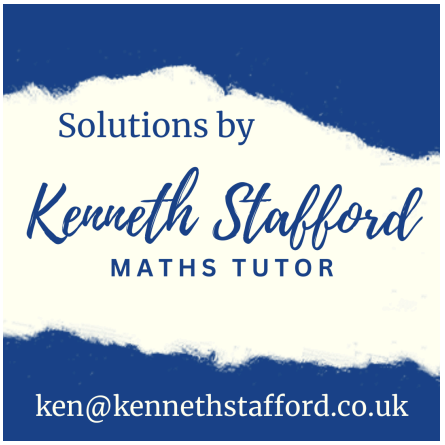
Name: SOLUTIONS

GCSE (1 - 9)

Area of a Sector

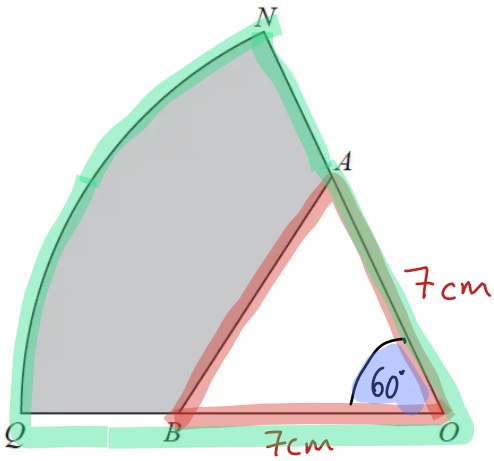




These questions are compiled from *released* Pearson Edexcel GCSE maths exam papers
They contain exam questions from up until the ***Summer 2023*** exam series
More recent exam papers do exist but are withheld for mock exams
As new exam papers are released these worksheets will gradually be updated
The ***most current*** version of these worksheets will always be available at: kennethstafford.co.uk

Question	Where the question appeared
1	Edexcel, GCSE, Summer 2017, Paper 2H, Q17
2	Edexcel, GCSE, Autumn 2017, Paper 2H, Q20
3	Edexcel, GCSE, Autumn 2018, Paper 1H, Q17
4	Edexcel, GCSE, Summer 2019, Paper 2H, Q12
5	Edexcel, GCSE, Autumn 2019, Paper 3H, Q23
6	Edexcel, GCSE, Autumn 2020, Paper 1H, Q22
7	Edexcel, GCSE, November 2022, Paper 2F, Q21

1



ONQ is a sector of a circle with centre *O* and radius 11 cm.

A is the point on *ON* and *B* is the point on *OQ* such that *AOB* is an equilateral triangle of side 7 cm.

Calculate the area of the shaded region as a percentage of the area of the sector *ONQ*.
Give your answer correct to 1 decimal place.

Area of AOB = $\frac{1}{2} \times 7 \times 7 \times \sin 60 = 21.2176\text{ cm}^2$

Area of sector ONQ = $\frac{60}{360} \times 11^2 \times \pi = 63.3555\text{cm}^2$

$63.3555 - 21.2176 = 42.1378$

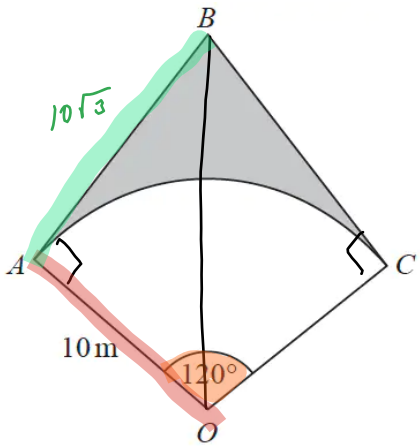
$\frac{42.1378}{63.3555} \times 100 = 66.510$

66.5 %

(Total for Question 17 is 5 marks)

[Edexcel, GCSE, Summer 2017, Paper 2H, Q17]

2

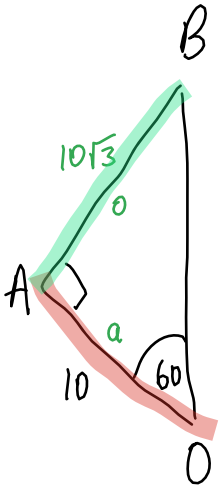


OAC is a sector of a circle, centre O, radius 10 m.

BA is the tangent to the circle at point A.
BC is the tangent to the circle at point C.

Angle $AOC = 120°$

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



AB: $opp = 10 \times \tan(60)$

$= 10\sqrt{3}$

Area of AOB $= \frac{1}{2} \times 10 \times 10\sqrt{3}$

$= 50\sqrt{3}$

Area of ABCO $= 2 \times 50\sqrt{3} = 100\sqrt{3}$

Area of AOC $= \frac{120}{360} \times 10^2 \times \pi$

$= 104.7197$

Shaded region $= 100\sqrt{3} - 104.7197$

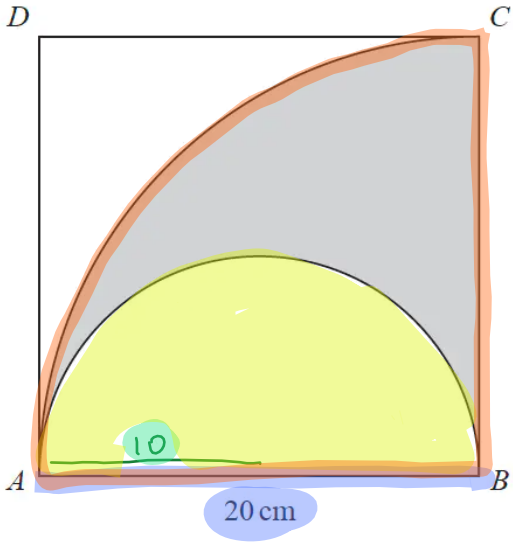
$= 68.5$ m^2

(Total for Question 20 is 5 marks)

[Edexcel, GCSE, Autumn 2017, Paper 2H, Q20]

3

The diagram shows a square $ABCD$ with sides of length 20 cm.
It also shows a semicircle and an arc of a circle.



AB is the diameter of the semicircle.
AC is an arc of a circle with centre B.

Show that $\dfrac{\text{area of shaded region}}{\text{area of square}} = \dfrac{\pi}{8}$

Area of square $= 20 \times 20 = 400\text{cm}^2$

Area of semicircle $= \frac{1}{2} \times 10^2 \times \pi = 50\pi\text{cm}^2$

Area of sector $= \frac{1}{4} \times 20^2 \times \pi = 100\pi\text{cm}^2$

Area of shaded region $= 100\pi - 50\pi = 50\pi\text{cm}^2$

$$\frac{\text{Area of shaded region}}{\text{Area of square}} = \frac{50\pi}{400} = \frac{\pi}{8}$$

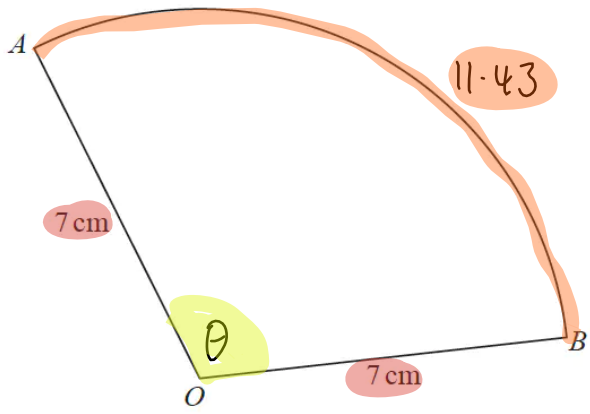
$\div 50$ $\div 50$

(Total for Question 7 is 4 marks)

[Edexcel, GCSE, Autumn 2018, Paper 1H, Q17]

4

OAB is a sector of a circle with centre *O* and radius 7 cm.



The area of the sector is 40 cm²

Calculate the perimeter of the sector.
Give your answer correct to 3 significant figures.

Area of sector $= \frac{\theta}{360} \times 7^2 \times \pi = 40$

$\frac{\theta}{360} \times 49\pi = 40$

$\frac{\theta}{360} = \frac{40}{49\pi}$

$\theta = 360 \times \frac{40}{49\pi}$

$\theta = 93.544°$

Circumference of circle $= 2 \times 7 \times \pi$
$= 14\pi$

Arc length of sector $= 14\pi \times \frac{93.544}{360}$
$= 11.43\text{cm}$

Perimeter $= 11.43 + 7 + 7$
$= 25.4285$

25.4 ..... cm

(Total for Question 12 is 4 marks)

[Edexcel, GCSE, Summer 2019, Paper 2H, Q12]

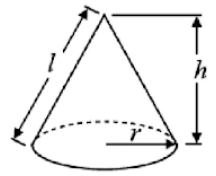
5

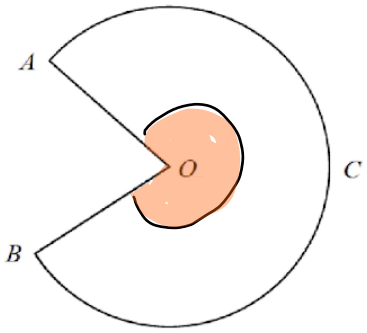
The diagram shows a sector $OACB$ of a circle with centre O.
The point C is the midpoint of the arc AB.

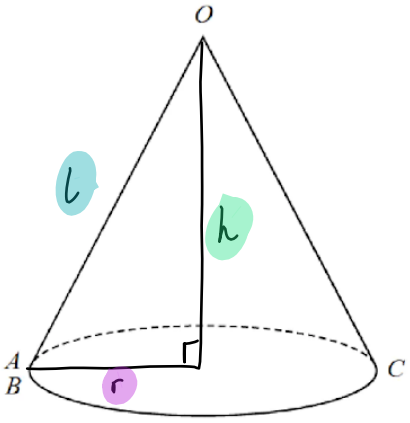
The diagram also shows a hollow cone with vertex O.
The cone is formed by joining OA and OB.

Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$

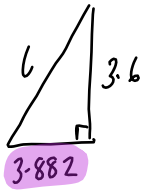






The cone has volume 56.8 cm³ and height 3.6 cm.

Calculate the size of angle AOB of sector $OACB$.
Give your answer correct to 3 significant figures.
You must show all your working.



$l^2 = 3.6^2 + 3.882^2$

$l^2 = 28.03$

$l = 5.29$

$\frac{1}{3}\pi r^2 h = 56.8$

$\frac{1}{3} \times \pi \times r^2 \times 3.6 = 56.8$

$1.2\pi r^2 = 56.8$

$r^2 = \frac{56.8}{1.2\pi}$

$r = \sqrt{ANS}$

$r = 3.882$

Curved surface area $= \pi \times 3.882 \times 5.29$

$= 64.57$

Area of circle $= \pi \times 3.882^2 = 47.34$

$\frac{47.34}{64.57} \times 360 = 263.96$

264 °

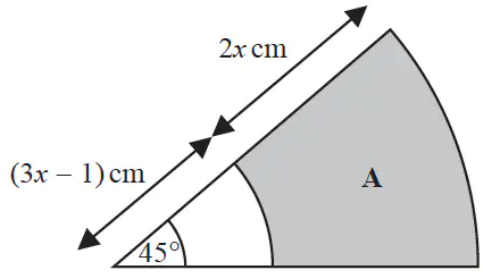
(Total for Question 23 is 5 marks)

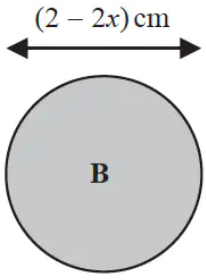
[Edexcel, GCSE, Autumn 2019, Paper 3H, Q23]

6

The diagram shows two shaded shapes, **A** and **B**.

Shape **A** is formed by removing a sector of a circle with radius $(3x - 1)$ cm from a sector of the circle with radius $(5x - 1)$ cm.
Shape **B** is a circle of diameter $(2 - 2x)$ cm.





Shape B
Area of Circle
$\pi(1-x)^2$
$=(1-2x+x^2)\pi$

The area of shape **A** is equal to the area of shape **B**.

Find the value of x.
You must show all your working.

$\frac{45}{360} \times \pi \times (5x-1)^2 = \frac{1}{8}(25x^2-10x+1)\pi$ Large Sector

$\frac{45}{360} \times \pi \times (3x-1)^2 = \frac{1}{8}(9x^2-6x+1)\pi$ Small Sector

Shape A $= \frac{1}{8}(25x^2-10x+1)\pi - \frac{1}{8}(9x^2-6x+1)\pi = \frac{1}{8}(16x^2-4x)\pi$

$\frac{1}{8}(16x^2-4x)\pi = (1-2x+x^2)\pi$

$\times 8$

$16x^2-4x = 8(1-2x+x^2)$

$16x^2-4x = 8-16x+8x^2$

$8x^2+12x-8=0$

$2x^2+3x-2=0$

$(2x-1)(x+2)=0$

$x=\frac{1}{2}$ $x=-2$ ($x=\frac{1}{2}$ can't be negative)

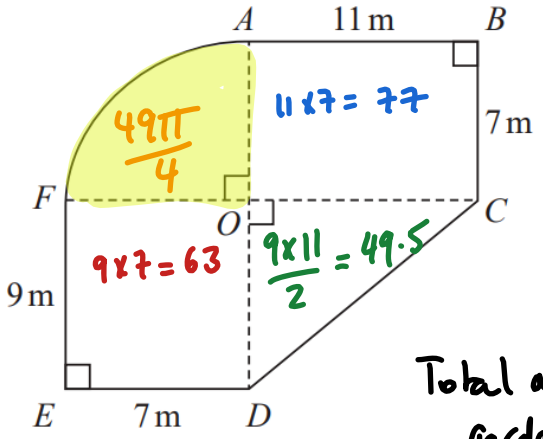
(Total for Question 22 is 5 marks)

[Edexcel, GCSE, Autumn 2020, Paper 1H, Q22]

7

The diagram shows a plan of Jason's garden.

ABCO and *DEFO* are rectangles.
CDO is a right-angled triangle.
AFO is a sector of a circle with centre *O* and angle *AOF* = 90°



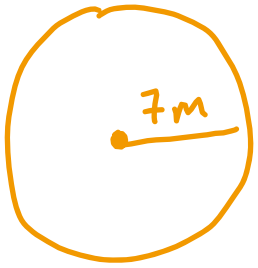
$\frac{49\pi}{4}$ $11 \times 7 = 77$ $9 \times 7 = 63$ $\frac{9 \times 11}{2} = 49.5$

Total area of garden $= 63 + 77 + 49.5 + \frac{49\pi}{4}$

$= 227.98 m^2$

Jason is going to cover his garden with grass seed.
Each bag of grass seed covers 14 m² of garden.
Each bag of grass seed costs £10.95

Work out how much it will cost Jason to buy all the bags of grass seed he needs.



Area $= \pi \times 7^2 = 49\pi$

Area of sector $= \frac{49\pi}{4}$

$\frac{227.98}{14} = 16.28$ (17 bags)

$17 \times 10.95 =$ £ 186.15

(Total for Question 21 is 5 marks)

[Edexcel, GCSE, November 2022, Paper 2F, Q21]