Dr Oliver Mathematics
Mathematics Standard Grade: Credit Level
2008 Paper 2: Calculator
1 hour 20 minutes

The total number of marks available is 51.
You must write down all the stages in your working.

1. A local council recycles 42 000 tonnes of waste a year. (4)
   The council aims to increase the amount of waste recycled by 8% each year.
   How much waste does it expect to recycle in 3 years time?
   Give your answer **to three significant figures**.

2. In a class, 30 pupils sat a test.
   The marks are illustrated by the stem and leaf diagram below.

0	9								
1	6	6	7	8					
2	0	4	5	7	9	9	9		
3	2	2	3	5	5	6	8		
4	0	2	3	4	5	5	7	7	8
5	0	0							

   Key: $1|6 = 16$
   $n = 30$

   (a) Write down the median and the modal mark. (2)

   (b) Find the probability that a pupil selected at random scored **at least** 40 marks. (1)

3. In a sale, all cameras are reduced by 20%. (3)
   A camera now costs £45.
   Calculate the original cost of the camera.

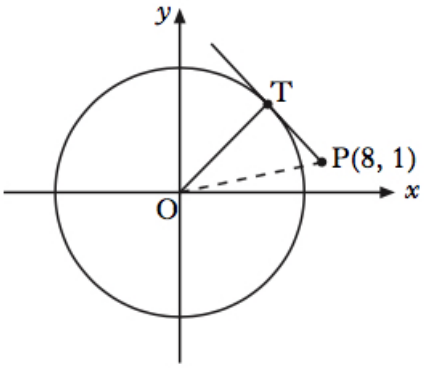
4. Aaron saves 50 pence and 20 pence coins in his piggy bank.
   Let x be the number of 50 pence coins in his bank.
   Let y be the number of 20 pence coins in his bank.

   (a) There are 60 coins in his bank. (1)
   Write down an equation in x and y to illustrate this information.

   (b) The total value of the coins is £17.40. (1)
   Write down another equation in x and y to illustrate this information.

   (c) Hence find **algebraically** the number of 50 pence coins Aaron has in his piggy bank. (3)

5. A circle, centre the origin, is shown.



P is the point $(8, 1)$.

(a) Calculate the length of OP. (2)

The diagram also shows a tangent from P which touches the circle at T.
The radius of the circle is 5 units.

(b) Calculate the length of PT. (2)

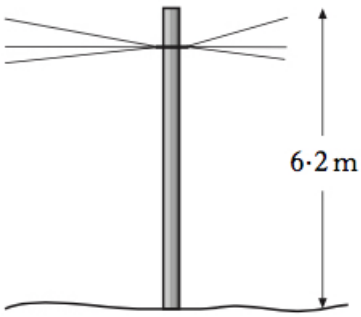
6. The distance, d kilometres, to the horizon, when viewed from a cliff top, varies directly as the square root of the height, h metres, of the cliff top above sea level. (5)

From a cliff top 16 metres above sea level, the distance to the horizon is 14 kilometres.

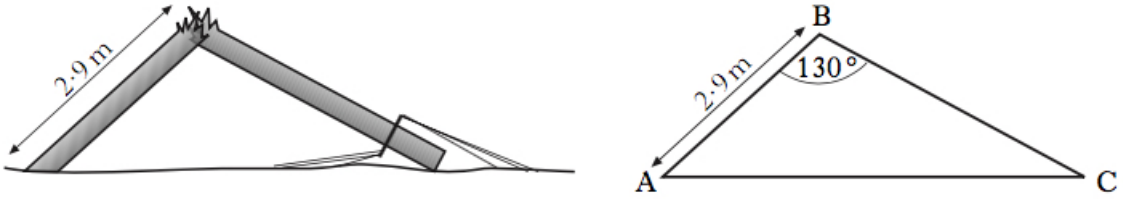
A boat is 20 kilometres from a cliff whose top is 40 metres above sea level.

Is the boat beyond the horizon?
Justify your answer.

7. A telegraph pole is 6.2 metres high. (4)

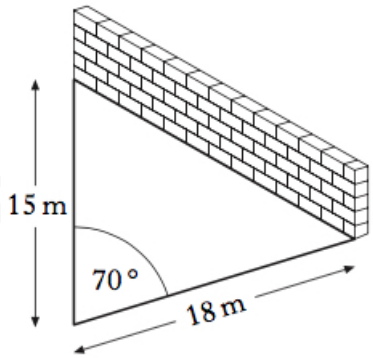


The wind blows the pole over into the position as shown below.



AB is 2.9 metres and angle ABC is 130°.
Calculate the length of AC.

8. A farmer builds a sheep-pen using two lengths of fencing and a wall.

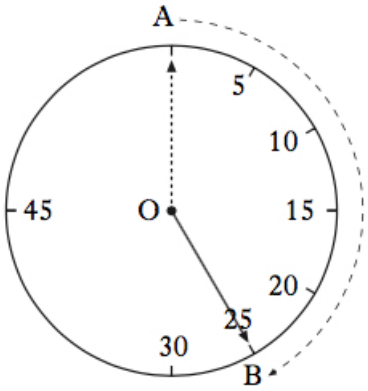


The two lengths of fencing are 15 metres and 18 metres long.

(a) Calculate the area of the sheep-pen, when the angle between the fencing is 70°. (3)

(b) What angle between the fencing would give the farmer the largest possible area? (1)

9. Contestants in a quiz have 25 seconds to answer a question.
This time is indicated on the clock.
The tip of the clock hand moves through the arc AB as shown.



(a) Calculate the size of angle AOB. (1)

The length of arc AB is 120 centimetres.

(b) Calculate the length of the clock hand. (4)

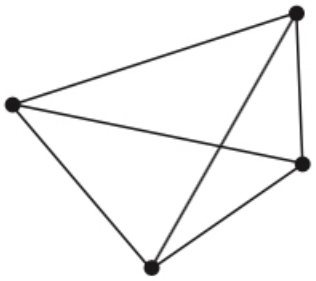
10. To hire a car costs £25 per day plus a mileage charge.
The first 200 miles are free with each additional mile charged at 12 pence.

(a) Calculate the cost of hiring a car for 4 days when the mileage is 640 miles. (1)

A car is hired for d days and the mileage is m, miles where $m > 200$.

(b) Write down a formula for the cost £C of hiring the car. (3)

11. The minimum number of roads joining 4 towns to each other is six, as shown.



The minimum number of roads, r, joining n towns to each other is given by the formula

$$r = \tfrac{1}{2}n(n-1).$$

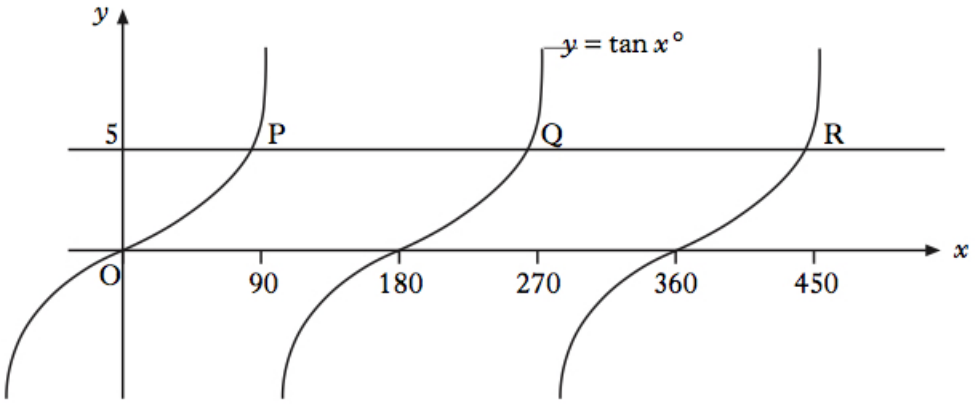
(a) State the minimum number of roads needed to join 7 towns to each other. (1)

(b) When $r = 55$, show that (2)

$$n^2 - n - 110 = 0.$$

(c) Hence find **algebraically** the value of n. (3)

12. The diagram shows part of the graph of $y = \tan x^\circ$.
The line $y = 5$ is drawn and intersects the graph of $y = \tan x^\circ$ at P and Q.



(a) Find the x-coordinates of P and Q. (3)

(b) Write down the x-coordinate of the point R, where the line $y = 5$ next intersects the graph of $y = \tan x^\circ$. (1)