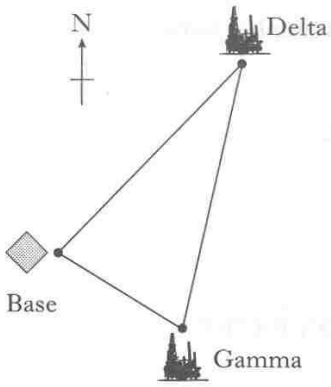
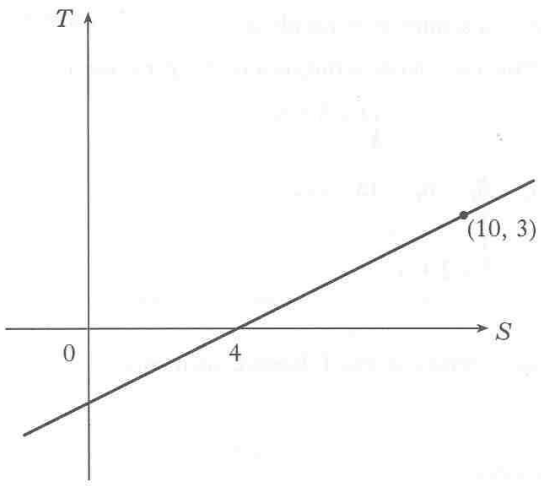
| | KU | RA |
|---|---|---|
| **1.** Paul bought a car last year.<br>It has lost $12\frac{1}{2}\%$ of its value since then.<br>It is now valued at £10 500.<br>How much did Paul pay for his car? | 2 | |
| **2.** A newspaper report stated:<br>"Concorde has now flown $7{\cdot}1 \times 10^7$ miles.<br>This is equivalent to 300 journeys from the earth to the moon."<br>Calculate the distance from the earth to the moon.<br>Give your answer in **scientific notation correct to 2 significant figures.** | 3 | |
| **3.** Solve **algebraically** the inequality<br>$5x - 4 < 2(1 - 2x)$. | 3 | |
| **4.** The diagram shows the positions of a helicopter base and two oil rigs, Delta and Gamma.<br>  <br><br>From the helicopter base, the oil rig Delta is 35 kilometres away on a bearing of 050°.<br>From the same base, the oil rig Gamma is 20 kilometres away on a bearing of 125°.<br>Calculate the distance between Delta and Gamma.<br>**Do not use a scale drawing.** | | 5 |

| | KU | RA |
|---|---|---|

**5.**




Find the equation of the given straight line in terms of $T$ and $S$. **4**

**6.** Factorise $3x^2 - 5x - 2$. **2**

**7.** Anna hired a mobile phone at a fixed charge of £17·50 per month.

She is also charged for her total call time each month.

15 minutes of this total call time are **free**. The rest of her call time is charged at 35 pence per minute.

(*a*) What is the total cost for Anna's phone in a month when her **total call time** is 42 minutes? **2**

(*b*) Write down a formula for the total cost, £$C$, for Anna's phone in a month when her **total call time** is $t$ minutes, where $t \geq 15$. **3**

| KU | RA |
|---|---|

**8.** A Fibonacci sequence is a sequence of numbers.

After the first two terms, each term is the sum of the previous two terms.

eg **2, 3, 5, 8, 13, .....**

$13 = 5 + 8$

$5 = 2 + 3$

(*a*) Write down the next three terms of this Fibonacci sequence.

**5, –1, 4, ___, ___, ___,** **1**

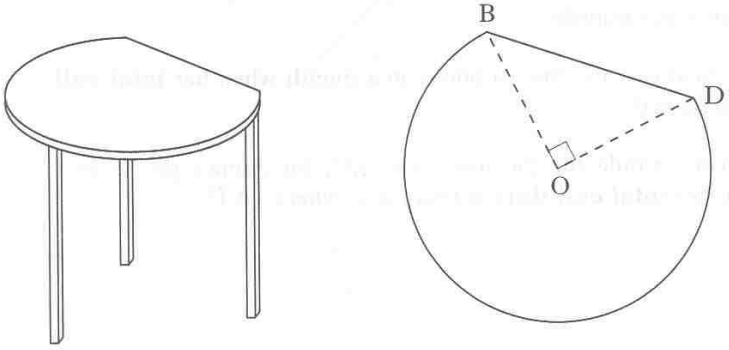
(*b*) For the Fibonacci sequence

**4, –3, 1, –2, –1, –3, –4, .....**

show that the sum of the first six terms is equal to four times the fifth term. **2**

(*c*) If $p$ and $q$ are the first two terms of a Fibonacci sequence, **prove** that the sum of the first six terms is equal to four times the fifth term. **3**

**9.** The diagram shows a table whose top is in the shape of part of a circle with centre, O, and radius 60 centimetres.




BD is a straight line.

Angle BOD is 90°.

Calculate the perimeter of the table top. **3**

| KU | RA |
|---|---|

**10.** A wooden toy box is prism-shaped as shown in figure 1.

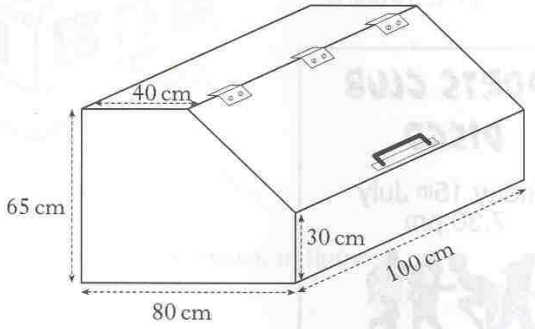



figure 1

The uniform cross-section of the box is shown in figure 2.

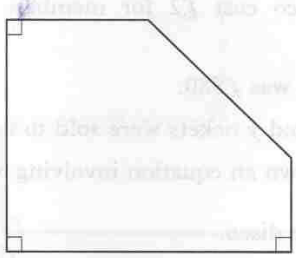
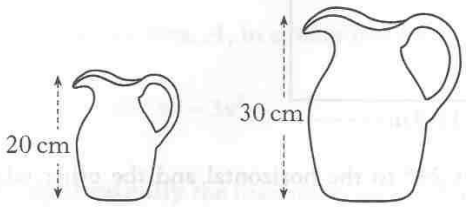


figure 2

Calculate the volume of the box in **cubic metres**. **4**

**11.** The diagram below shows two jugs which are mathematically similar.




The volume of the smaller jug is 0·8 litre.

Find the volume of the larger jug. **3**

| | KU | RA |
|---|---|---|
| **12.** Solve **algebraically** the equation $2 + 3\sin x° = 0$ for $0 \leq x < 360$. | 3 | |
| **13.** | | |


The tickets for a Sports Club disco cost £2 for members and £3 for non-members.

(*a*) The total ticket money collected was £580.

$x$ tickets were sold to members and $y$ tickets were sold to non-members.

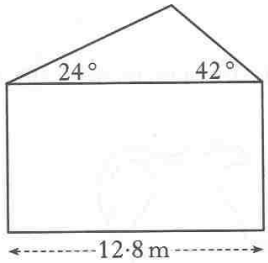
Use this information to write down an equation involving $x$ and $y$. | | 2 |

(*b*) 250 people bought tickets for the disco.

Write down another equation involving $x$ and $y$. | | 1 |

(*c*) How many tickets were sold to members? | | 3 |

**14.** The end wall of a bungalow is in the shape of a rectangle and a triangle as shown below.




The roof has one edge inclined at 24° to the horizontal and the other edge inclined at 42° to the horizontal.

The width of the house is 12·8 metres.

Calculate the length of the longer sloping edge of the roof.

**Do not use a scale drawing.** | 4 | |

15.


figure 1

A gardener creates an L-shaped flower-bed. He uses the house walls and concrete edging for the boundary as shown in figure 1.

| KU | RA |
|---|---|
| | |

He plans his flower-bed as shown in figure 2.

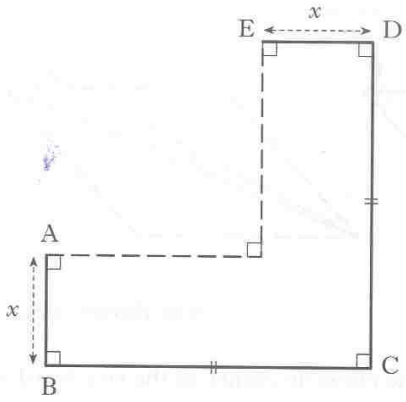



figure 2

(*a*) He uses a total of **6 metres of edging**.

AB = ED = $x$ metres
BC = DC

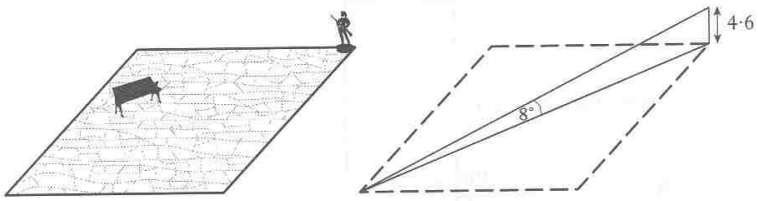
Show that the length, in metres, of BC can be expressed as BC = 3 – $x$. **2**

(*b*) Hence show that the area, $A$, in square metres, of the flower-bed can be expressed as

$$A = 6x - 3x^2.$$ **3**

(*c*) Calculate **algebraically** the maximum area of the flower-bed. **3**

| | KU | RA |
|---|---|---|
| **16.** (*a*) Express $\sqrt{32}$ as a surd in its simplest form. | 1 | |
| (*b*) Simplify $a^2(a^{-5}+4)$. | 2 | |
| (*c*) Multiply out the brackets and collect like terms $(x-2)(x^2+3x-4)$. | 3 | |
| **17.** A statue stands at the corner of a square courtyard. | | |




The statue is 4·6 metres high.

The angle of elevation from the opposite corner of the courtyard to the top of the statute is 8°.

| | | |
|---|---|---|
| (*a*) Find the distance from the base of the statue to the opposite corner of the courtyard. | | 2 |
| (*b*) Show that the length of the side of the courtyard is approximately 23 metres. | | 3 |
| **18.** $f(x)=3^x$ | | |
| (*a*) Find $f(4)$. | 1 | |
| (*b*) Given that $f(x)=\sqrt{27}$, find $x$. | 3 | |

**19.**

The table below shows the distances, in metres ($d$), travelled by a snowboarder in seconds ($t$).

| Time in seconds ($t$) | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Distance in metres ($d$) | 5 | 20 | 45 | 80 |

($a$) Explain why $d$ varies directly as $t^2$. **1**

($b$) Write down the formula connecting $d$ and $t$. **1**

($c$) How does the distance change when the time is multiplied by six? **2**