

# National 5 - Mathematics

## Mock Exam A (2022) - C Serra

### Paper 2 (Calculator)

Duration - 1 hour 30 minutes

#### FORMULAE LIST

The roots of  $ax^2 + bx + c = 0$  are  $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule:  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule:  $a^2 = b^2 + c^2 - 2bc \cos A$  or  $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

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

Volume of a sphere:  $V = \frac{4}{3}\pi r^3$

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

Volume of a pyramid:  $V = \frac{1}{3}Ah$

Standard deviation:  $s = \sqrt{\frac{\sum(x - \bar{x})^2}{n-1}}$   
or  $s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}}$ , where  $n$  is the sample size.

**Attempt ALL questions.**

**You may use a calculator.**

**To earn full marks you must show your working in your answers. State the units for your answer where appropriate.**

1. In 2019, a cottage was valued at £94,000. Its value rose by 4.5% each following year.

Calculate the value of the cottage in 2022. Give your answer to 2 significant figures.

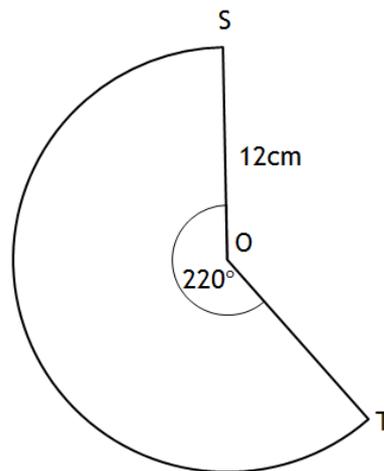
4

2. A rocket ship travels at an average speed of  $2.8 \times 10^4$  mph.

Calculate the distance travelled in one day. Write your answer in scientific notation.

2

3. The diagram below shows a sector of a circle, centre O.

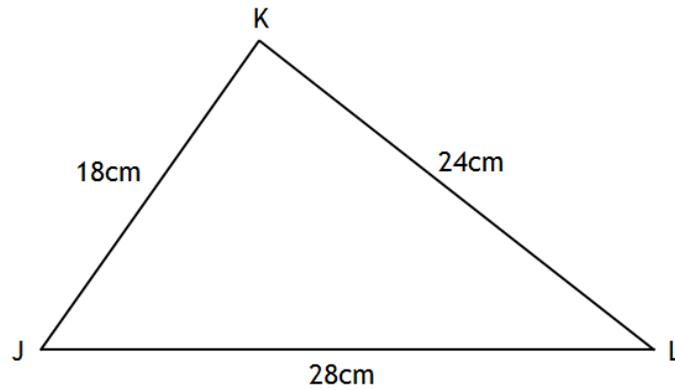


The radius of the circle is 12 centimetres.

Calculate the length of the major arc ST.

3

4. Triangle JKL is shown.



Calculate the size of angle JLK.

3

5. Write  $x^2 + 12x - 2$  in the form  $(x + p)^2 + q$ .

2

6. Jim works part-time at a local newsagent. He receives a 5% pay rise, and now earns £180.60 a week.

Calculate Jim's weekly pay before the pay rise.

3



9. Simplify  $\left(n^{\frac{1}{2}}\right)^6 \times n^{-5}$ .

Give your answer with a **positive** power.

**3**

10. Show that  $(1 + \cos x)(1 - \cos x) = \sin^2 x$ .

**2**

11. Solve the equation  $2x^2 + 7x - 6 = 0$ .

Give your answers correct to 1 decimal place.

**3**

12. Express

$$\frac{c}{3c - 15} \div \frac{2}{c - 5}$$

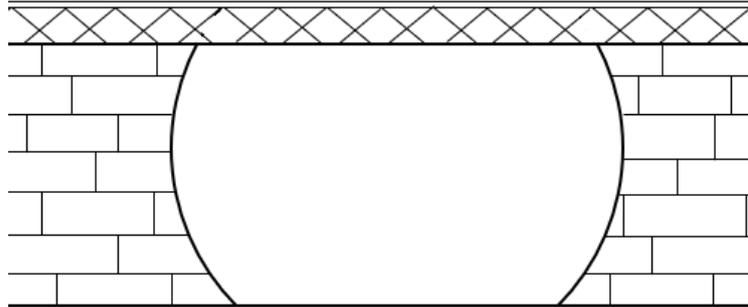
as a single fraction in its simplest form.

**3**

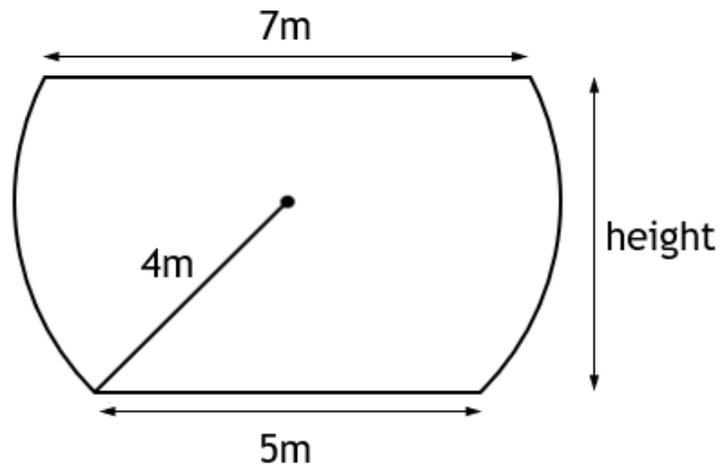
13. Solve  $3\tan x + 5 = 1$ ,  $0 \leq x < 360$ .

3

14. A pedestrian bridge lies atop a circular tunnel.



A diagram of a cross-section of the tunnel is shown below.

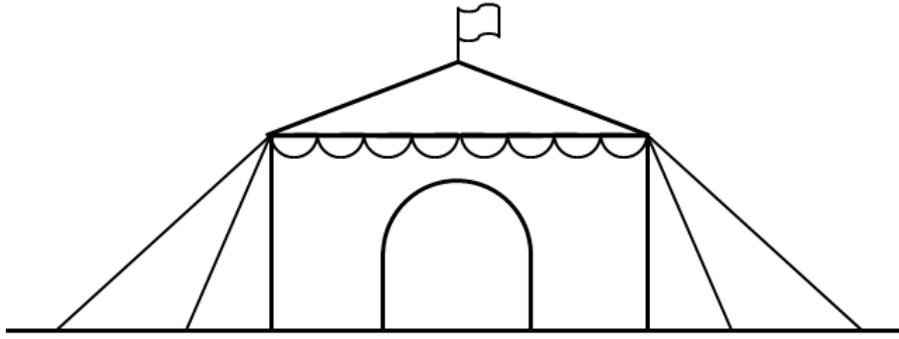


The radius of the tunnel is 4 metres. The width of the roof of the tunnel is 7 metres, and the width of the tunnel floor is 5 metres.

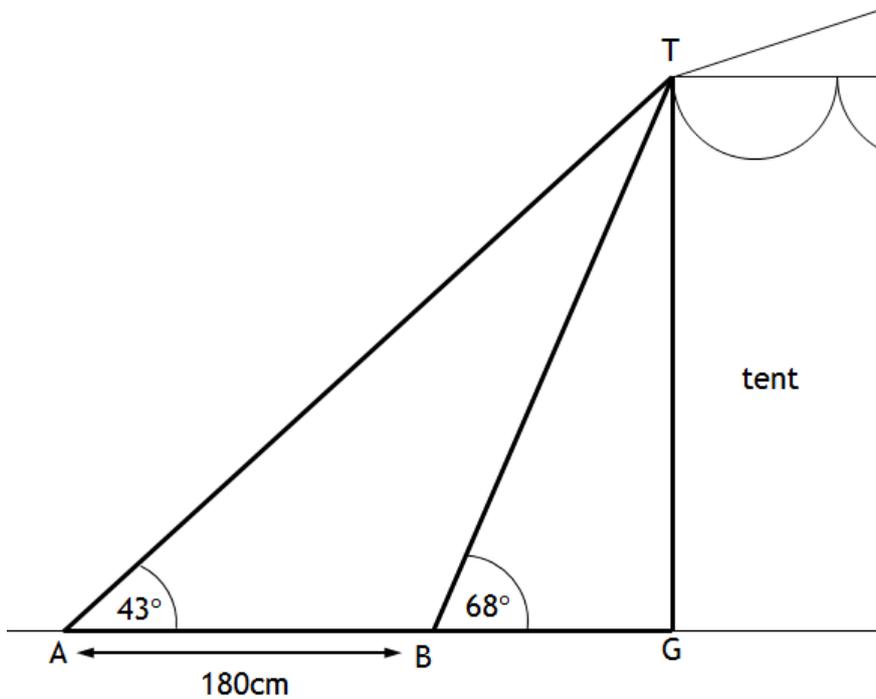
Find the height of the tunnel.

5

15. A tent is set up at a summer festival. The tent is held up at each corner by two taut ropes.



A diagram of the ropes holding up the tent is shown below. AT represents the outer rope and BT represents the inner rope.



- The angle of elevation of the outer rope is  $43^\circ$
- The angle of elevation of the inner rope is  $68^\circ$
- The distance between A and B is 180 centimetres

Calculate the height of the tent wall, GT.

5

[END OF QUESTION PAPER]