

- * 6 The costs of sending letters and packets are shown below.

Letter	1st class	2nd class
up to 100 g	43p	29p

large letter	1st class	2nd class
up to 100 g	60p	46p
up to 250 g	85p	60p
up to 500 g	£1.15	75p

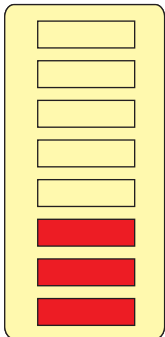
Packet	1st class	2nd class
up to 100 g	£1.24	£1.01
up to 250 g	£1.57	£1.35
up to 500 g	£2.04	£1.72
up to 750 g	£2.64	£2.20
up to 1 kg	£3.25	£3.85
up to 1.5 kg	£5.18	£4.49
up to 2 kg	£6.62	£5.79

Sarah sends four packets by 2nd class post weighing 184 g, 275 g, 1100 g and 1.85 kg. She also sends five large letters by 2nd class post each weighing 150 g and two large letters by 1st class post each weighing 420 g.

Finally she sends a number of letters by 1st class post.

If the total cost is £23.81, how many letters did she send?

- * 7



The bars above show the amount of fuel in Avery's car.

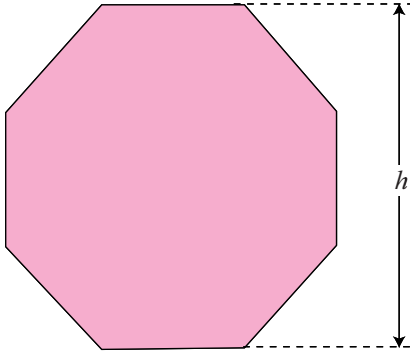
Each bar shows $\frac{1}{8}$ of the petrol in the car's tank.

A gallon of petrol costs £7.56

Avery fills up this petrol tank completely which costs a further £42.

Assuming that one gallon is 4.5 litres, how many litres does Avery's petrol tank contain when it is full?

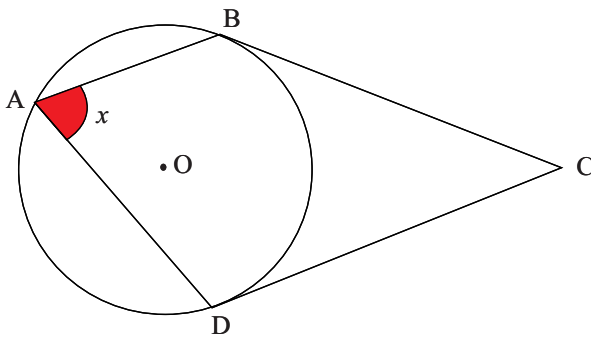
* 6



Calculate the height h of this regular octagon if each side of the octagon has length 3 cm.

Give your answer to two decimal places.

* 7



A, B and D are points on the circumference of the circle, centre O.

BC and CD are tangents to the circle.

Prove that angle BCD = $180 - 2x$

* 8

A vintage car is filled with one gallon of petrol.

The car will travel 6 miles on each litre of petrol.

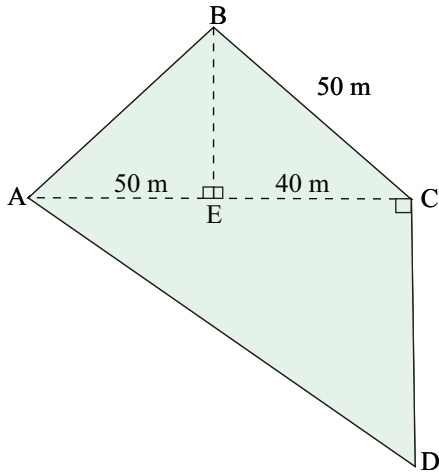
The car travels 9 miles due south from a petrol pump then 7 miles due west.

Will it have enough petrol to travel directly back to the petrol pump? You must explain your reasons fully.

1 gallon = 4.5 litres



* 6



3m wide fence panel
£12.99 each



A farmer wants to put fencing completely around the field shown opposite. The length CD is equal to the length AC.

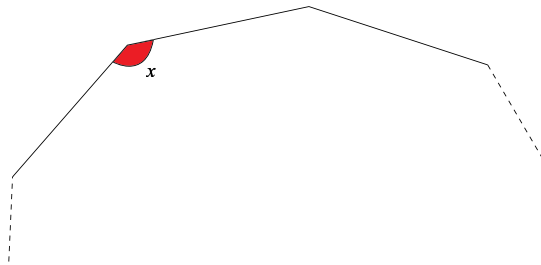
Each outer edge of the field will be fenced using 3m wide fence panels. Parts of a fence panel cannot be used on more than one side of the field.

What is the least amount the farmer will have to pay for all the fence panels?

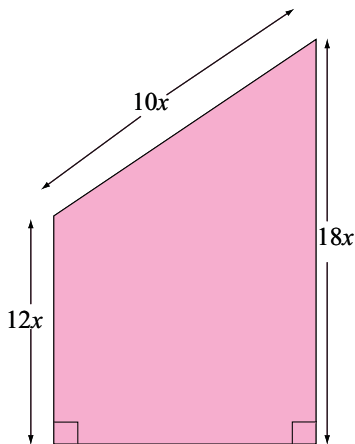
* 7 Angle x opposite is the interior angle of a regular polygon with n sides.

Express x in terms of n .

Give reasons for your answer.



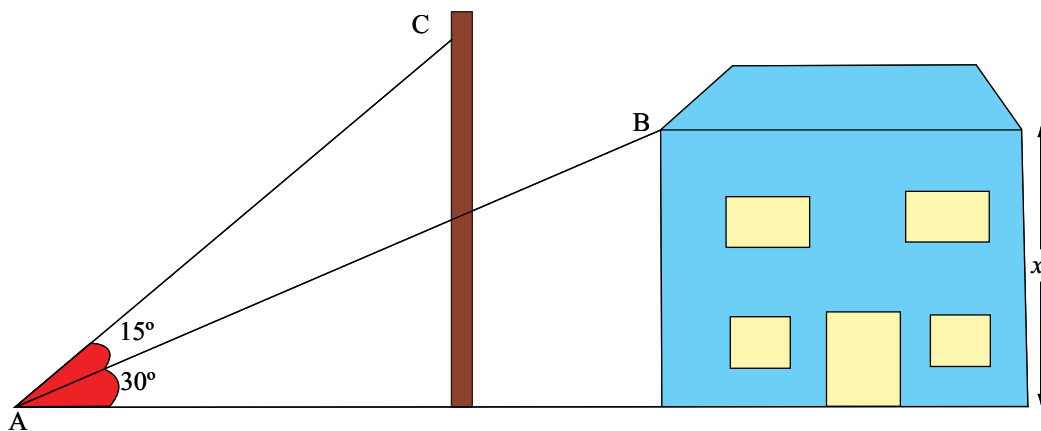
* 8



Find an expression for the area of this trapezium in terms of x .

Show all your working out.

* 9



Mr Higgins attaches a rope from a point A to a point B on his house x metres above the ground. He wants to fix Christmas lights to this rope which has length h metres.

He attaches another rope from a point A to a point C on a flagpole. The length AB is equal to the length AC.

Find the height of C above the ground in terms of x .

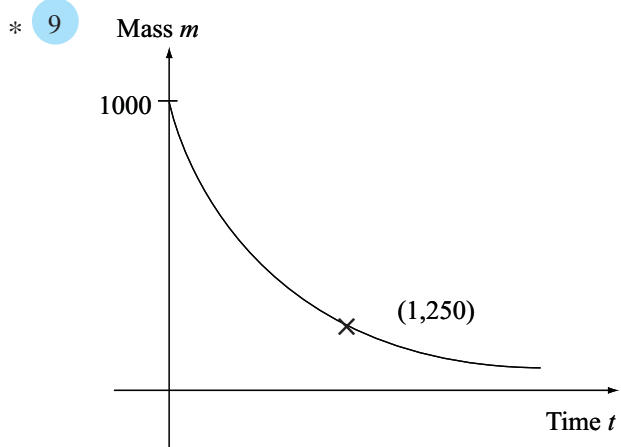
- * 10 A group of people agree to pay a total of £360 for a day's rock climbing. Each person will pay an equal share.

Four people pull out at the last moment so the remaining members of the group each have to pay an extra £3.

- (a) If x is the original number of people, prove that $x^2 - 4x - 480 = 0$
- (b) Find the original number of people in the group.



- * 8 (a) Draw the graph of $y = x^3 - 2x^2 - x + 2$ for values of x from $x = -2$ to $x = 3$.
- (b) Use your graph to solve $x^3 - 2x^2 - x + 2 = 0$
- (c) Use your graph to solve $x^3 - 2x^2 - x + 2 = 4$
- (d) Use your graph to solve $x^3 - 2x^2 - x + 4 = 0$



The graph shows how the mass of a radioactive substance decays.

The mass m is measured in grams and the time t is measured in years.

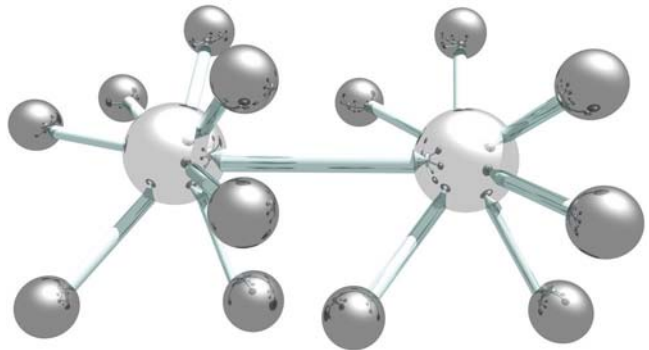
The mass m is given by the formula $m = p(n^{-t})$

Calculate the mass after 6 years.

- * 10 The density of substance A is x grams/cm³. The density of substance B is $(x + 3)$ grams/cm³.

21 g of substance A and 60 g of substance B have a total volume of 9 cm³.

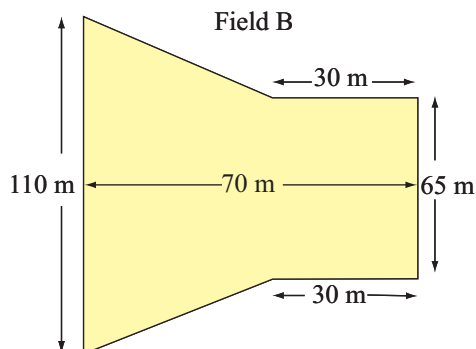
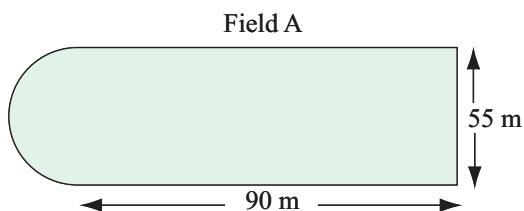
Show that $x^2 - 6x - 7 = 0$ and find the actual density of substance B.



G

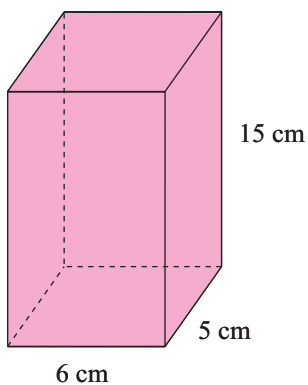
GEOMETRY 2

* 1



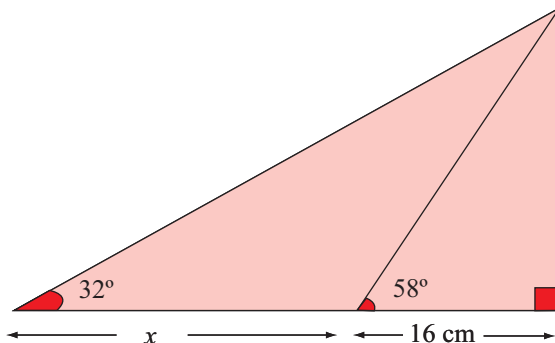
A farmer needs to spray two fields at a cost of £3.87 per 100 m². Field A is a semi-circle attached to a rectangle. Field B is a trapezium joined to a rectangle. Which field will be more expensive to spray and by how much?

* 2 A pencil case is in the shape of a cuboid as shown below.



Can a 16.5 cm long pencil fit into the pencil case?
Explain your answer fully.

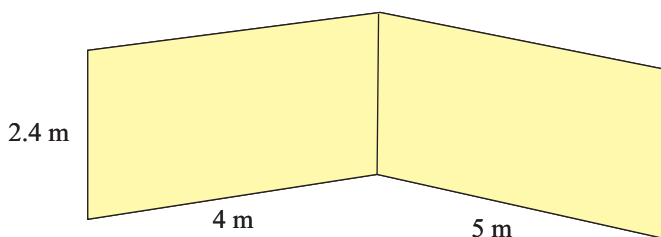
* 6



Calculate the value of x .
Show your working out fully.
Give your final answer to one decimal place.

* 7

Mr Moore is 63 years old and wants to wallpaper two walls in his living room. The size of the rectangular walls is shown below.



Each roll of wallpaper measures 10 m by 55 cm.

Mr Moore is advised to leave at least 1 cm extra wallpaper whenever he reaches the top or bottom of the wall.

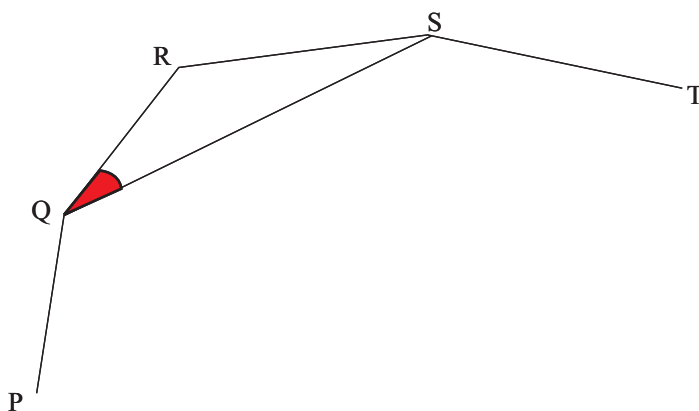
He also needs tins of wallpaper paste. Each tin covers 8 m^2 . In addition to the wallpaper and paste, Mr Moore decides that he must buy wallpaper scissors and a wallpaper brush.

The cost of each item in his local store is shown opposite.

The store offers over 60 year-olds a 10% discount on Wednesdays. Calculate the least amount of money that Mr Moore will have to spend if he buys the items on a Wednesday morning.

Item	Cost
One roll of wallpaper	£17.49
One tin of paste	£5.99
Scissors	£5.69
Brush	£4.99

* 8



PQRST is part of a regular polygon with n sides.

- Express angle RQS in terms of n .
- Find the actual value of angle RQS when $n = 60$.

M

MIXED 11

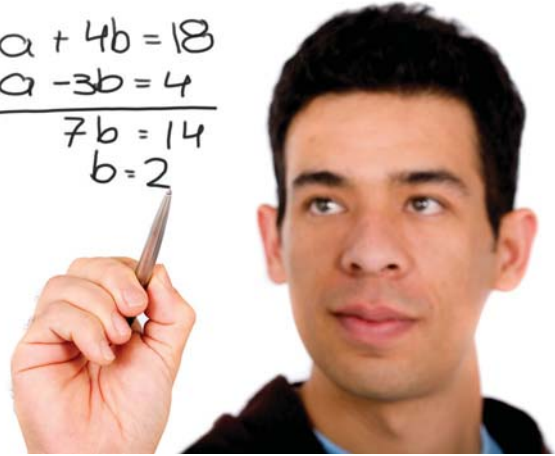
- * 1 Mason is a student.

45% of the total money he lives on for the year comes from a student loan. His parents give him 30% of the money.

He earns the rest of the money by delivering papers and doing bar work in the ratio 9:16.

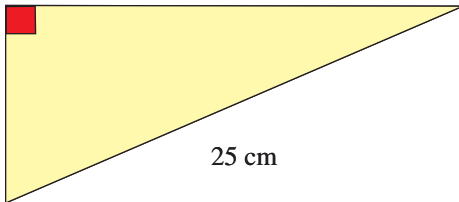
If he earns £1200 from the bar work, how much money in total does he have to live on for the year?

$$\begin{array}{r} 2a + 4b = 18 \\ 2a - 3b = 4 \\ \hline 7b = 14 \\ b = 2 \end{array}$$



- * 2

24 cm



Calculate the area of this triangle

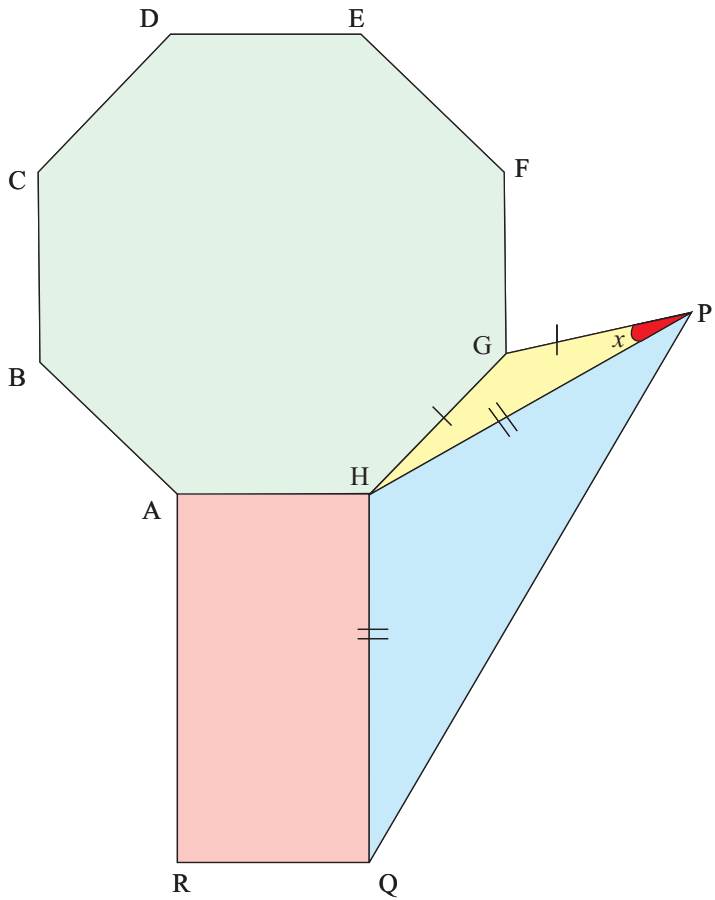
- * 3 Some people were asked which American city was their favourite. Their responses are shown below.

City	Frequency
Los Angeles	52
Chicago	16
New York	110
San Francisco	32
Washington	30



Represent this information in a suitable diagram or chart.

* 3



ABCDEFGH is a regular octagon.

AHQR is a rectangle.

$GH = GP$

$HQ = HP$

Angle $GPH = x$

Express angle PQH in terms of x .

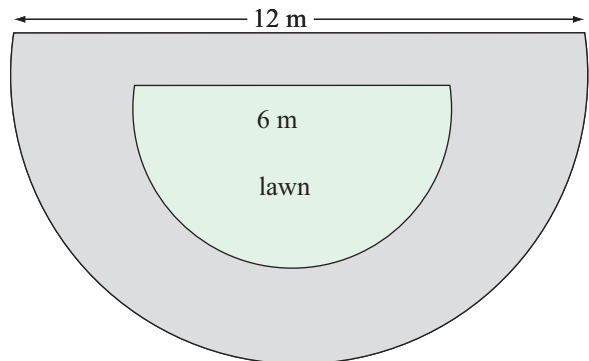
* 4

A large house has a drive in front of it as shown opposite.

The diagram shows a smaller semi-circle inside a larger semi-circle.

The drive is to be covered with gravel.

There are two types of gravel available as shown in the table below.



One tonne of gravel A	One tonne of gravel B
Covers 17 m^2	Covers 12 m^2
Costs £148	Costs £106

The gravel can only be bought in multiples of tonnes.

Which gravel will be cheaper to use and by how much?

- * 4 There are 190 year 11 students in Heath Hill School.
82 of these students are female.

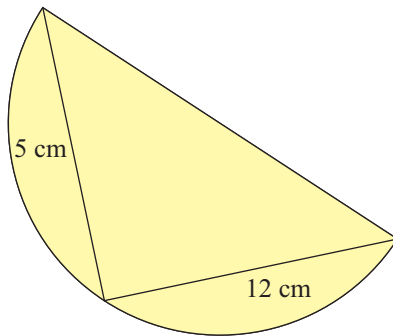
At the end of year 11 all the students will either stay at school, go to college or leave education.

40 females go to college and 8 males leave education.
 $\frac{3}{5}$ of the 80 students who stay at school are male.

Find the total number of students who go to college.



- * 5



Calculate the perimeter of this semi-circle.

Give your answer to one decimal place.

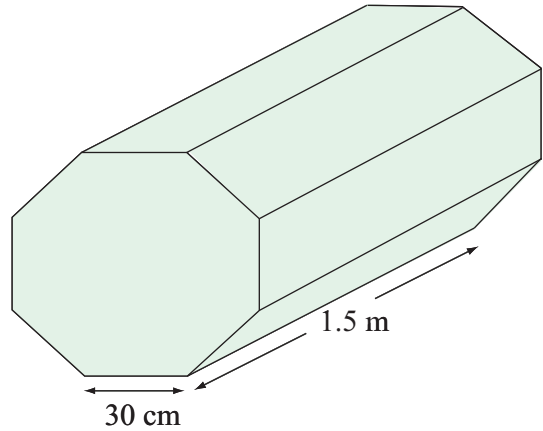
- * 6 Alexis invests £50 000 in the Cahill Building Society for 4 years and receives 3.5% per annum simple interest.

Her brother also has £50 000 to invest.
He puts it in Bentleys Bank where it receives a compound interest rate. After 4 years he has £1000 more than Alexis in his account.
What annual compound interest rate did he receive?



- * 7 Christian uses oil to heat his house. The oil is stored in a tank which is a regular octagonal prism as shown opposite. The oil costs 62p per litre.

The oil tank is filled up to 55% of its total capacity. Calculate the value of the oil in the tank at this moment.



- * 8 Riya investigates house prices in two areas, one in Hanford and the other in Matwick.

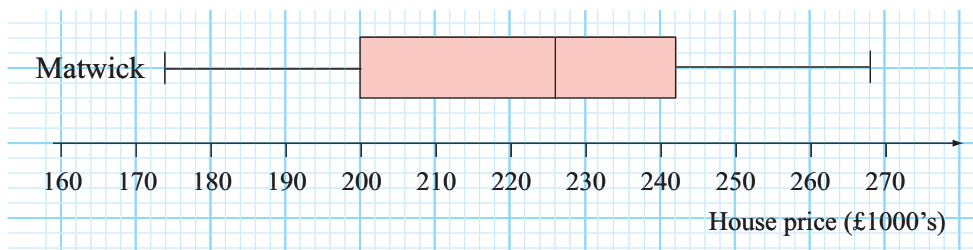
The frequency table below gives information about the house prices in Hanford.

House price (p) (£ 1000's)	Frequency
$140 < p \leq 150$	4
$150 < p \leq 160$	2
$160 < p \leq 170$	4
$170 < p \leq 180$	10
$180 < p \leq 190$	14
$190 < p \leq 200$	34
$200 < p \leq 210$	6
$210 < p \leq 230$	4
$230 < p \leq 260$	2

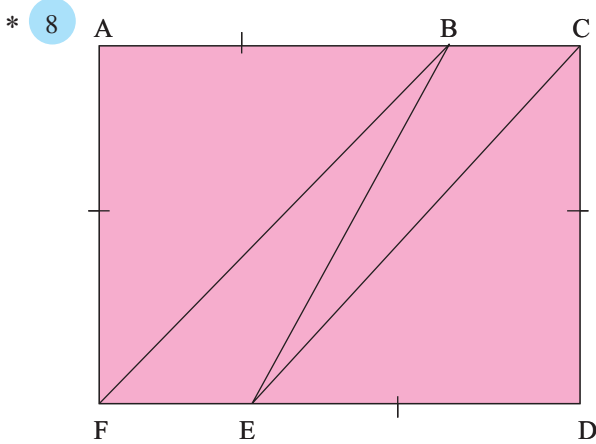
The lowest price was £147 000.

The highest price was £256 000.

- (a) Draw a cumulative frequency graph to show these house prices.
- (b) Draw a box plot to show these house prices.
- (c) The house prices for Matwick are shown in the box plot below.



Compare fully the house prices in Hanford with the house prices in Matwick.



ACDF is a rectangle.

Triangle ABF is isosceles.

Triangle CDE is isosceles.

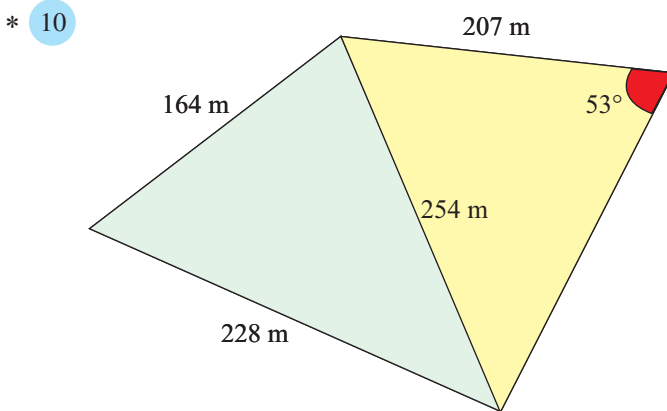
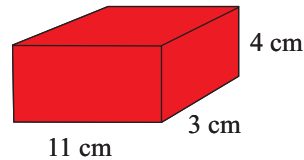
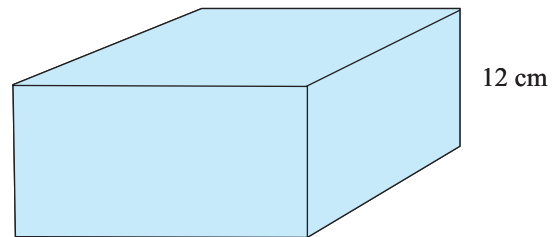
Prove that triangles BEF and BCE are congruent.

- * 9 A rectangular box has height 12 cm. The length of its base is equal to four times its width plus 5 where all dimensions are given in cm. The volume of the box is 2772 cm^3 .

This box is to be filled with smaller boxes each with dimensions

$11 \text{ cm} \times 3 \text{ cm} \times 4 \text{ cm}$.

Work out the greatest number of these smaller boxes which can fit into the larger box.



The table below shows how much profit a farmer can expect from planting barley and wheat.

Wheat £800 per hectare
Barley £1230 per hectare

The farmer must plant one of the triangular fields shown opposite with wheat and one with barley. Calculate the maximum profit the farmer can expect. [1 hectare = $10\,000 \text{ m}^2$.]