Substitution / Formulae

1. Given a = 15, b = 8, c = 5 and d = 12, calculate

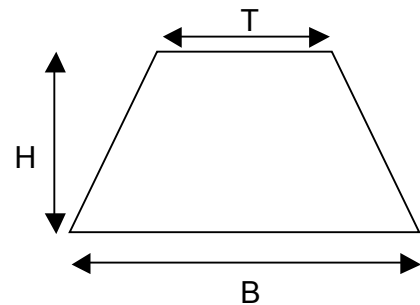   (a) ab + c   (b) 3c + 4d   (c) da – bc   (d) c + ab   (e) 3cd

   (f) $b^2 + d^2$ (g) 4(5b – c)   (h) $\dfrac{a^2 - d}{2}$ (i) $\dfrac{c(c + 2d)}{10}$

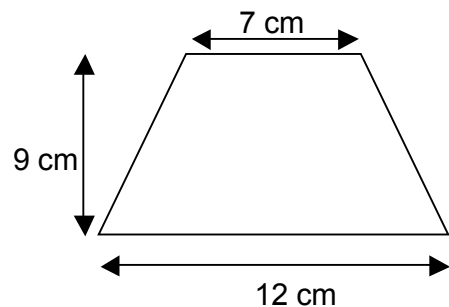2. Given p = 2.6, q = 7.5 and t = 6.6, calculate

   (a) 6pq – qt   (b) $\frac{1}{2}$ qt – p^2 (c) t(3t + 4p)   (d) $\frac{1}{3}(q^2 - t^2)$

3. The area of the trapezium shown is given by
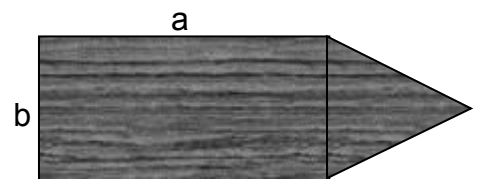
$$A = \tfrac{1}{2} H(T + B)$$

   Find the area of the trapezium shown opposite.

4. The area of the wooden board shown is given by the formula

$$A = \tfrac{3}{2} ab$$

   Calculate A when a = 6.2 cm and b = 2.9 cm.

5. The surface area of a cone is found using the formula

$$A = \pi rs + \pi r^2$$

   where r is the radius of the base of the cone and s is the slant height of the cone.

   Calculate the surface area of a cone of radius 15 cm and slant height 8.5 cm.

6. Given that $d = \sqrt{\dfrac{kl}{R}}$, evaluate d when k = 150, l = 5.5 and R = 0.65.

7. To convert degrees Fahrenheit into degrees Celsius we use the formula

$$C = \frac{5(F - 32)}{9}$$

Change 85^0 Fahrenheit into degrees Celsius.

8. A particular formula for electric current is $\quad I = \frac{nE}{R + nr}$.

Evaluate I when n = 4.2, E = 160, R = 17.5 and r = 3.6.

9. The formula $F = \frac{m(v - u)}{t}$ occurs in mechanics.

Calculate F when m = 3.55, v = 7.9, u = 1.8 and t = 2.5.

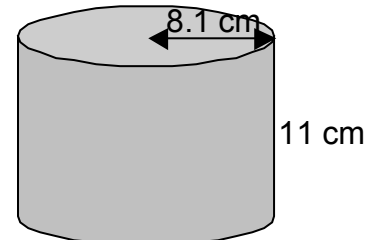10. The distance travelled by a rocket is given by $s = ut + \frac{1}{2}at^2$.

Calculate s when u = 5.5, t = 150 and a = 0.8.

11. The volume of a cylinder is given by the formula

$$V = \pi r^2 h$$

where r is the radius of the base and h is the height of the cylinder.

Calculate the volume of the cylinder opposite.

8.1 cm

11 cm

12. The acceleration of a train is found using the formula

$$a = \frac{v^2 - u^2}{2s}$$

Calculate a when v = 37.5, u = 1.9 and s = 3.5.

13. The time period of a pendulum is given by

$$T = 2\pi\sqrt{\frac{l}{g}}$$

where l is the length of the pendulum and g is the gravitational acceleration.

Calculate T when l = 0.47 and g = 9.55.

14. Given $E = mgh + \frac{1}{2}mv^2$, find E when m = 7.2, g = 2.7, h = 20 and v = 7.5.

15. At a height h metres above sea level, the distance to the horizon, d km, is found using

$$d = 4\sqrt{h}$$

   Calculate the distance to the horizon when the height above sea level is 360 metres.

16. The amount of light needed in an office depends on its room index, R. Given

$$R = \frac{LW}{H(L+W)}$$

   where L metres is the length of the office
           W metres is the width of the office
           H metres is the height of the light above the desk

   Calculate the room index for an office 6.2 m long, 3.9 m wide and with a light 1.8 m above the desk.

17. A formula is given as $V = I\sqrt{R^2 + x^2}$.

   Find V when I = 27, R = 36 and x = 48.

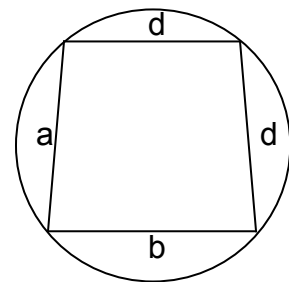18. The sum of the squares of the integers from 1 to n is given by

$$S = \frac{1}{6}n(n+1)(2n+1)$$

   Find the sum of the squares from 1 to 24.

19. The area, A, of a quadrilateral drawn inside a circle
    can be found using the formula

$$A = \sqrt{(s-a)(s-b)(s-c)(s-d)}$$

   where $s = \dfrac{a+b+c+d}{2}$

   Use this formula to find the area of the quadrilateral
   shown opposite.