Name: _____

Pythagoras and Trigonometry
Problem Solving 1

Date:

Time:

Total marks available: 22

Total marks achieved: _____

Solutions

Questions

Q1.

The diagram shows a regular pentagon *ABCDE*.

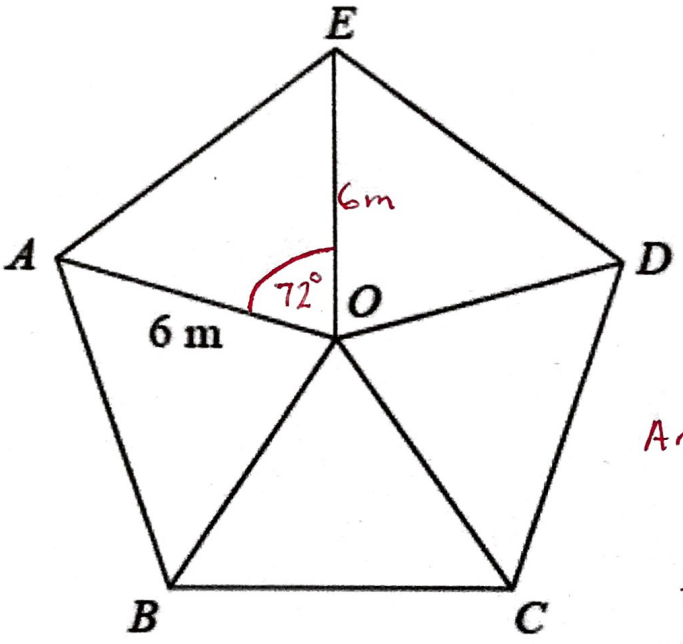

Diagram NOT accurately drawn

$\angle AOE = \frac{360}{5} = 72°$

Area of $\triangle AOE$

$= \frac{1}{2}ab\sin C$

$= \frac{1}{2} \times 6 \times 6 \times \sin 72°$

$= 17.12 \text{ m}^2$

The pentagon is divided into 5 isosceles triangles.
OA = *OB* = *OC* = *OD* = *OE* = 6 m

Work out the area of the pentagon.
Give your answer correct to 1 decimal place.

Area of pentagon

$= 5 \times 17.12$

$= 85.6 \text{ m}^2$

85.6 ..... m^2

to 1 d.p.

(Total for question = 4 marks)

Q2.

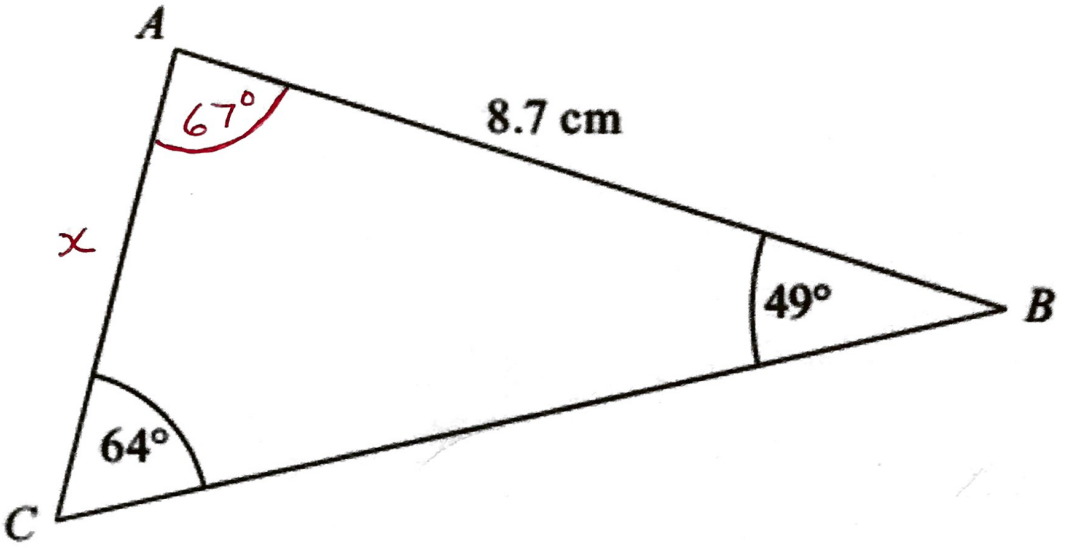

Diagram **NOT** accurately drawn

ABC is a triangle.

AB = 8.7 cm.
Angle *ABC* = 49°.
Angle *ACB* = 64°.

Calculate the area of triangle *ABC*.
Give your answer correct to 3 significant figures.

$\angle CAB = 180 - (64 + 49) = 67^\circ$

Sine Rule

$$\frac{x}{\sin 49^\circ} = \frac{8.7}{\sin 64^\circ}$$

$$x = \frac{8.7}{\sin 64^\circ} \times \sin 49^\circ$$

$$x = 7.305 \text{ cm}$$

Area of $\triangle ABC = \frac{1}{2} bc \sin A$

$= \frac{1}{2} \times 7.305 \times 8.7 \sin 67^\circ$

$= 29.25 \text{ cm}^2$

$= 29.3 \text{ cm}^2$ to 3 s.f.

.....29.3..... cm²

(Total for Question is 5 marks)

Q3.

* The diagram shows a triangle *DEF* inside a rectangle *ABCD*.

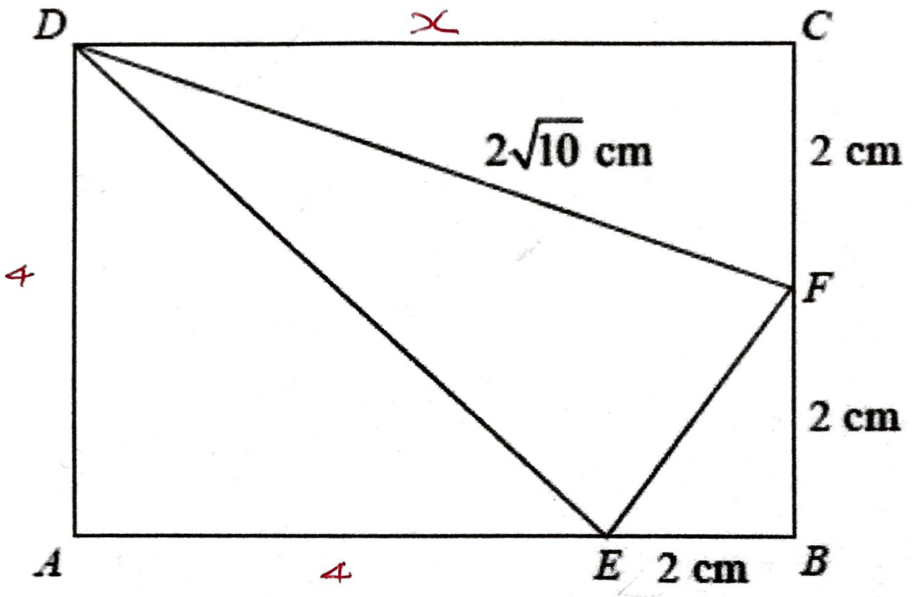

Diagram NOT accurately drawn

Show that the area of triangle *DEF* is 8 cm^2.
You must show all your working.

In $\triangle DCF$

$x^2 + 2^2 = (2\sqrt{10})^2$

$x^2 + 4 = 40$

$x^2 = 40 - 4 = 36$

$x = \sqrt{36} = 6$

So area of rectangle $= 6 \times 4 = 24\ cm^2$

Area of $\triangle AED = \frac{1}{2} \times 4 \times 4 = 8\ cm^2$

Area of $\triangle BEF = \frac{1}{2} \times 2 \times 2 = 2\ cm^2$

Area of $\triangle DCF = \frac{1}{2} \times 2 \times 6 = 6\ cm^2$

Total $= 16\ cm^2$

Area of $\triangle DEF = 24 - 16 = 8\ cm^2$

Area of $\triangle DEF$
= Area of rectangle minus the sum of the areas of other three triangles

(Total for question = 4 marks)

Q4.

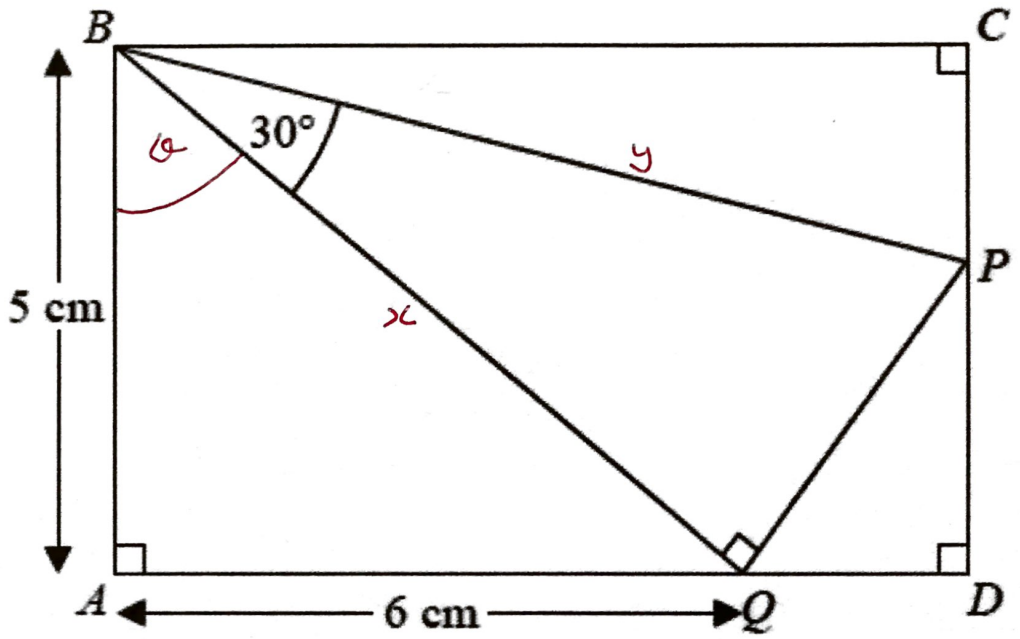

Diagram NOT accurately drawn

In the diagram,

ABCD is a rectangle
P lies on the line *CD*
Q lies on the line *AD*
PQB is a right-angled triangle

Work out the length of *BC*.
Give your answer correct to 3 significant figures.
You must show your working.

In △ ABQ

$5^2 + 6^2 = x^2$

$25 + 36 = x^2$

$61 = x^2$

$\sqrt{61} = x$

$x = 7.810$

In △ BAQ

$\tan\theta = \frac{6}{5}$

$\theta = \tan^{-1}\left(\frac{6}{5}\right) = 50.2^\circ$

In △ BQP

$\cos 30 = \frac{x}{y}$

$y \cos 30 = x$

$y = \frac{x}{\cos 30} = \frac{7.810}{\cos 30}$

$y = 9.018$ cm

$\therefore \angle PBC = 90 - 30 - 50.2$

$= 9.8^\circ$

In △ PBC

$\cos 9.8^\circ = \frac{BC}{y}$

$y \cos 9.8^\circ = BC$

$9.018 \cos 9.8 = BC$

$8.886 = BC$

$BC = 8.89$ .....cm

to 3 s.f.

(Total for question = 5 marks)

Q5.

The diagram shows a square *ABCD* inside a circle.

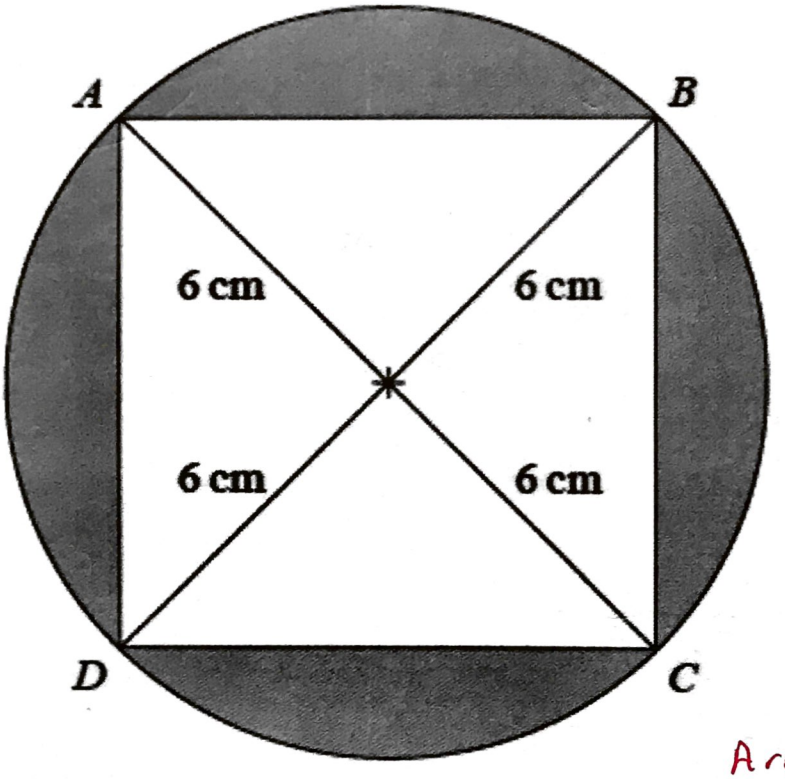

Diagram NOT accurately drawn

The points *A*, *B*, *C* and *D* lie on the circle.

The radius of the circle is 6 cm.

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

Area of Shaded Regions

= Area of circle − Area of square

Area of circle

$= \pi r^2 = \pi \times 6^2$

$= 113.097 \text{ cm}^2$

Area of $\triangle ADB$

$= \frac{1}{2}$ base × height

$= \frac{1}{2} \times 12 \times 6 = 36 \text{ cm}^2$

Area of square $= 2 \times 36$

$= 72 \text{ cm}^2$

Area of shaded region

$= 113.097 - 72$

$= 41.097$

$= 41.1 \text{ cm}^2$ to 3 s.f.

41.1 ..... cm^2

(Total for question = 4 marks)