

1. Without using a calculator or decimal approximations, arrange these numbers in decreasing order: $3\sqrt{5}$, $2\sqrt{11}$, $\sqrt{46}$.

2. Evaluate, without a calculator

(a) $3\frac{5}{6} - 1\frac{7}{8}$

(b) $4\frac{2}{3} \times 1\frac{2}{7}$

(c) $\frac{7}{9} \div 2\frac{1}{3}$

(d) $1\frac{5}{12} \times 3\frac{1}{5}$

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

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

3. Evaluate, without a calculator

(a) 0.8 of $160 \div 0.4$

(b) $1.7^2 - 0.3 \times -0.6$

(c) $3.4 \div 0.25$

4. Evaluate, without a calculator

(a) $6\frac{1}{4}\%$ of 960.

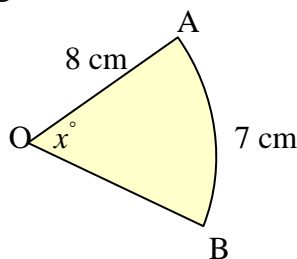
(b) $37\frac{1}{2}\%$ of 360.

(c) $62\frac{1}{2}\%$ of 816.

5. ABCD is a square. The point E is outside the square so that CDE is an equilateral triangle. Find the size of angle BED.

6. Tom left a motorway service station and travelled towards Glasgow at a steady speed of 60 mph. Tam left the same service station 10 minutes after Tom and travelled in the same direction at a steady speed, overtaking Tom after another 1 hour 40 minutes. At what speed did Tam travel?

7. The length of arc AB in the diagram below is 7 cm. Find the size of the angle AOB.



8. Evaluate

(a) $(2 - \sqrt{3})(2 + \sqrt{3})$

(b) $(1 - \sqrt{2})^2$

(c) $\sqrt{2}\sqrt{3}\sqrt{6}$

(d) $(\sqrt{2})^4$

9. Express with a rational denominator:

(a) $\frac{14}{\sqrt{2}}$

(b) $\frac{3}{\sqrt{7}}$

(c) $\sqrt{\frac{1}{12}}$

10. (a) Factorise $3x^2 - 6x$.
 (b) Hence simplify $\frac{3x^2 - 6x}{x^2 - 4}$, $x \neq \pm 2$.

11. Factorise:

- (a) $9x^2 - 16y^2$ (b) $x^2 - x - 20$
 (c) $2x^2 - x - 3$ (d) $3y^2 - 2y - 1$

12. A cylindrical urn for holding drinking water has radius 24 cm and height 40 cm. Conical drinking cups have radius 3 cm and height h cm.

- (a) Find the volume of the cylinder.
 (b) Given that 640 of the conical cups can be filled from the full cylinder, find the value of h .

13. A hemisphere has diameter 10.4 cm. Calculate its volume, correct to 3 s.f.

14. Expand and simplify:

- (a) $(4a - 3)(3a + 5)$ (b) $(x - 3)(2x^2 - 3x + 4)$

15. Consecutive Natural Numbers can be summed using the following formula:

$$1 + 2 + 3 + 4 + \dots + n = \frac{n(n+1)}{2}$$

- (a) Use this formula to find the value of $1 + 2 + 3 + 4 + \dots + 100$.
 (b) Use this formula to find the value of $1 + 2 + 3 + 4 + \dots + 50$.
 (c) **Hence** find the value of $51 + 52 + 53 + 54 + \dots + 100$
 (d) Write down a formula for $1 + 2 + 3 + 4 + \dots + 2m$

16. A doctor's travelling expenses, £ C , are worked out as follows:

For journeys of 150 miles or less $C = \frac{18N}{100}$

For journeys of more than 150 miles $C = 27 + \frac{12(N - 150)}{100}$,

where N is the number of miles travelled.

- (a) How much is she paid for a 90 mile journey?
 (b) How much is she paid for a 216 mile journey?