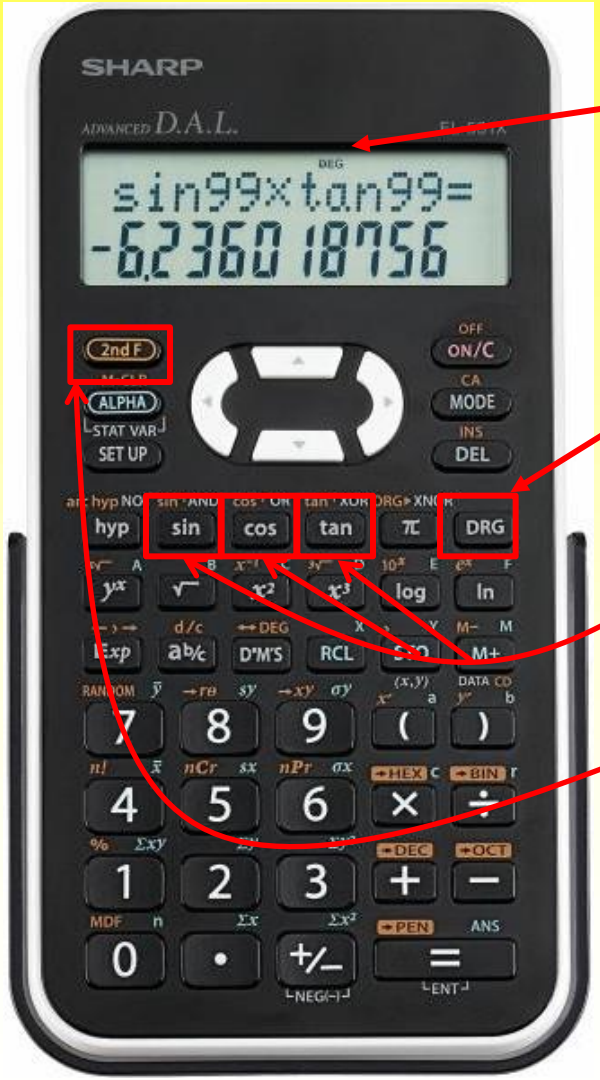
ST. JEAN DE BREBEUF
MATHEMATICS

CHAPTER 2.1

TRIGONOMETRIC RATIOS WITH ACUTE ANGLES

CHAPTER 2.1 TRIGONOMETRIC RATIOS WITH ACUTE ANGLES

GETTING TO KNOW YOUR CALCULATOR!



MAKE SURE CALCULATOR IS IN <u>DEG</u> (Degrees mode)

→If not, press **DRG** until top of screen says "DEG"

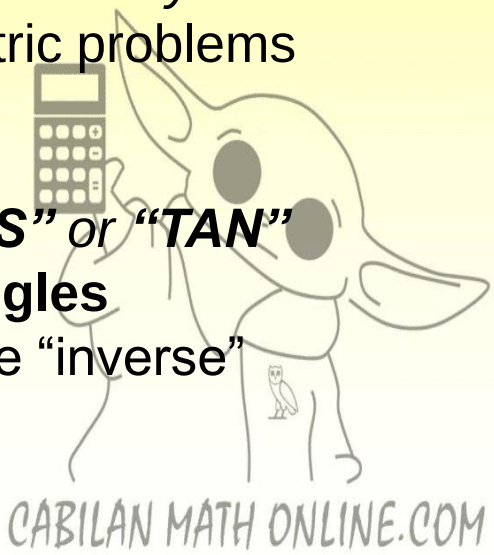
"SIN", "COS" and "TAN" *keys*

→ Used for trigonometric problems

"2ndF" + "SIN", "COS" *or* ***"TAN"***

→ Used for solving **angles**

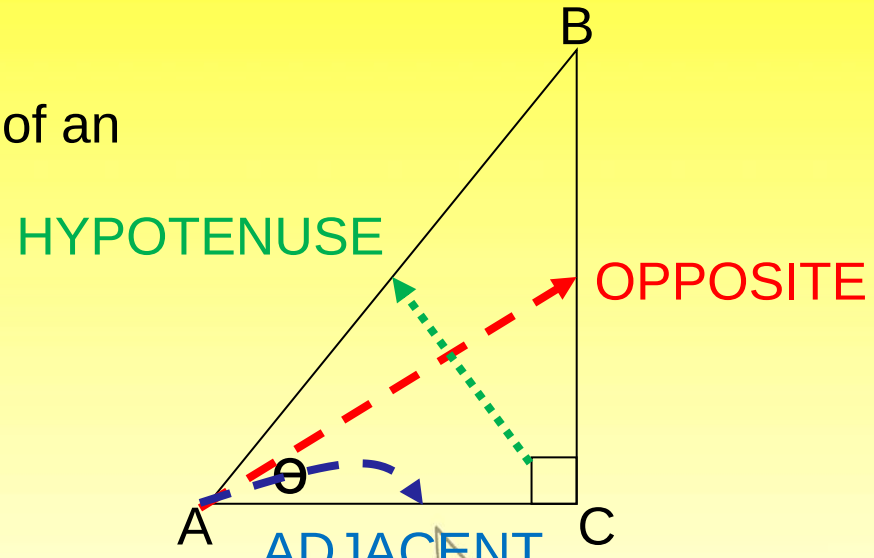
→ Known as taking the "inverse"



CHAPTER 2.1 TRIGONOMETRIC RATIOS WITH ACUTE ANGLES

KEY CONCEPTS

For any *right triangle*, the primary trigonometric ratios are defined in terms of an *acute* interior angle, $\angle\theta$



$$\sin\theta = \frac{OPPOSITE}{HYPOTENUSE}$$

$$\cos\theta = \frac{ADJACENT}{HYPOTENUSE}$$

$$\tan\theta = \frac{OPPOSITE}{ADJACENT}$$

*** Recall: The **Hypotenuse** is the LONGEST side and is located directly across the *right* angle

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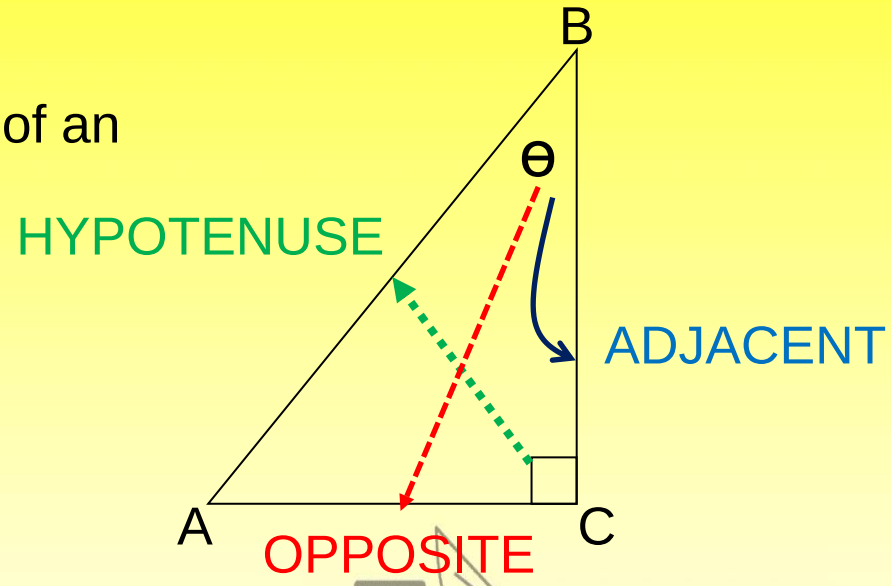

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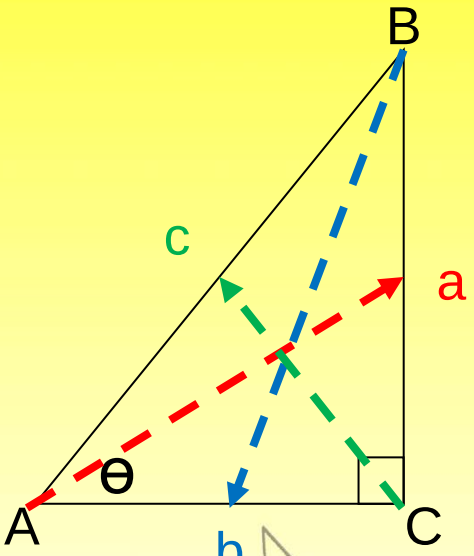
KEY CONCEPTS

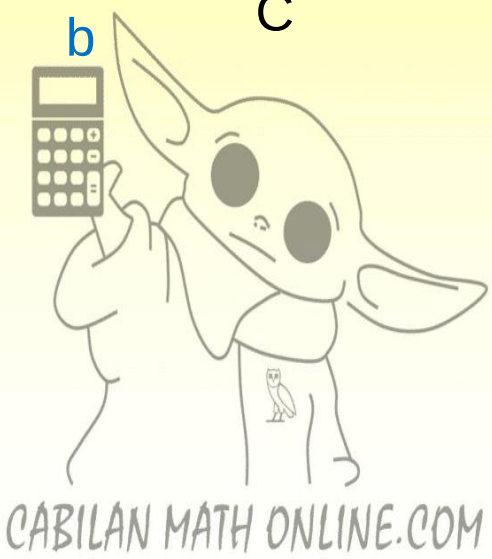
When **labelling the sides** of *any* triangle, the sides are assigned the <u>lowercase</u> letter of the angle directly across from it

The *primary trigonometric ratios* can be used to determine **side lengths** and/or **angle measurements** in a *right triangle* (if sufficient information about the triangle is known)

The choice of which trigonometric ratio to apply depends on the given information and the information that is needed

→ For any given interior angle, always identify which sides are given first before determining which trigonometric ratio to use!



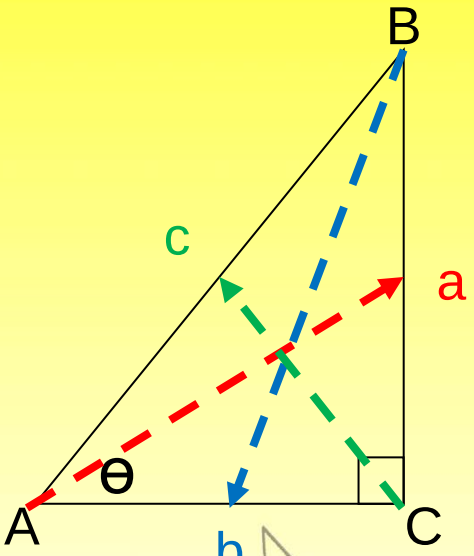


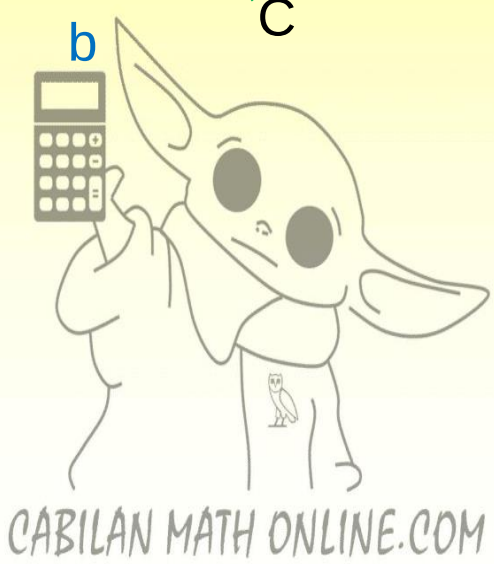
CHAPTER 2.1 TRIGONOMETRIC RATIOS WITH ACUTE ANGLES

KEY CONCEPTS

To **solve a triangle**, <u>all side lengths</u> and <u>angle measures</u> must be determined

→ The **Pythagorean Theorem ($c^2 = a^2 + b^2$**, where *c* represents the length of the *Hypotenuse***)** can be used to solve for the *length* of any side of a *right* triangle, provided that the lengths of the other two sides are provided

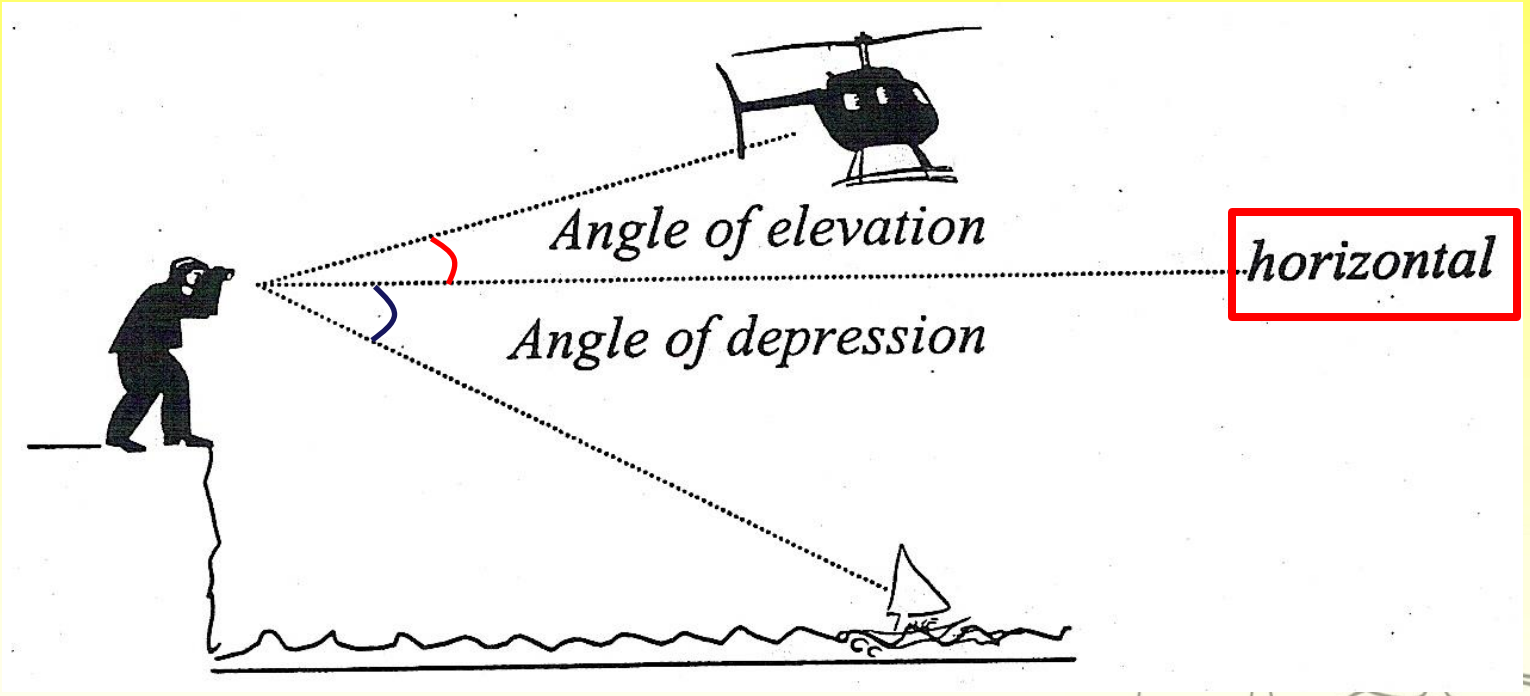




CHAPTER 2.1 TRIGONOMETRIC RATIOS WITH ACUTE ANGLES

KEY CONCEPTS

ANGLE OF ELEVATION and ANGLE OF DEPRESSION



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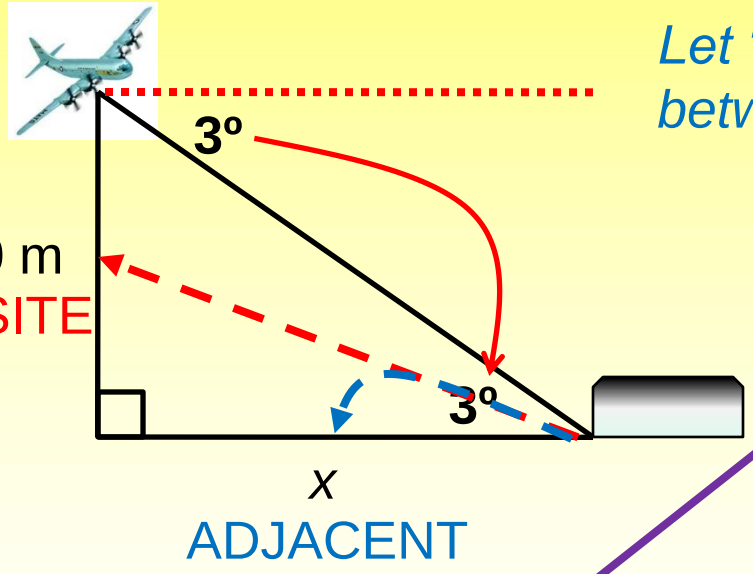
CHAPTER 2.1 TRIGONOMETRIC RATIOS WITH ACUTE ANGLES

EXAMPLE 1 *Using Trigonometric Ratios to Determine Side Length*

The standard approach for an airplane to an airport runway is at an *angle of depression* of **3º** at a height of **150 metres**. To successfully land the airplane, calculate the horizontal distance between the airplane and the airport.



Let "x" represent the horizontal distance between the airplane and the airport

$$\tan 3° = \frac{OPPOSITE}{ADJACENT}$$

$$\tan 3° = \frac{150}{x}$$

$$\frac{\tan 3°}{1} = \frac{150}{x}$$

$$x = 2862\,m$$

- Write "1" underneath tan 3º
- Cross multiply

$$\frac{x \tan 3°}{\tan 3°} = \frac{150}{\tan 3°}$$

The horizontal distance is **2862 metres**

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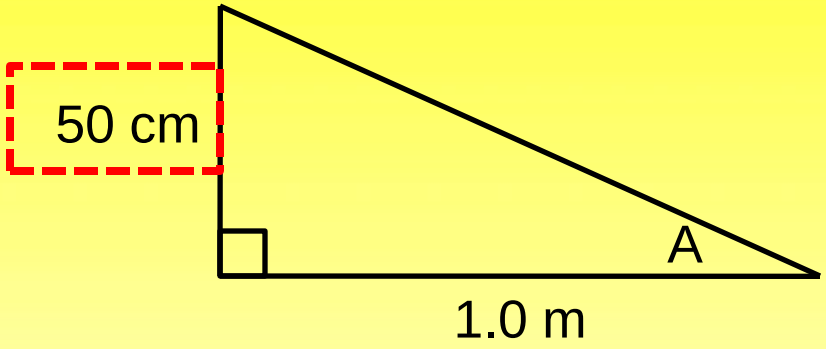
CHAPTER 2.1 TRIGONOMETRIC RATIOS WITH ACUTE ANGLES

EXAMPLE 2

Using Trigonometric Ratios to Determine an Angle

Atozzio is building a skateboard ramp. He wants it to have a *vertical* rise of **50 cm** over a *horizontal* distance of **1.0 m**.

At what *angle of elevation* should he build the ramp? Round the answer to the nearest degree.



Let "A" represent the *angle of elevation*

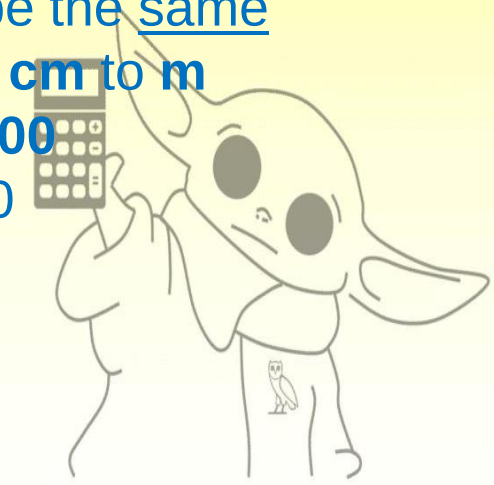
All units have to be the same

→Change **50 cm** to **m**

→Divide by **100**

= 50 / 100

= **0.5 m**



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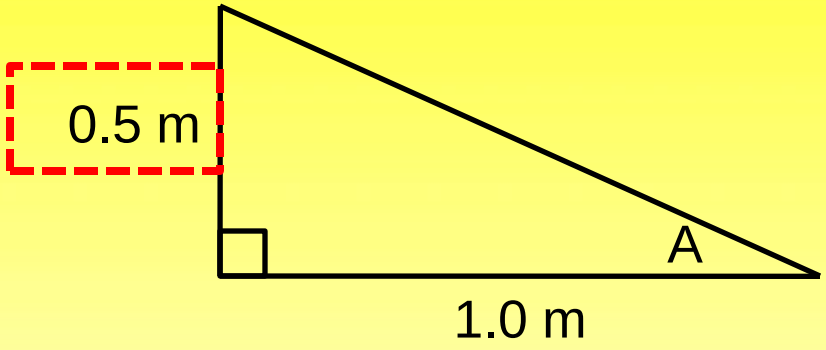

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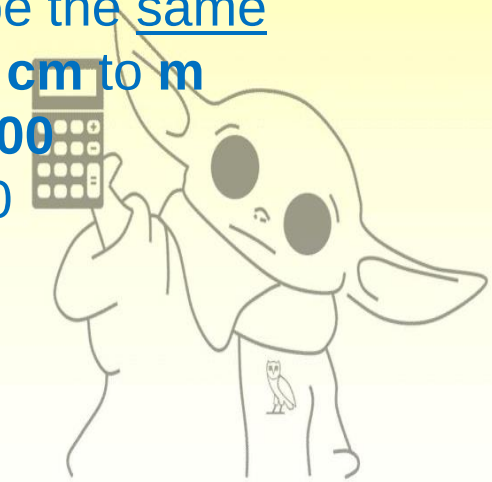

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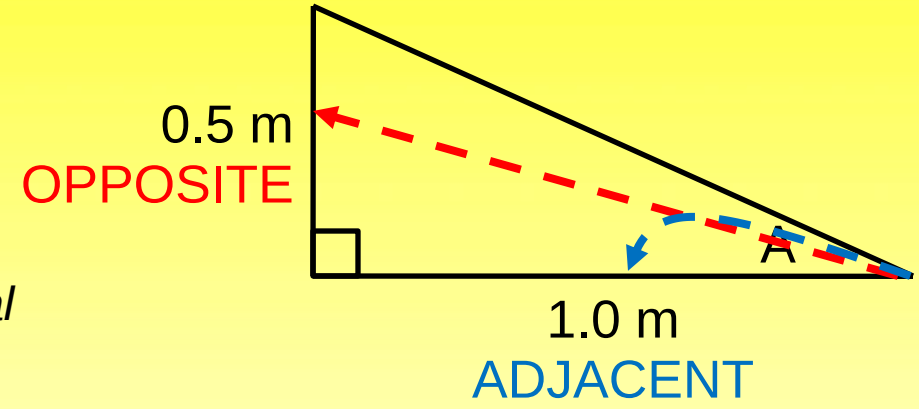

$$\tan A = \frac{OPPOSITE}{ADJACENT}$$

$$\tan A = \frac{0.5}{1.0}$$

$$\angle A = \tan^{-1}(0.5)$$

INVERSE tan → Press **2nd/Shift** then **tan**

$$\angle A = 26.5651°$$

$$\angle A = 27°$$

The *angle of elevation* should be **27°**

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HOMEWORK / SEATWORK

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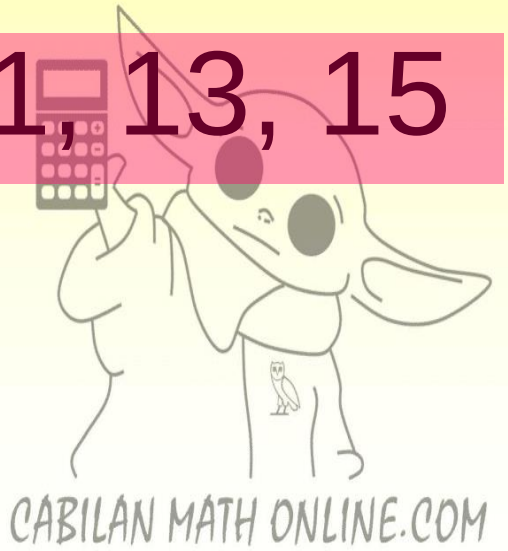
(Day 1) #3 – 5

(Day 2) 1, 2, 6, 7, 9, 11, 13, 15