

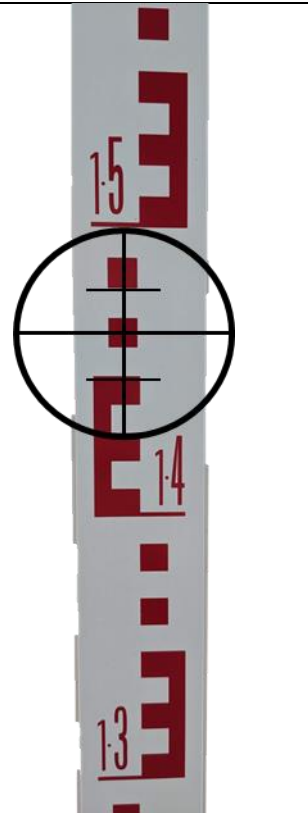
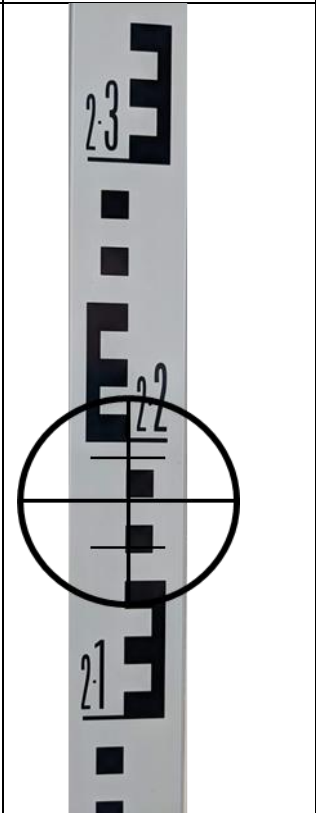
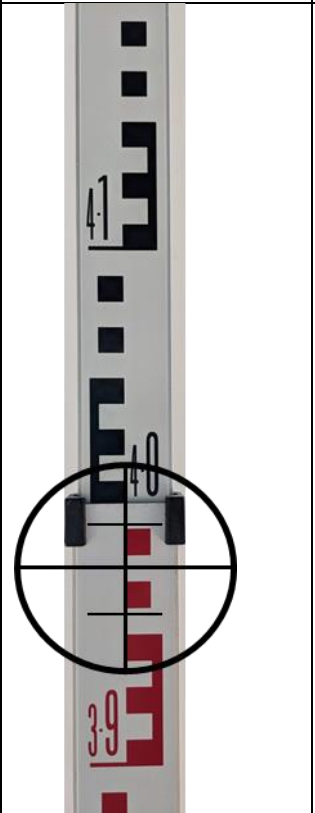
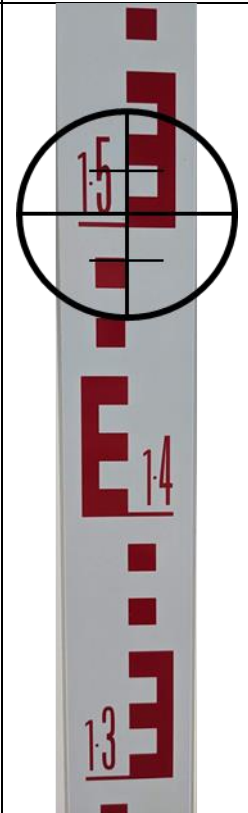


DIGITAL SURVEYING

By Corey Strachan 2218673

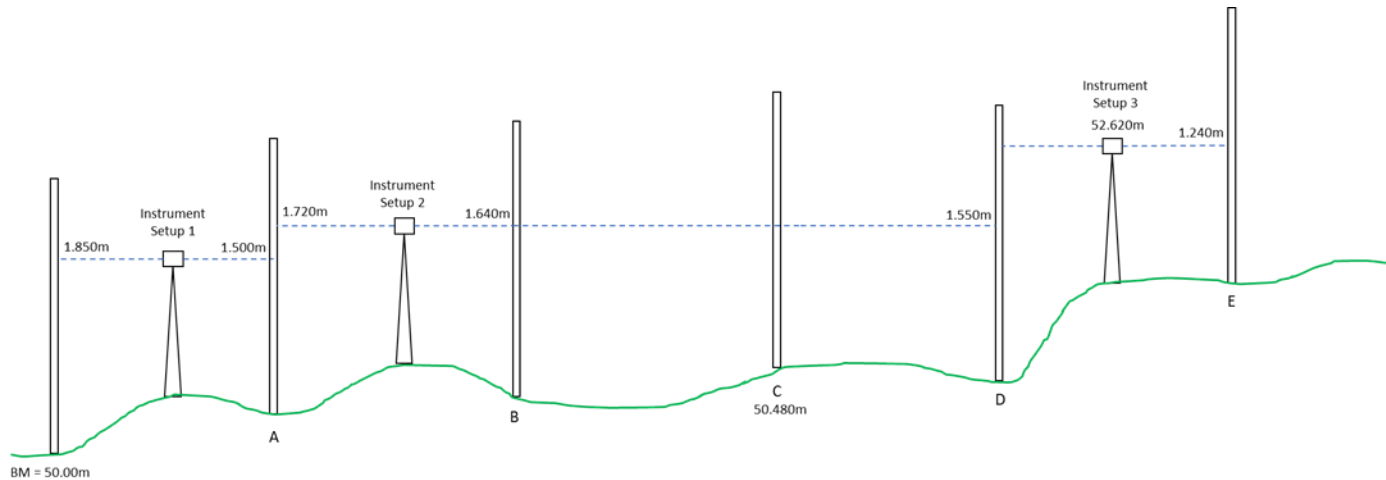
Date of Submission: 22/11/2023

1. Read the level off of the following staffs.

a.	b.	c.	d.	e.
				

- a) 1.465m
- b) 2.179m
- c) 3.975m
- d) 0.820m
- e) 1.503m

2. A levelling survey has been carried out but some information is missing, using the height of collimation method, complete the table.



Back Sight	Intermediate	Fore Sight	Height Collimation of	Reduced Level	Remarks
1.850			a. 51.850	50.000	BM
1.720		1.500	b. 52.070	c. 50.350	A
	1.640			d. 50.430	B
	e. 1.590			50.480	C
f. 2.100		1.550	52.620	g. 50.520	D
		1.240		h. 51.380	E

A: $50.000 + 1.850 = \mathbf{51.850}$ (RL + BS)
B: $50.350 + 1.720 = \mathbf{52.070}$ (RL + BS)
C: $51.850 - 1.500 = \mathbf{50.350}$ (HOC – FS)
D: $52.070 - 1.640 = \mathbf{50.430}$ (HOC – IS)
E: $52.070 - 50.480 = \mathbf{1.590}$ (Subtract RL from HOC)
F: $52.620 - 50.520 = \mathbf{2.100}$ (Subtract RL from HOC)
G: $52.070 - 1.550 = \mathbf{50.520}$ (HOC – FS)
H: $52.620 - 1.240 = \mathbf{51.380}$ (HOC – FS)

i. **Carry out a check on the levels.**

[30 Marks]

$$\sum BS - \sum FS = \text{Last RL} - \text{First RL}$$

$$\text{BS: } 1.850 + 1.720 + 2.100 = \mathbf{5.670}$$

$$\text{FS: } 1.500 + 1.550 + 1.240 = \mathbf{4.290}$$

$$5.670 - 4.290 = \mathbf{1.380}$$

$$\text{Last RL } 51.380 - \text{First RL } 50.000 = \mathbf{1.380}$$

3. **A building site is being set-up, as part of this a security fence needs to be installed around the perimeter. Calculate the perimeter and area of the following site.**

Point A 100E 200N
Point B 200E 300N
Point C 350E 225N
Point D 325E 125N
Point E 175E 50N

[40 Marks]

Corey Strachan 2218673

Perimeter of site: 747.6m

Area of site 37500m²

(See attached workings)

4. A new sewer is to be laid to drain a residential development to a manhole on an existing sewer. The centres of three proposed manholes A, B and C on the new sewer have been pegged out on site and the levels of the tops of the pegs were measured as follows:

A= 109.980 m B= 110.150 m C = 110.270 m

The new sewer is to be constructed to fall into the manhole on the existing sewer at a gradient of 1 in 100. The horizontal distance between the manhole on the existing sewer and proposed manhole A is 75.000 m, with successive horizontal distance intervals between AB and BC being 80.000 m and 65.000 m, respectively. The cover level of the manhole on the existing sewer is 109.550 m and the invert level of the pipe is 2.5 m below its cover level.

Calculate the invert levels below the cover for the three new manholes.

[15 Marks]

Invert Levels

A: 107.800m

B: 108.600m

C: 109.250m

Dig Levels

A: 2.180m

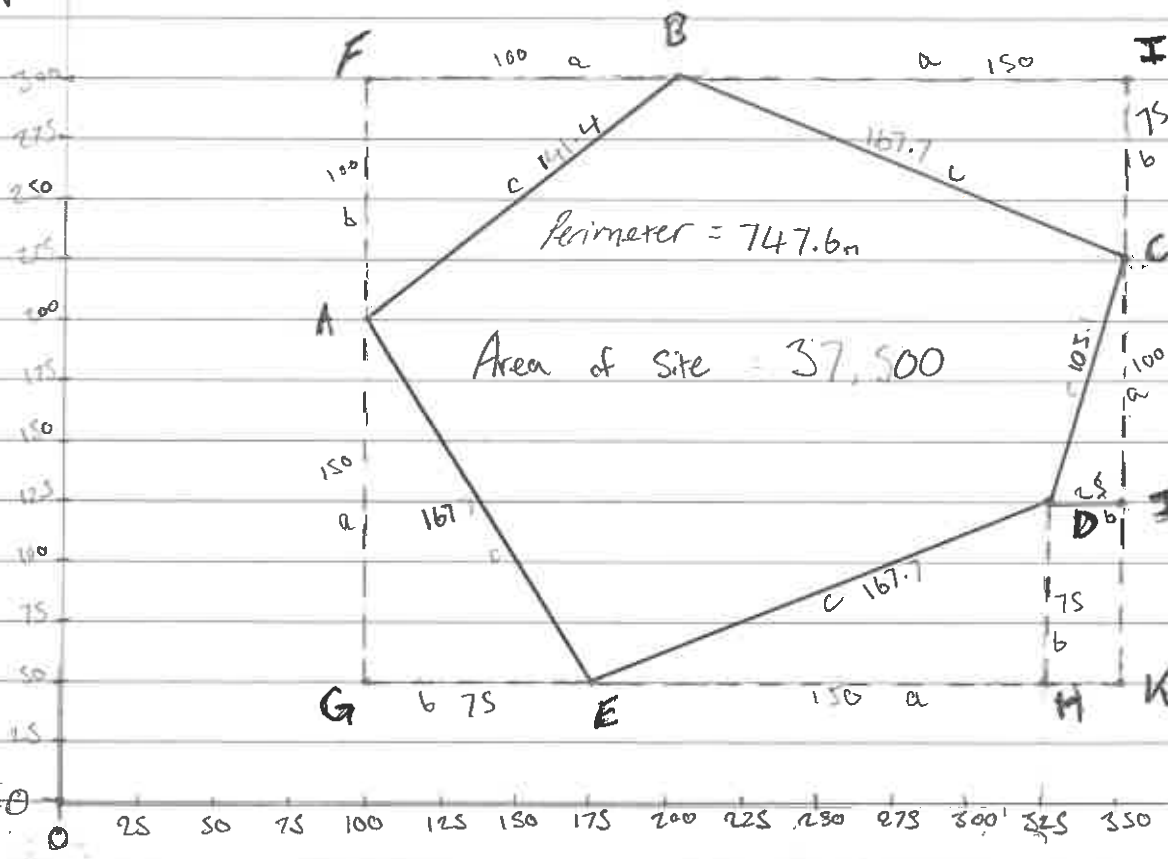
B: 1.550m

C: 1.020m

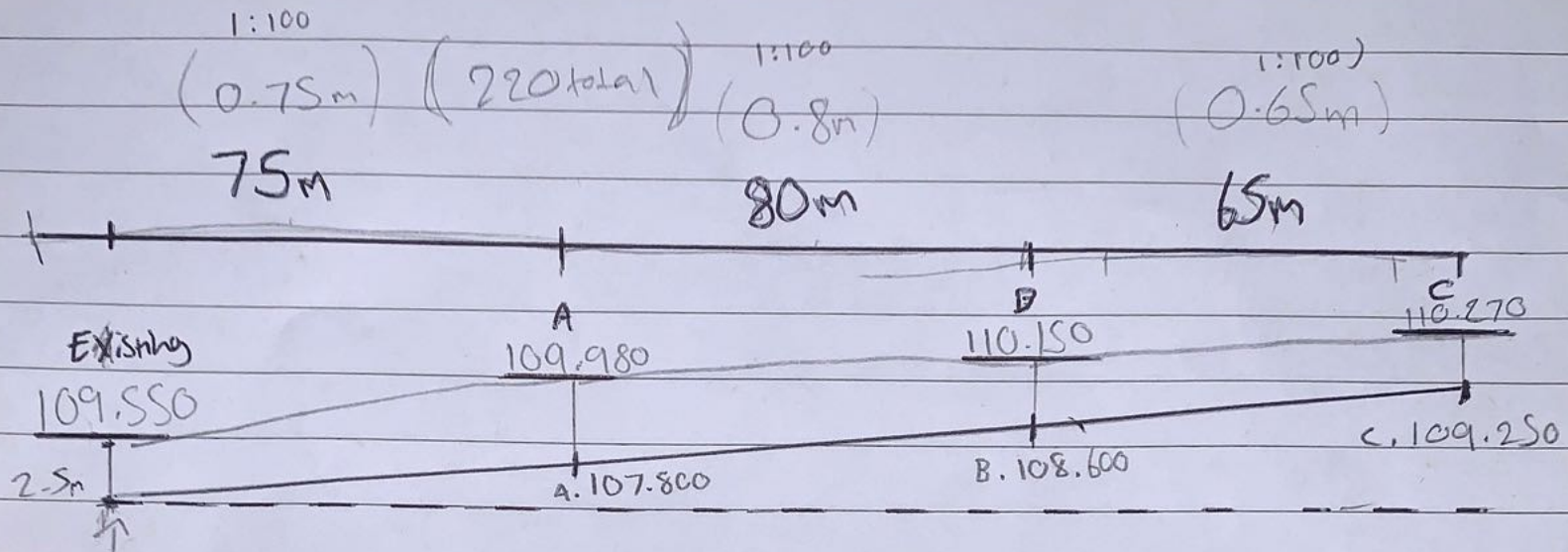
(See attached Workings)

	BCI/		Perimeter
Triangle ABF	AEG / DEH	CDS	$167.7 \times 3 + 141.4$
$a^2 + b^2 = c^2$	$150^2 + 75^2 = c^2$	$100^2 + 25^2 = c^2$	$+ 103.1$
$100^2 + 100^2 = c^2$	$22,500 + 5,625 = c^2$	$10000 + 625 = c^2$	$= 747.6$
$10,000 + 10,000 = c^2$	$28,125 = c^2$	$10,625 = c^2$	
$20,000 = c^2$	$\sqrt{28125} = 167.7$	$\sqrt{10,625} = 103.1$	
$\sqrt{20000} = 141.4$			

N



Areas	Triangle ABF	Triangles BCI/AEG/DEH	Triangle CDS
Triangle = $\frac{1}{2}$ base $\times$ height	$\frac{100 \times 100}{2} = 5000m^2$	$\frac{75 \times 150}{2} = 5625m^2$	$\frac{25 \times 100}{2} = 1250m^2$
Rectangle = Length $\times$ width			
Rectangle DSKH	Rectangle FING	Area of geometry calculated outside of site:	
$25 \times 75 = 1875m^2$	$250 \times 250 = 62,500m^2$	$5625 \times 3 + 1250 + 5000 + 1875$	
		$= 25,000m^2$	
		$62,500 - 25,000 = 37,500m^2$	



	Invert levels	A	B	C
109.550		107.050	107.050	107.050
- 2.500		+ 0.750	+ 1.550	+ 2.200
107.050		107.800m	108.600m	109.250

2.2 = total fall

Dig levels

Existing $\rightarrow$ B fall = 1.55m

$$\begin{array}{r} \textcircled{A} 109.980 \\ - 107.800 \\ \hline 2.180m \end{array} \quad \begin{array}{r} \textcircled{B} 110.150 \\ - 108.600 \\ \hline 1.550m \end{array}$$

Existing $\rightarrow$ A fall = 0.75m

$$\begin{array}{r} \textcircled{C} 110.270 \\ - 109.250 \\ \hline 1.020m \end{array}$$

5. Briefly describe one piece of Surveying equipment, including what it can be used to measure.

[5 Marks]

Total station

The total station is a measuring device on a tripod, often robotic with tracking capabilities. Once set up and its position is fixed using GNSS/GPS, it uses electronic distance measurement to collect distance, levels and angles between its position and a surveyor with a detail pole and prism. Non-prism measurement can be achieved using the laser on the total station for measuring difficult to reach, or unsafe areas.

Data is collected as points, or sometimes strings of points via a logging device. The data can then be imported into various industry software.