A1 | **Fatima Al Fihri :** First Muslim Woman Mathematics Educator

"Fatima was called the "mother of boys" by the parents of her students."
(Mohammed Yasser Hilali, 2020)

Do Now:

1. Who was Fatima Al Fihiri?

She was the founder of world's first university

2. What was her contribution in math education?

Fatima taught mathematics at the university she founded

3. Why did she name the world's oldest university Al Qarawiyyin?

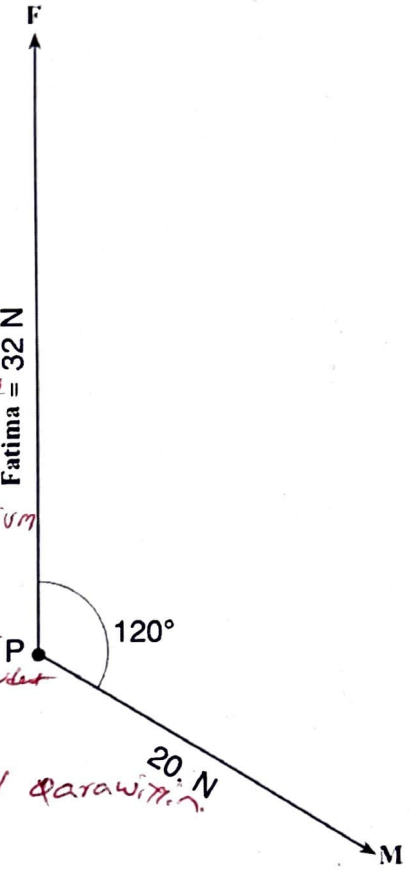
She was born in Kairoun, Tunisia. She named her university much the same way Marie Curie named her discovery Polonium

4. How can Fatima Al Fihri's story be used in the fight of stereotypes against Muslim Women Mathematics educators?

minority students will be motivated upon finding someone who looks like them in the STEM field. while other students benefit from a more inclusive mindset.

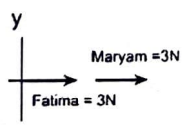
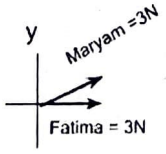
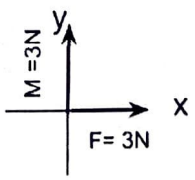
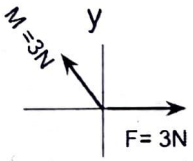
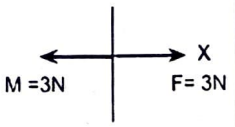
5. How are these three people connected: Fatima Al Fihiri, Jacobus Golius and René Descartes?

Jacob Golius learned mathematics at university of Al Qarawiyin. Later he taught mathematics to Rene Descartes.



Big Idea:

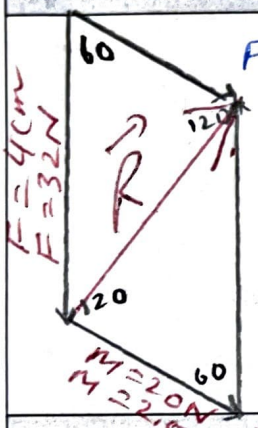
6. Fatima Al Fihri was physically present during the entire construction of the building which is now known as Al Qarawiyyin University (857 - 859 AD). Her sister Maryam would occasionally visit the construction site. They would often discuss mathematics while they observed the construction of the buildings. One day, Fatima and Maryam attached a rope to a brick and pulled it by changing the angle between them to observe the direction of displacement of the brick. The units reflect modern conventions in vector algebra.

Degrees	0	30	90	120	180
Scenarios					
Predict sum (Magnitude only)	$R = 6N$	$R < 6N$	$R << 6N$	$R <<< 6N$	$R = 0N$

Use Trigonometry					
$F_x = 3\cos 0 = 3$ $F_y = 3\sin 0 = 0$ $M_x = 3\cos 0 = 3$ $M_y = 3\sin 0 = 0$ $R = \sqrt{6^2+0^2}$ $R = 6\ N$	$3\cos 0 = 3$ $3\sin 0 = 0$ $3\cos 30 = 2.6$ $3\sin 30 = 1.5$ $x = 3+2.6 = 5.6$ $y = 0+1.5 = 1.5$ $R = \sqrt{5.6^2+1.5^2}$ $R = 5.8\ N$	$3\cos 0 = 3$ $3\sin 0 = 0$ $3\cos 90 = 0$ $3\sin 90 = 3$ $x = 3+0 = 3$ $y = 0+3 = 3$ $R = \sqrt{3^2+3^2}$ $R = 4.2\ N$	$3\cos 0 = 3$ $3\sin 0 = 0$ $3\cos 120 = -1.5$ $3\sin 120 = 2.6$ $x = 3-1.5 = 1.5$ $y = 0+2.6 = 2.6$ $R = \sqrt{1.5^2+2.6^2}$ $R = 3\ N$	$3\cos 0 = 3$ $3\sin 0 = 0$ $3\cos 180 = -3$ $3\sin 180 = 0$ $R = \sqrt{0^2+0^2}$ $R = 0\ N$	

7. Fatima and Maryam are pulling an object P. Fatima pulls straight north at 32 N and Maraym pulls 120 degrees SE of Fatima, as shown in the diagram above. Find the resultant in seven different ways.

Protractor



$F = \frac{4\text{cm}}{4} = \frac{32\text{N}}{4}$

$1\text{cm} = 8\text{N}\ (F)$

$M = \frac{2.5\text{cm}}{2.5} = \frac{20\text{N}}{2.5}$

$1\text{cm} = 8\text{N}\ (m)$

$R = 3.5\text{cm} \times \frac{8\text{N}}{1\text{cm}} = 28\text{N}$

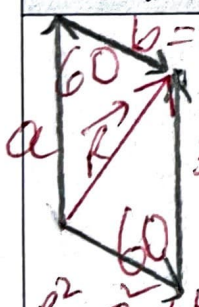
Parallelogram

$R^2 = a^2+b^2+2ab\cos 120$

$R^2 = 32^2+20^2+2(32)(20)(-\frac{1}{2})$

$R = 28\ N$

~~Geometry~~ Law of Cosine

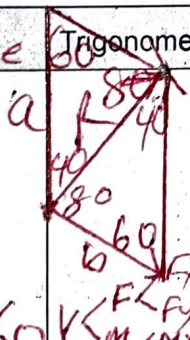


$R^2 = a^2+b^2-2ab\cos 60$

$R^2 = 32^2+20^2-2(32)(20)(\frac{1}{2})$

$R = 28\ N$

Trigonometry



$F_x = 32\cos 90 = 0$

$F_y = 32\sin 90 = 32$

$M_x = 20\cos(-30) = 17.3$

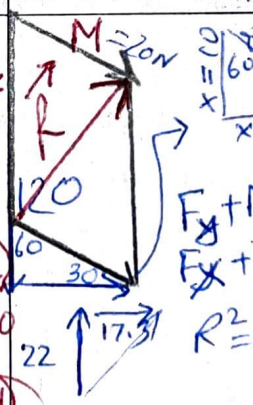
$M_y = 20\sin(-30) = -10$

$x = 0+17.3 = 17.3$

$y = 32-10 = 22$

$R = \sqrt{17.3^2+22^2} = 28\text{N}$

~~Law of Cosine~~ Geometry

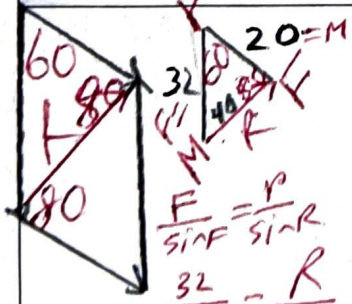


$F_y + M_y = \uparrow 32 \downarrow 10 = \uparrow 22$

$F_x + M_x = 0 + \overrightarrow{17.3} = \overrightarrow{17.3}$

$R^2 = \sqrt{22^2+17.3} = 28\text{N}$

Law of Sine



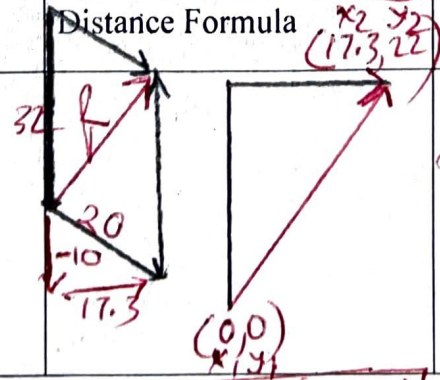
$\frac{F}{\sin F} = \frac{R}{\sin R}$

$\frac{32}{\sin 80} = \frac{R}{\sin 60}$

$R = \frac{32\sin 60}{\sin 80}$

$R = 28\ N$

Distance Formula



$R = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$R = \sqrt{(17.3-0)^2+(22-0)^2}$

$R = 28\ N$

Quadratic Equation

$a^2+b^2-2ab\cos = c^2$

$R^2+400-2(20)R\cos 82 = 32^2$

$R^2+400-40R\cos 82 = 1024$

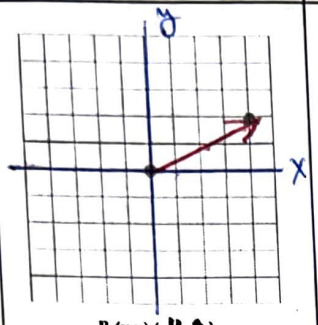
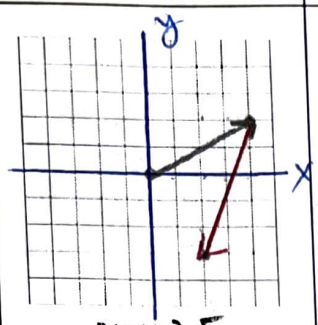
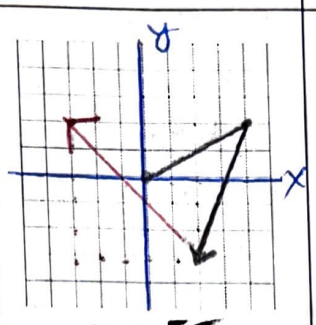
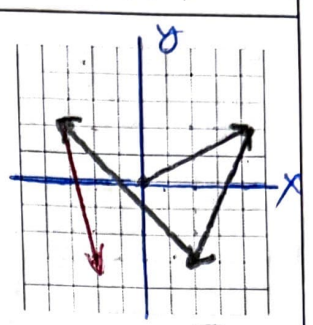
$R^2-5.6R-624 = 0$

$\frac{5.6 \pm \sqrt{5.6^2+4(624}}{2}$

$= 28\ N$

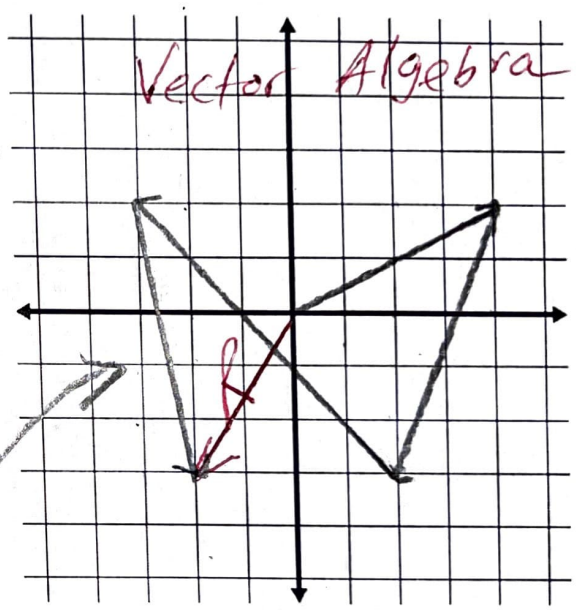
Exit Slip:

Below are 4 pairs of vector components. For each vector, sketch the resultant of the components using the cartesian coordinate below. Assume each box is one meter.

Vector 1 (4,2)	Vector 2 (-2, -5)	Vector 3 (-5,+5)	Vector 4 (1,-5)
			
$P_1(x,y)$ (4,2)	$P_2(x,y)$ (-2,-5)	$P_3(x,y)$ (-5,5)	$P_4(x,y)$ (1,-5)

1. Starting from the center of the larger grid to the right, draw an arrow that represents vector 1 then Starting from the end of vector 1, draw and label vector 2. Draw vector 3 starting from the end of vector 2, and then draw vector 4 starting from the end of vector 3.

2) Lastly, draw an arrow that starts at the center of the Cartician Coordinate and ends at the end of vector 4. Label that as "total displacement."



Algebra

x	y
4	2
-2	-5
-5	5
1	-5
-2	-3

(-2,-3) angle

$R = \sqrt{(-2)^2 + (-3)^2}$

$R = \sqrt{4 + 9}$

$R = \sqrt{13}$

$R = 3.6\ N$

Bibliography:

1. "Fatima Al-Fihri: Founder of the World's Oldest University – DW – 05/08/2020." Dw.Com, https://www.dw.com/en/fatima-al-fihri-founder-of-the-worlds-oldest-university/a-53371150. Accessed 24 Dec. 2022.