

Unit 1 *Algorithmic Approach*

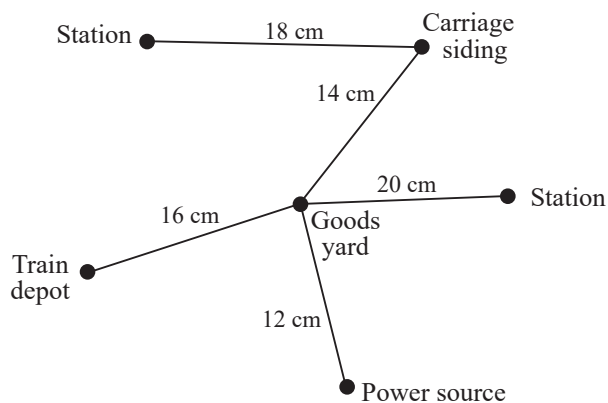
## Text Answers

## 1.1 Examples of Algorithms

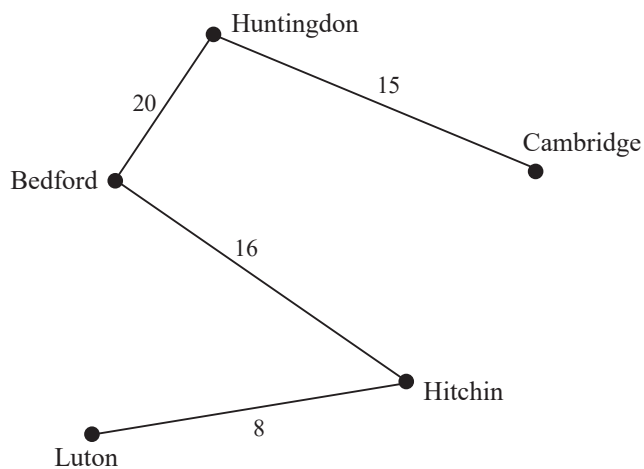
1. (a) 1 (b) 2
2. (a) 3 iterations (b) 6 iterations
3. Use the formula  $x_{n+1} = \frac{1}{2} \left( x_n + \frac{3}{x_n} \right)$
4. Easter Sunday in 2016 is on March 28th.
6. Earliest: March 22nd (this will next occur in 2160)  
Latest: April 25th (this will next occur in 2038)

## 1.2 Using Algorithms for Problem Solving

1. The minimum solution is 80 cm, as shown below.



2. The shortest route is 59 miles, as shown below.

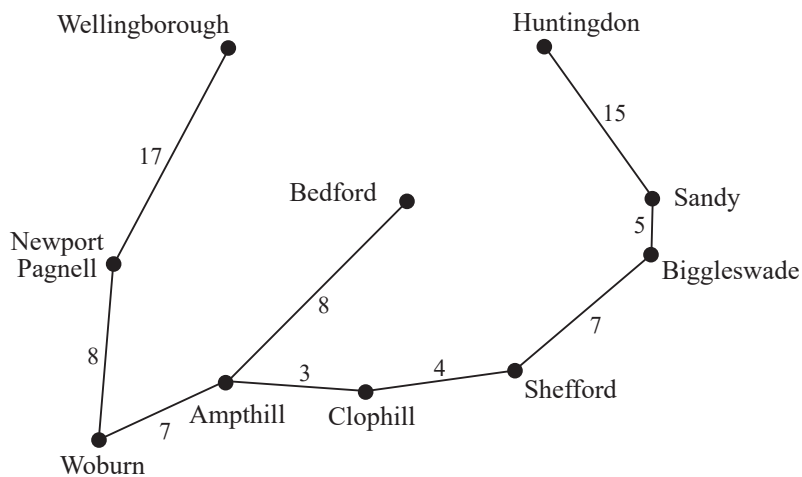


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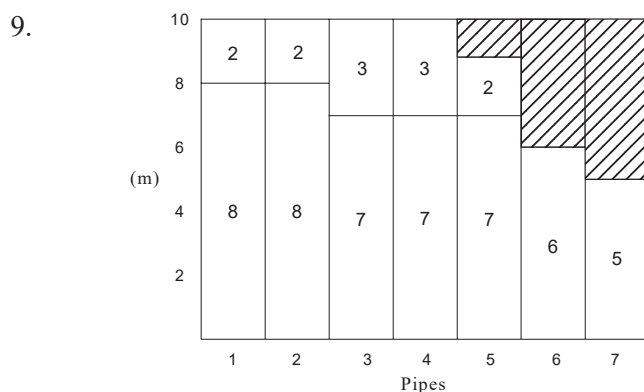
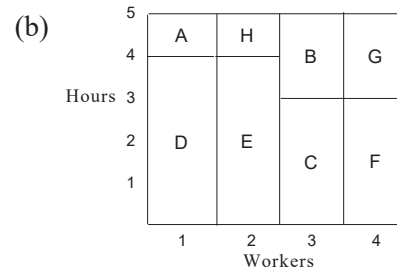
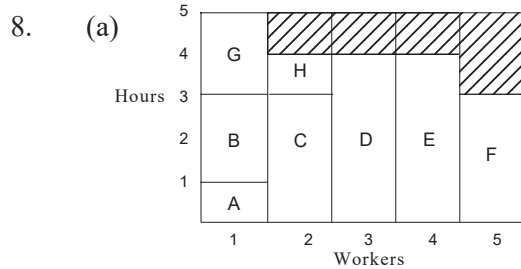
## 1.2

3. The shortest length of cable needed is 74 miles, as shown below.



An equivalent solution is found by joining Bedford to Sandy rather than to Ampthill.

4. Minimum length of pipe is 155 m.  
 5. Minimum total distance is 180 m.  
 6. Shortest possible length of system is 1700 m.  
 7. PO-CL-LU-BR-KI-KE-BA-RA, KI-CS, BR-PA, CL-WE; 67 miles



This is optimal; although the total length required is 60 m, it is not possible to find a solution with no waste.

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- 1.2 10. It is possible to meet the order with just 10 sheets, cut appropriately.

$$4 \text{ sheets with twelve } 4 \times 2 + \text{one } 3 \times 1 \quad (96 + 3 = 99)$$

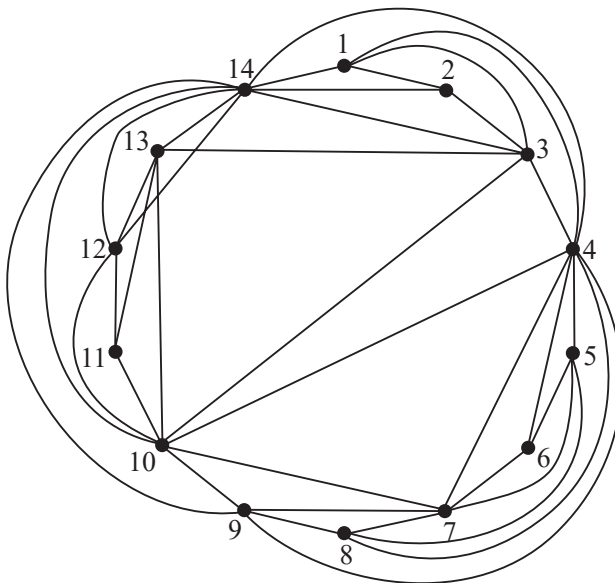
$$5 \text{ sheets with ten } 3 \times 1 + \text{two } 7 \times 5 \quad (30 + 70 = 100)$$

$$1 \text{ sheet with two } 7 \times 5 + \text{six } 3 \times 1 + \text{one } 4 \times 2 \quad (70 + 18 + 8 = 96)$$

## 1.3 Summary

1. (a) Possible (b) Possible

2.



3. You will get a contradiction when using the planetary algorithm.

4. Graph is planar.

