1. Evaluate, without a calculator:

   (a) $1\frac{1}{2} \times 2\frac{1}{3}$

   (b) $3\frac{1}{4} \times 1\frac{1}{7}$

   (c) $6\frac{1}{2} \div 3\frac{3}{4}$

   (d) $\frac{1}{2}$ of $\frac{1}{3} + \frac{1}{4}$
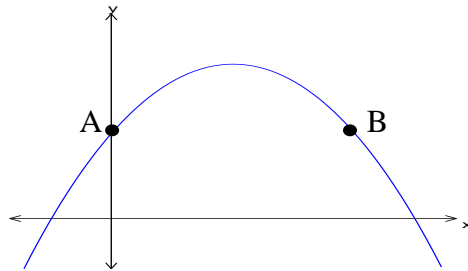
   (e) $2\frac{1}{7} \div 1\frac{2}{3}$

   (f) $2\frac{1}{2}\left(\frac{1}{4} + \frac{1}{2}\right)$

2. Use a calculator to evaluate:

   (a) $1\cdot3 \times 10^4 \times 2\cdot7 \times 10^{16}$

   (b) $1\cdot8 \times 10^{-3} \times 9\cdot0 \times 10^{-6}$

3. The parabola sketched below has equation $y = 20 - (x-3)^2$.

   (a) State the coordinates of the maximum turning point.
   (b) State the equation of the axis of symmetry.
   (c) A is the point where the graph crosses the y-axis, and B has the same y-coordinate as A.
   Find the coordinates of A and B.

4. Given that $\sin 30^\circ = \frac{1}{2}$ and $\cos 30^\circ = \frac{\sqrt{3}}{2}$, find, without a calculator, the exact value of

   (a) $\sin 150^\circ$

   (b) $\cos 150^\circ$

   (c) $\sin 330^\circ$

   (d) $\cos 210^\circ$

   (e) $\cos 330^\circ$

   (f) $\sin 210^\circ$

5. Ship A is anchored 25 km from port P on a bearing of 035°.
   Ship B is anchored 35 km from port P on a bearing of 107°.
   Calculate the direct distance from ship A to ship B.

6. (a) Solve $x^2 + 3x - 5 = 0$, giving the roots correct to 2 decimal places.

   (b) Remove brackets and simplify $a^{\frac{1}{2}}\left(a + \frac{1}{a}\right)$.

   (c) Express $\sqrt{128} - \sqrt{18}$ as a surd in its simplest form.

   (d) $f(x) = x^{\frac{2}{3}}$. Evaluate $f(27)$.

7. Triangle ABC has $AB = 4$ units, $AC = 6$ units and $BC = 5$ units.
   Show that $\cos A = \frac{9}{16}$ exactly.

8.   The milk yield in pints of a sample of eight dairy cows was recorded.
        The data gave the following summary totals:

$$\sum x = 48, \qquad \sum x^2 = 324.$$

     (a)   Calculate the sample mean and standard deviation, giving your answers correct to 1 decimal place, if necessary.

     (b)   Another sample of dairy cows had a mean milk yield of $4\cdot9$ pints and a standard deviation of $2\cdot0$.

           How does this sample compare with the sample in part (a)?

9.   Draw a sketch of the graph of $y = 4\sin x^{\circ} - 3$, for $0 \le x \le 360$.
        As usual, your sketch should show the coordinates of turning points and points of intersection with the axes.

10.   The sketch shows the graph of $y = a \times b^x$, where a and b are constants. Find the values of a and b.
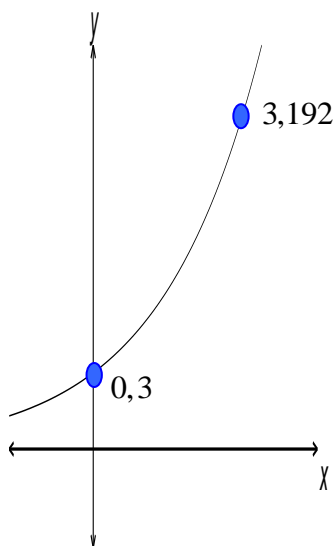
11.   The breadth of a rectangle is x units and the length is 14 units greater than the breadth.
        The area of the rectangle is 176 sq units.
        Find the perimeter of the rectangle. Use an algebraic approach, not "trial and error".

12.   A function f is defined by $f(t) = t^2 + t + 1$.

     (a)   Find $f(4)$.

     (b)   If $f(a) = 21$, find the possible values of a.

13.   Use the quadratic formula on the equation $x^2 - 2x + 5 = 0$.
        Explain why this equation can have no real roots.