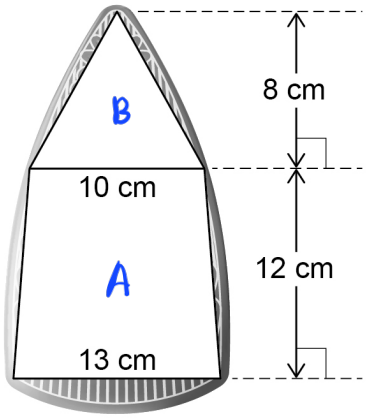
1 Ralf has an iron.

He models the base as a triangle joined to a trapezium.

Not drawn accurately



1 (a) The iron applies a force of 25 newtons (N)

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the pressure using Ralf's model.

[4 marks]

Area of A : $\frac{1}{2} \times (13+10) \times 12 = 138$ (1)

Area of B : $\frac{1}{2} \times 10 \times 8 = 40$ (1)

Total area : $138 + 40 = 178$ (1)

pressure = $\frac{25}{178} = 0.140$ (1)

Answer 0.14 N/cm^2

1 (b) Is the actual pressure greater than, equal to or less than your answer to part (a)?

Tick **one** box.

☐ greater than ☐ equal to ☑ less than (1)

Give a reason for your answer.

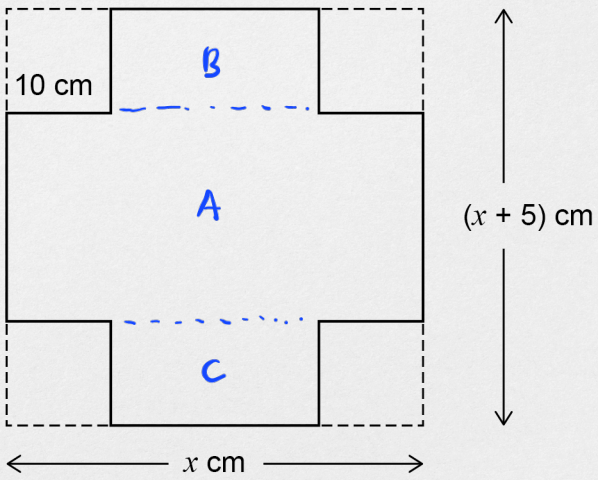
[2 marks]

The actual area is bigger. (1)

2 Kate has the following question for homework.

The net of a box is made by cutting four squares from a piece of cardboard.
The cardboard is a rectangle with width x cm and length $(x + 5)$ cm
Each square has side length 10 cm
The area of the net is 1000 cm^2
Work out the value of x.

Not drawn accurately



2 (a) Show that Kate can form the equation $x^2 + 5x - 1400 = 0$

[3 marks]

Area of A : $(x-15)(x) = x^2 - 15x$ (1)

Area of B : $(x-20)(10) = 10x - 200$

Area of C : $(x-20)(10) = 10x - 200$

Area of net = total area A, B and C

$1000 = x^2 - 15x + 10x - 200 + 10x - 200$

$1000 = x^2 + 5x - 400$ (1)

$x^2 + 5x - 400 - 1000 = 0$

$x^2 + 5x - 1400 = 0$ (shown)

(1)

2 (b) Kate correctly factorises the equation to get $(x + 40)(x - 35) = 0$

Her answer to the homework question is $x = -40$ or $x = 35$

Is her answer correct?

Tick a box.

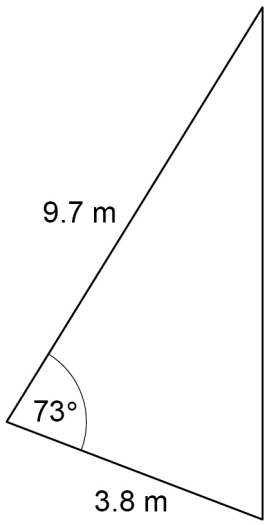
☐ Yes ☑ No

Give a reason for your answer.

x cannot be negative (1)

[1 mark]

3 Here is a triangular sail.



Not drawn accurately

3 (a) Vicky needs to buy waterproofing liquid for the sail.

She will put **3 coats** of liquid on **each** side of the sail.

A litre of liquid covers 8.5 square metres of sail.

How many 1-litre bottles of liquid does Vicky need?

[3 marks]

Area : $\frac{1}{2} \times 9.7 \times 3.8 \times \sin 73^\circ = 17.6\ldots m^2$ (1)

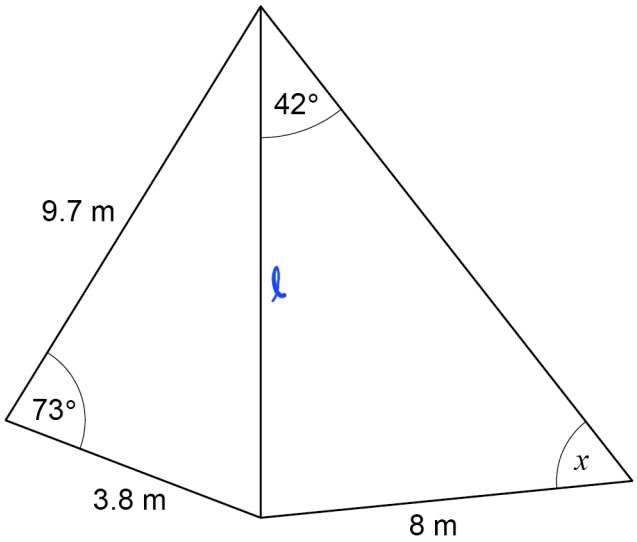
Total area of liquid needed : $17.6\ldots \times 6 = 105.7\ldots m^2$ (1)

$105.7 \div 8.5 = 12.4$

≈ 13 (1)

Answer 13

3 (b) Another sail is joined to the first sail as shown.



Not drawn accurately

x is an acute angle.

Work out the size of angle x.

[5 marks]

$l^2 = 9.7^2 + 3.8^2 - 2 \times 9.7 \times 3.8 \times \cos 73°$

$= 94.09 + 14.44 - 73.72 \cos 73°$

$= 86.976\ldots$ (1)

$l = \sqrt{86.976\ldots}$ (1)

$= 9.32\ldots$ (1)

$\frac{\sin x}{9.32\ldots} = \frac{\sin 42}{8}$ (1)

$\sin x = 0.0836\ldots \times 9.32\ldots$

$= 0.779\ldots$

$x = \sin^{-1} 0.779\ldots$

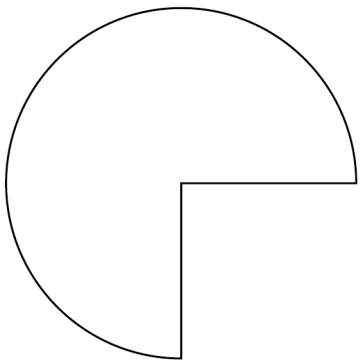
$= 51.2°$

Answer 51.2 (1) degrees

4 Here are two shapes, P and Q.

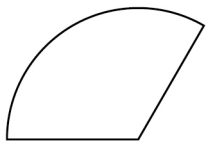
P

$\frac{3}{4}$ of a circle, radius 20 cm



Q

$\frac{1}{3}$ of a circle, radius 15 cm



Not drawn accurately

How many times bigger is the area of P than the area of Q?

You **must** show your working.

[4 marks]

Area of P : $\frac{3}{4} \times (\pi \times 20^2)$

$= \frac{3}{4} \times 400\pi$ (1)

$= 300\pi$ (1)

Area of Q : $\frac{1}{3} \times (\pi \times 15^2)$

$= \frac{1}{3} \times 225\pi$

$= 75\pi$ (1)

$\frac{P}{Q} = \frac{300}{75} = 4$ (1)

Answer 4

5 To be rented, a bedroom must have a floor area of at least 6.51 m^2

A bedroom has a rectangular floor.

The floor measures 2.4 m by 2.9 m, each correct to 2 significant figures.

Show that the bedroom can be rented.

[3 marks]

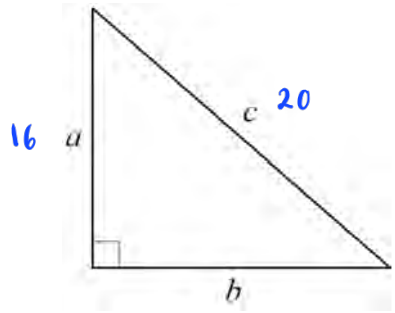
L_B = 2.35 and 2.85 (1)

U_B = 2.45 and 2.95

lowest possible area = 2.35 × 2.85 (1)

= 6.6975 (1)

6



Not drawn accurately

In this right-angled triangle,

$a = 16\,\text{cm}$

$a : c = 4 : 5$

Work out the area of the triangle.

[4 marks]

$c = \frac{5}{4} \times 16 = 20$ (1)

$b = \sqrt{20^2 - 16^2}$

$= \sqrt{144}$ (1)

$= 12$ (1)

$\text{Area} = \frac{1}{2} \times 16 \times 12$

$= 96$ (1)

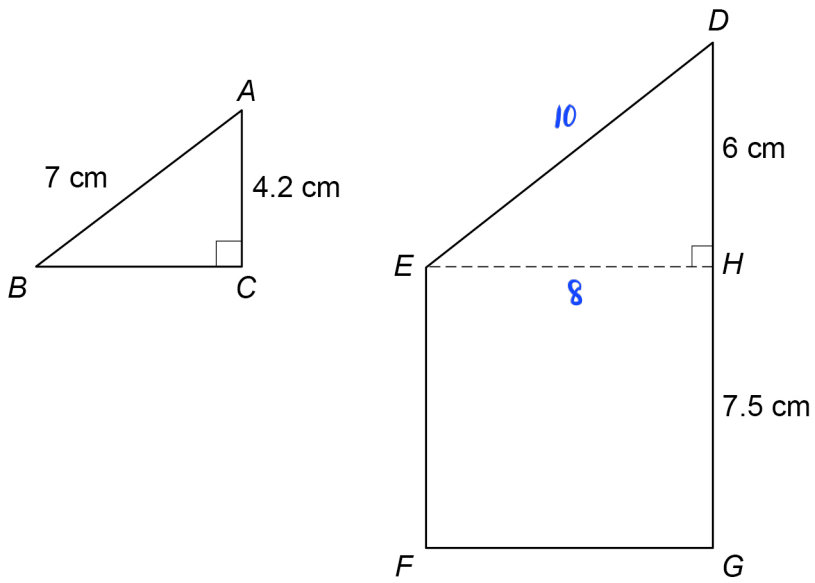
Answer 96 cm^2

7 Trapezium *DEFG* is formed by joining

triangle *DEH*

to

rectangle *EFGH*.



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ABC is similar to *DEH*.

Work out the area of *DEFG*.

[5 marks]

$\frac{DE}{7} = \frac{6}{4.2}$

$DE = \frac{6}{4.2} \times 7 = 10$ (1)

$EH = \sqrt{10^2 - 6^2}$ (1)

$= \sqrt{64} = 8$ (1)

Area $DEH = \frac{1}{2} \times 6 \times 8 = 24$ (1)

Area $EFGH = 8 \times 7.5 = 60$

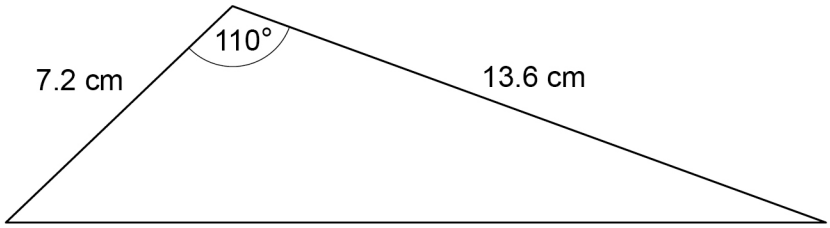
Area $DEFG = 24 + 60 = 84$

Answer 84 (1) cm^2

8 Two sides of a triangle are measured to 1 decimal place.

The angle between the sides is measured to the nearest degree.

Not drawn accurately



Work out the upper bound for the area of the triangle.

You **must** show your working.

[4 marks]

UB : 7.25 , 110.5 , 13.65 (1)

LB : 7.15 , 109.5 , 13.55

(1)

$\text{Area}_{UB} = \frac{1}{2} \times 7.25 \times 13.65 \times \sin 109.5$ (1)

$= 46.64...$ (1)

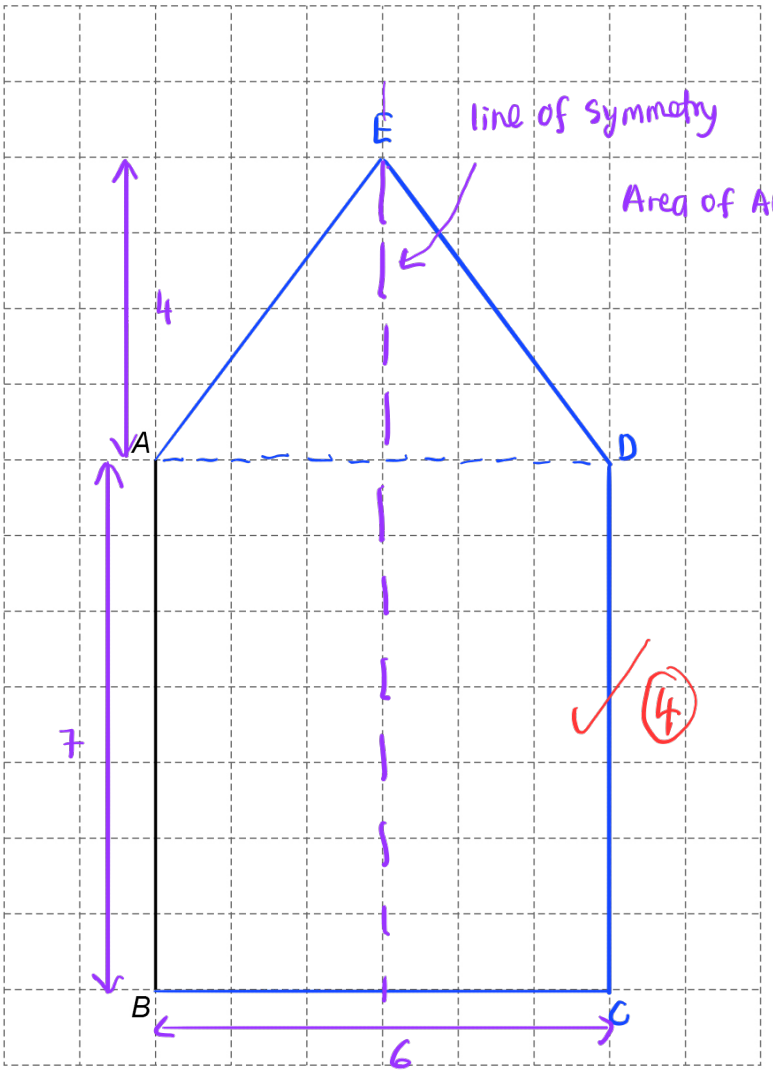
Answer 46.64 cm^2

9 *ABCDE* is a pentagon with $AB = 7$ cm

- $BC = 6$ cm
- *AB* and *BC* are perpendicular.
- *AB* and *DC* are equal **and** parallel.
- Area of the pentagon $= 54\,\text{cm}^2$
- The pentagon has exactly **one** line of symmetry.

Complete a **labelled** drawing of the pentagon.

[4 marks]



Area of ABCD = $7 \times 6 = 42$ cm^2

Area of ADE = $54 - 42 = 12$ cm^2