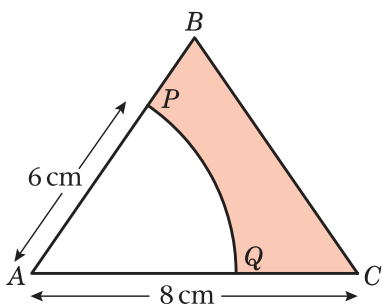# 2 Review Exercise

1 Expand and simplify $(1 - x)^5$.

2 In the diagram, ABC is an equilateral triangle with side 8 cm.
PQ is an arc of a circle centre A, radius 6 cm.
Find the perimeter of the shaded region in the diagram.

3 The sum to infinity of a geometric series is 15. Given that the first term is 5,

  a find the common ratio,

  b find the third term.

4 Sketch the graph of $y = \sin\theta°$ in the interval $-\dfrac{3\pi}{2} \leqslant \theta < \pi$.

5 Find the first three terms, in descending powers of b, of the binomial expansion of $(2a + 3b)^6$, giving each term in its simplest form.

6 AB is an arc of a circle centre O. Arc $AB = 8$ cm and $OA = OB = 12$ cm.

  a Find, in radians, $\angle AOB$.

  b Calculate the length of the chord AB, giving your answer to 3 significant figures.

7 A geometric series has first term 4 and common ration r. The sum of the first three terms of the series is 7.

  a Show that $4r^2 + 4r - 3 = 0$.

  b Find the two possible values of r.

  Given that r is positive,

  c find the sum to infinity of the series.

8 **a** Write down the number of cycles of the graph $y = \sin nx$ in the interval $0 \leqslant x \leqslant 360°$.

  b Hence write down the period of the graph $y = \sin nx$.

9 **a** Find the first four terms, in ascending powers of x, of the binomial expansion of $(1 + px)^7$, where p is a non-zero constant.

Given that, in this expansion, the coefficients of x and x^2 are equal,

b find the value of p,

c find the coefficient of x^3.

10 A sector of a circle of radius 8 cm contains an angle of θ radians. Given that the perimeter of the sector is 30 cm, find the area of the sector.

11 A pendulum is set swinging. Its first oscillation is through 30°. Each succeeding oscillation is $\frac{9}{10}$ of the one before it. What is the total angle described by the pendulum before it stops?

12 Write down the exact value of

a $\sin 30°$, **b** $\cos 330°$, **c** $\tan(-60°)$.

13 **a** Find the first three terms, in ascending powers of x, of the binomial expansion of $(1 - ax)^8$, where a is a non-zero integer.

The first three terms are 1, $-24x$ and bx^2, where b is a constant.

b Find the value of a and the value of b.

14 In the diagram, A and B are points on the circumference of a circle centre O and radius 5 cm.
$\angle AOB = \theta$ radians. $AB = 6$ cm.
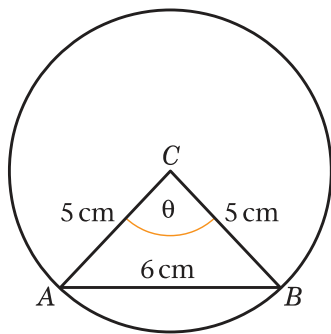
a Find the value of θ.

b Calculate the length of the minor arc AB.

15 The fifth and sixth terms of a geometric series are 4.5 and 6.75 respectively.

a Find the common ratio.

b Find the first term.

c Find the sum of the first 20 terms, giving your answer to 3 decimal places.

16 Given that θ is an acute angle measured in degrees, express in term of $\cos 2\theta$

a $\cos(360° + 2\theta)$,

b $\cos(-2\theta)$,

c $\cos(180° - 2\theta)$.

17 **a** Expand $(1 - 2x)^{10}$ in ascending powers of x up to and including the term in x^3.

b Use your answer to part **a** to evaluate $(0.98)^{10}$ correct to 3 decimal places.

18 In the diagram,
$AB = 10$ cm, $AC = 13$ cm.
$\angle CAB = 0.6$ radians.
BD is an arc of a circle centre A and radius 10 cm.
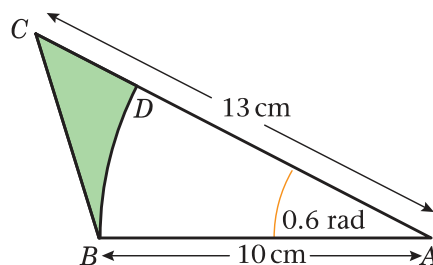
a Calculate the length of the arc BD.

b Calculate the shaded area in the diagram.

19 The value of a gold coin in 2000 was £180. The value of the coin increases by 5% per annum.

a Write down an expression for the value of the coin after n years.
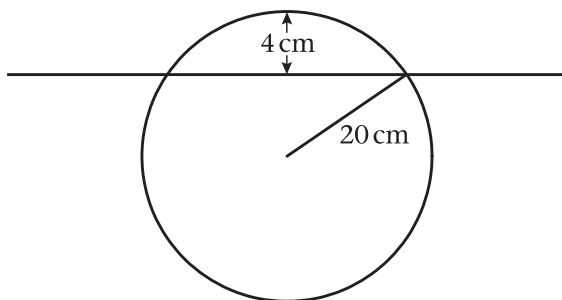
b Find the year in which the value of the coin exceeds £360.

20 Given that x is an acute angle measured in radians, express in terms of $\sin x$

  a $\sin (2\pi - x)$,   **b** $\sin (\pi + x)$,

  c $\cos \left(\dfrac{\pi}{2} - x \right)$.

21 Expand and simplify $\left(x - \dfrac{1}{x} \right)^6$.

22 A cylindrical log, length 2 m, radius 20 cm, floats with its axis horizontal and with its highest point 4 cm above the water level. Find the volume of the log in the water.

23 **a** On the same axes, in the interval $0 \leqslant x \leqslant 360°$, sketch the graphs of $y = \tan (x - 90°)$ and $y = \sin x$.

  b Hence write down the number of solutions of the equation $\tan (x - 90°) = \sin x$ in the interval $0 \leqslant x \leqslant 360°$.

24 A geometric series has first term 4 and common ratio $\frac{4}{3}$. Find the greatest number of terms the series can have without its sum exceeding 100.

25 Describe geometrically the transformation which maps the graph of

  a $y = \tan x$ onto the graph of $y = \tan (x - 45°)$,

  b $y = \sin x$ onto the graph of $y = 3 \sin x$,

  c $y = \cos x$ onto the graph of $y = \cos \dfrac{x}{2}$,

  d $y = \sin x$ onto the graph of $y = \sin x - 3$.

26 If x is so small that terms of x^3 and higher can be ignored, and $(2 - x)(1 + 2x)^5 \approx a + bx + cx^2$, find the values of the constants a, b and c.

27 A chord of a circle, radius 20 cm, divides the circumference in the ratio $1:3$. Find the ratio of the areas of the segments into which the circle is divided by the chord.

28 x, 3 and $x + 8$ are the fourth, fifth and sixth terms of geometric series.

  a Find the two possible values of x and the corresponding values of the common ratio.

  Given that the sum to infinity of the series exists,

  b find the first term,

  c find the sum to infinity of the series.

29 **a** Sketch the graph of $y = 1.5 \cos (x - 60°)$ in the interval $0 \leqslant x < 360°$.

  b Write down the coordinates of the points where your graph meets the coordinate axes.

30 Without using a calculator, solve $\sin(x - 20°) = -\dfrac{\sqrt{3}}{2}$ in the interval $0 \leqslant x \leqslant 360°$.