MATHS

SSEP EXAMPLE // CIVIL CONSTRUCTION
DEVELOPED BY // Onewhero Area School and Dempsey Wood

ACTIVITY EXAMPLE

KEY WORDS

Trigonometry | percentages | decimals | ratios | numbers | height | weight | velocity | length | calculations | measurement | range | cost | circumference | area | volume

ALSO USEFUL FOR

Science | Physics | Business | Engineering

PROGRAMME OUTLINE

3 POINTS OF CONTACT

- Dempsey Wood staff come into classroom (x2)
- Workplace visit (x1)

EXAMPLE

1. Dempsey Wood staff come into classroom, introduce themselves and their careers, background to engineering, and how maths is used in the industry. Student activity: Trigonometry exercise.
2. Workplace visit includes tour of worksite, meeting staff and hearing about different careers, equipment demonstrations. Student activity: maths worksheets related to each 'station'.
3. Dempsey Wood staff come into classroom. Student activity: Measuring emissions



For more on SSEP see:
www.smartnz.nz

Site visit plan and worksheet:

Onewhero Area School (OAS) year 10 students, parents and faculty visiting Dempsey Woods construction site at 160 Bremner Road, Drury as part of the Smart Waikato SSEP program to see how the math they learn in school is used on a construction site.

Time	Activity
9am	Ready site, place flags and check for hazards. Check BBQ has gas, put sausages on ice and butter bread
10am sign-in at site office	All to meet at Dempsey Wood's Site Office - 160 Bremner Road, Drury
10.05am	1. HS Check shoes, hand out Hi-vis 2. Brief Welcome - Jared 3. HS Induction - Donna 4. Project Introduction - James 5. Explain timeline for the day - Jared 6. HS Primer (more details about specific risks) - Rae

Group	DW	Onewhero
Red	Richa	
Yellow	Sophia	
Blue	Rae	
Grey	Donna	

	Station Name	DW	Notes	Curriculum
1	Pump Station Note: this is the longest walk, approx. 8 minutes from site office)	Wimpie	Flow. Capacity. Pipes.	Volume, measurements
2	Stockpile (tbc) sediment	Roeloff	Productivity.	Area, Volume, fuel usage
3	Roading	Saula	Gradient. Crossfalls pipe sizes. Plans	Measurement, gradient
4	Drone (tbc)	Ollie	Trig	Trig, Area, volume

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<table>
<tr><td></td><td>Split into 4 groups and head to first location.
Five minutes has been allowed for transitioning between locations and 20 minutes to cover the talking points. Move safely but quickly!
The Pump Station is 7-8 minutes' walk from site office. Therefore it will have a 15 minutes for presentation and Q and A.
<table><tr><td>Red - Richa</td><td>1 - Pumpstation</td></tr><tr><td>Yellow - Sophia</td><td>2 - Stockpile</td></tr><tr><td>Blue - Rae</td><td>3 - Roading</td></tr><tr><td>Grey - Donna</td><td>4 - Drone</td></tr></table></td></tr>
<tr><td>10:55am</td><td>Move to the second location<table><tr><td>Red - Richa</td><td>2 - Stockpile</td></tr><tr><td>Yellow - Sophia</td><td>3 - Roading</td></tr><tr><td>Blue - Rae</td><td>4 - Drone</td></tr><tr><td>Grey - Donna</td><td>1 - Pumpstation</td></tr></table></td></tr>
<tr><td>11:20am</td><td>Move to third location<table><tr><td>Red - Richa</td><td>3 - Roading</td></tr><tr><td>Yellow - Sophia</td><td>4 - Drone</td></tr><tr><td>Blue - Rae</td><td>1 - Pumpstation</td></tr><tr><td>Grey - Donna</td><td>2 - Stockpile</td></tr></table></td></tr>
<tr><td>11:30am</td><td>Start BBQ - Jared/Site Staff</td></tr>
<tr><td>11:45am</td><td>Move to forth location<table><tr><td>Red - Richa</td><td>4 - Drone</td></tr><tr><td>Yellow - Sophia</td><td>1 - Pumpstation</td></tr><tr><td>Blue - Rae</td><td>2 - Stockpile</td></tr><tr><td>Grey - Donna</td><td>3 - Roading</td></tr></table></td></tr>
<tr><td>12:15pm</td><td>BBQ Lunch at site office - bread and bangers
PPE collected</td></tr>
<tr><td>12:35pm</td><td>Final speech - Jared/James
Thank you from OAS - Brent/Student</td></tr>
<tr><td>12:45pm</td><td>School party departs site
Jared Cleans Up. Collects flags etc</td></tr>
</table>

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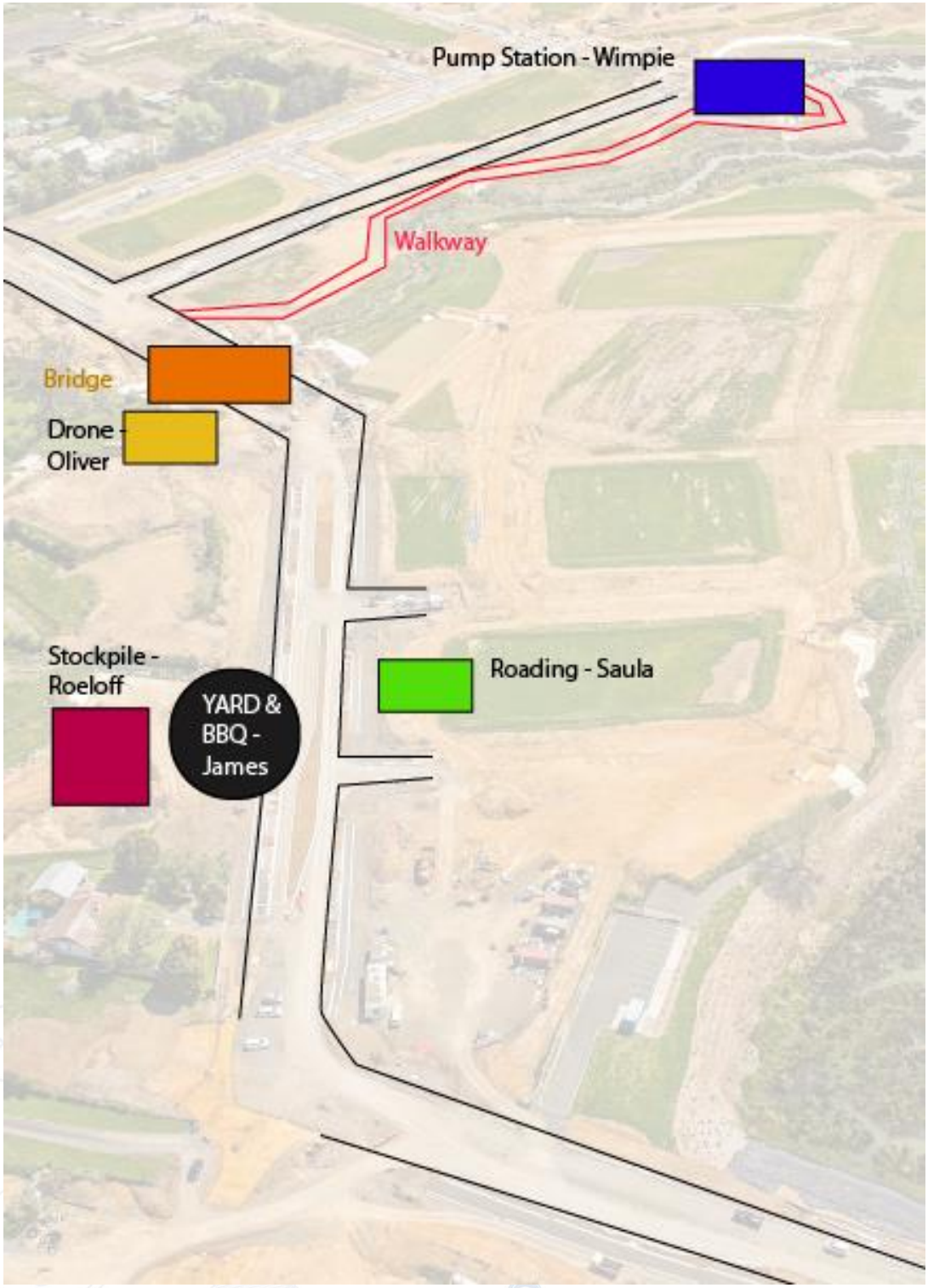
ACTIVITY EXAMPLE



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Station 1 Worksheet - Wimpie - Pump Stations:

1. If one house produces 100lt of wastewater every day and there are 100 houses, how much water will accumulate inside of the pump station every day?

2. The pump station has two float level switches, a **low** level and a **high**-level switch.

   When the wastewater from the houses fills the pump station to the high-level switch, it will then turn on the pump. The water level will drop until it reaches the low-level switch that will turn the pump off.

   If there is 10,000lt of wastewater in the pump station and the pump can pump out 40lt/second, how long will it take the pump to complete the cycle?

3. If the SCADA communication fails on the receiving pump station and it doesn't tell the sending pump station to stop pumping wastewater, what impact can that have on the environment?

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Station 2 - Roeloff - Earthworks and Productivity:

Scenario: You have just finished an earthwork (cut to fill) job. The job consisted of cutting clay from a stockpile and cutting from natural ground. On completion of the job, the following queries were sent through to you by the quantity surveyor so they could tender more accurately on the next project.

Given the below details, answer the question(s) associated:

1. The tender document indicated 40 000m³ needed to be filled. We used 46 000m³ to fill. What would your compaction factor be? (Compaction factor is the **ratio** between actual vs. calculated volume)

2. You have the choice between using either Bully & Scoop's (B&S), Scrappers or a combination of both machines. Given the following:
    i. B&S: Costs $500/hr (exclusive of mark-up) and can cart 13m³ at a time @ a max speed of 15km/h fully laden
    ii. Scrapper: Costs $1000/hr (exclusive of mark-up) and can cart 10m³ at a time @ a max speed of 30km/h fully laden
    iii. A typical working day is 10hrs
    iv. You only get paid $10 for every cubic meter shifted.
    v. Your farthest hauling distance is 500m away from the fill area.
    vi. Your mark-up amount/ profit margin is 5%

    a. Which machine(s) or combination of machines would you use to maximise your profit?

    b. What is the minimum load each machine in your combination should do to make its allowable? (allowable is the minimum amount of loads to ascertain the 5% mark-up per day.)

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Station 3 - Saula - Drainage/Roading:

1. The quantity of water that a cesspit can collect can be found by using the formula Q=VA.

   Quantity = m3/s
   Velocity = 0.5m/s
   Area = 100m2

   What is the total quantity in L/s?

2. A 5m wide road has a crown with a 75mm vertical height difference between the edge of the seal and the centre of the road. Using rise and fall formula, what percentage is the crossfall of the road?

3. A concrete footpath is 1.8m wide, 100m long and depth is 100mm. You are the Site Engineer, how much concrete to you required to complete the footpath?

4. In a subdivision development, assuming the minimum pressure for the principal water main of 100mm nominal diameter is 13kpa. What would be the resultant force in the pipe?

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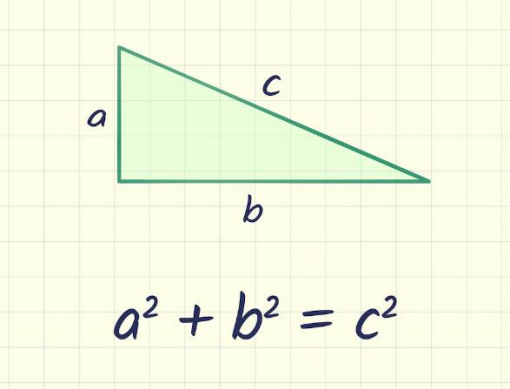
Station 4 - Oliver - UAV

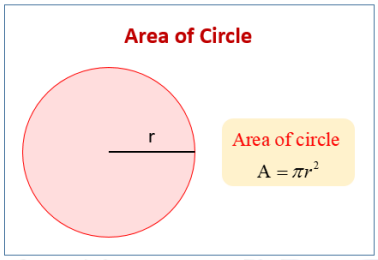
1. Live question using disto…

   If streetlight X is … away from us on the horizontal and … away on the vertical what is the sloped distance to it?



2. If the berm has a slope of 3% across 3m, what is the elevation difference between start and finish?

3. If my drone has a 6km range from takeoff, what area can it cover(2d)?



4. What is the most accurate form of surveying? Bonus point, what is the fastest?

5. What machines does Dempsey Wood have surveying equipment installed on?

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