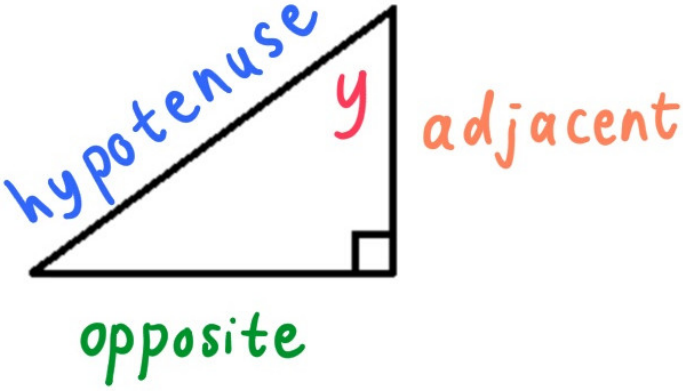
Triangle side identification

To determine the "name" of a triangle's side, imagine you are standing in the angle you are working with.



Meaning:
Side opposite the angle you are "standing" in

Meaning:
Side adjacent to the angle you are "standing" in



Now learn these patterns:

sinoh	cosah	tanoa

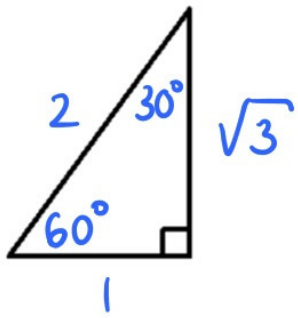
In any 90° triangle, when you have:

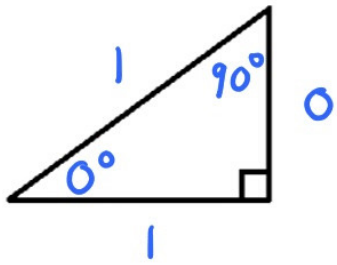
o and h, use sinoh $\Rightarrow \sin x = \frac{o}{h}$

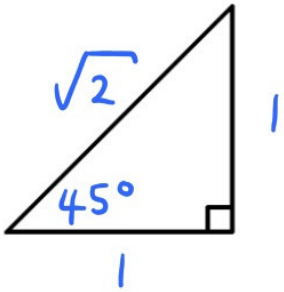
a and h, use cosah $\Rightarrow \cos x = \frac{a}{h}$

o and a, use tanoa $\Rightarrow \tan x = \frac{o}{a}$

Special triangles

- 

- 

- 

Co-functions

- $\operatorname{cosec} x = \dfrac{1}{\sin x}$
- $\sec x = \dfrac{1}{\cos x}$
- $\cot x = \dfrac{1}{\tan x}$

Identities

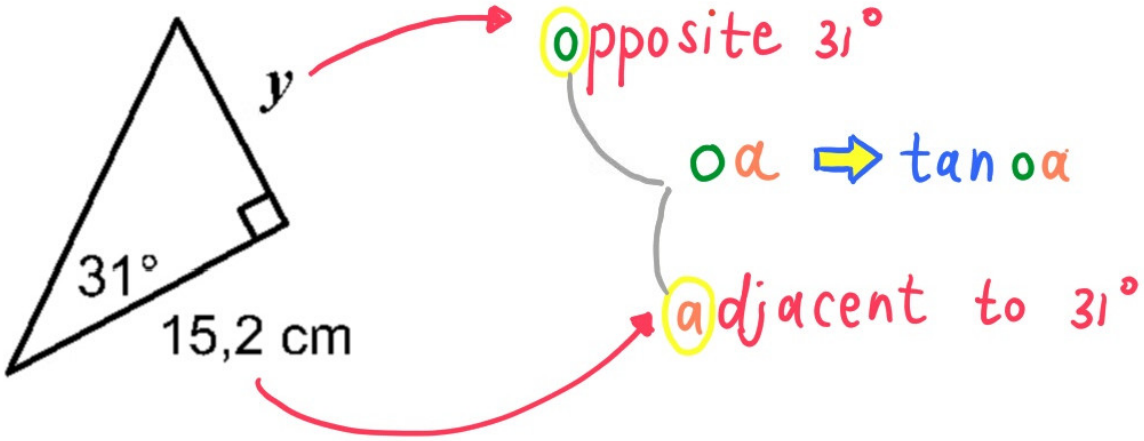
- $\tan x = \dfrac{\sin x}{\cos x}$
- $\sin^2 x + \cos^2 x = 1$

Example 1

Determine the values of x and y:

"Stand" in the angle that you have,
eg. 31°

(a)



Solution:

$$\tan 31° = \frac{o}{a}$$

$$\therefore \tan 31° = \frac{y}{15,2}$$

$\boxed{\times 15,2}$

$$\therefore (15,2)\tan 31° = \frac{y\,\cancel{(15,2)}}{\cancel{15,2}}$$

$$15,2 \tan 31° = y$$

$$9,13 \text{ cm} = y$$

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