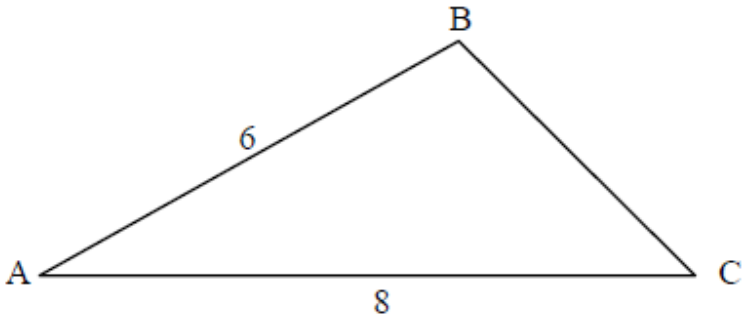
Review Set 2 [75 marks]

1. [Maximum mark: 5] SPM.1.SL.TZ0.1

The following diagram shows triangle ABC, with $AB = 6$ and $AC = 8$.

diagram not to scale



(a) Given that $\cos \hat{A} = \frac{5}{6}$ find the value of $\sin \hat{A}$. [3]

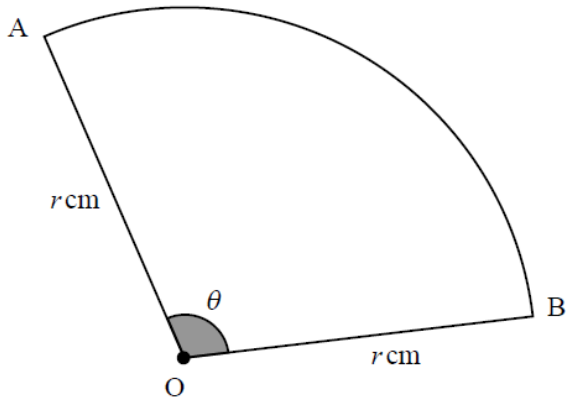
(b) Find the area of triangle ABC. [2]

2. [Maximum mark: 8] 24M.1.SL.TZ1.4

Points A and B lie on the circumference of a circle of radius r cm with centre at O.

The sector OAB is shown on the following diagram. The angle $\mathrm{A\hat{O}B}$ is denoted as θ and is measured in radians.

diagram not to scale



The perimeter of the sector is 10 cm and the area of the sector is 6.25 cm^2.

(a) Show that $4r^2 - 20r + 25 = 0$. [4]

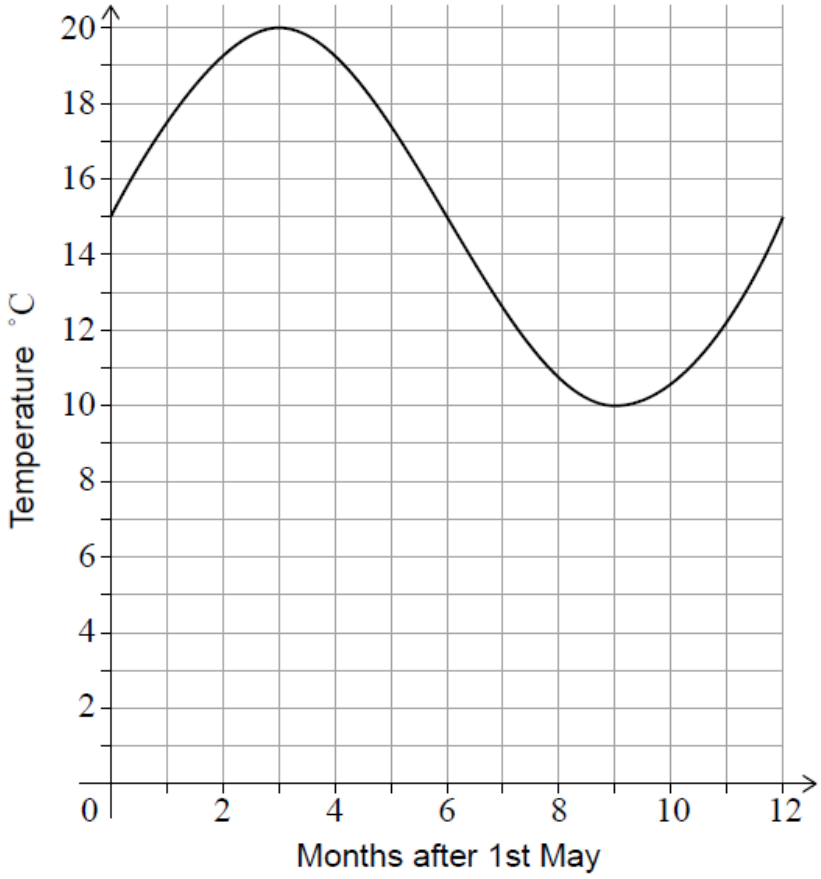
(b) Hence, or otherwise, find the value of r and the value of θ. [4]

3. [Maximum mark: 12] 24M.1.SL.TZ2.7

Alex only swims in the sea if the water temperature is at least $15\,^{\circ}\text{C}$. Alex goes into the sea close to home for the first time each year at the start of May when the water becomes warm enough.

Alex models the water temperature at midday with the function $f(x) = a \sin bx + c$ for $0 \leq x \leq 12$, where x is the number of months after 1st May and where $a,\ b,\ c > 0$.

The graph of $y = f(x)$ is shown in the following diagram.



(a) Show that $b = \frac{\pi}{6}$. [1]

(b) Write down the value of

(b.i) a; [1]

(b.ii) c. [1]

Alex is going on holiday and models the water temperature at midday in the sea at the holiday destination with the function $g(x) = 3.5 \sin \frac{\pi}{6}x + 11$, where $0 \leq x \leq 12$ and x is the number of months after 1st May.

(c) Using this new model $g(x)$

(c.i) find the midday water temperature on 1st October, five months after 1st May.

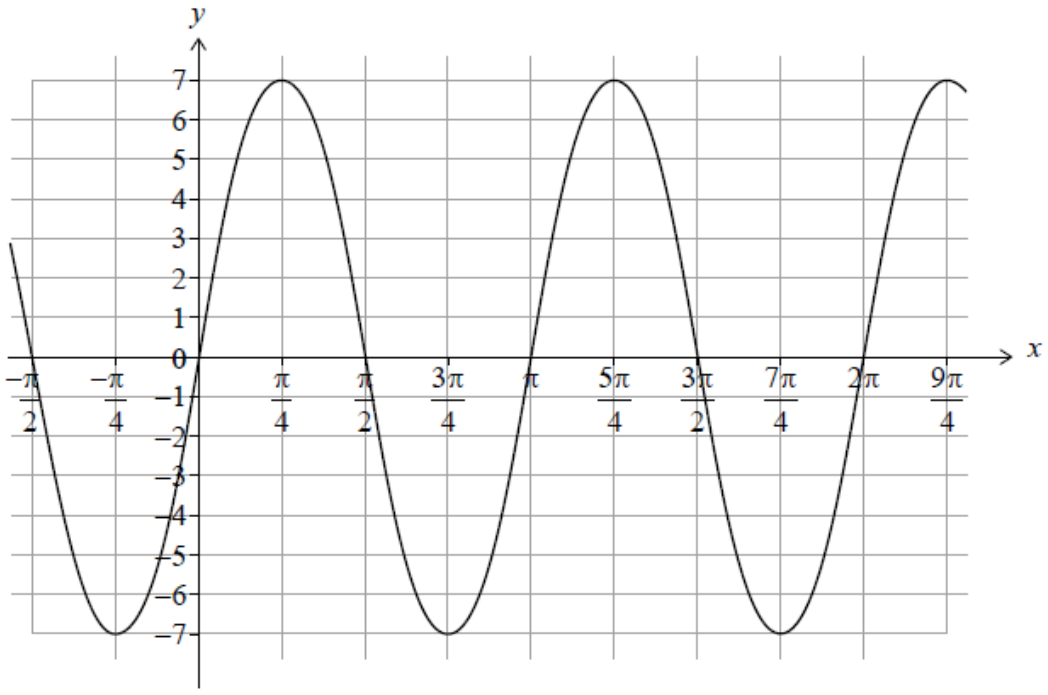
[3]

(c.ii) show that the midday water temperature is never warm enough for Alex to swim. [3]

(d) Alex compares the two models and finds that $g(x) = 0.7f(x) + q$. Determine the value of q. [3]

4. [Maximum mark: 7] 23N.1.SL.TZ1.1

Consider the function $f(x) = a \sin(bx)$ with $a,\ b \in \mathbb{Z}^+$. The following diagram shows part of the graph of f.



(a) Write down the value of a. [1]

(b.i) Write down the period of f. [1]

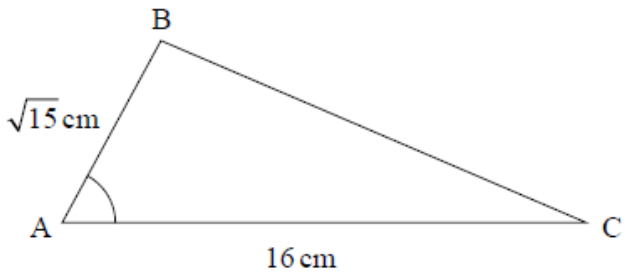
(b.ii) Hence, find the value of b. [2]

(c) Find the value of $f\left(\frac{\pi}{12}\right)$. [3]

5. [Maximum mark: 6] 23N.1.SL.TZ1.5

In the following triangle ABC, $\mathrm{AB} = \sqrt{15}\,\mathrm{cm}$, $\mathrm{AC} = 16\,\mathrm{cm}$ and $\cos \mathrm{B\hat{A}C} = \frac{1}{4}$.

diagram not to scale

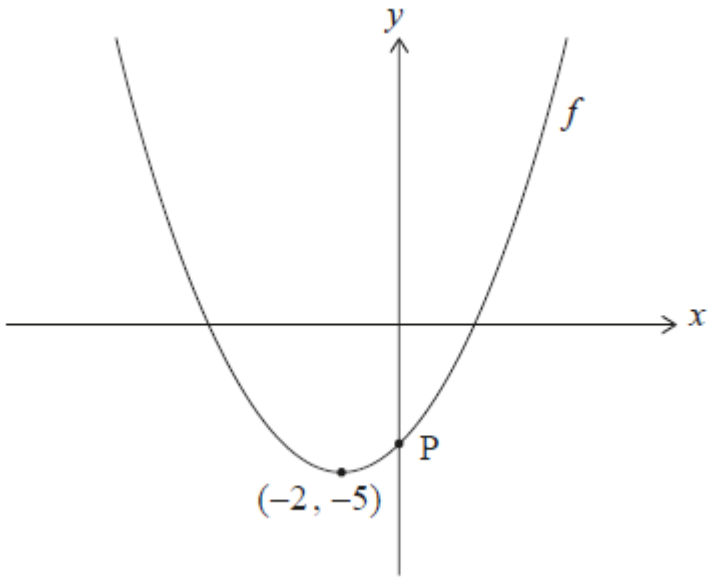


Find the area of triangle ABC. [6]

6. [Maximum mark: 5] 23M.1.SL.TZ2.7

The following diagram shows part of the graph of a quadratic function f.

The vertex of the parabola is $(-2, -5)$ and the y-intercept is at point P.



(a) Write down the equation of the axis of symmetry. [1]

The function can be written in the form $f\left(x\right) = \frac{1}{4}(x - h)^2 + k$, where h, $k \in \mathbb{Z}$.

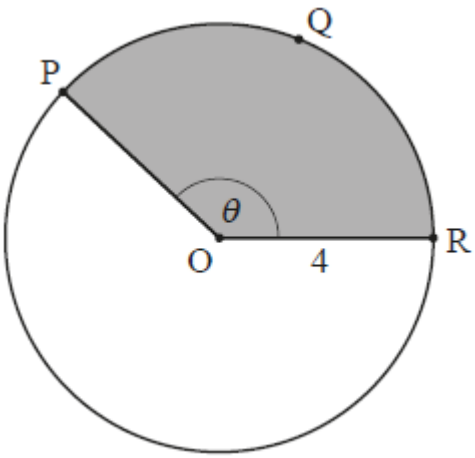
(b) Write down the values of h and k. [2]

(c) Find the y-coordinate of P. [2]

7. [Maximum mark: 6] 23M.1.SL.TZ2.1

The following diagram shows a circle with centre O and radius $4\ \mathrm{cm}$.

diagram not to scale



The points P, Q and R lie on the circumference of the circle and $\mathrm{P\hat{O}R} = \theta$, where θ is measured in radians.

The length of arc PQR is $10\ \mathrm{cm}$.

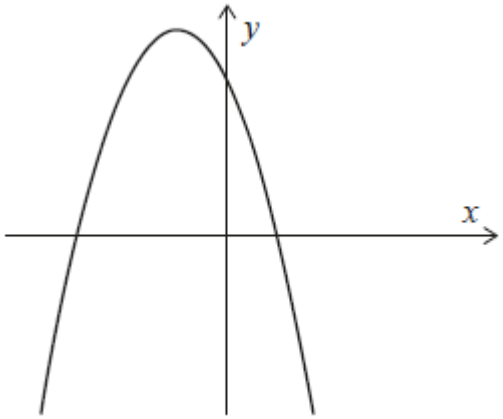
(a) Find the perimeter of the shaded sector. [2]

(b) Find θ. [2]

(c) Find the area of the shaded sector. [2]

8. [Maximum mark: 7] 21N.1.SL.TZ0.1

Consider the function $f(x) = -2(x-1)(x+3)$, for $x \in \mathbb{R}$. The following diagram shows part of the graph of f.



For the graph of f

(a.i) find the x-coordinates of the x-intercepts. [2]

(a.ii) find the coordinates of the vertex. [3]

(b) The function f can be written in the form

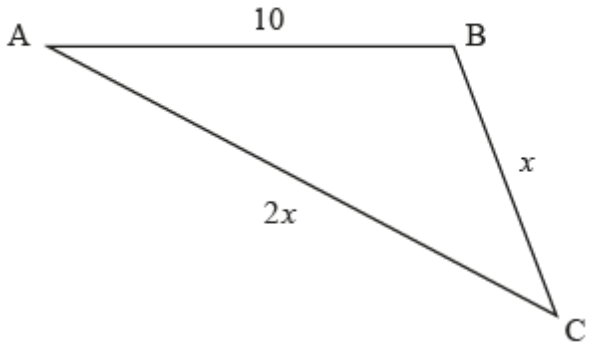
$$f(x) = -2(x - h)^2 + k.$$

Write down the value of h and the value of k. [2]

9. [Maximum mark: 7] 21M.1.SL.TZ2.6

The following diagram shows triangle ABC, with $\mathrm{AB} = 10$, $\mathrm{BC} = x$ and $\mathrm{AC} = 2x$.

diagram not to scale



[7]

Given that $\cos \widehat{C} = \frac{3}{4}$, find the area of the triangle.

Give your answer in the form $\frac{p\sqrt{q}}{2}$ where $p,\ q \in \mathbb{Z}^+$.

10. [Maximum mark: 6] 21M.1.SL.TZ2.3

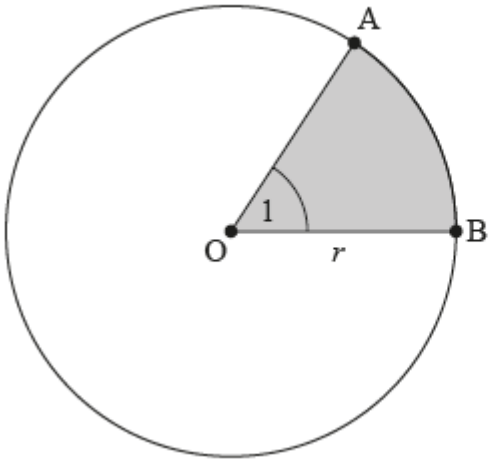
(a) Show that the equation $2\cos^2 x + 5\sin x = 4$ may be written in the form $2\sin^2 x - 5\sin x + 2 = 0$. [1]

(b) Hence, solve the equation $2\cos^2 x + 5\sin x = 4,\ 0 \leq x \leq 2\pi$. [5]

11. [Maximum mark: 6] 21M.1.SL.TZ2.1

The following diagram shows a circle with centre O and radius r.

diagram not to scale



Points A and B lie on the circumference of the circle, and $\mathrm{A\hat{O}B} = 1$ radian.

The perimeter of the shaded region is 12.

(a) Find the value of r. [3]

(b) Hence, find the exact area of the **non-shaded** region. [3]