

National 5 - Mathematics
Mock Exam A (2022) - C Serra
Paper 1 (Non-Calculator)
Duration - 1 hour

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 NOT use a calculator.

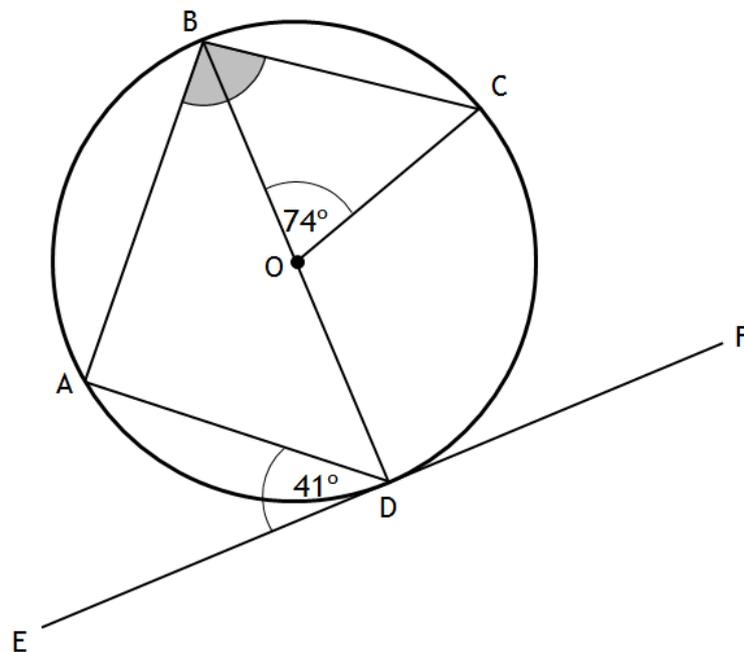
To earn full marks you must show your working in your answers. State the units for your answer where appropriate.

1. Given that $f(x) = x^2 - x$, evaluate $f(-10)$. 2

2. Calculate $5\frac{1}{7} - 2\frac{1}{5}$. 2

3. Expand and simplify $(2x - 3)(x + 2) + 4(x^2 - 2)$. 3

4. The diagram below shows a circle, centre O.



- EDF is a tangent to the circle
- Angle EDA = 41°
- Angle BOC = 74°

Calculate the size of angle ABC. 3

5. Solve, algebraically, the system of equations

$$6x + 2y = -2$$

$$9x - 3y = 9$$

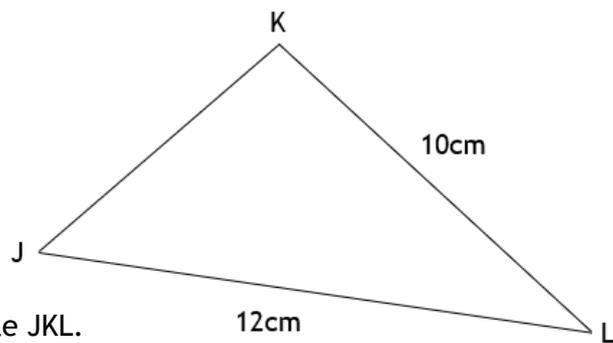
3

6. Express $\sqrt{300} - \sqrt{27} + 2\sqrt{3}$ as a surd in its simplest form.

3

7. In triangle JKL:

- $JL = 12\text{cm}$
- $KL = 10\text{cm}$
- $\sin L = \frac{3}{4}$



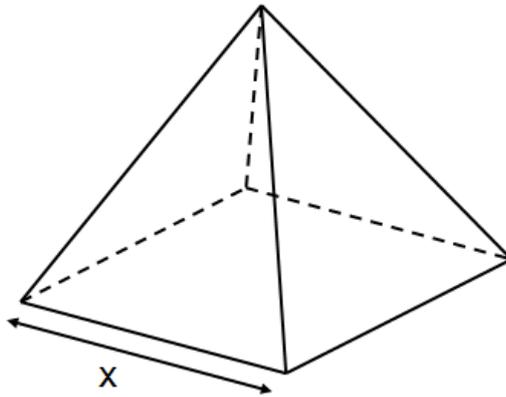
Calculate the area of triangle JKL.

2

8. Find the equation of the line joining the points $(-10,-8)$ and $(5,1)$.
Give the equation in its simplest form.

3

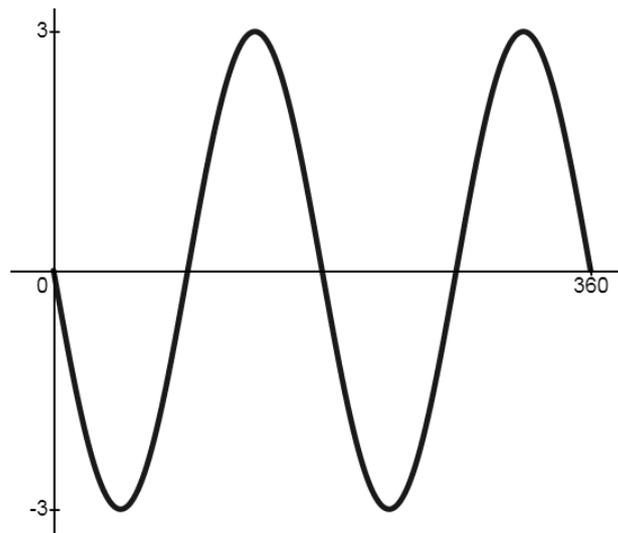
9. The diagram below shows a square-based pyramid of height 10cm and volume 270cm^3 .



Calculate the length of its base, marked x .

3

10. Part of the graph of $y = a\sin bx$ is shown in the diagram.



State the values of a and b .

2

11. State the period of $y = \cos 4x$. 1

12. Write the following in order of size, starting with the smallest:

$$\sin 80^\circ$$

$$\sin 180^\circ$$

$$\sin 280^\circ$$

Justify your answer.

2

13. Sketch the graph of $y = (x - 3)(x + 7)$.

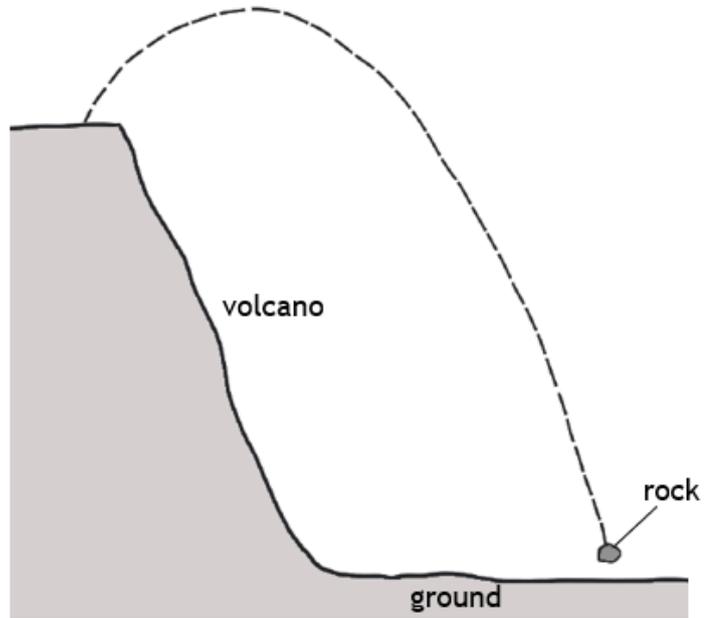
On your sketch, show clearly the points of intersection with the x-axis and the y-axis, and the coordinates of the turning point.

3

14. Solve, algebraically, the inequality $8 - 3(2 - x) < 9x$.

3

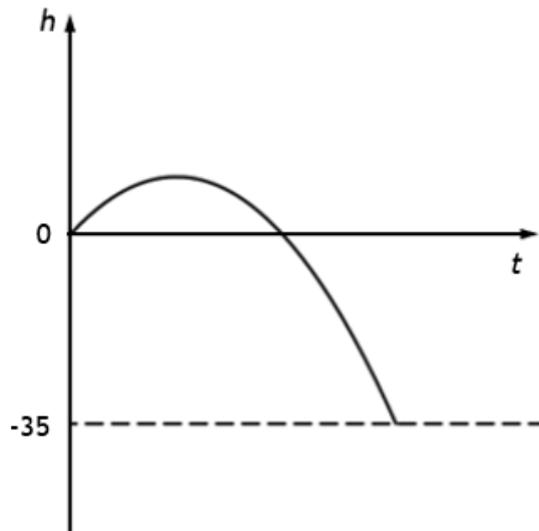
15. An erupting volcano ejects a rock.



The height, h metres, of the rock relative to the top of the volcano after t seconds is given by $h = 9t - 2t^2$.

- (a) Calculate the height of the rock above the volcano after 3 seconds. 1

The graph below represents the height, h metres, of the rock relative to the top of the volcano after t seconds.



The ground is 35 metres below the top of the volcano.

- (b) After how many seconds will the rock hit the ground? 4

[END OF QUESTION PAPER]