

Practice Paper 1

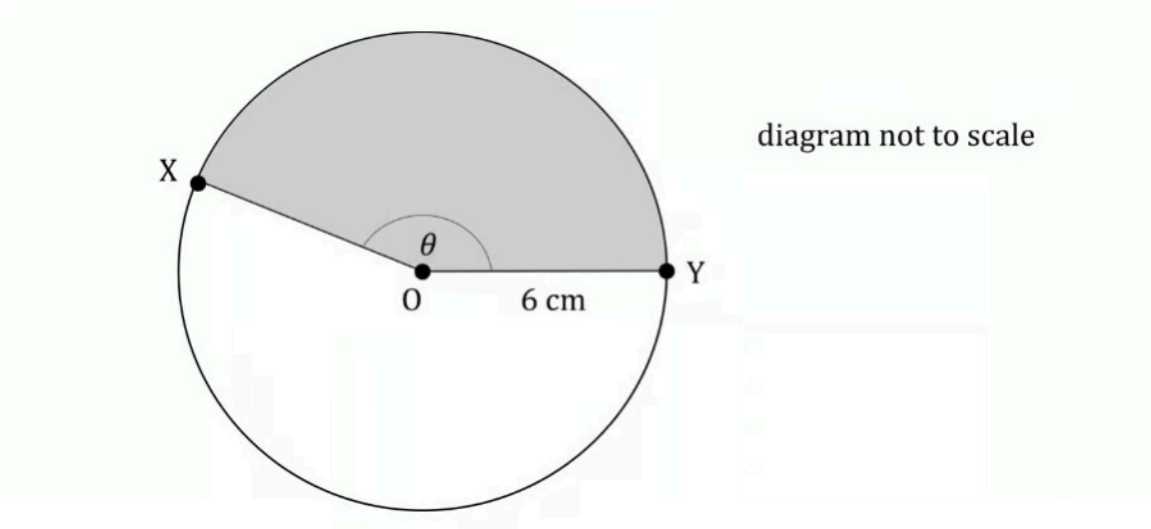
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Total Marks

/80

- 1 (a) The following diagram shows a circle with centre O and radius 6 cm. Points X and Y are points on the circumference and $\widehat{XOY} = \theta$ radians



The perimeter of the shaded sector is 30 cm.

Find the value of θ

(3 marks)

- (b) Hence, find the exact area of the **unshaded** sector.

(3 marks)

- 2 Prove that the square of an odd number is always odd.

(4 marks)

3 (a) Show that the equation $2 \sin^2 x + 3 \cos x = 0$ can be written in the form $a \cos^2 x + b \cos x + c = 0$, where a , b and c are integers to be found.

(2 marks)

(b) Hence, or otherwise, solve the equation $2 \sin^2 x + 3 \cos x = 0$ for $-180^\circ \leq x \leq 180^\circ$.

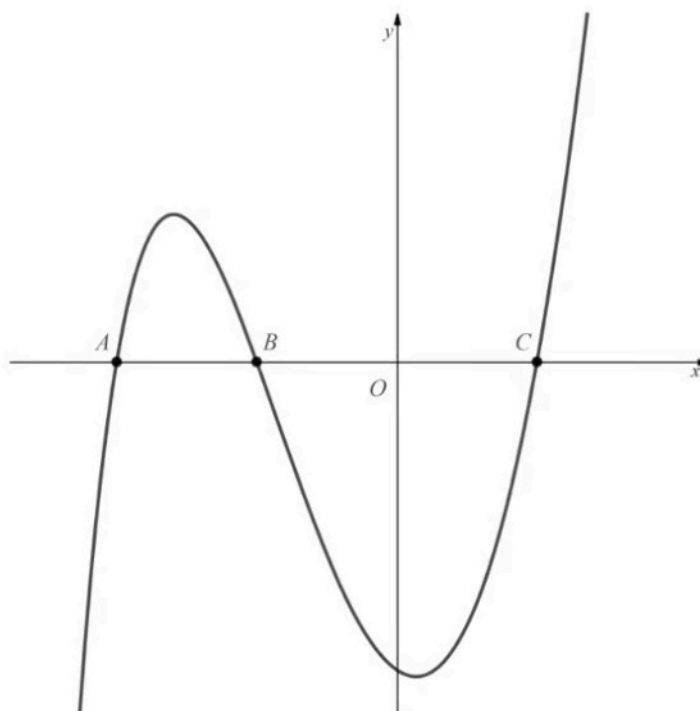
(3 marks)

4 In the expansion of $(x + h)^5$, where $h \in \mathbb{R}$, the coefficient of the term in x^3 is 320. Find the possible values of h .

(5 marks)

- 5 (a) The diagram below shows part of the graph of $y = f(x)$, where $f(x)$ is the function defined by

$$f(x) = (x^2 - 1) \ln(x + 3), x > -3$$



Points A, B and C are the three places where the graph intercepts the x -axis.

Find $f'(x)$.

(4 marks)

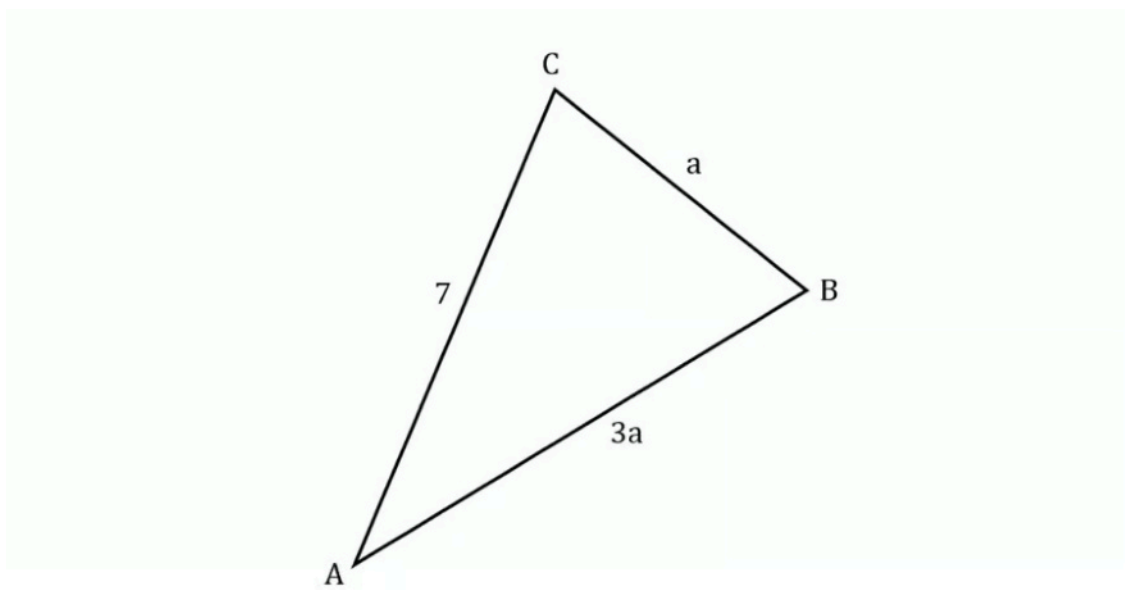
- (b) Show that the coordinates of point A are $(-2, 0)$.

(2 marks)

(c) Find the equation of the tangent to the curve at point A .

(3 marks)

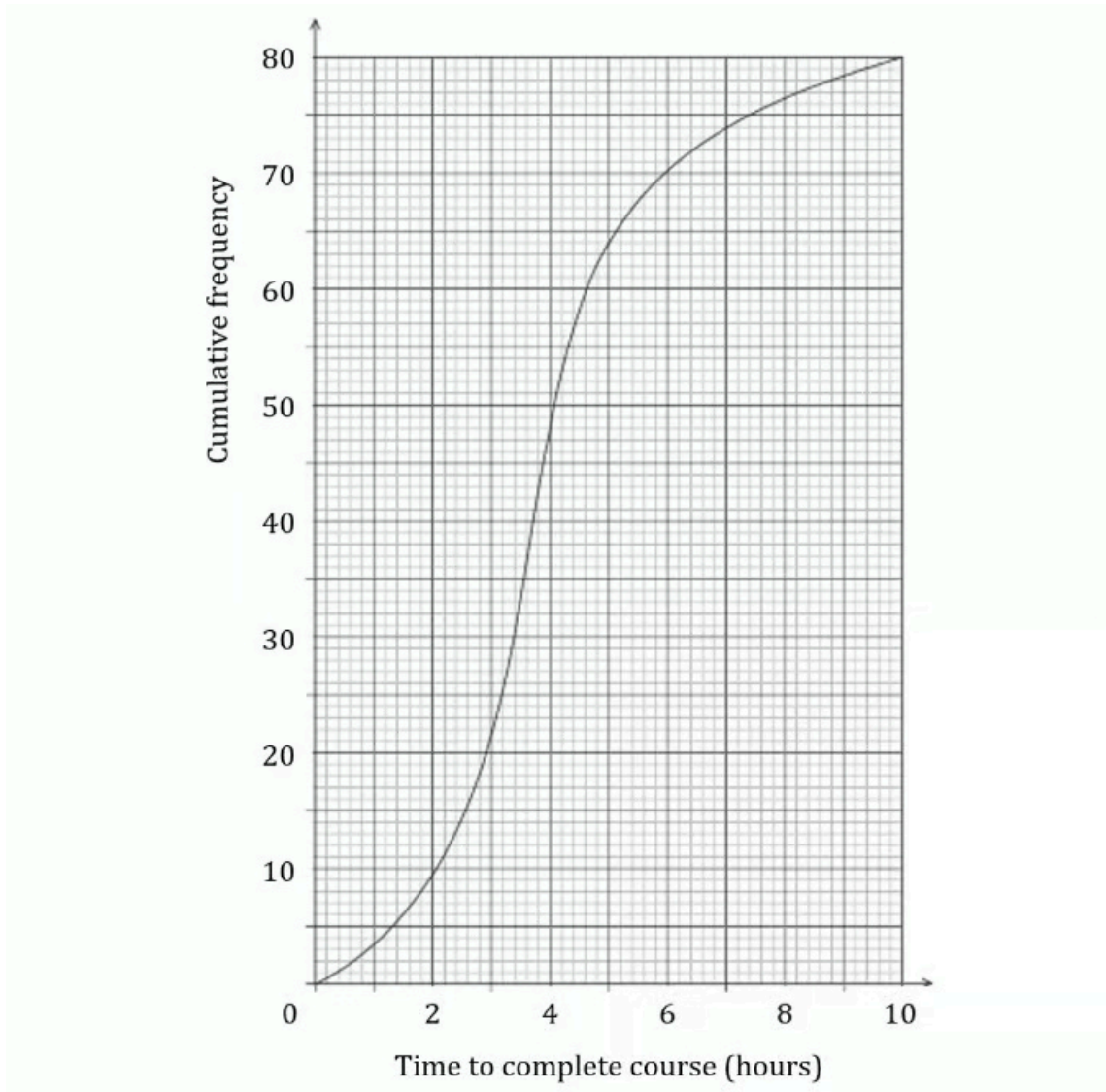
6 The following triangle shows triangle ABC , with $AB = 3a$, $BC = a$ and $AC = 7$.



Given that $\cos \widehat{ABC} = \frac{1}{2}$, find the area of the triangle. Give your answer in the form $\frac{p\sqrt{3}}{r}$ where $p, q \in \mathbb{R}$

(7 marks)

- 7 (a) The following cumulative frequency curve shows the number of hours, h , students took to complete their online driving course. The data is taken from 80 students, randomly selected from a large sample over a 12 month period.



Find the median number of hours spent completing the online driving course.

(2 marks)

- (b) Find the number of students whose online course time was within 1 hour of the median.

(2 marks)

(c) Calculate the interquartile range.

(2 marks)

(d) The same information is represented by the following table.

Hours, h	$0 < h \leq 2$	$2 < h \leq 4$	$4 < h \leq 7$	$7 < h \leq 10$
Frequency	9	p	q	6

Find the value of p and the value of q .

(3 marks)

(e) It is known that 10% of students take longer than d hours to complete the online driving course.

Find the value of d .

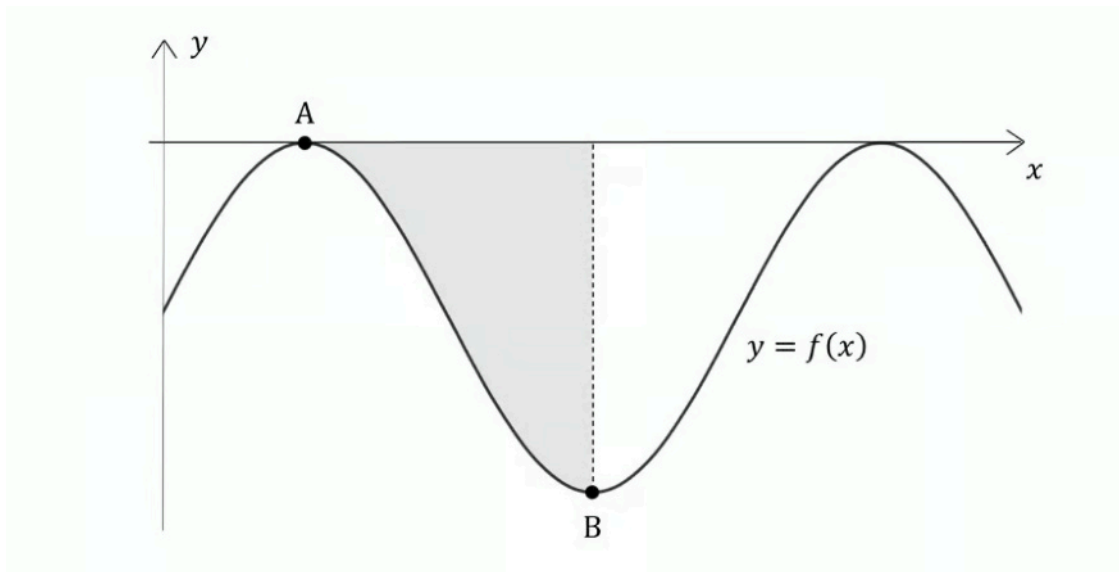
(3 marks)

- (f) It is known that over a 12 month period, 4000 students in total sat the online driving course.

Estimate the number of students over a 12 month period who took less than 3 hours to complete the course.

(3 marks)

- 8 (a)** Consider the function f defined by $f(x) = 3 \sin x - 3$, for $0 \leq x \leq 3\pi$. The following diagram shows the graph of $y = f(x)$.



The graph of f touches the x -axis at point **A** as shown. Point **B** is a local minimum of f . The shaded region is the area between the graph of $y = f(x)$ and the x -axis, between the points **A** and **B**.

Find the x -coordinates of **A** and **B**.

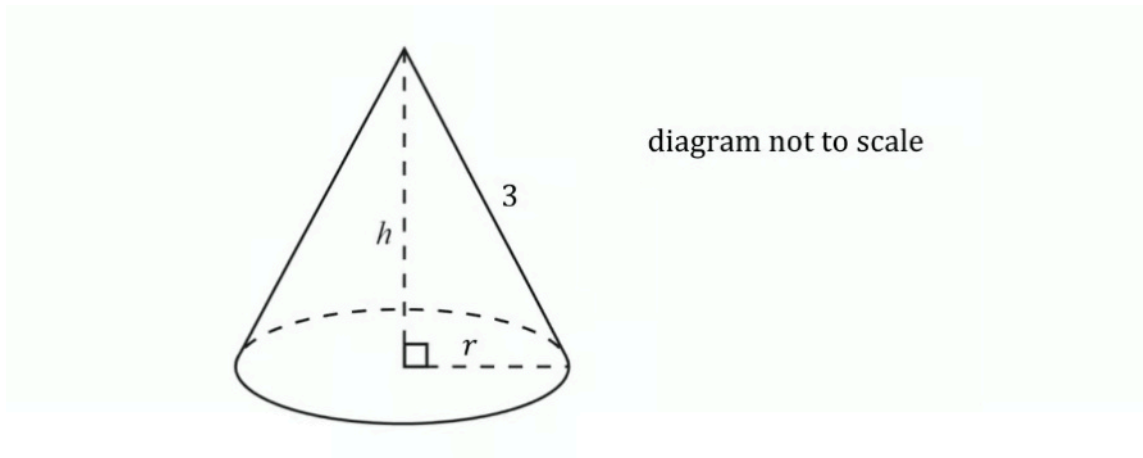
(4 marks)

- (b)** Show that the area of the shaded region is 3π units².

(5 marks)

- (c) The right cone in the diagram below has a curved surface area of twice the shaded area in the previous part of the question.

The cone has a slant height of 3, base radius r , and height h .



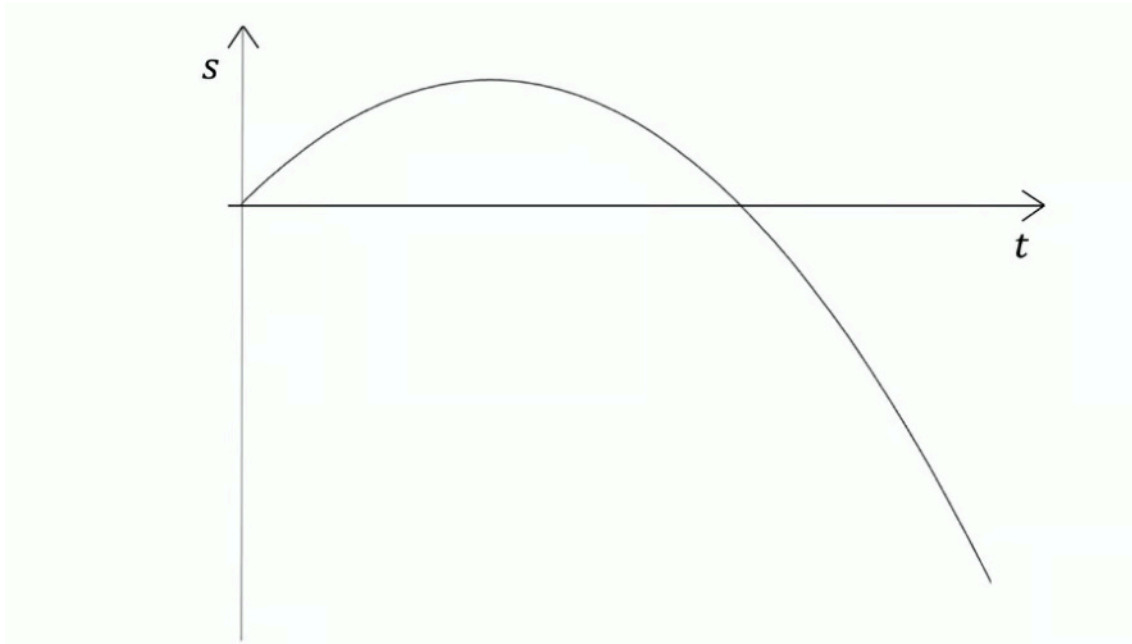
Find the value of r .

(2 marks)

- (d) Hence find the volume of the cone.

(4 marks)

- 9 (a) Particle A travels in a straight line such that its displacement, s meters, from a fixed origin after t seconds is given by $s(t) = t(6 - t)$, for $0 \leq t \leq 9$, as shown in the following diagram.



Particle A starts at the origin and passes through the origin again when $t = p$.

Find the value of p .

(2 marks)

- (b) Particle A changes direction when $t = q$.

- Find the value of q .
- Find the displacement of particle A from the origin when $t = q$.

(4 marks)

(c) Find the distance of particle **A** from the origin when $t = 9$.

(2 marks)

(d) The total distance travelled by particle **A** is given by d .

Find the value of d .

(2 marks)

(e) A second particle, particle **B**, travels along the same straight line such that its velocity is given by $v(t) = 5t - 10$, for $t \geq 0$.

When $t = k$, the distance travelled by particle **B** is d .

Find the value of k .

(4 marks)