1a. The first three terms of an arithmetic sequence are 5, 6.7 , 8.4 .

Find the common difference. *[2 marks]*

1b. Find the 28th term of the sequence. *[2 marks]*

1c. Find the sum of the first 28 terms. *[2 marks]*

2a. The first term of a geometric sequence is 200 and the sum of the first four terms is 324.8.

Find the common ratio. *[4 marks]*

2b. *[2 marks]* Find the tenth term.

3a. In an arithmetic sequence, $u_1 = 2$ and $u_3 = 8$.

Find d . *[2 marks]*

3b. Find u_{20} . *[2 marks]*

3c. Find S_{20} . *[2 marks]*

4a. In an arithmetic sequence $u_1 = 7$, $u_{20} = 64$ and $u_n = 3709$.

Find the value of the common difference. *[3 marks]*

4b. Find the value of n . *[2 marks]*

5a. The first three terms of an infinite geometric sequence are 32, 16 and 8.

Write down the value of r . *[1 mark]*

5b. Find u_6 . *[2 marks]*

5c. Find the sum to infinity of this sequence. *[2 marks]*

6a. Consider the arithmetic sequence 3, 9, 15, $\cdots$, 1353 .

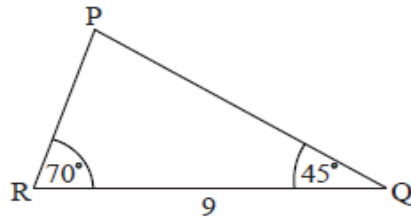Write down the common difference. *[1 mark]*

6b. Find the number of terms in the sequence. *[3 marks]*

6c. Find the sum of the sequence. *[2 marks]*

7a. The following diagram shows ΔPQR, where RQ = 9 cm, $P\hat{R}Q = 70°$ and $P\hat{Q}R = 45°$.

diagram
not to scale

Find $R\hat{P}Q$.   *[1 mark]*

7b. Find PR.   *[3 marks]*
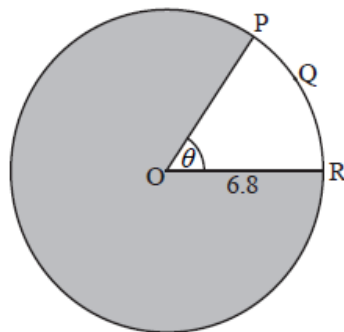
7c. Find the area of ΔPQR.   *[2 marks]*

8a. Consider the following circle with centre O and radius 6.8 cm.

diagram
not to scale

The length of the arc PQR is 8.5 cm.

Find the value of θ.   *[2 marks]*

8b. Find the area of the shaded region.   *[4 marks]*
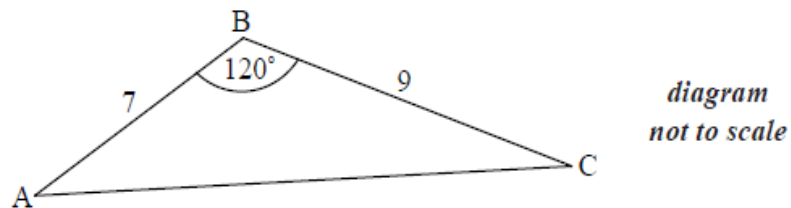
9a. Consider the triangle ABC, where AB =10 , BC = 7 and $C\hat{A}B = 30°$.

Find the two possible values of $A\hat{C}B$.   *[4 marks]*

9b. Hence, find $A\hat{B}C$, given that it is acute.   *[2 marks]*

10a. The following diagram shows triangle ABC .

B
120°
7
9
diagram
not to scale
A
C

AB = 7 cm, BC = 9 cm and $A\widehat{B}C = 120°$.

Find AC .   [3 marks]
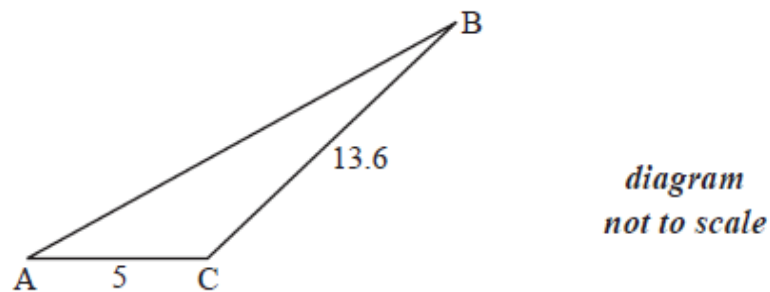
10b. Find $B\widehat{A}C$.   [3 marks]

11a. The following diagram shows the triangle ABC.

B
13.6
diagram
not to scale
A   5   C

The angle at C is obtuse, $AC = 5$ cm, $BC = 13.6$ cm and the area is 20 cm² .

Find $A\widehat{C}B$.   [4 marks]

11b. Find AB.   [3 marks]

12a. Let $f(x) = \frac{\cos x}{\sin x}$, for $\sin x \neq 0$.

Use the quotient rule to show that $f'(x) = \frac{-1}{\sin^2 x}$. [5 marks]

12b. Find $f''(x)$. [3 marks]

12c. In the following table, $f'\left(\frac{\pi}{2}\right) = p$ and $f''\left(\frac{\pi}{2}\right) = q$. The table also gives approximate values of $f'(x)$ and $f''(x)$ near $x = \frac{\pi}{2}$.

x	$\frac{\pi}{2} - 0.1$	$\frac{\pi}{2}$	$\frac{\pi}{2} + 0.1$
$f'(x)$	-1.01	p	-1.01
$f''(x)$	0.203	q	-0.203

Find the value of p and of q. [3 marks]

12d. Use information from the table to explain why there is a point of inflexion on the graph of f where $x = \frac{\pi}{2}$. [2 marks]

13a. Let $f(x) = \cos 2x$ and $g(x) = 2x^2 - 1$.

Find $f\left(\frac{\pi}{2}\right)$. [2 marks]

13b. Find $(g \circ f)\left(\frac{\pi}{2}\right)$. [2 marks]

13c. Given that $(g \circ f)(x)$ can be written as $\cos(kx)$, find the value of k, $k \in \mathbb{Z}$. [3 marks]