

MRB1 Imscrúdú Matamaiticiúil: Bealaí Taisceadán

Problem Statement

I am going to investigate the quickest possible routes to different classrooms from my locker. I will calculate the distance of all possible routes and choose the quickest one.
(Diagrams of the school are in the results section)

Assumptions

In order to find the quickest possible routes, I will have to make a few assumptions.

- I am always walking at the same speed, weight of my bag and other students in the hall won't slow me down.
- I won't be talking to my friends while walking to the classrooms because it would slow me down.
- Any extra time waiting for the teacher to get to the room will not be counted because this varies on the teacher and the distance they have to travel.

How I will investigate the problem

First I will measure the speed I walk at, I will do this by timing how long it takes me to walk ten metres. I will repeat this a few times and will calculate the average to be accurate.

Next I will measure the distance from my locker to different rooms I am in during the week (Rooms: 18, 8, 11, 43, 40 and the hall.) I will do this using a trundle wheel.

I will measure the distance of all possible routes and then choose the quickest one based on which one has the shortest distance and will calculate how long the walk will take based on how long it takes me to walk ten metres.

I will put my results into charts and ~~graphs~~ and I will also use (these routes from now on.)
(tables)

Ceaptar fadhb agus déantar ráiteas agus déantar iarracht an fhadhb a shimpliú ach toimhdí a dhéanamh.

Roghnaítear straitéis oiriúnach chun tabhairt faoin bhfadhb.

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My Walking Speed

Before I measure the distance of the different routes, I must calculate my walking speed.

To do this I am going to measure out 10 metres in the corridor and time how long it takes me to walk the distance.

To be accurate I will walk the distance 3 times and I will repeat this in another area of the school

Test 1 $\frac{8.53 + 8.51 + 8.85}{3}$

1. 8:53 seconds } The Mean =
2. 8:51 seconds } 8:63 seconds
3. 8:85 seconds }

Test 2 $\frac{8.09 + 8.43 + 8.20}{3}$

1. 8:09 seconds } The Mean =
2. 8:43 seconds } 8:24 seconds
3. 8:20 seconds }

My Walking Speed

Now that I have timed how long it takes me to walk 10m in 2 different locations, I will find the mean of the two different locations to be more accurate.

$$\frac{8.63 + 8.24}{2}$$

The Mean = 8.435 seconds

It takes me 8:44 seconds to walk 10m, which means it takes me 0.84 seconds to walk 1m.

Bristear síos an fhadhb ina céimeanna.

Leantar nósanna imeachta oiriúnacha matamaiticiúla agus úsáidtear teanga chruinn mhatamaiticiúil.

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My Locker To Room 18

Room 18 is my base room which means I am in this room more than any other room in the school.

There are 2 possible routes to go to room 18:

Route 1: Inside the building
Route 2: Outside the building

Route 1 = 26m 90cm
Route 2 = 130m 51cm

Now I need to calculate how long it would take me to walk each distance.

Route 1: Predicted Time:

$$0.84 \times 26 = 21.84$$
$$0.84 \div 10 = 0.084$$
$$0.084 \times 9 = 0.756$$

My Locker to Room 18

Route 1: Predicted Time:

$$21.84 + 0.756 = 22.6 \text{ seconds}$$

I will round this to 23 seconds.

Route 2: Predicted Time:

$$0.84 \times 130 = 109.2$$
$$0.84 \div 100 = 0.0084$$
$$0.0084 \times 51 = 0.4284$$
$$109.2 + 0.4284 = 109.6284$$

I will round this to 110 seconds

Route 1 = 23 seconds (26m 90cm)
Route 2 = 110 seconds (130m 51cm)

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My Locker to Room - 18

Route 1 Actual Time: 23 seconds
Route 2 Actual Time: 95 seconds

| Route | Length | Predicted Time | Actual Time | % Error |
|-------|-----------|----------------|-------------|---------|
| 1 | 26m 90cm | 23 seconds | 23 sec | 0% |
| 2 | 130m 51cm | 110 seconds | 95 sec | 15.7% |

% Error

Route 1:

$$\left(\frac{23-23}{23}\right) 100 = 0$$

Route 2:

$$\left(\frac{110-95}{95}\right) 100 = 15.7$$

Locker to Hall

I am in the hall for PE

Route 1: Inside the building
Route 2: Outside the building

Route 1 = 38 m
Route 2 = 118 m 60 cm

Route 1:

$$0.84 \times 38 = 32.92 \text{ seconds}$$

Route 2: Round to 33 seconds

$$0.84 \times 118 = 99.12$$

$$0.84 \div 10 = 0.084$$

$$0.084 \times 6 = 0.504$$

$$99.12 + 0.504 = 99.624 \text{ seconds}$$

Round to 100 seconds

Téitear ar ais chuig an straitéis cé nach luaitear sin go sainráite.

Leantar nósanna imeachta oiriúnacha matamaiticiúla.

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Locker to Hall

Actual Time

Route 1 = 35 seconds

Route 2 = 97 seconds

% Error

Route 1:

$$\left(\frac{35-33}{33}\right)100 = 6.06\%$$

Route 2:

$$\left(\frac{100-97}{97}\right)100 = 3.09\%$$

| Route | Length | Predicted Time | Actual Time | % Error |
|-------|----------|----------------|-------------|---------|
| 1 | 38m | 33sec | 35sec | 6.06% |
| 2 | 118m/60m | 100sec | 97sec | 3.09% |

Taifeadtar sonraí go córasach agus leantar nósanna imeachta oiriúnacha matamaiticiúla.

Locker to Science Lab

In order for me to find the quickest route to the science lab, I will have to measure the distance of stairs, I will get back to this later. for now I will calculate the distance of the routes without the stairs, then add the distance of the stairs later.

Route 1 (without stairs): Outside

Route 2 (without stairs) Inside

Route 3 (without stairs) Inside and then through the courtyard.

Route 1 = 85m

Route 2 = 110m

Route 3 = 105m

Úsáidtear focail chun léargas a thabhairt ar an bhfadhb.

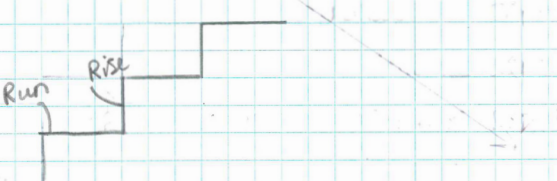
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Locker to science lab

Distance of the stairs
there are 2 steps and they are used in every route

The height of each step is known as the Rise

The length of each step is known as the Run

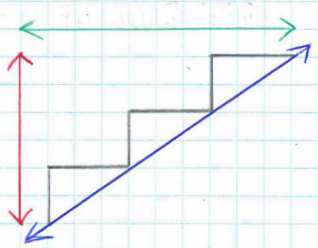


The Stringer Length is the total length of the stairs, we find this using Pythagoras' theorem

Locker to Science Lab

Pythagoras' Theorem

Red Line = Total Rise
Green Line = Total Run
Blue Line = Stringer Length



Green Line: a
Red Line: b
Blue Line: c

$$a^2 + b^2 = c^2 \quad \text{or} \quad c = \sqrt{a^2 + b^2}$$

Leantar nósanna imeachta matamaiticiúla agus úsáidtear teanga chruinn mhatamaiticiúil, nodaireacht shiombalach agus léirithe amhairc.

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Locker to Science Lab

Now that I know how to calculate the distance of stairs using Pythagoras' theorem, I will calculate the distance of the stairs in the routes

Run = 30 cm Total Run = 90 cm
Rise = 15 cm Total Rise = 45 cm
Number of steps = 3
Stirmer Length: =

$a = 90$ $b = 45$ $c = ?$
 $90^2 + 45^2 = c^2$
 $90^2 + 45^2 = 10125$
 $\sqrt{10125} = 100.6 \text{ cm} \rightarrow \text{Round to } 102 \text{ cm}$

Route 1 = $102 - 85 = 95.2 \text{ m}$
Route 2 = $102 - 110 = 111.2 \text{ m}$
Route 3 = $102 + 105 = 106.2 \text{ m}$
↑ Round each one down

Locker to Science Lab

Route 1: 95 m = 95.2 m
Route 2: 111 m = 111.2 m
Route 3: 106 m = 106.2 m

Estimated Time:

Route 1:
 $95 \times 0.84 = 79.8 \text{ sec}$
Round to = 78 seconds

Route 2:
 $0.84 \times 111 = 93.24 \text{ sec}$
Round to 93 seconds

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Locker to Science Lab

Estimated Time:

Route 3:

$$0.84 \times 106 = 89.04$$

Round to 89 seconds

Actual Time:

Route 1 = 68 seconds
Route 2 = 93 seconds
Route 3 = 95 seconds

% Error:

Route 1: $(\frac{78-68}{68})100 = 14.7\%$

Route 2: $(\frac{93-93}{93})100 = 0\%$

Route 3: $(\frac{95-89}{95})100 = 6.3\%$

Locker To Science Lab

| Route | Length | Predicted Time | Actual Time | % Error |
|-------|--------|----------------|-------------|---------|
| 1 | 95m | 78sec | 68sec | 14.7% |
| 2 | 111m | 93sec | 93sec | 0% |
| 3 | 106m | 89sec | 95sec | 6.3% |

Leantar nósanna imeachta oiriúnacha matamaiticiúla

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Locker To Room 11

There are 2 routes to room 11
Route 1: Inside the building
Route 2: Outside the building

Lengths:
Route 1 = 87 m 90 cm
Route 2 = 79 m 20 cm

Predicted Time:
Route 1:
 $0.84 \times 87 = 73.08$
 $\frac{(0.84)9}{10} = 0.756$
 $0.756 + 73.08 = 73.836 \text{ sec}$ → Round to 74

Locker To Room 11

Predicted Time
Route 2:
 $79 \times 0.84 = 66.36$
 $\frac{(0.84)2}{10} = 0.168$
 $66.36 + 0.168 = 66.528 \text{ sec}$ → Round to 67

Actual Time:
Route 1: 63 sec
Route 2: 57 sec

% Error:
Route 1:
 $\frac{(74-63)}{63} 100 = 17.460317\%$ → Round to 18%
Route 2:
 $\frac{(67-57)}{57} 100 = 17.5438\%$ → Round to 18%

Leantar nósanna
imeachta
oiriúnacha
matamaiticiúla

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Locker to Room 11

| Route | Length | Predicted Time | Actual Time | % Error |
|-------|----------|----------------|-------------|---------|
| 1 | 87m 90cm | 74 sec | 63 sec | 18% |
| 2 | 79m 20cm | 67 sec | 57 sec | 18% |

Locker to Room 40

Room 40 is the first room so far to be in the gallery, which is a different building from the one I've been in so far. The gallery has two floors that are both the same and has 2 sets of stairs, also the same. Room 40 is on the ground floor so I won't have to calculate the length of the stairs.

Route 1 = From the front entrance of the gallery.

Route 2 = From the back entrance of the gallery.

Route 3 = From the back entrance, walking from the front.

Route 4 = The back entrance walking from the side.

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Locker to Room 40

Route 1 = 66 m
Route 2 = 101 m
Route 3 = 101 m
Route 4 = 99 m

Predicted Time

Route 1: $0.84 \times 66 = 55.44 \text{ sec}$ → Round to 55 sec
Route 2: $0.84 \times 101 = 84.84 \text{ sec}$ → Round to 85 sec
Route 3: $0.84 \times 101 = 84.84 \text{ sec}$ → Round to 85 sec
Route 4: $0.84 \times 99 = 83.16 \text{ sec}$ → Round to 83 sec

Locker to Room 40

Actual Time:

Route 1 = 45 sec
Route 2 = 70 sec
Route 3 = 66 sec
Route 4 = 66 sec

% Error

Route 1:
 $\frac{(55 - 45)}{45} \times 100 = 22.2\%$ → Round to 22%

Route 2:
 $\frac{(85 - 70)}{70} \times 100 = 21.4\%$ → Round to 21%

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Locker to Room 40

% Error

Route 3: $\frac{(85-66)}{66} \times 100 = 28.78\%$ Round to 29%

Route 4: $\frac{(83-66)}{66} \times 100 = 25.75\%$ Round to 26%

| Route | Length | Predicted Time | Actual Time | % Error |
|-------|--------|----------------|-------------|---------|
| 1 | 66m | 55sec | 45sec | 22% |
| 2 | 101m | 85sec | 70sec | 21% |
| 3 | 101m | 85sec | 66sec | 29% |
| 4 | 99m | 83sec | 66sec | 26% |

Locker to Music Room

The Music Room is also in the gallery and is on the second floor. I will have to use Pythagoras' theorem to find distance of the stairs.

Route 1: Front entrance of the gallery + the stairs at the front

Route 2: Back entrance of the gallery + the stairs at the back

Route 3: The back entrance walking from the front + the back stairs

Route 4: The back entrance of the gallery walking from the side + the stairs at the back

Length (Without Stairs):

Route 1 = 84m
Route 2 = 103m
Route 3 = 102m
Route 4 = 101m

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Locker to Music Room

Distance of stairs:

The distance of the stairs are the same at the front and back of the gallery.

Run = 30 cm Total Run = 480 cm
Rise = 19 cm Total Rise = 304 cm
Number of Steps = 16

Stringer Length:

$a = 480$ $b = 304$ $c = ?$

$480^2 + 304^2 = 322816$

$\sqrt{322816} = 568.1689889$

Round to 568 cm

Locker to Music Room

Distance of total route:

Route 1: $84 + 5 \cdot 68 = 89.68$ m
Round to 90m

Route 2: $103 + 5 \cdot 68 = 108.68$
Round to 109m

Route 3: $102 + 5 \cdot 68 = 107.68$
Round to 108m

Route 4: $101 + 5 \cdot 68 = 106.68$
Round to 107m

Predicted Time:

Route 1: $0.84 \times 90 = 75.6$ sec

Route 2: $0.84 \times 109 = 91.56$ sec

Route 3: $0.84 \times 108 = 90.72$ sec

Route 4: $0.84 \times 107 = 89.88$ sec

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Locker to Music Room

Predicted Time:

Rounded:

Route 1 = 76 sec
 Route 2 = 92 sec
 Route 3 = 91 sec
 Route 4 = 90 sec

Actual Time

Route 1: 68 sec
 Route 2: 83 sec
 Route 3: 78 sec
 Route 4: 78 sec

% Error:

Route 1:

$$\frac{(76 - 68)}{68} \times 100 = 12\%$$

Route 2:

$$\frac{(92 - 83)}{83} \times 100 = 11\%$$

Locker to Music Room

% Error:

Route 3:

$$\frac{(91 - 78)}{78} \times 100 = 17\%$$

Route 4:

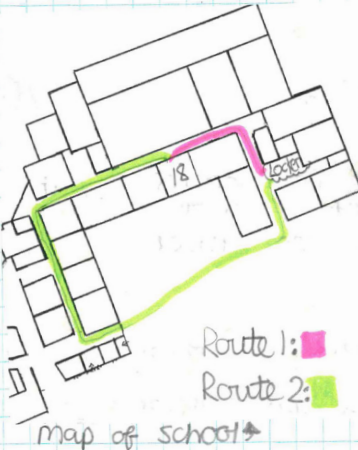
$$\frac{(90 - 78)}{78} \times 100 = 15\%$$

| Route | Length | Predicted Time | Actual Time | % Error |
|-------|--------|----------------|-------------|---------|
| 1 | 90m | 76sec | 68sec | 12% |
| 2 | 109m | 92sec | 83sec | 11% |
| 3 | 108m | 91sec | 78sec | 17% |
| 4 | 107m | 90sec | 78sec | 15% |

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Results: Locker to Room 18

| Route | Length | Predicted Time | Actual Time | % Error |
|-------|----------|----------------|-------------|---------|
| 1 | 26m 90cm | 23 seconds | 23 seconds | 0% |
| 2 | 30m 51cm | 110 seconds | 95 seconds | 15.7% |



Room 18 is my base room, which means it is the room I'm in the most.

Before I started, I thought that route 1 would be the quickest and I was correct.

My predicted time and the actual time were very similar.

At the start of the investigation I assumed that other students in the hall won't slow me → Next Page

Tugtar tuairim maidir le réasúnacht an réitigh agus téitear ar ais chuig na toimhdí.

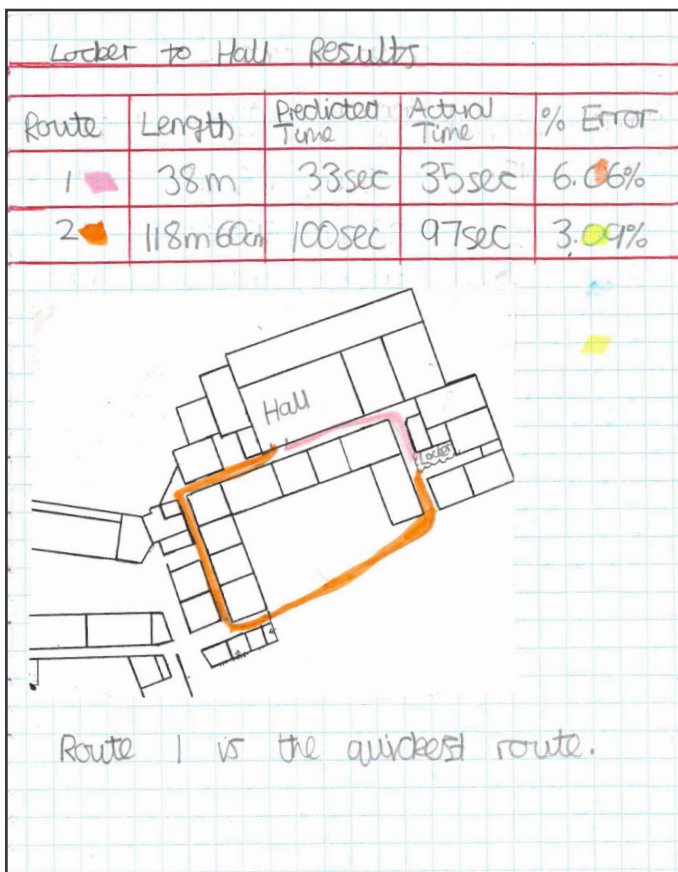
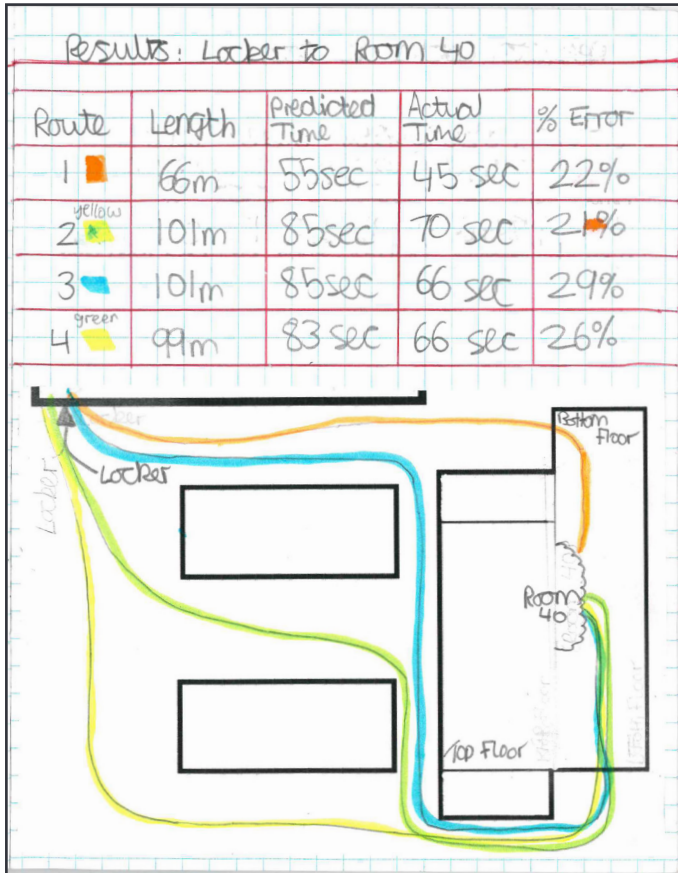
Results: Locker to Room 18

- down, obviously, there will be other students in the corridor but if I assume that it will affect each route, then my results could still be accurate. There is no way to measure extra time caused by students because different students walk at different paces and they walk different routes to different classrooms everyday. This will apply to everything which means it might not be accurate but its the closest way I will get to finding the quickest time.

The quickest route to Room 18 is route 1 and is the route I will be walking from now on.

Tugtar tuairim maidir le réasúnacht an réitigh agus téitear ar ais chuig

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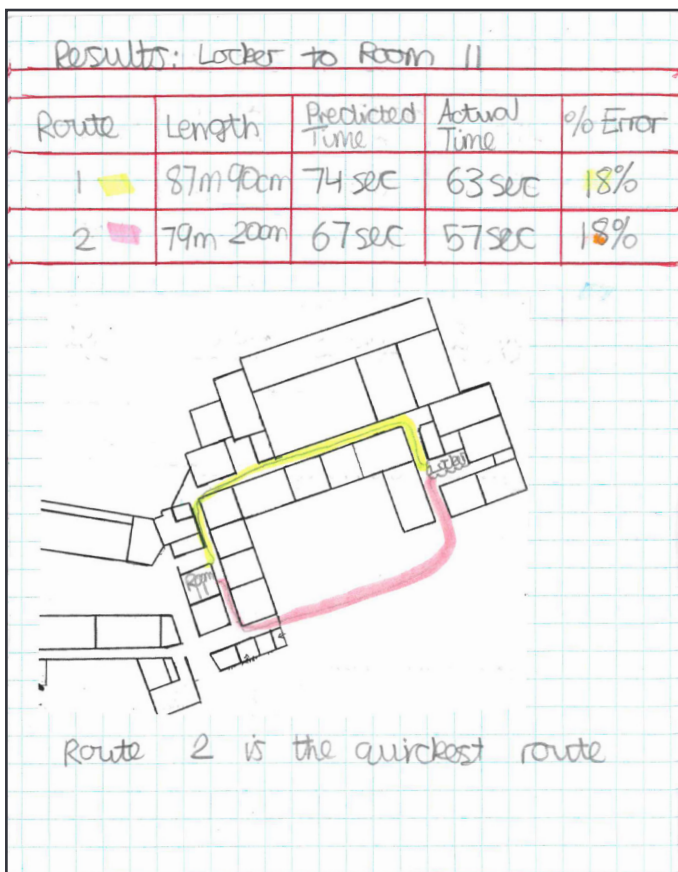
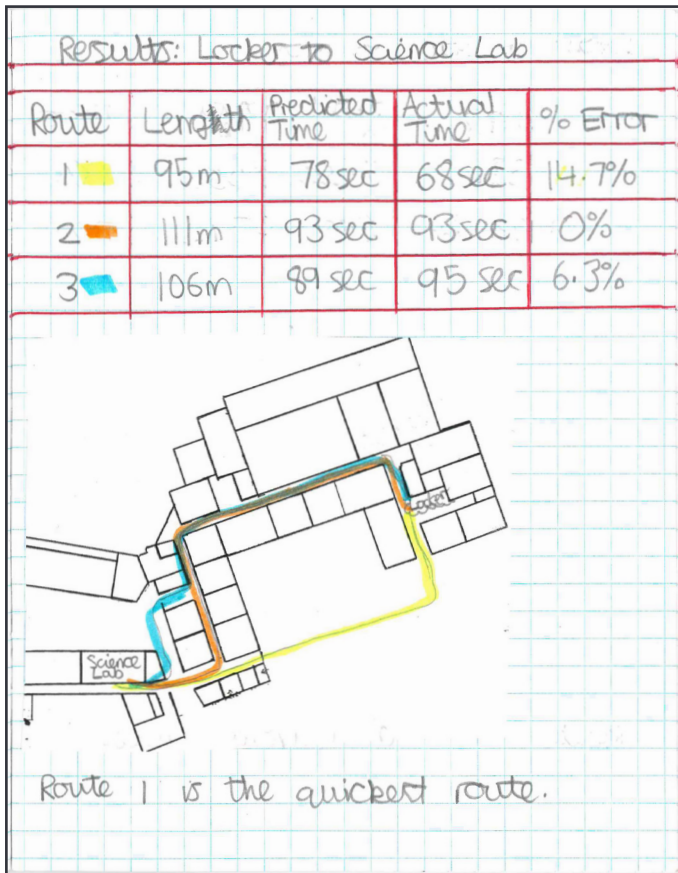


Taifeadtar sonraí go córasach.

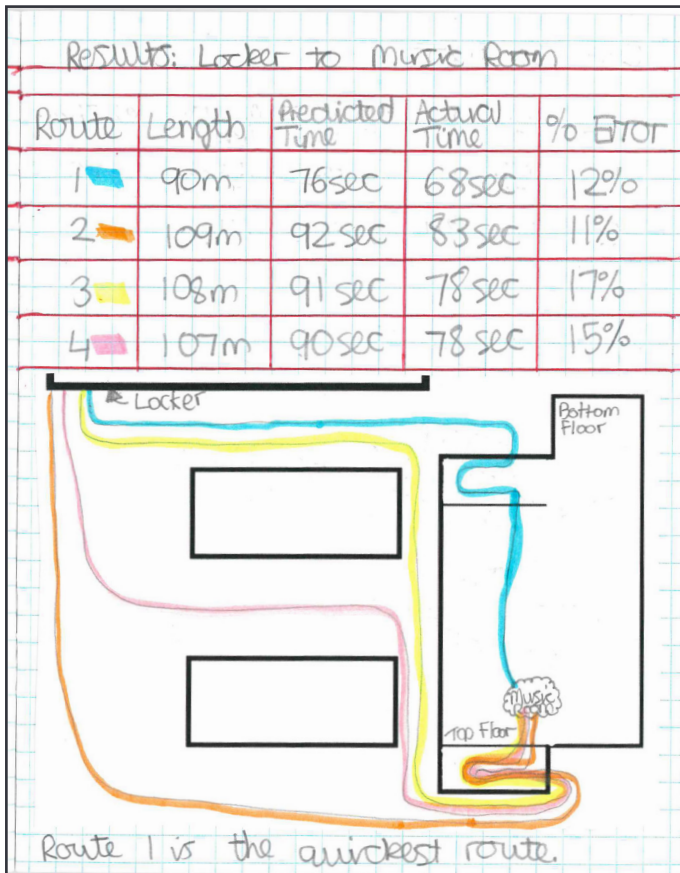
Úsáidtear léirithe amhairc.

Úsáidtear teanga chruinn mhatamaiticiúil.

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CRA Conclusion

I chose to investigate the quickest possible routes to different classrooms in the school from my locker because it is useful information that I can use and save some time moving around the school.

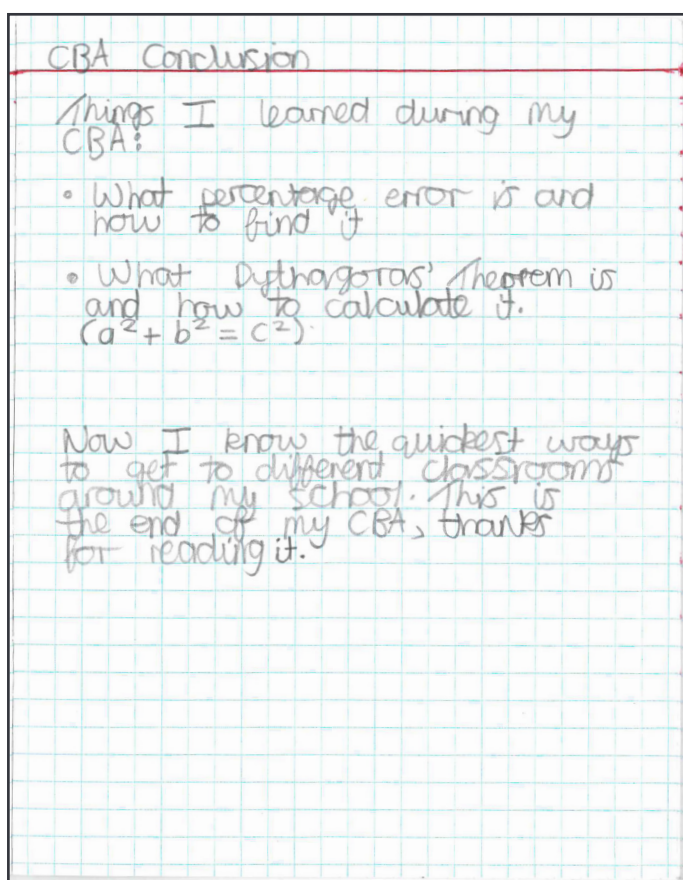
If I was to do this investigation again, some things I would do differently are:

- I wouldn't include as many classrooms because some of the investigation was very repetitive
- I would manage my time better, I spent a lot of time at the start measuring the routes, if I did the investigation again I would measure the routes quicker

Tugtar tuairim maidir le réasúnacht an réitigh agus téitear ar ais chuig na toimhdí.

Aithnítear na gnéithe ar éirigh go maith leo

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Tuairisceoir a bronnadh: Ag teacht leis na hionchais