Class Plan:

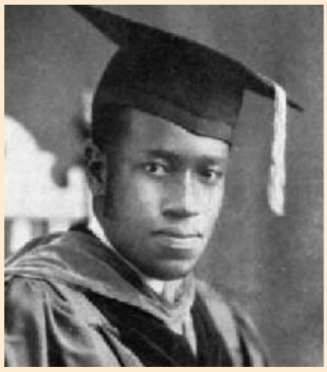
(3 Day week - no assignment sheet)

1. Mathematician!
2. Warm Up
3. Unit Test Rubric
4. Vector Review

Mathematician Monday!

Elbert Frank Cox

Elbert Frank Cox (December 5, 1895 – November 28, 1969) was an American mathematician who became the first black person in the world to receive a Ph.D. in mathematics.



https://en.wikipedia.org/wiki/Elbert_Frank_Cox

Mathematician Monday!

Elbert F. Cox was born and raised in a college town in a racially mixed neighborhood, but at segregated schools.

His father, a school principal, had graduated from Evansville College and had done graduate work at Indiana University. Close knit and highly religious, the Cox family had a respect for learning that reflected the father's educational career.

When young Elbert demonstrated unusual ability in high school mathematics and physics, he was directed toward Indiana University.

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After he graduated in from Indiana University with his Bachelor's Degree in 1917, Cox joined the U.S Army to fight in World War I.

After he was discharged from the Army, he began his career as a high school math teacher.

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In December 1921 he applied for admission to Cornell University, one of seven American universities with a doctoral program in mathematics.

One of his references wrote a positive letter followed by another letter anticipating difficulties for him because he was a colored man.[1]

Mathematician Monday!

Fox was awarded his PhD by Cornell in 1925, for his dissertation, **The polynomial solutions of the difference equation af(x+1) + bf(x) = [Phi](x).[2]**

He spent most of his life as a professor at Howard University in Washington, D.C.

Mathematician Monday!

During his life, Cox published two articles.

He expanded on the work Niels Nörlund had done on Euler polynomials as a solution to a particular difference equation[2].

Cox used generalised Euler polynomials and the generalised Boole summation formula to expand on the Boole summation formula.

He also studied a number of specialised polynomials as solutions for certain differential equations. In his other paper, published in 1947, he mathematically compared three systems of grading.[3]

Mathematician Monday!

The National Association of Mathematicians established the Cox-Talbot Address in his honor, which is annually delivered at the NAM's national meetings.

Each year NAM invites a mathematical scientist or educator who exemplifies the spirit of Cox and Talbot in both personal achievement and service to the mathematical community. The hour-long lecture takes place during the annual NAM Banquet as part of the Joint Mathematics Meetings.

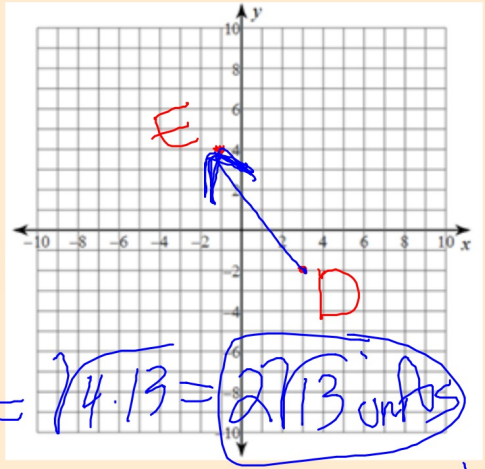
The Elbert F. Cox Scholarship Fund, which is used to help black students pursue studies, is also named after him.

Warm Up:

$D(3,-2)$ $E(-1,4)$

1) Construct $\overrightarrow{DE}$.

2) Find $\left|\overrightarrow{DE}\right|$.



$\overrightarrow{DE} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} = \begin{pmatrix} -1-3 \\ 4--2 \end{pmatrix}$

② $\sqrt{(-4)^2+6^2} = \sqrt{52} = \sqrt{4 \cdot 13} = 2\sqrt{13}$ units

How is this different from $\overrightarrow{ED}$? $\begin{pmatrix} 4 \\ -6 \end{pmatrix}$

Unit Test Rubric:

7 8	• Select appropriate mathematics when solving **challenging problems in both familiar and unfamiliar situations.** • Apply the selected mathematics successfully when solving these problems. • Generally solve these problems correctly.			• All problems are solved correctly ***without error***. (8) -Component form -magnitude -vector operations (algebraically and graphically) -Parallel and orthogonal vectors -applications • Vector notation is used **correctly**.

Vector Review:

DO: Vector Applications.

DONE?: Look at past reviews.
Any questions?

Vector Applications

1. 1. In a science lab, a laser is shot towards a series of mirrors. The beam of light travels out of the laser gun $\begin{pmatrix} 0 \\ 30 \end{pmatrix}$ before hitting the first mirror. The beam of light leaves the 1st mirror at a trajectory of $\begin{pmatrix} 15 \\ -40 \end{pmatrix}$ before hitting the 2nd mirror. The beam of light leaves the 2nd mirror and hits a 3rd mirror. Then the final trajectory from the 3rd mirror to the light detector is represented by $\begin{pmatrix} 20 \\ 10 \end{pmatrix}$. The total displacement vector of the beam of light from the gun to the detector is represented by $\begin{pmatrix} 35 \\ 50 \end{pmatrix}$.

$\begin{pmatrix} 35 \\ 50 \end{pmatrix}$

$35+b=35$

$b=0$

A. How far away is the laser gun from the light detector in the science lab?

$\left|\begin{pmatrix} 35 \\ 50 \end{pmatrix}\right|$

B. Use the given vectors to make an equation representing the laser's path.

$30-40+C+10=50$

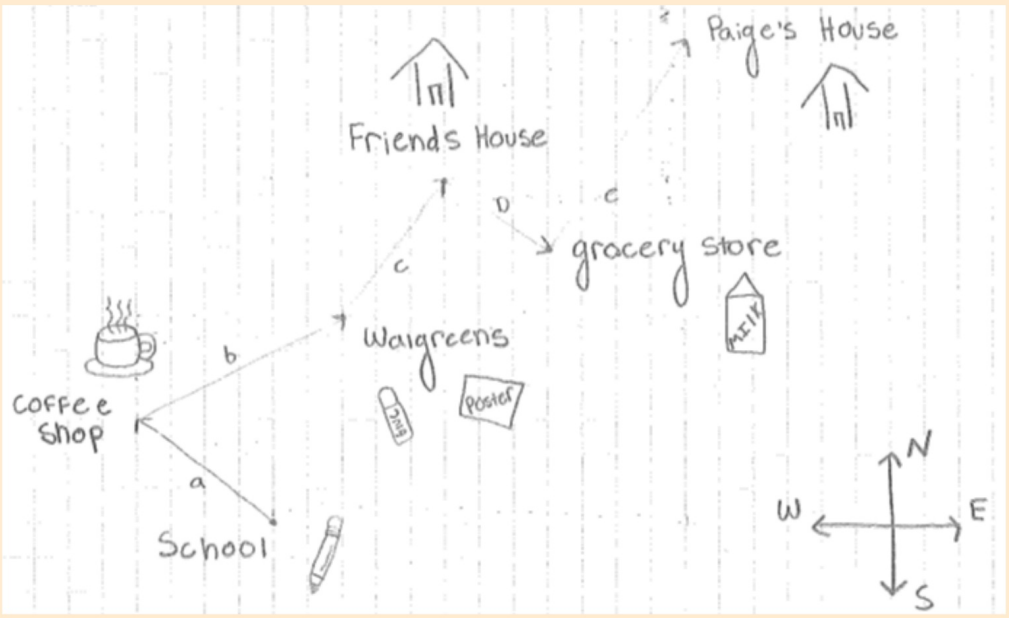
X

C. Using this equation, find the missing vector from the 2nd mirror to the 3rd mirror.

$$\begin{pmatrix} 0 \\ 30 \end{pmatrix}+\begin{pmatrix} 15 \\ -40 \end{pmatrix}+\begin{pmatrix} b \\ C \end{pmatrix}+\begin{pmatrix} 20 \\ 10 \end{pmatrix}=\begin{pmatrix} 35 \\ 50 \end{pmatrix}$$

2.

One day after School, Paige left School and walked 4 blocks West and 3 blocks North to a coffee shop to meet some friends to work on a project for Science class. Once they got some coffee, they relized they needed some supplies from the store. They walked 6 blocks east and 3 blocks north to go to Walgreens and get the stuff they needed. They left Walgreens and went to one of their houses. Paiges friend lives 4 blocks north of Walgreens and 3 blocks east of the store. After finishing the project, Paige got a text from her mom telling her to stop at the grocery store on her way home from School to get some milk. So when she left to go home she walked 3 blocks east and 2 blocks south to the grocery store and picked up the Milk. She then walked 6 blocks north and 4 blocks east to go home.


Paige's House
Friends House
d
e
grocery store
c
Walgreens
b
coffee shop
a
School
N
W
E
S

Question #1: What are the vectors of her journey?

Question #2: How many blocks did she travel in total?

Question #3: What was the displacement vector of her journey?

Question #4: If a drone flew from Paiges school to her house how far would she travel?

Question #5: How far is the coffee shop from Paige's school?

Question #6: What is the sum of vector c and vector d? (from Walgreens to friends house, and from friends house to grocery store)

Question #7: What would be the displacement vector from Paige's friends house to her house and what is the magnitude of that vector?

Question # 6: What is the sum of vector c and vector d? (from Walgreens to friends house, and from friends house to grocery store)

Question # 7: What would be the displacement vector from Paige's friends house to her house and what is the magnitude of that vector?

Solutions

1. A. Total displacement vector: $\begin{pmatrix} 35 \\ 50 \end{pmatrix}$

magnitude of ↳ : $\sqrt{35^2 + 50^2} = \sqrt{1225 + 2500} = \sqrt{3725}$

≈ 61.03 units.

Solutions

B. $\begin{pmatrix} 0 \\ 30 \end{pmatrix} + \begin{pmatrix} 15 \\ -40 \end{pmatrix} + \vec{v} + \begin{pmatrix} 20 \\ 10 \end{pmatrix} = \begin{pmatrix} 35 \\ 50 \end{pmatrix}$ where $\vec{v}$ = light's path from 2nd mirror to 3rd mirror.

C. If $\begin{pmatrix} 0 \\ 30 \end{pmatrix} + \begin{pmatrix} 15 \\ -40 \end{pmatrix} + \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 20 \\ 10 \end{pmatrix} = \begin{pmatrix} 35 \\ 50 \end{pmatrix}$, then

$0 + 15 + x + 20 = 35$ and $30 - 40 + y + 10 = 50$

$x + 35 = 35$ $\quad$ $y + 0 = 50$

$x = 0$ $\quad$ $y = 50$

$\vec{v} = \begin{pmatrix} 0 \\ 50 \end{pmatrix}$

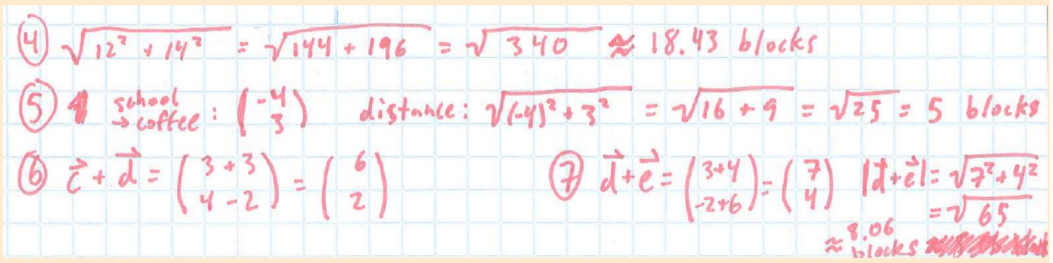
Solutions

2. ① $\vec{a} \begin{pmatrix} -4 \\ 3 \end{pmatrix}$ school → coffee $\vec{b} \begin{pmatrix} 6 \\ 3 \end{pmatrix}$ coffee → store $\vec{c} \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ store → friend's $\vec{d} \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ friends → grocery $\vec{e} \begin{pmatrix} 4 \\ 6 \end{pmatrix}$ grocery → home

② $4 + 3 + 6 + 3 + 3 + 4 + 3 + 2 + 4 + 6 = 38$ blocks

③ $\begin{pmatrix} -4 + 6 + 3 + 3 + 4 \\ 3 + 3 + 4 + 2 + 6 \end{pmatrix} = \begin{pmatrix} 12 \\ 14 \end{pmatrix}$

Solutions


④ $\sqrt{12^2 + 14^2} = \sqrt{144 + 196} = \sqrt{340} \approx 18.43$ blocks
⑤ school → coffee : $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$ distance: $\sqrt{(-4)^2 + 3^2} = \sqrt{16 + 9} = \sqrt{25} = 5$ blocks
⑥ $\vec{c} + \vec{d} = \begin{pmatrix} 3+3 \\ 4-2 \end{pmatrix} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$
⑦ $\vec{d} + \vec{e} = \begin{pmatrix} 3+4 \\ -2+6 \end{pmatrix} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$ $|\vec{d} + \vec{e}| = \sqrt{7^2 + 4^2} = \sqrt{65} \approx 8.06$ blocks

Exercises...

Study for Unit 2 Test Tomorrow!

After school help:
Ms. Berg's room W125

Look over exemplars!