1 The diagram shows trapezium *ABCD* in which *BC* and *AD* are parallel.

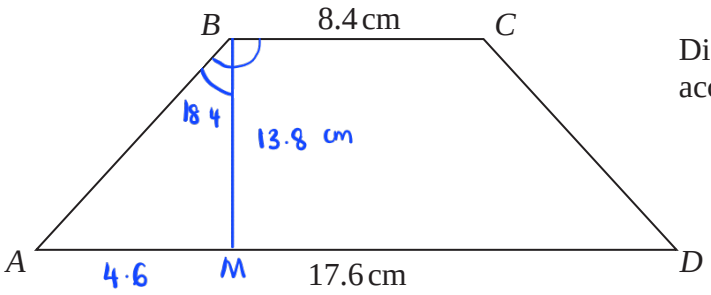


Diagram **NOT** accurately drawn

The trapezium has exactly one line of symmetry.

BC = 8.4 cm
AD = 17.6 cm

The trapezium has area 179.4 cm^2

Work out the size of angle *ABC*.
Give your answer correct to 1 decimal place.

Area of trapezium ABCD : $\frac{1}{2} \times (BC + AD) \times BM = 179.4$

$\frac{1}{2} \times (8.4 + 17.6) \times BM = 179.4$ (1)

$BM = \frac{179.4}{13} = 13.8$ cm (1)

$AM = \frac{17.6 - 8.4}{2} = 4.6$ cm (1)

Finding angle ABM :

$\tan \angle ABM = \frac{4.6}{13.8}$ (1)

$\angle ABM = \tan^{-1} \frac{1}{3}$

$= 18.43°$ (1)

∴ Angle ABC = $18.43° + 90°$

$= 108.4°$ (1)

108.4 °

(Total for Question 1 is 6 marks)

2 The diagram shows an isosceles triangle.

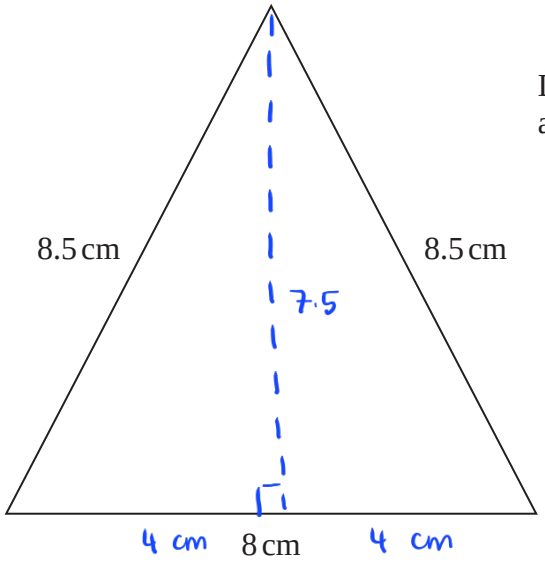


Diagram **NOT** accurately drawn

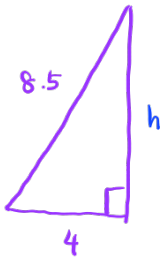
Work out the area of the triangle.

By using Pythagoras' theorem :

$h = \sqrt{8.5^2 - 4^2}$

$= \sqrt{56.25}$ (1)

$= 7.5$ cm (1)



Area of triangle : $\frac{1}{2}$ x base x height

$= \frac{1}{2} \times 8 \text{ cm} \times 7.5 \text{ cm}$ (1)

$= 30 \text{ cm}^2$ (1)

30 ..... cm^2

(Total for Question 2 is 4 marks)

3 The diagram shows Yuen's garden.

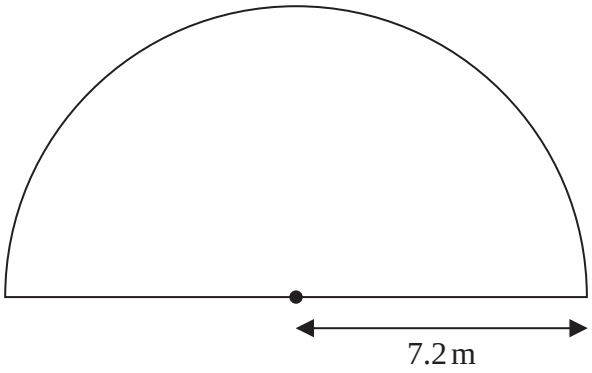


Diagram **NOT** accurately drawn

The garden is in the shape of a semicircle of radius 7.2 m.
Yuen is going to cover his garden with grass seed.

Yuen has 12 boxes of grass seed.
Each box of grass seed contains enough seed to cover 6 m^2 of the garden.

Has Yuen enough grass seed for his garden?
Show your working clearly.

Area of semicircle $= \frac{\pi r^2}{2}$

Area of semicircle $= \frac{\pi (7.2)^2}{2} = 81.43\ m^2$ (1)

Amount of grass seed $= 12 \times 6 = 72\ m^2$ (1)

No, Yuen does not have enough grass seed for his garden. He only has enough grass seed to cover $72 m^2$ which is less than $81.43\ m^2$. (1)

(Total for Question 3 is 3 marks)

4 The diagram shows the prism *ABCDEF* with cross section triangle *ABC*.

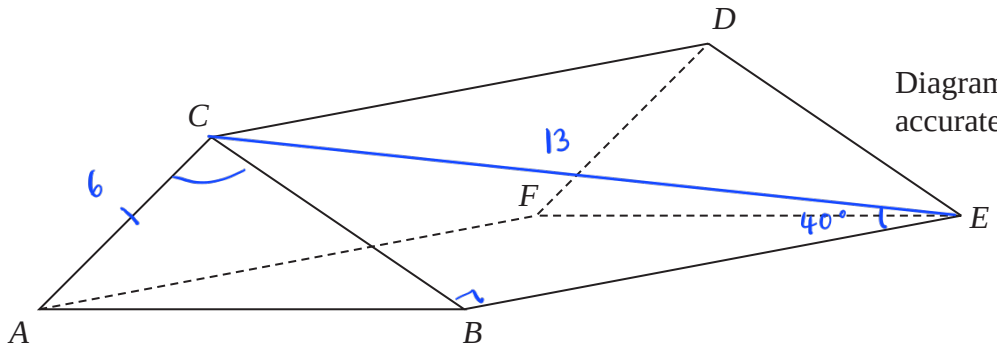


Diagram **NOT** accurately drawn

Angle *BEC* = 40° and angle *ACB* is obtuse.
AC = 6 cm and *CE* = 13 cm

The area of triangle *ABC* is 22 cm^2

Calculate the length of *AB*.
Give your answer correct to one decimal place.

$CB = 13 \sin 40°$

$= 8.3562\ldots$ (1)

Area of triangle $= \frac{1}{2} ab \sin C$

$22 = \frac{1}{2} \times 6 \times 8.3562\ldots \sin \angle ACB$ (1)

$\sin \angle ACB = 0.87758\ldots$

Acute version $ACB = \sin^{-1}(0.87758\ldots)$

$= 61.353°$ (1)

$ACB = 180 - 61.353 = 118.647°$ (1)

cosine rule → $a^2 = b^2 + c^2 - 2bc \cos A$

$(AB)^2 = 6^2 + (8.3562)^2 - 2(6)(8.3562) \cos 118.647°$

$= 153.899$ (1)

$AB = \sqrt{153.899}$

$= 12.4$ cm (1)

12.4 ..... cm

(Total for Question 4 is 6 marks)

5 The diagram shows a box in the shape of a cuboid.

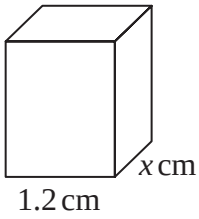


Diagram **NOT** accurately drawn

The box is put on a table.
The face of the box in contact with the table has length 1.2 metres and width x metres.

The force exerted by the box on the table is 27 newtons.
The pressure on the table due to the box is 30 newtons/m^2

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

Work out the value of x.

Area of the base of the box :

$1.2x$ m^2

$30 \text{ N/m}^2 = \dfrac{27 \text{ N}}{1.2x \text{ m}^2}$ (1)

$1.2x = \dfrac{27}{30}$

$1.2x = 0.9$

$x = \dfrac{0.9}{1.2}$ (1)

$= 0.75$ (1)

$x =$ 0.75

(Total for Question 5 is 3 marks)

6 $\mathbf{L}_1$ and $\mathbf{L}_2$ are two straight lines.
The origin of the coordinate axes is O.

$\mathbf{L}_1$ has equation $5x + 10y = 8$
$\mathbf{L}_2$ is perpendicular to $\mathbf{L}_1$ and passes through the point with coordinates (8, 6)

$\mathbf{L}_2$ crosses the x-axis at the point A.
$\mathbf{L}_2$ intersects the straight line with equation $x = -3$ at the point B.

Find the area of triangle AOB.
Show your working clearly.

Equation of L_1 : $5x + 10y = 8$

$10y = -5x + 8$

$y = -\frac{1}{2}x + \frac{4}{5}$ ← in terms of $y = mx + c$

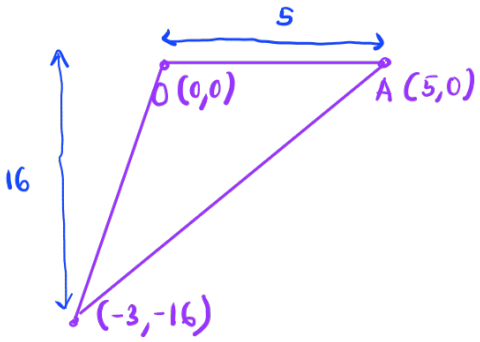
Gradient of L_1 : $-\frac{1}{2}$

Gradient of L_2 : 2 → $m_{L_1} = \frac{-1}{m_{L_2}}$ (1)

Equation of L_2 : $6 = 2(8) + c$

$c = -10$

$\therefore y = 2x - 10$ (1)



when L_2 crosses point A :

$y = 0$: $0 = 2x - 10$

$x = 5$ (1)

$\therefore L_2$ crosses point A at (5,0)

when L_2 intersects at point B :

$x = -3$: $y = 2(-3) - 10$

$y = -16$

$\therefore L_2$ intersects at $(-3, -16)$

Area $= \frac{1}{2} \times 5 \times 16$ (1)

$= 40$ (1)

40

(Total for Question 6 is 5 marks)

7 The area of a rectangle is $18\,\text{cm}^2$

The length of the rectangle is $\left(\sqrt{7}+1\right)$ cm.

Without using a calculator and showing each stage of your working,

find the width of the rectangle.
Give your answer in the form $a\sqrt{b}+c$ where a, b and c are integers.

$(\sqrt{7}+1) \times w = 18$

$w = \frac{18}{\sqrt{7}+1} \times \frac{\sqrt{7}-1}{\sqrt{7}-1}$ (1)

$= \frac{18\sqrt{7}-18}{7-1}$ (1)

$= \frac{18\sqrt{7}-18}{6}$

$w = 3\sqrt{7}-3$ (1)

Area = length x width

$3\sqrt{7}-3$ cm

(Total for Question 7 is 3 marks)

8 The diagram shows a rectangle *ABCD* and a semicircle with diameter *AB* where *AB* = 12 cm. The point *E* lies on *DC* and also on the semicircle.

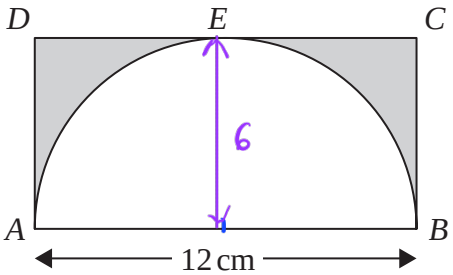


Diagram **NOT** accurately drawn

radius = 6 cm

Work out the area of the shaded region.
Give your answer correct to 3 significant figures.

Area of rectangle : $12 \times 6 = 72$ cm^2 (1)

Area of Semicircle : $\frac{1}{2} \times \pi \times 6^2 = 56.54$ cm^2

Area of shaded region = Area of rectangle − Area of Semicircle

: 72 cm^2 − 56.54 cm^2 (1)

: 15.5 cm^2 (1)

15.5 ..... cm^2

(Total for Question 8 is 3 marks)

9 The diagram shows a kite *ABCD*

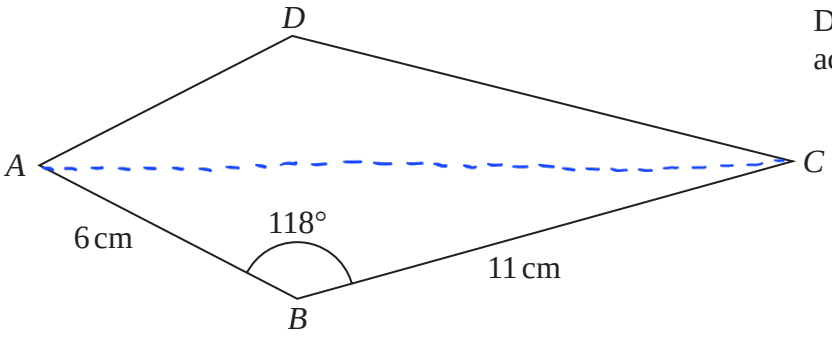


Diagram **NOT** accurately drawn

AB = 6 cm *BC* = 11 cm Angle *ABC* = 118°

Calculate the area of the kite.
Give your answer correct to 3 significant figures.

· Both sides of kite are symmetrical.

Find area of one half of the kite :

$\frac{1}{2} \times AB \times BC \times \sin ABC^{\circ}$

$= \frac{1}{2} \times 6 \times 11 \times \sin 118^{\circ}$ (1)

$= 29.13 \text{ cm}^2$

Area of the whole kite :

$2 \times 29.13 \text{ cm}^2$ (1)

$= 58.3 \text{ cm}^2$ (1)

58.3 ..... cm^2

(Total for Question 9 is 3 marks)

10 The diagram shows isosceles triangle *ABC*

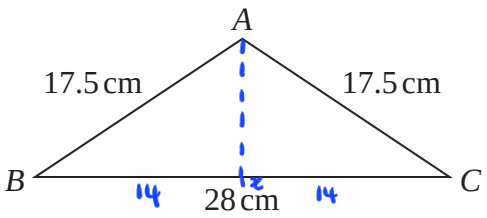


Diagram **NOT** accurately drawn

AB = *AC* = 17.5 cm *BC* = 28 cm

Calculate the area of triangle *ABC*

$AX = \sqrt{17.5^2 - 14^2}$ (1)

$= \sqrt{110.25}$

$= 10.5$ (1)

Area ABC $= 2 \times \frac{1}{2} \times 10.5 \times 14$ (1)

$= 147 \text{ cm}^2$

(1)

147 ..... cm^2

(Total for Question 10 is 4 marks)

11 The diagram shows a circle with centre O

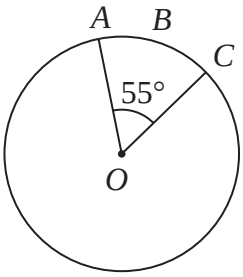


Diagram **NOT** accurately drawn

A, B and C are points on the circle so that the length of the arc ABC is 5 cm.

Given that angle $AOC = 55°$

work out the area of the circle.
Give your answer correct to one decimal place.

$\frac{55}{360} \times 2 \times \pi \times r = 5$ (1)

$r = \frac{5 \times 360}{2 \times \pi \times 55}$ (1)

$= 5.2$

Area $= \pi \times 5.2^2$ (1)

$= 85.2$ (1)

85.2 ..... cm^2

(Total for Question 11 is 4 marks)

12 The diagram shows triangle *PQR*

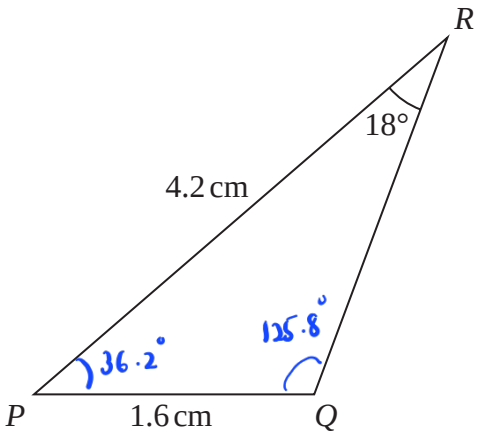


Diagram **NOT** accurately drawn

PQ = 1.6 cm *PR* = 4.2 cm Angle *PRQ* = 18°

Given that angle *PQR* is obtuse,

work out the area of triangle *PQR*
Give your answer correct to 3 significant figures.

$\frac{\sin PQR}{4.2} = \frac{\sin 18}{1.6}$ (1)

$\angle PQR = \sin^{-1}\left(\frac{\sin 18}{1.6}(4.2)\right)$

$= 54.2^\circ$ (acute) (1)

$\angle PQR = 180^\circ - 54.2^\circ = 125.8^\circ$ (obtuse) (1)

$\angle QPR = 180^\circ - 125.8^\circ - 18^\circ = 36.2^\circ$

(1)

Area $= \frac{1}{2} \times 4.2 \times 1.6 \times \sin 36.2^\circ$ (1)

$= 1.98$ (1)

1.98 ..... cm^2

(Total for Question 12 is 6 marks)

13 The diagram shows an isosceles triangle *ABC*

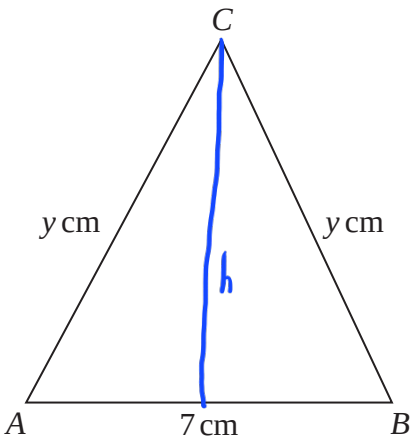


Diagram **NOT** accurately drawn

AB = 7 cm *AC* = *BC* = *y* cm

The area of the triangle is 42 cm^2

Work out the value of *y*

Area : $\frac{1}{2} \times 7 \times h = 42$

$h = 12$ (1)

$y^2 = 12^2 + 3.5^2$ (1)

$y = \sqrt{12^2 + 3.5^2}$ (1)

$= 12.5$ (1)

y = 12.5

(Total for Question 13 is 4 marks)

14 *R* and *T* are points on a circle, centre *O*

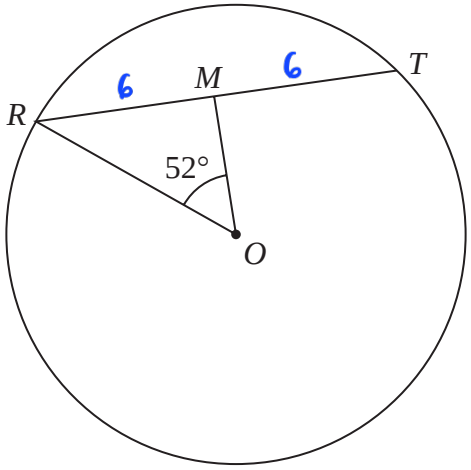


Diagram **NOT** accurately drawn

RT = 12 cm
M is the midpoint of *RT*
Angle *ROM* = 52°

Work out the area of the circle.
Give your answer correct to 3 significant figures.

$\sin 52° = \frac{6}{r}$ (1)

$r = \frac{6}{\sin 52°}$ (1)

$= 7.614$

Area $= \pi \times 7.614^2$ (1)

$= 182$ (1)

182 ..... cm^2

(Total for Question 14 is 4 marks)

15

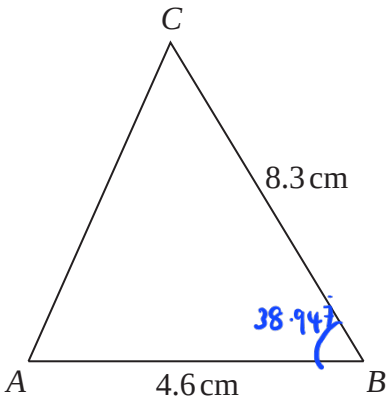


Diagram **NOT** accurately drawn

$AB = 4.6\,\text{cm}$ $BC = 8.3\,\text{cm}$ angle ABC is acute

The area of triangle ABC is $12\,\text{cm}^2$

Work out the perimeter of triangle ABC
Give your answer correct to 3 significant figures.

$12 = \frac{1}{2} \times 8.3 \times 4.6 \times \sin ABC$ (1)

$ABC = \sin^{-1} \frac{12}{\frac{1}{2} \times 8.3 \times 4.6}$ (1)

$= 38.947\ldots$

$AC^2 = 4.6^2 \times 8.3^2 - 2(4.6)(8.3) \cos 38.947$ (1)

$AC^2 = 30.6627\ldots$

$AC = \sqrt{30.6627\ldots}$ (1)

$= 18.4$ (1)

18.4 ..... cm

(Total for Question 15 is 5 marks)

16 The diagram shows an isosceles triangle, with base length 24 cm.

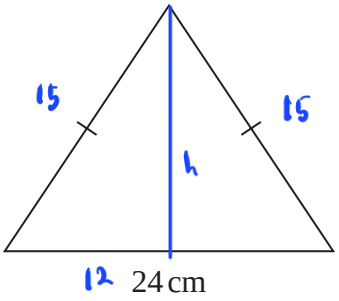


Diagram **NOT** accurately drawn

The perimeter of the triangle is 54 cm.

Work out the area of the triangle.

$2x + 24 = 54$

$x = 15$ (1)

$h^2 = 15^2 - 12^2$ (1)

$h = \sqrt{81}$ (1)

$= 9$

$\text{Area} = \frac{1}{2} \times 9 \times 24$ (1)

$= 108$ (1)

108 ..... cm^2

(Total for Question 16 is 5 marks)

17 A field is in the shape of a trapezium.

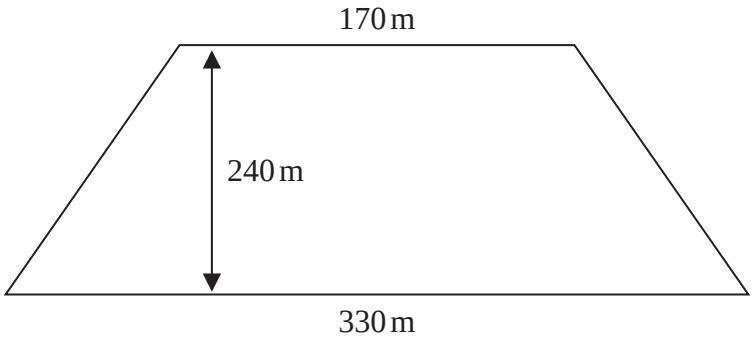


Diagram **NOT** accurately drawn

The field is sold for a price of $49 650

Given that 1 hectare = 10 000 m^2

work out the average price of the field per hectare.

Area = $\frac{1}{2} \times 240 \times (170 + 330)$ (1)

= 120×500

= $60\,000\ m^2$

in hectare : $\frac{60\,000}{10000}$ (1)

= 6 hectares

price per hectare = $\frac{49\,650}{6}$ (1) = 8275 (1)

$ 8275

(Total for Question 17 is 4 marks)