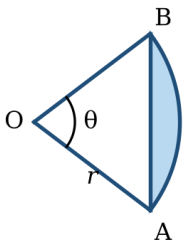
Day 204 **A Level Maths: B Tier 10-a-day**

1 A box of mass 10 kg rests on a rough horizontal floor, with coefficient of friction 0.2. A horizontal force of 16 N is applied to the box. Take g = 9.8 m s^{-2}.
Determine whether the box moves. Find the friction force, or the acceleration if it moves.

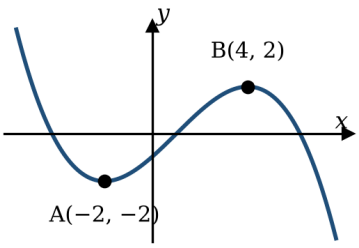
2 The length X cm of a metal rod is normal with mean 45, s.d. 1.5.
Find k (3 s.f.): (a) P(X < k) = 0.1,
(b) P(X > k) = 0.01.

3 The points A and B have coordinates (7, 4) and (3, −5).
(a) Find the midpoint of AB.
(b) Find the line AB as ax + by + c = 0, with integer a, b, c.

4 The shaded region is the segment cut off by the chord AB of a circle with centre O and radius 7 cm. Angle AOB = 1.3 radians.
Find the area of the segment, to 3 s.f.



5 The diagram shows the curve y = f(x). A and B are the turning points. Find the turning points of:
(a) y = 2f(x) (b) y = f(x − 1)



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6 A particle moves so that at time t s its velocity is $v = (2t^2 + 3)\mathbf{i} + (2t - 6)\mathbf{j}$ m s^{-1}. Find the time when the particle is moving in the direction of $\mathbf{i}$, and its speed then.	
7 The equation $5x^2 + kx + 45 = 0$ has equal roots. Find the possible values of k.	
8 A factory says a proportion 0.5 of its parts are defective. In a sample of 30 parts, 11 are defective. Test, at the 5% significance level, whether the proportion is different from 0.5.	
9 Squares of side x cm are cut from the corners of a square card of side 36 cm and the sides are folded up to make an open box. Find x for the greatest volume, and that volume.	
10 Points A, B and C have position vectors $\begin{pmatrix} -3 \\ -3 \\ 3 \end{pmatrix}$, $\begin{pmatrix} -4 \\ 0 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} p \\ 3 \\ 5 \end{pmatrix}$ respectively. Given that A, B, C are collinear, find p.	