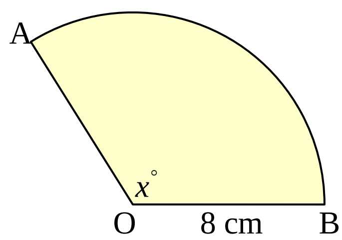
1. Calculate, without a calculator:

(a) $2\frac{1}{2}+1\frac{2}{3}$ (b) $3\frac{1}{10}-2\frac{3}{4}$ (c) $4\frac{2}{3}+3\frac{1}{5}$

2. The area of the sector below is $70\,\text{cm}^2$.
Find the length of the arc AB.



3. Calculate the volume of the largest cone which can be placed inside a cube which has edges of length 10 cm. The base of the cone sits on the base of the cube.

4. Calculate the gradient of the line segments joining the following pairs of points.

(a) C $-1, 3$ and D $7, 0$.

(b) E $-2, -3$ and F $5, -17$.

(c) G $-1, -4$ and H $4, -11$.

5. Multiply the brackets and simplify:

(a) $(3a-1)(5a-3)$ (b) $(4k+7)(2k-5)$

(c) $(3x-2y)(5x-3y)$ (d) $(3x-y)^2$

(e) $(2x-3)(5x^2-4x+1)$ (f) $(2x-1)(4x+3)-4(2-x)$

6. Factorise:

(a) $x^2-9x+20$ (b) $y^2+4y-21$

(c) $2a^2-a-1$ (d) $6t^2+11t+3$

(e) $2x^2-5x+3$ (f) $5k^2+4k-1$

7. A cylindrical soft drinks can has height 15 cm and diameter $6\cdot5$ cm.
A new cylindrical can holds the same volume but has a reduced height of 12 cm.
Find the diameter of the new can, correct to 1 decimal place.

8. Express each of the following functions in the form indicated

(a) $x^2+10x+27=(x+a)^2+b$

(b) $x^2-x-1=(x-a)^2+b$

(c) $11-2x-x^2=a-(x+b)^2$

(d) $12-4x-x^2=a-(x+b)^2$

9. Calculate, without a calculator:

(a) 80% of a number is 560. What is the number?

(b) $117\frac{1}{2}\%$ of a number is 235. What is the number?

(c) With $12\frac{1}{2}\%$ extra, the contents of a can are 900 ml. What are the normal contents?

10. By first factorising numerator and denominator, simplify each of these fractions:

(a) $\dfrac{3x+6}{x^2-4}$ (b) $\dfrac{a^2-a-6}{2a^2-5a-3}$ (c) $\dfrac{x+7}{x^2+6x-7}$

11. Simplify

(a) $\dfrac{1}{x}+\dfrac{1}{x-1}$ (b) $\dfrac{x+3}{(x+3)^3}$ (c) $\dfrac{1}{a-1}-\dfrac{1}{a+1}$

12. The diagram below shows a square of side length y divided into a square of side length x and four congruent rectangles.
Find an expression for the length of the longer side of each rectangle in terms of x and y.