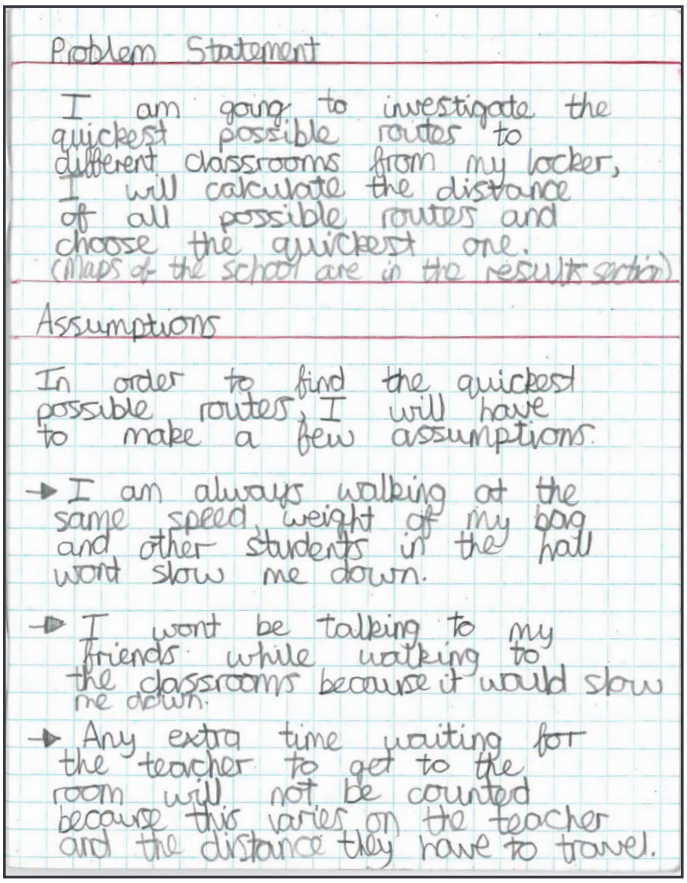
CBA1 Mathematical Investigation: Locker Routes



Problem Statement

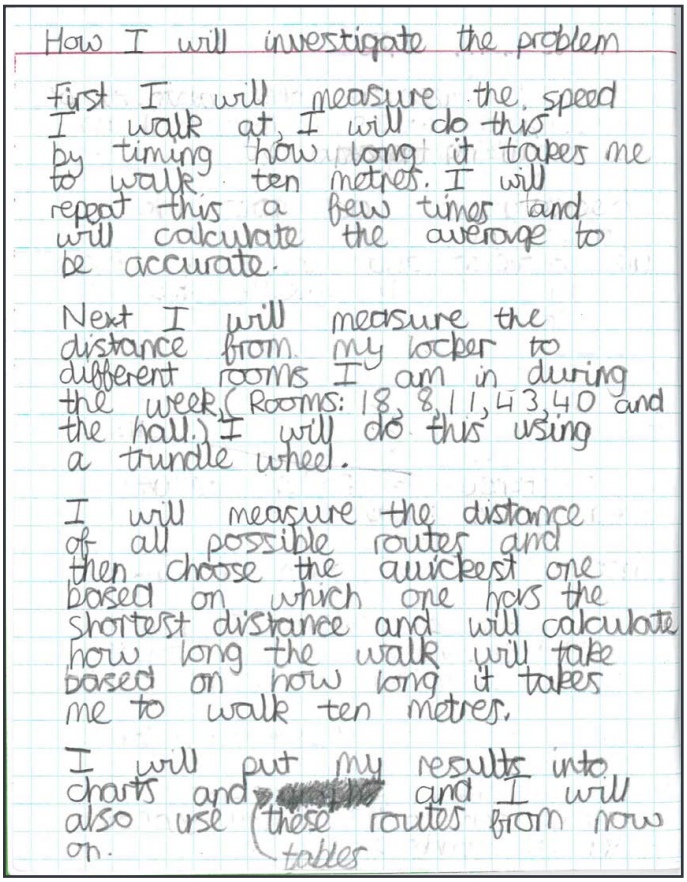
I am going to investigate the quickest possible routes to different classrooms from my locker, I will calculate the distance of all possible routes and choose the quickest one.
(Maps of the school are in the results section)

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 wont slow me down.
- I wont 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.

Poses a problem and statement and attemps to simplify the problem by making assumptions



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.

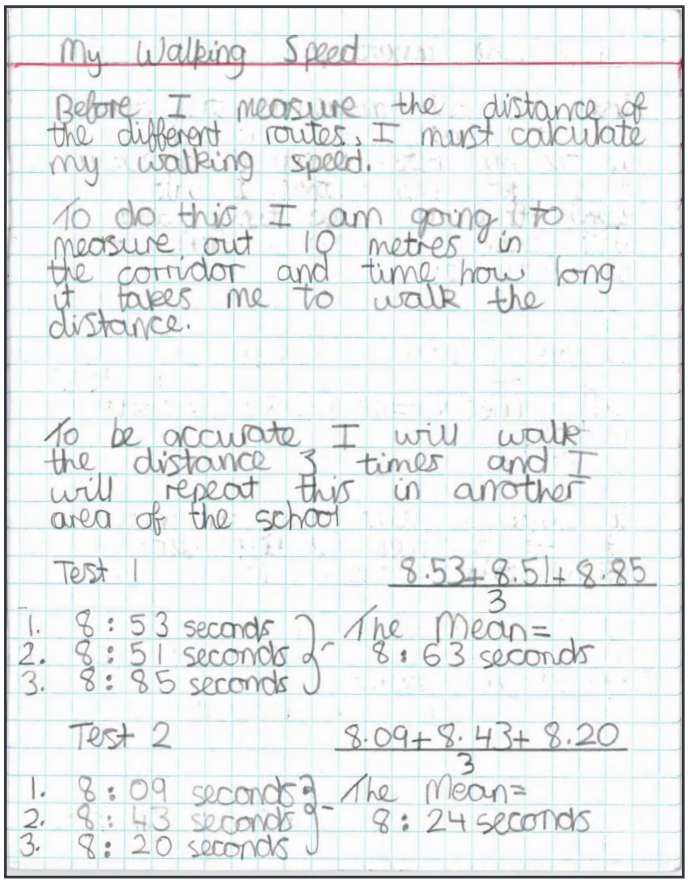
Next I will measure the distance from my locker to different rooms I am in during the week (Rooms: 18, 8, 11, 43, 40 and the hall.) I will do this using a trundle wheel.

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 tables and I will also use these routes from now on.

Chooses an appropriate strategy to enage with the problem

CBA1 Mathematical Investigation: Locker Routes



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

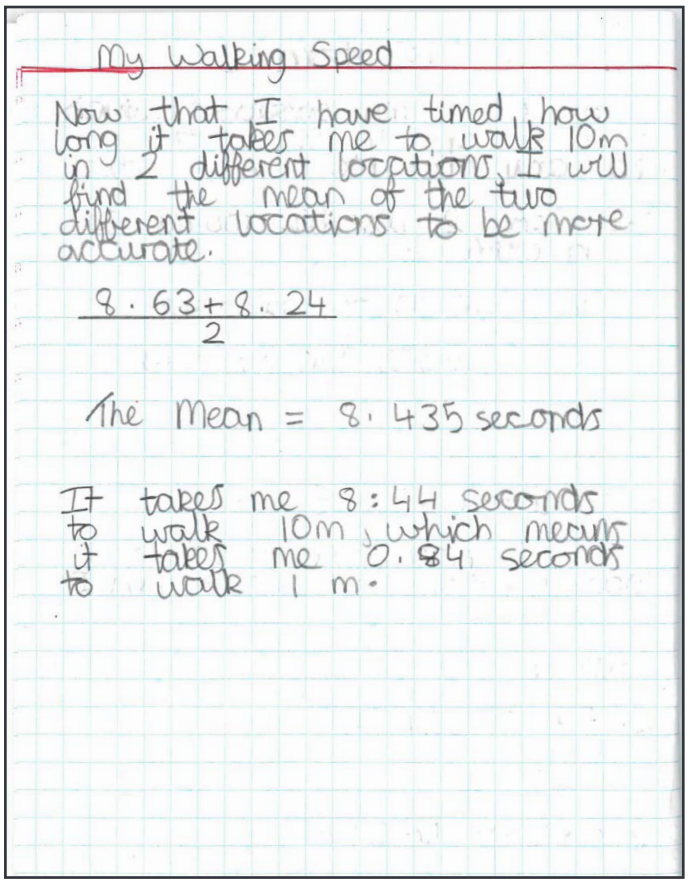
1. 8:53 seconds
2. 8:51 seconds
3. 8:85 seconds

$\frac{8.53+8.51+8.85}{3}$ The Mean = 8:63 seconds

Test 2

1. 8:09 seconds
2. 8:43 seconds
3. 8:20 seconds

$\frac{8.09+8.43+8.20}{3}$ The Mean = 8:24 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.

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

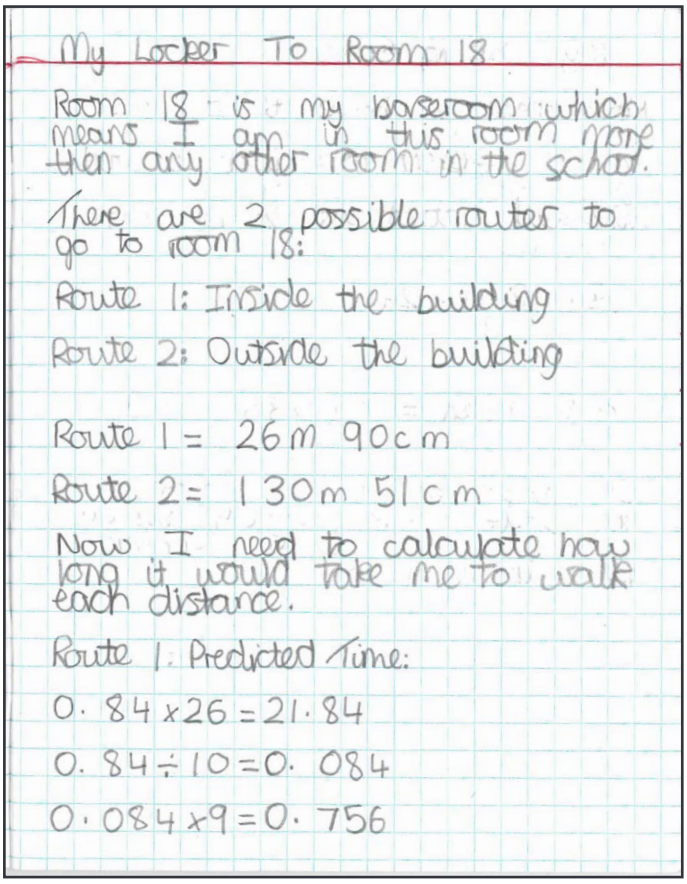
The Mean = 8.435 seconds

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

Breaks the problem down into steps

Suitable mathematical procedures are followed, and accurate mathematical language is used.

CBA1 Mathematical Investigation: Locker Routes



My Locker To Room 18

Room 18 is my baseroom 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

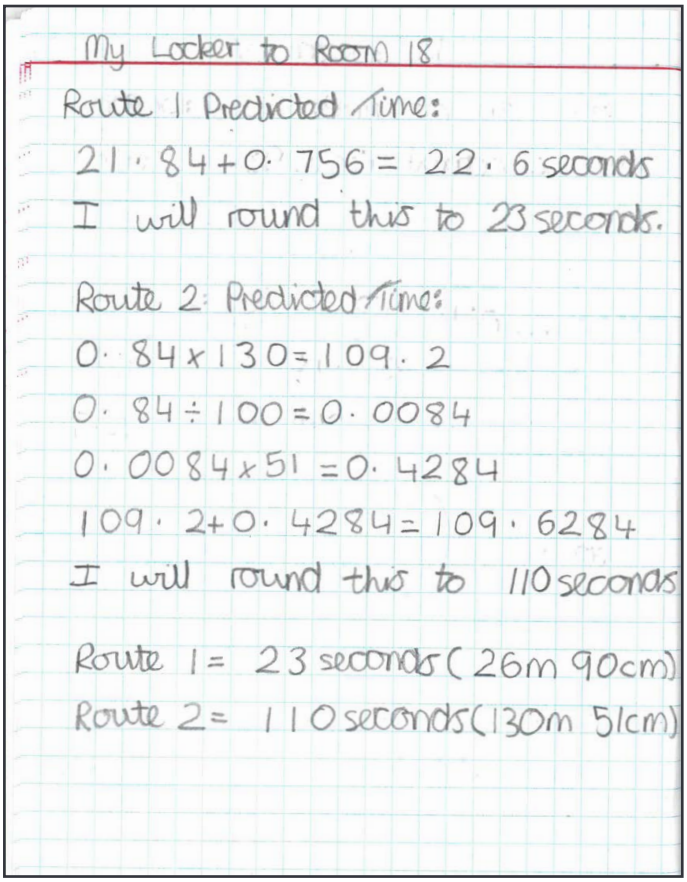
Now I need to calculate how long it would take me to walk each distance.

Route 1: Predicted Time:

0.84 x 26 = 21.84

0.84 ÷ 10 = 0.084

0.084 x 9 = 0.756



My Locker to Room 18

Route 1 Predicted Time:

21.84 + 0.756 = 22.6 seconds

I will round this to 23 seconds.

Route 2: Predicted Time:

0.84 x 130 = 109.2

0.84 ÷ 100 = 0.0084

0.0084 x 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)

CBA1 Mathematical Investigation: Locker Routes

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:

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

Revisists the strategy although not explicitly stated.

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 = 118m 60cm

Route 1:

0.84x38 = 32.92 seconds

Round to 33seconds

Route 2:

0.84x118 = 99.12

0.84÷10 = 0.084

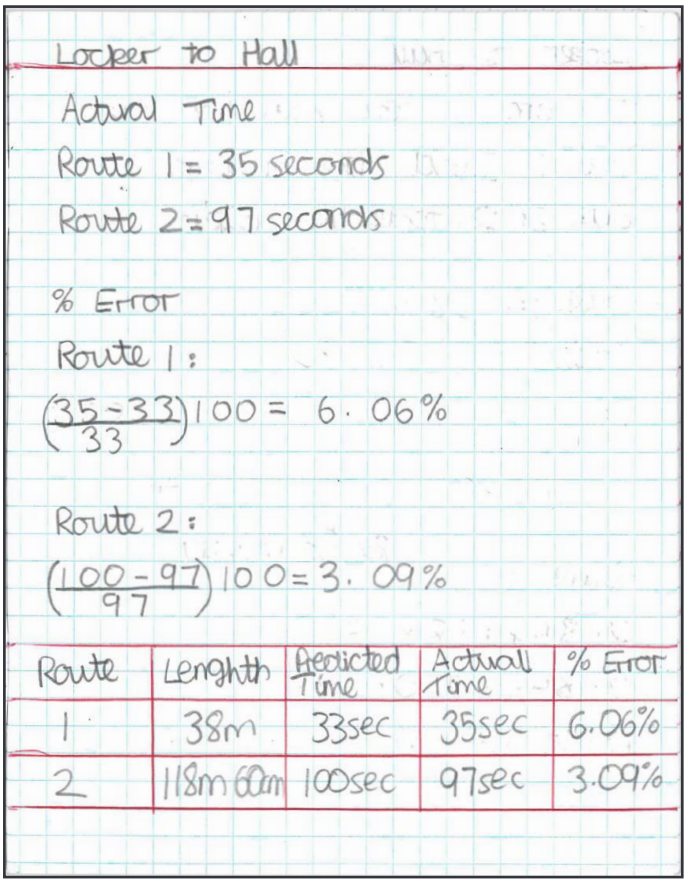
0.084x6 = 0.504

99.12+0.504 = 99.624second

Round to 100seconds

Suitable mathematical procedures are followed.

CBA1 Mathematical Investigation: Locker Routes



Locker to Hall

Actual Time

Route 1 = 35 seconds

Route 2 = 97 seconds

% Error

Route 1:

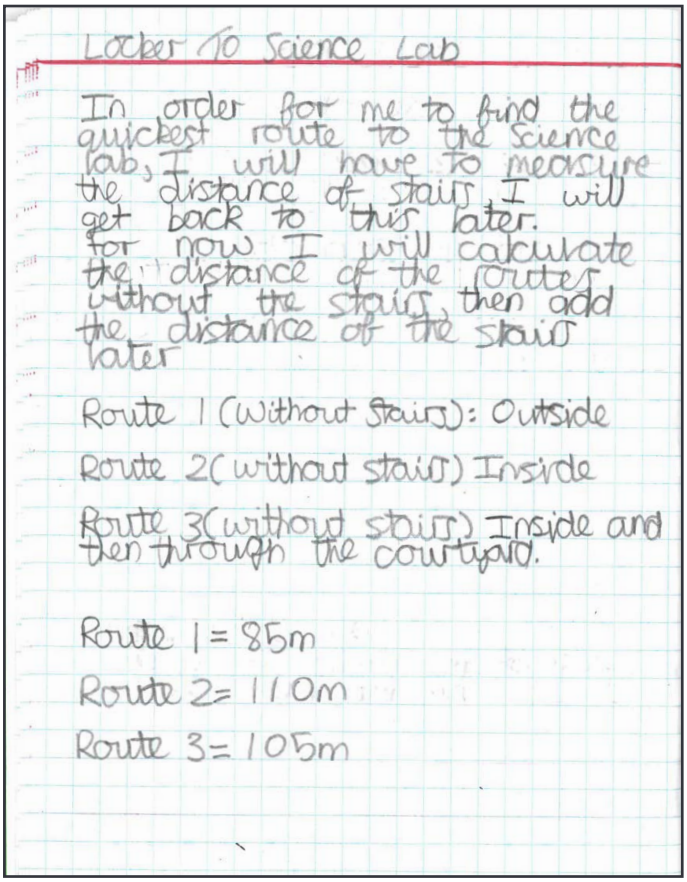
$\left(\frac{35-33}{33}\right)100 = 6.06\%$

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 60cm	100sec	97sec	3.09%

Records data systematically and follows suitable mathematical procedures.



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.

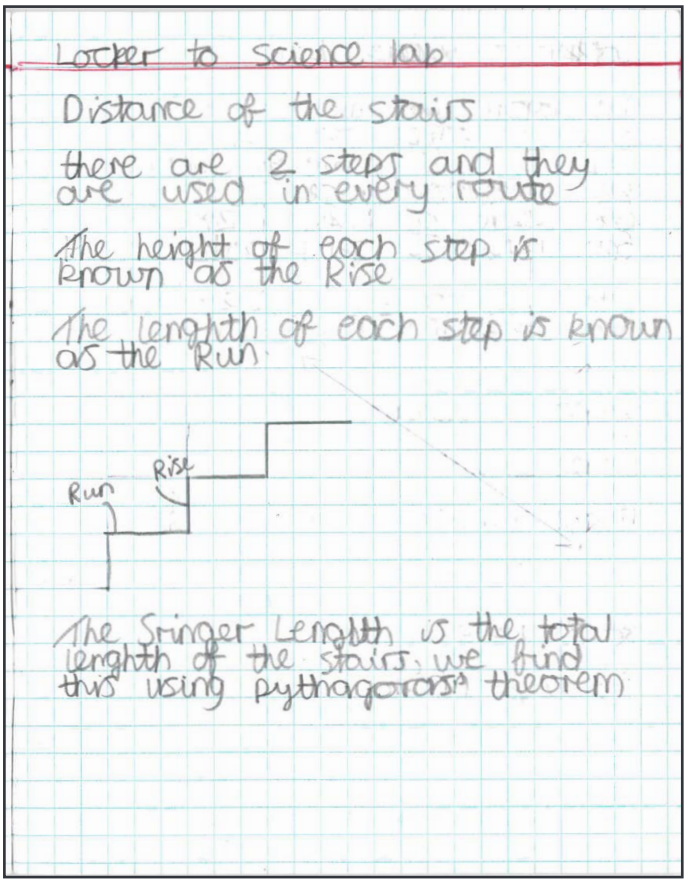
Route 1 = 85m

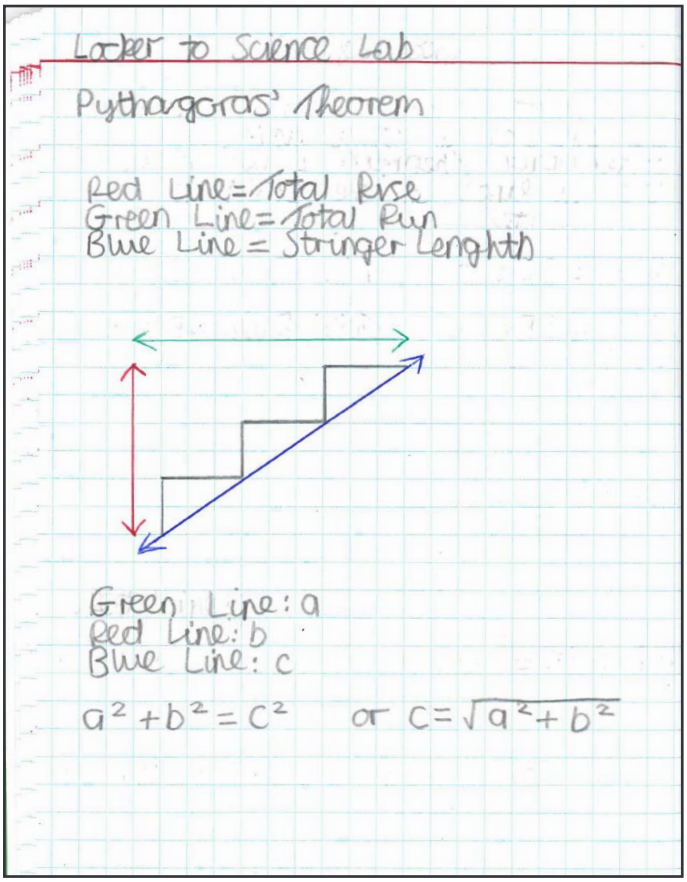
Route 2 = 110m

Route 3 = 105m

Words are used to provide insights into the problem.

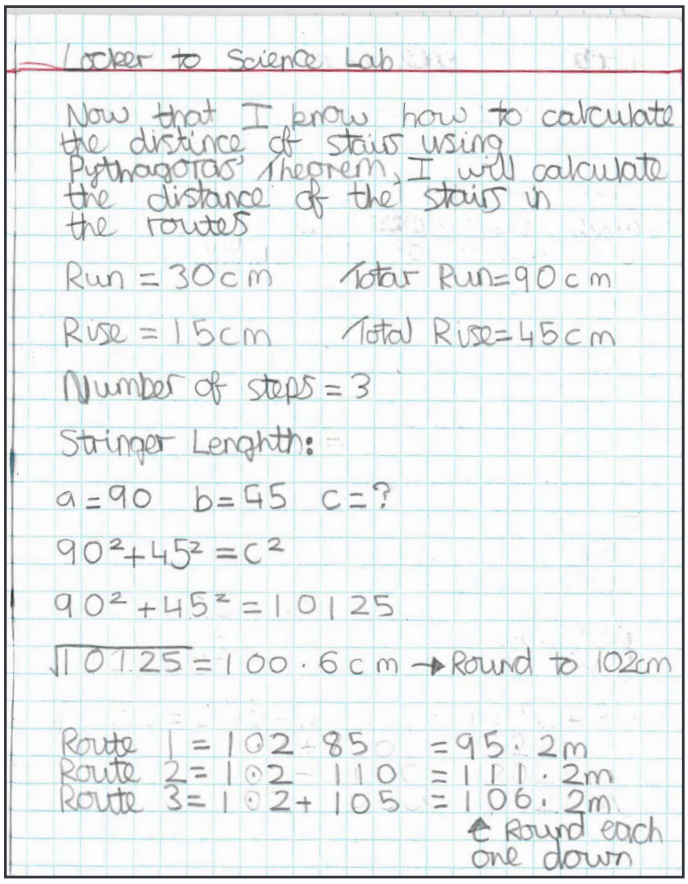
CBA1 Mathematical Investigation: Locker Routes





Mathematical procedures are followed and accuarate mathematical language symbolic notation and visual representations are used.

CBA1 Mathematical Investigation: Locker Routes



Locker to Science Lab

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

Run = 30cm Total Run=90cm

Rise = 15cm Total Rise=45cm

Number of steps = 3

Stringer Lenghth:

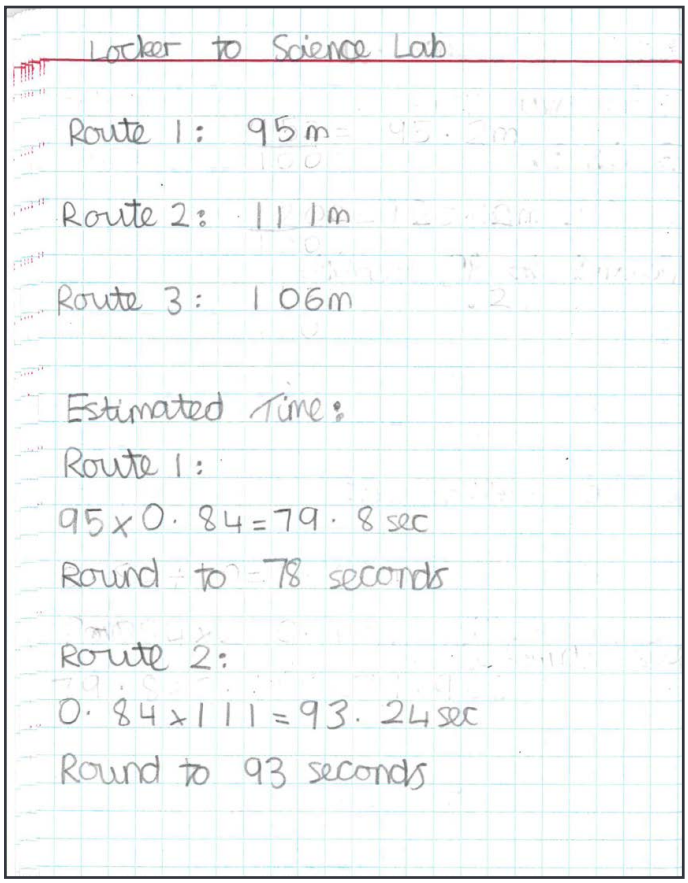
a=90 b=45 c=?

$90^2+45^2=c^2$

$90^2+45^2=10125$

$\sqrt{10125}=100.6\,cm$ → Round to 102cm

Route 1 = 102 - 85 = 95.2m
Route 2 = 102 + 110 = 111.2m
Route 3 = 102 + 105 = 106.2m
← Round each one down



Locker to Science Lab

Route 1: 95m

Route 2: 111m

Route 3: 106m

Estimated Time:

Route 1:

$95 \times 0.84 = 79.8$ sec

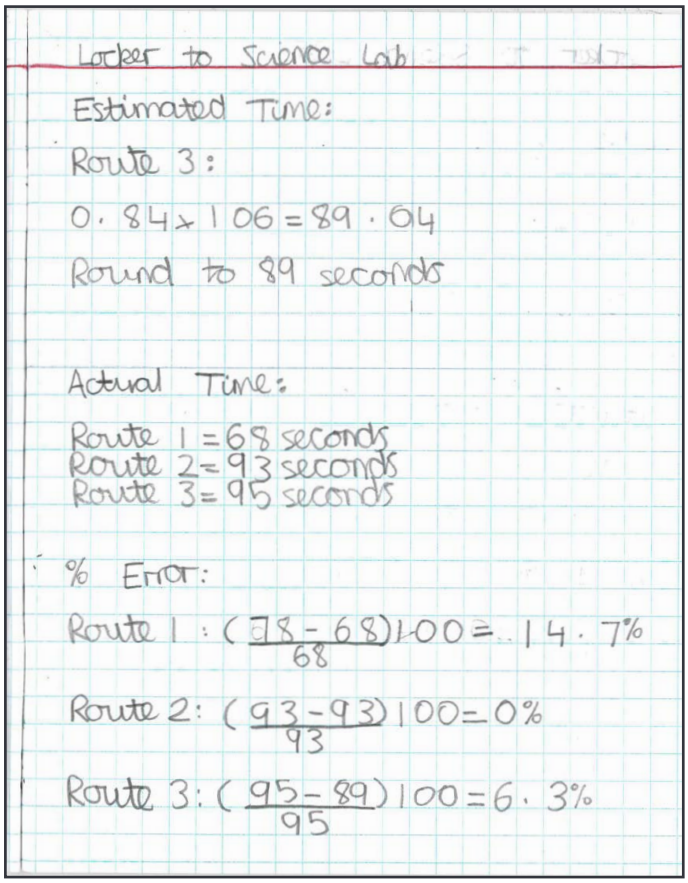
Round to 78 seconds

Route 2:

$0.84 \times 111 = 93.24$ sec

Round to 93 seconds

CBA1 Mathematical Investigation: Locker Routes



Locker to Science Lab

Estimated Time:

Route 3:

$0.84 \times 106 = 89.04$

Round to 89 seconds

Actual Time:

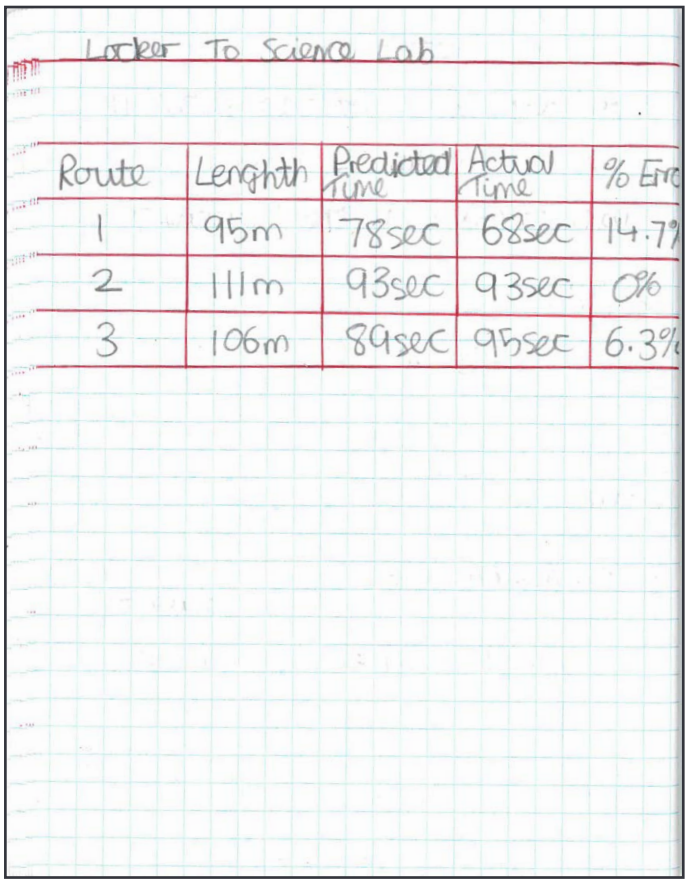
Route 1 = 68 seconds
Route 2 = 93 seconds
Route 3 = 95 seconds

% Error:

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

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

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

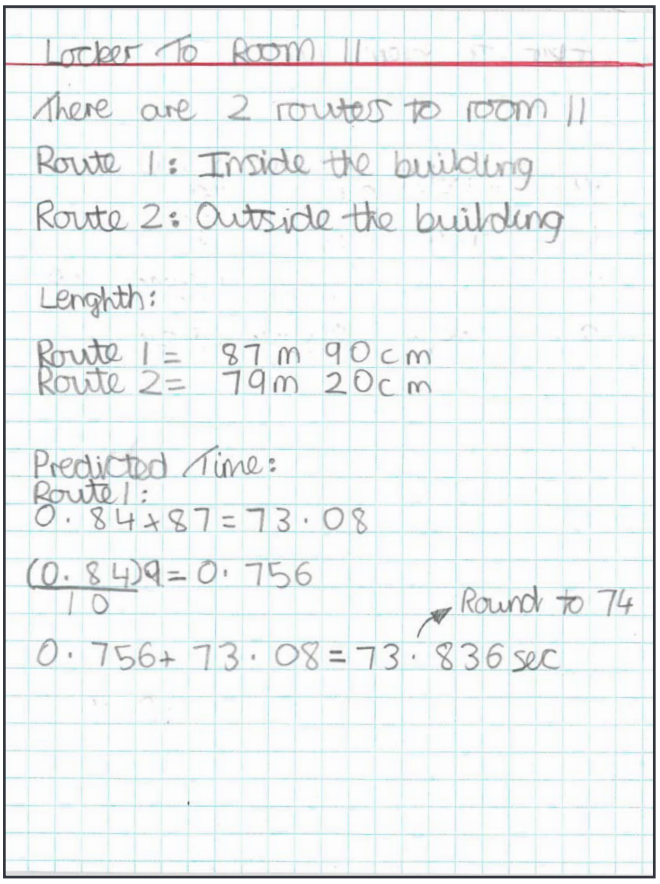


Locker To Science Lab

Route	Lenghth	Predicted Time	Actual Time	% Err
1	95m	78sec	68sec	14.7%
2	111m	93sec	93sec	0%
3	106m	89sec	95sec	6.3%

Suitable mathematical procedures are followed

CBA1 Mathematical Investigation: Locker Routes



Locker To Room 11

There are 2 routes to room 11

Route 1: Inside the building

Route 2: Outside the building

Lenghth:

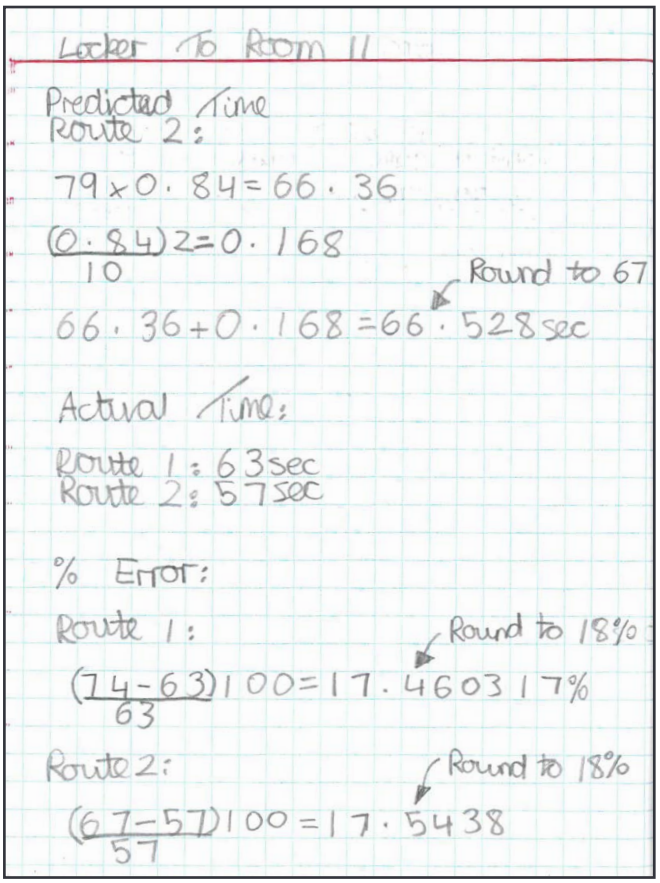
Route 1 = 87 m 90 cm
Route 2 = 79m 20cm

Predicted Time:
Route 1:
$0.84 \times 87 = 73.08$

$\frac{(0.84)}{10}9 = 0.756$

Round to 74

$0.756 + 73.08 = 73.836$ sec



Locker To Room 11

Predicted Time
Route 2:

$79 \times 0.84 = 66.36$

$\frac{(0.84)}{10}2 = 0.168$

Round to 67

$66.36 + 0.168 = 66.528$ sec

Actual Time:

Route 1: 63sec
Route 2: 57sec

% Error:

Route 1:

Round to 18%

$\frac{(74-63)}{63}100 = 17.460317\%$

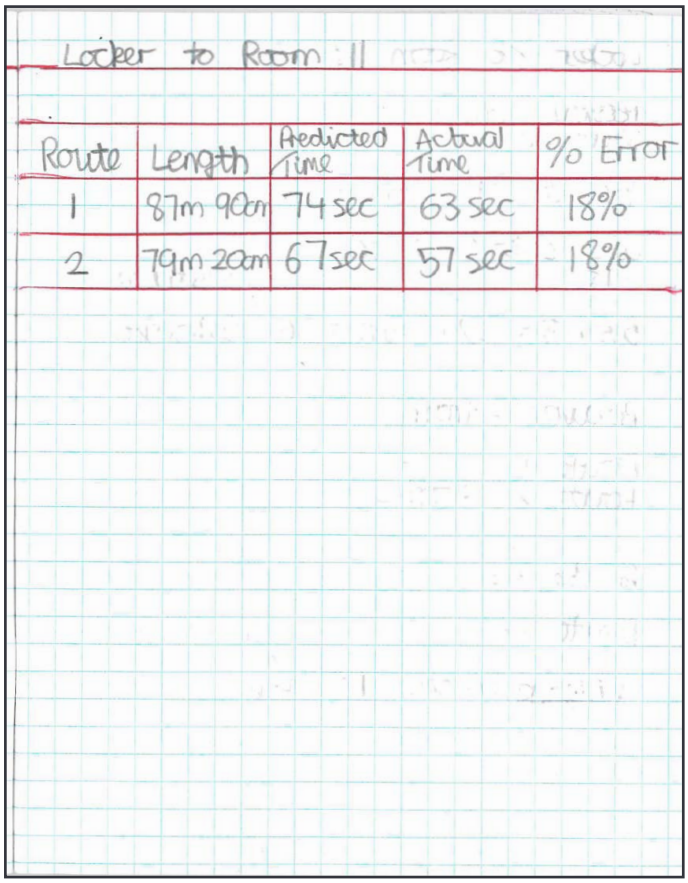
Route 2:

Round to 18%

$\frac{(67-57)}{57}100 = 17.5438$

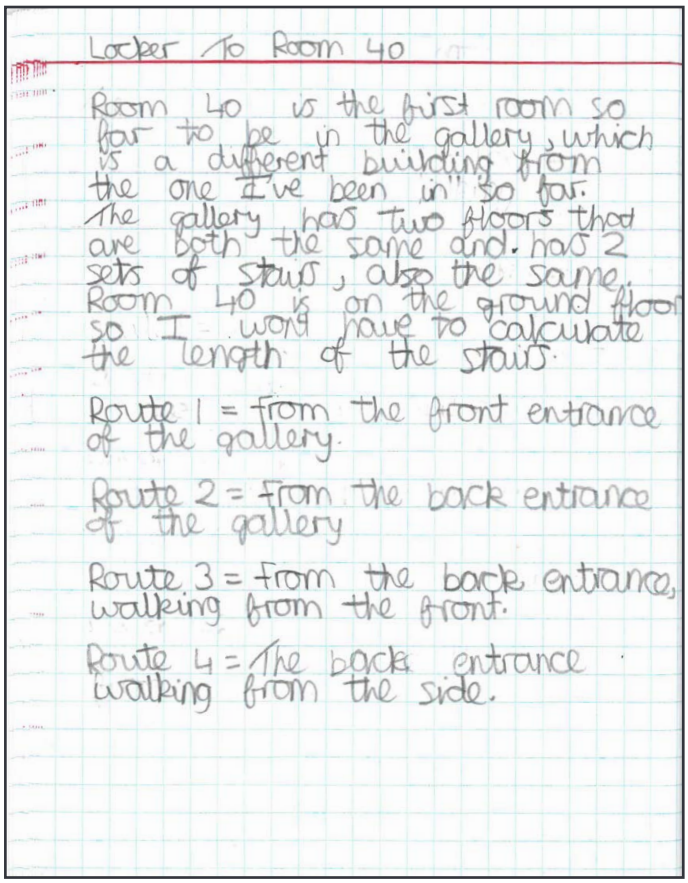
Suitable mathematical procedures are followed

CBA1 Mathematical Investigation: Locker Routes



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.

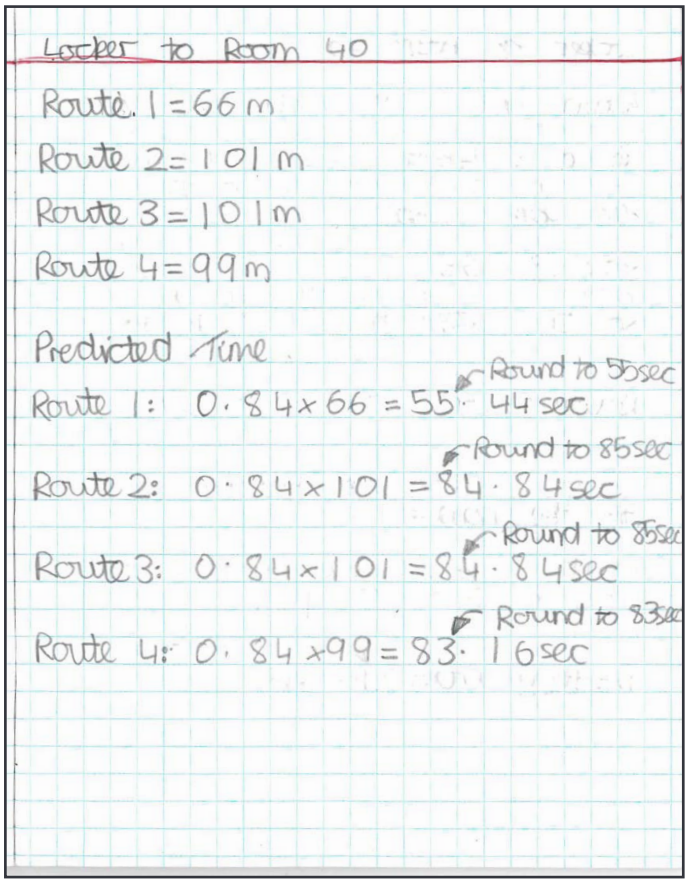
Route 1 = from the front entrance of the gallery.

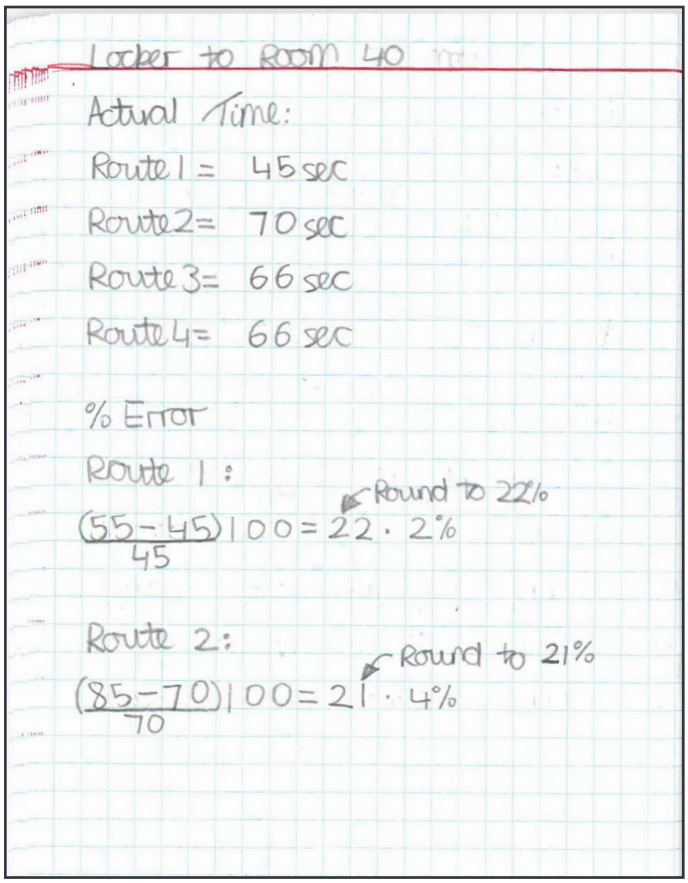
Route 2 = from the back entrance of the gallery

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

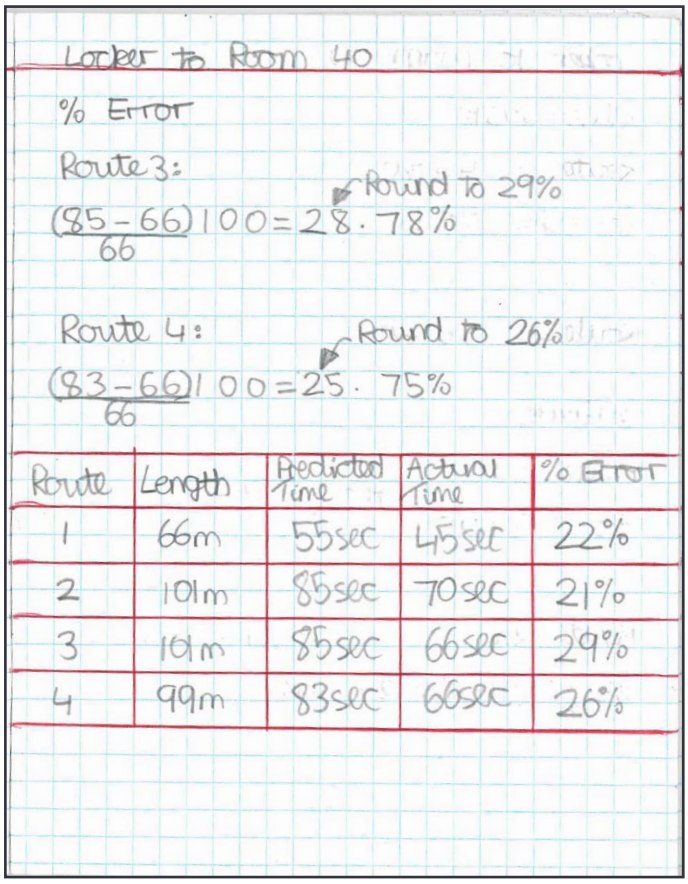
Route 4 = The back entrance walking from the side.

CBA1 Mathematical Investigation: Locker Routes





CBA1 Mathematical Investigation: Locker Routes



Locker to Room 40

% Error

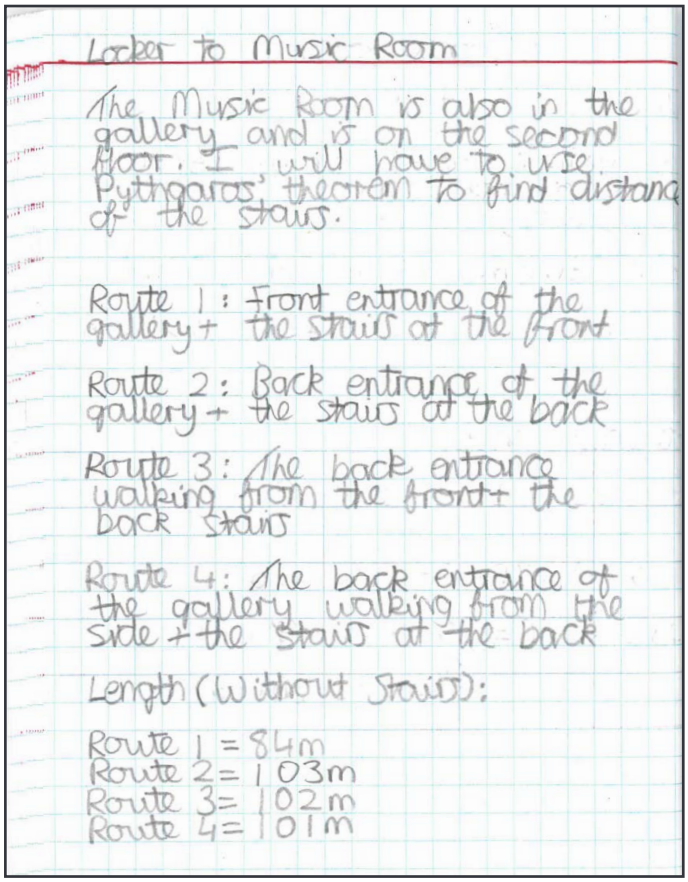
Route 3:

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

Route 4:

$\frac{(83-66)}{66} 100 = 25.75\%$ 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 Pythgaras' 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

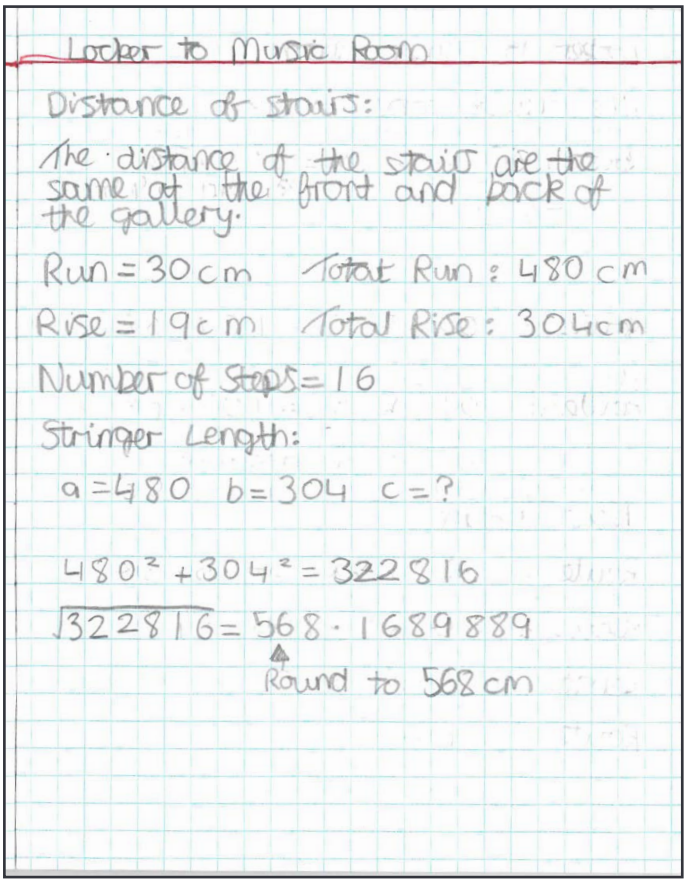
Route 3: The back entrance walking from the front + the back stairs

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

CBA1 Mathematical Investigation: Locker Routes



Locker to Music Room

Distance of stairs:

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

Run = 30cm Total Run: 480 cm

Rise = 19cm Total Rise: 304cm

Number of Steps = 16

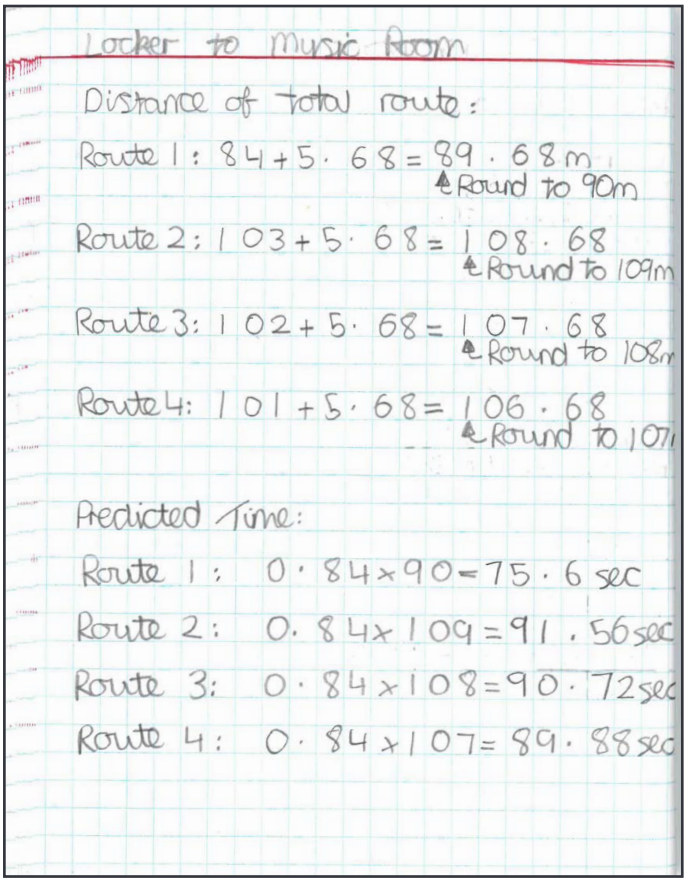
Stringer Length:

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 + 5.68 = 89.68m
Round to 90m

Route 2: 103 + 5.68 = 108.68
Round to 109m

Route 3: 102 + 5.68 = 107.68
Round to 108m

Route 4: 101 + 5.68 = 106.68
Round to 107

Predicted Time:

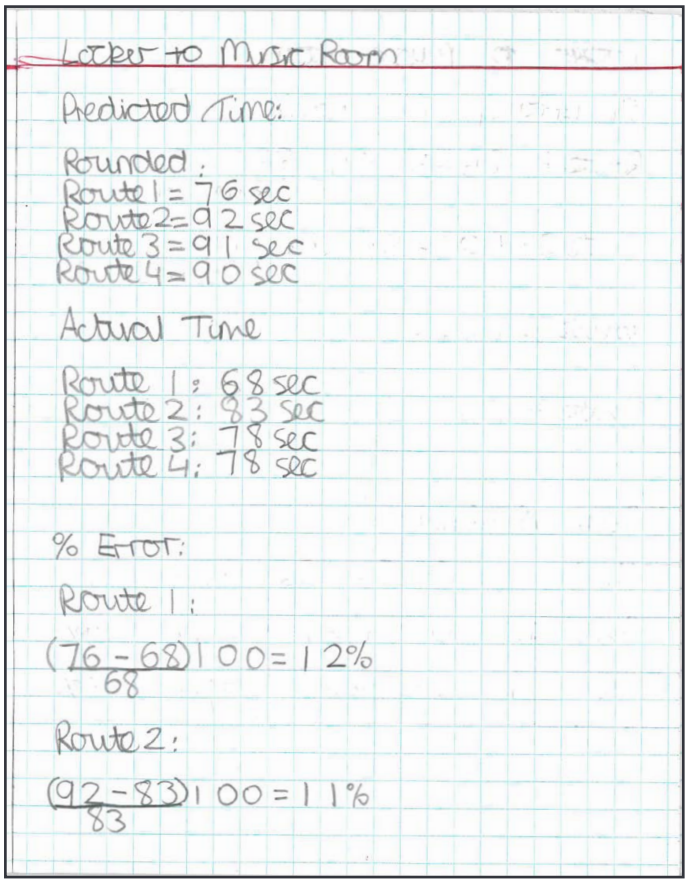
Route 1: 0.84 × 90 = 75.6 sec

Route 2: 0.84 × 109 = 91.56 sec

Route 3: 0.84 × 108 = 90.72 sec

Route 4: 0.84 × 107 = 89.88 sec

CBA1 Mathematical Investigation: Locker Routes



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

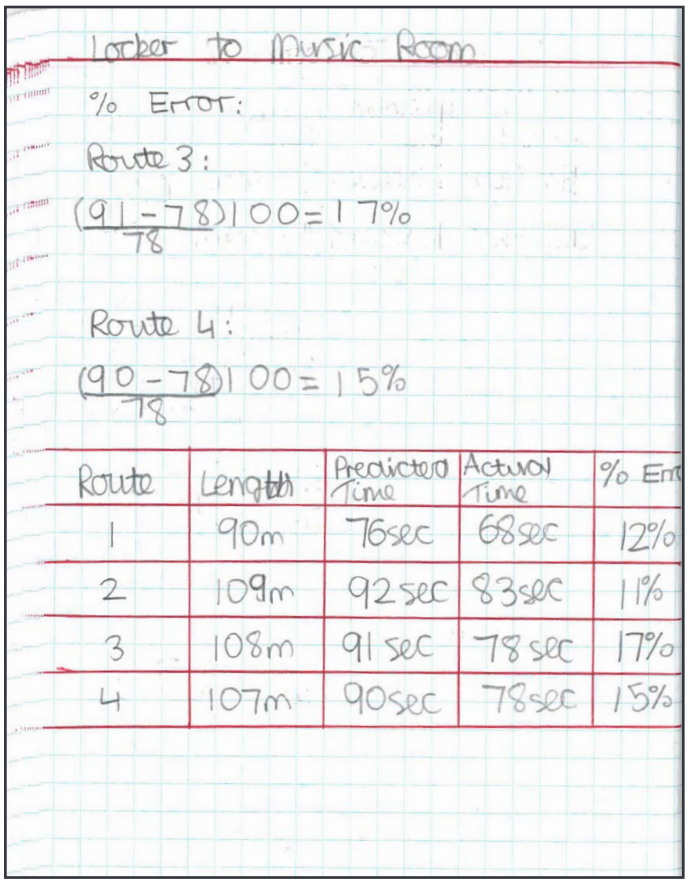
% Error:

Route 1:

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

Route 2:

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



Locker to Music Room

% Error:

Route 3:

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

Route 4:

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

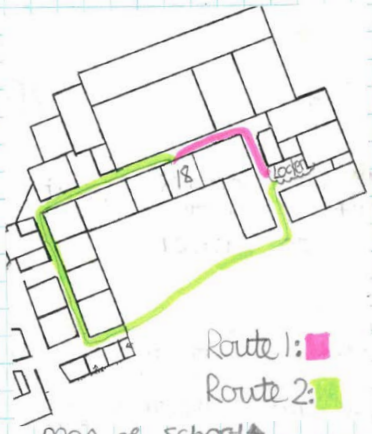
Route	Length	Predicted Time	Actual Time	% Error
1	90m	76sec	68sec	12%
2	109m	92sec	83sec	11%
3	108m	91sec	78sec	17%
4	107m	90sec	78sec	15%

CBA1 Mathematical Investigation: Locker Routes

Results: Locker to Room 18

Locker to Room 18

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



Map of school

At the start of the investigation I assumed that other students in the hall wont slow me

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.

Comments on the reasonableness of the solution.

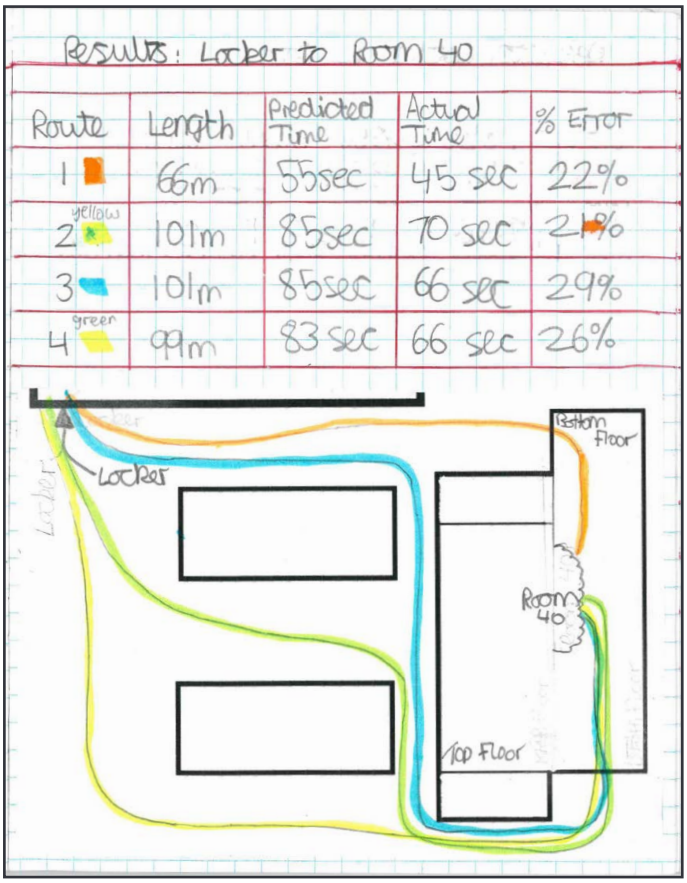
Results: Locker to Room 18

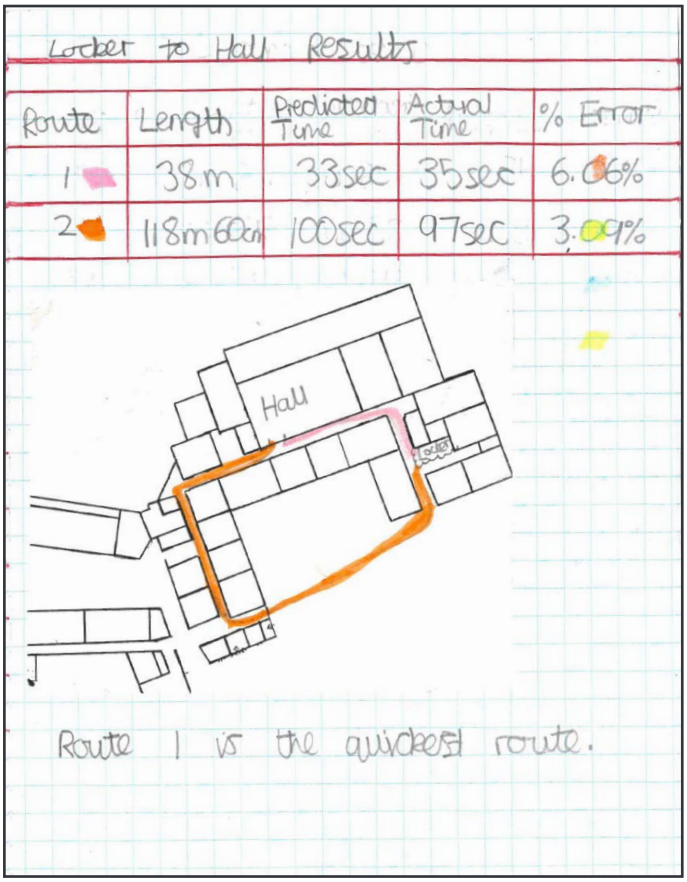
- down, obviously there will be other students in the corridor but if I assume that it will affect each route then my results could still be accurate. There is no way to measure extra time caused by students because different students walk at different paces and they walk different routes to different 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.

Comments on the reasonableness of the solution and revisits assumptions.

CBA1 Mathematical Investigation: Locker Routes





Records data systematically

Visual representations are used

Accurate mathematical language is used.

CBA1 Mathematical Investigation: Locker Routes

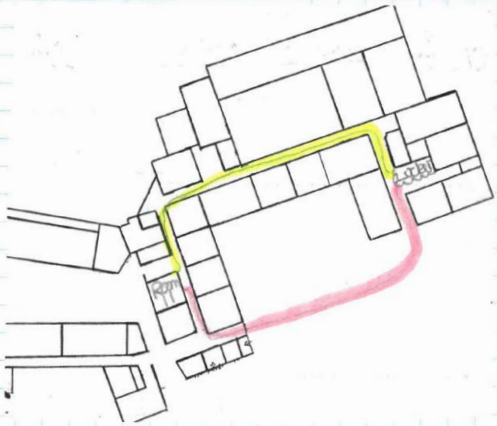
Results: Locker to Science Lab

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

Route 1 is the quickest route.

Results: Locker to Room 11

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

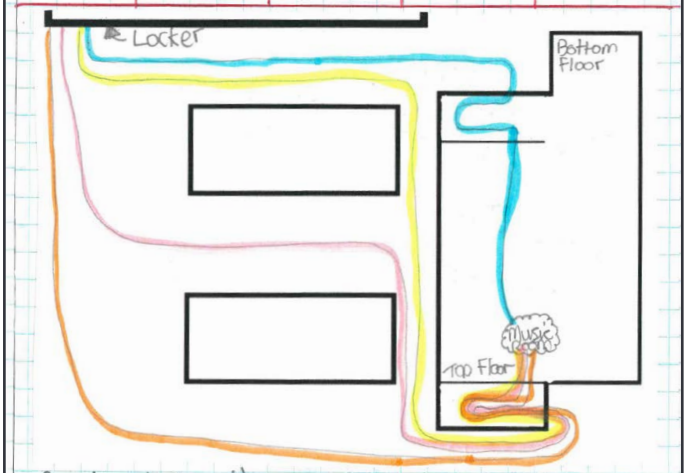


Route 2 is the quickest route

CBA1 Mathematical Investigation: Locker Routes

Results: Locker to Music Room

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%



Route 1 is the quickest route.

CBA 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.

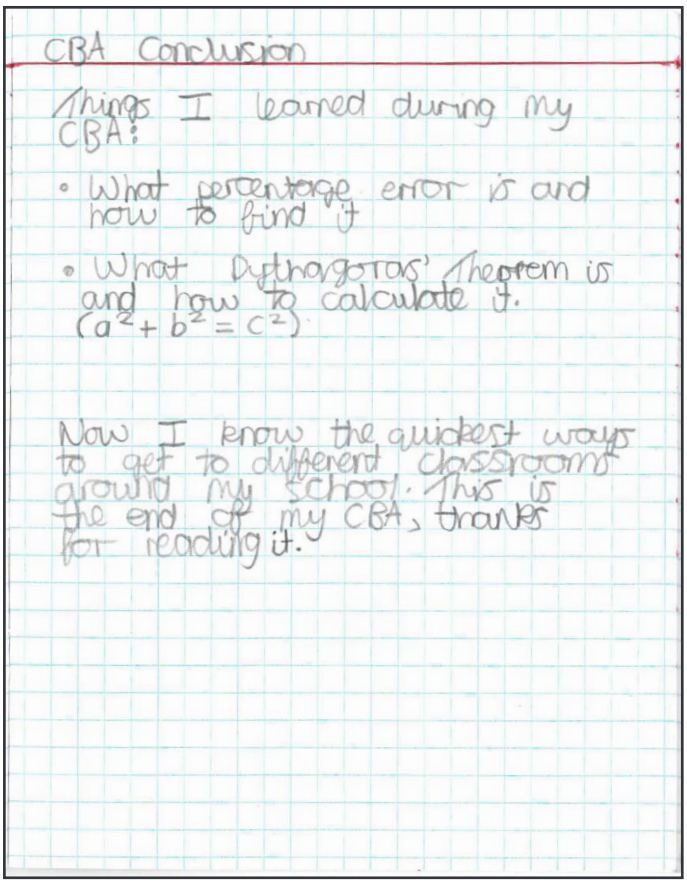
If I was to do this investigation again, somethings I would do differently are:

- I wouldn't include as many classrooms because some of the investigation was very repetative
- 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

Comments on the reasonableness of the solution and makes a concrete connection to the original question.

Identifies what what worked well and what could be improved.

CBA1 Mathematical Investigation: Locker Routes



CBA Conclusion

Things I learned during my CBA:

- What percentage error is and how to find it
- What Pythagoras' Theorem is and how to calculate it. ($a^2 + b^2 = c^2$)

Now I know the quickest ways to get to different classrooms around my school. This is the end of my CBA, thanks for reading it.

Overall judgement: In line with expectations

Exceptional | Above expectations | In line with expectations | Yet to meet expectations