Simpson's Rule

$$\text{Area} = \frac{W}{3}\{(\text{first} + \text{last}) + 4(\text{evens}) + 2(\text{odds})\}$$

Where:

W = the width of each section
(first + last) = the first ordinate + the last ordinate
4 (evens) = 4 X (the sum of all the even ordinates)
2 (odds) = 2 X (the sum of all the odd ordinates ***Except*** the first and last)

Example:

$$\text{Area} = \frac{W}{3}\{(\text{first} + \text{last}) + 4(\text{evens}) + 2(\text{odds})\}$$

$W = \frac{300}{6} = 50$

$$= \frac{50}{3}\{(6 + 0) + 4(8+14+10) + 2(12+12)\}$$

$$= \frac{50}{3}\{(6) + 4(32) + 2(24)\}$$

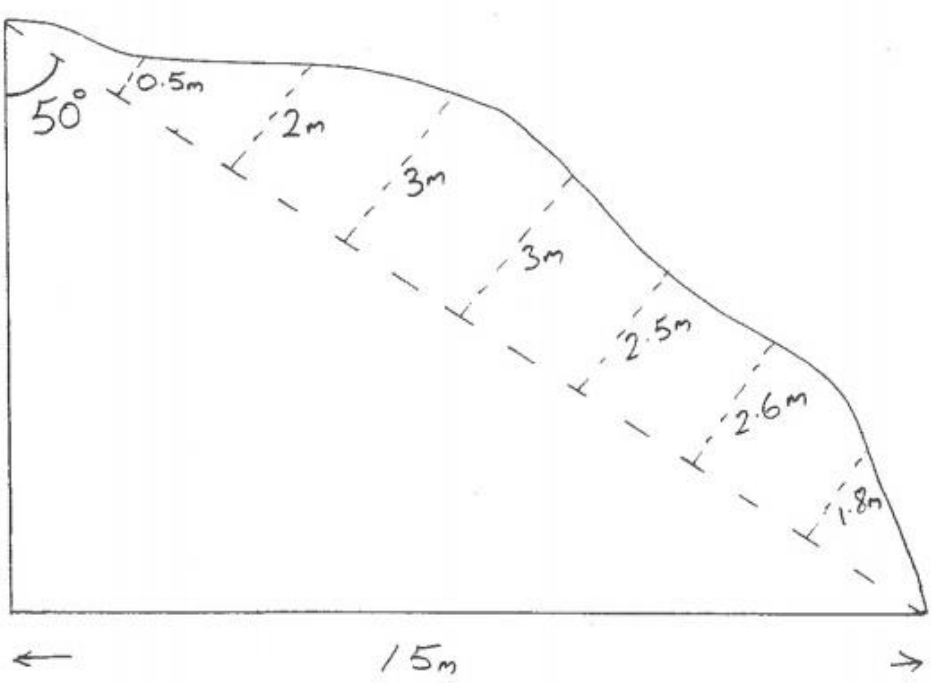
$$= \frac{50}{3}\{6 + 128 + 48\}$$

$$= \frac{50 \text{ X } 182}{3}$$

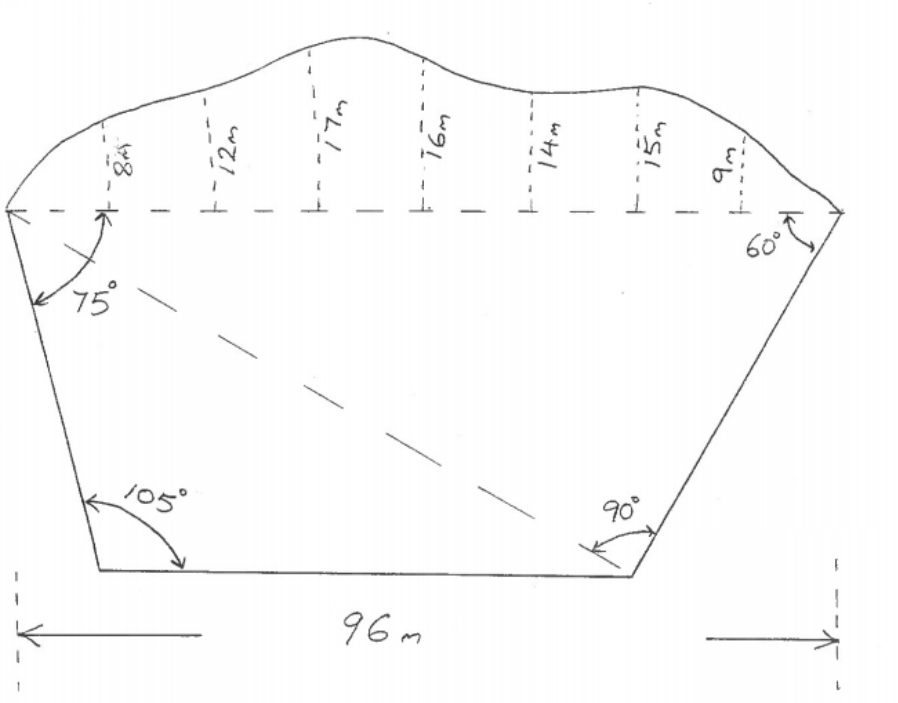
$$= 3033.33\text{m}^2$$

Irregular Areas

Q 1 Calculate the area of the field below.

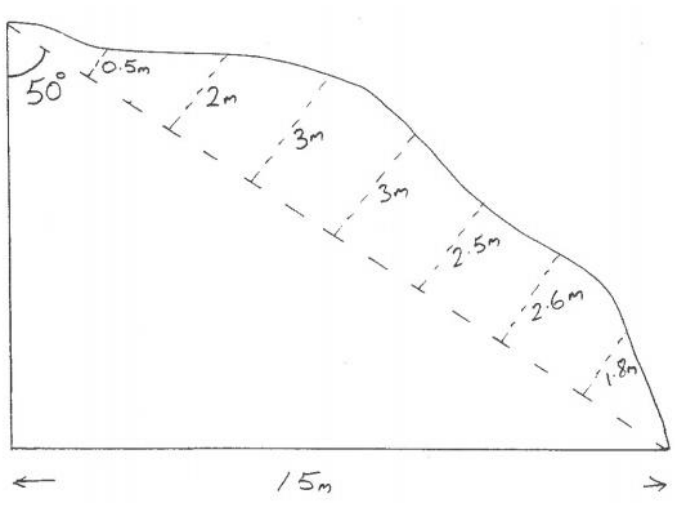


Q 2 Calculate the area of the field below.



Irregular Areas (Answers)

Answer Q. 1



First we need the two side lengths of the triangle

$$\text{Sin } 50° = \frac{15}{x}$$

$$0.766 = \frac{15}{x}$$

$$x = \frac{15}{0..766}$$

Answer = 19.581m

$a^2 + b^2 = c^2$
$a^2 = c^2 - b^2$
$x^2 = 19.581^2 - 15^2$
$x^2 = 383.42 - 225$
$x = \sqrt{158.42}$
x = 12.586m

We can now get the area of the triangle and the irregular area

Area of triangle = ½ x base x height
= 0.5 x 15 x 12.586
= 94.3987m²

$$\text{Irregular Area} = \frac{W}{3}\{ (\text{first} + \text{last}) + 4 (\text{evens}) + 2 (\text{odds}) \}$$

$$= \frac{2.448}{3}\{ (0 + 0) + 4 (0.5+3+2.5+1.8) + 2 (2+3+2.6) \}$$

$$= \frac{2.448}{3}\{ (0) + 4 (7.8) + 2 (7.6) \}$$

$$= \frac{2.448}{3}\{ 0 + 31.2 + 15.2 \}$$

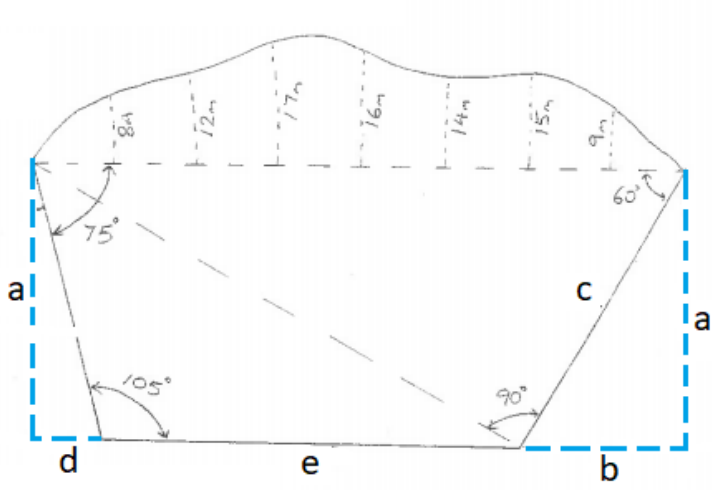
$$= \frac{2.448 \text{ X } 46.4}{3}$$

= 37.8624m²

Total Area = 94.3987 + 37.8624 = 132.2611m²

Irregular Areas (Answers)

Ans. 2 To solve this question we need height a, lengths b, c and d.



We have to get length c first:

$$\text{Cos } 60° = \frac{x}{96}$$

$$0.5 = \frac{x}{96}$$

$$0.5 \times 96 = x$$

Length c = 48m

Using this we can get height a, and then length b:

$$\text{Cos } 30° = \frac{x}{48}$$

$$0.866 = \frac{x}{48}$$

$$0.866 \times 48 = x$$

height a = 41.569m

$a^2 + b^2 = c^2$
$b^2 = c^2 - a^2$
$b^2 = 48^2 - 41.569^2$
$b^2 = 2304 - 1728$
$b = \sqrt{576}$
b = 24m

We also need length d:

$$\text{Tan } 15° = \frac{x}{41.569}$$

$$0.268 = x \div 41.569$$

$$0.268 \times 41.569 = x$$

Length d = 11.138m

Length of base = 96 – (24 + 11.138)
= 96 – 35.138 = 60.862m

$$\text{Area of Trapezium} = \frac{(a + b)}{2} \times h = \frac{(96 + 60.862)}{2} \times 41.569 = 3260.269m^2$$

$$\text{Irregular Area} = \frac{W}{3} \{ (\text{first} + \text{last}) + 4 (\text{evens}) + 2 (\text{odds}) \}$$

$$= \frac{12}{3} \{ (0 + 0) + 4(8+17+14+9) + 2(12+16+15) \}$$

$$= \frac{12}{3} \{ (0) + 4 (48) + 2 (43) \}$$

$$= \frac{12}{3} \{ 0 + 192 + 86 \}$$

$$= \frac{12 \text{ X } 278}{3}$$

$$= \mathbf{1{,}112m^2}$$

Total Area = 3260.269 + 1112 = 4,372.269m²