Development of an app to support learning in A-level maths

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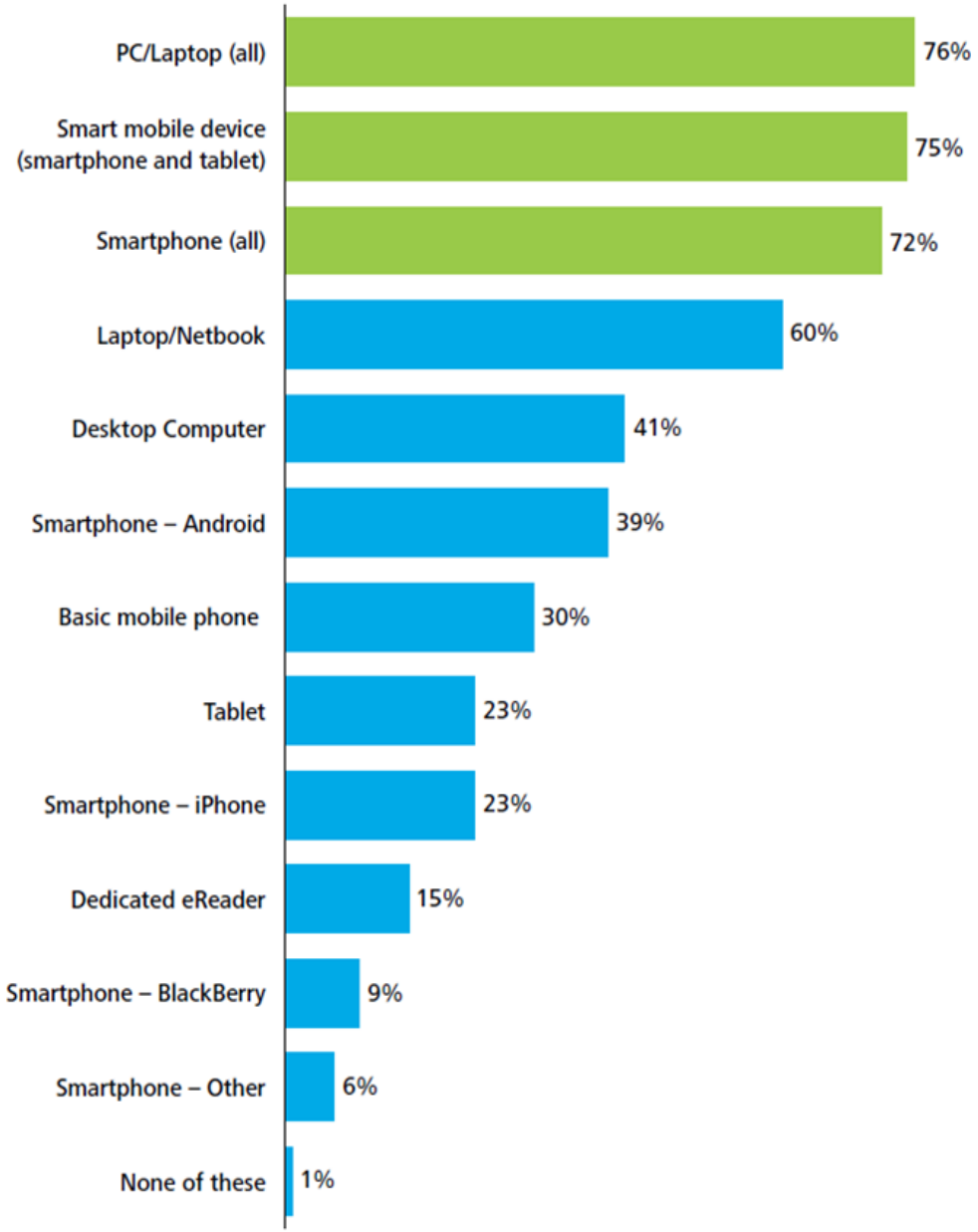
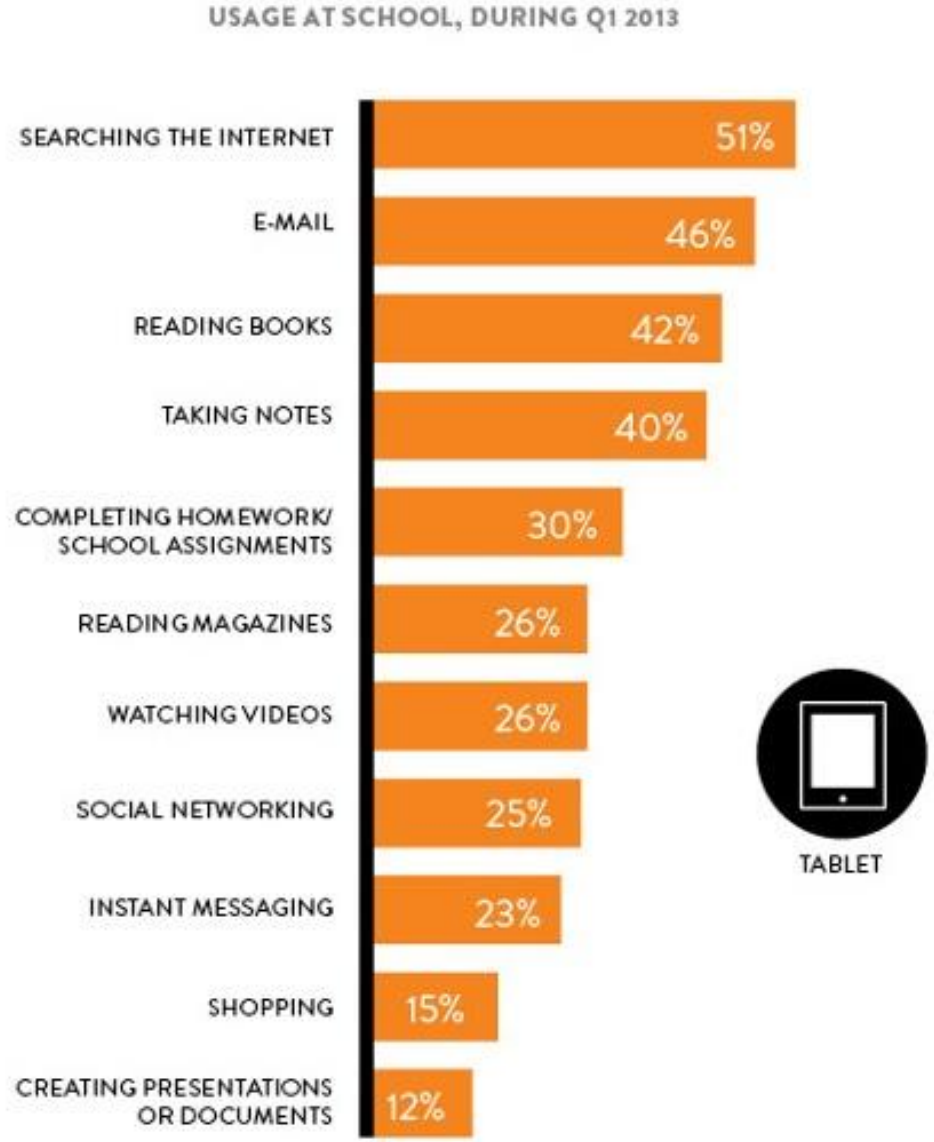


Source: Deloitte research, May 2013
Question: *Which of the following do you own?*
Base: UK consumers (n=1032)

Device ownership in the UK



Read as: Among those who used their tablet at school, 51% said they used their device to search the internet using their device in the classroom.

Source: Nielsen, Connected Devices Report

Educational activities – tablet owners

Existing apps

PTC A-Level Maths Solutions

- Mechanics - Circular Motion
- Mechanics - Differential Equations
- Mechanics - Inclined Plane
- Mechanics - Momentum and Impulse
- Mechanics - Rectilinear Motion
- Mechanics - Statics
- Mechanics - Vectors
- Pure - Algebra
- Pure - Complex Numbers
- Pure - Cosine Rule
- Pure - Differentiation
- Pure - Geometry
- Pure - Integration
- Pure - Matrices

Question | Answer

PTCM002010Q

At time t s, the position vector $\mathbf{r}$ m of a particle P is given by

$$\mathbf{r} = (3t^2 + 1)\mathbf{i} + (13t - 2t^2)\mathbf{j}.$$

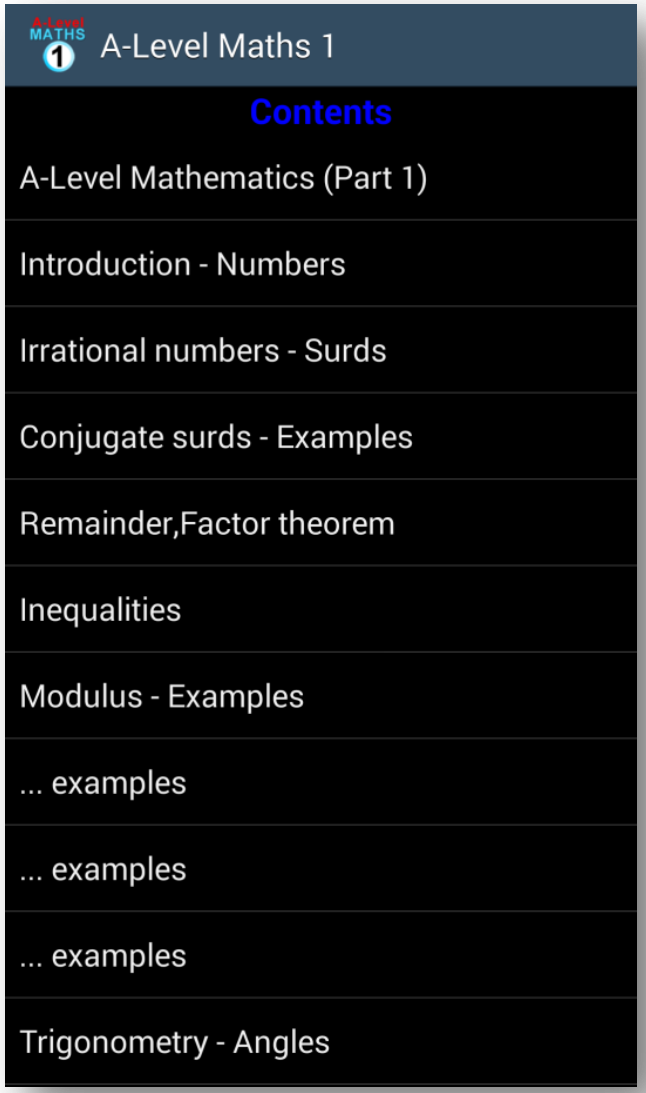
(a) Find the speed of P when $t = 2$. [4]

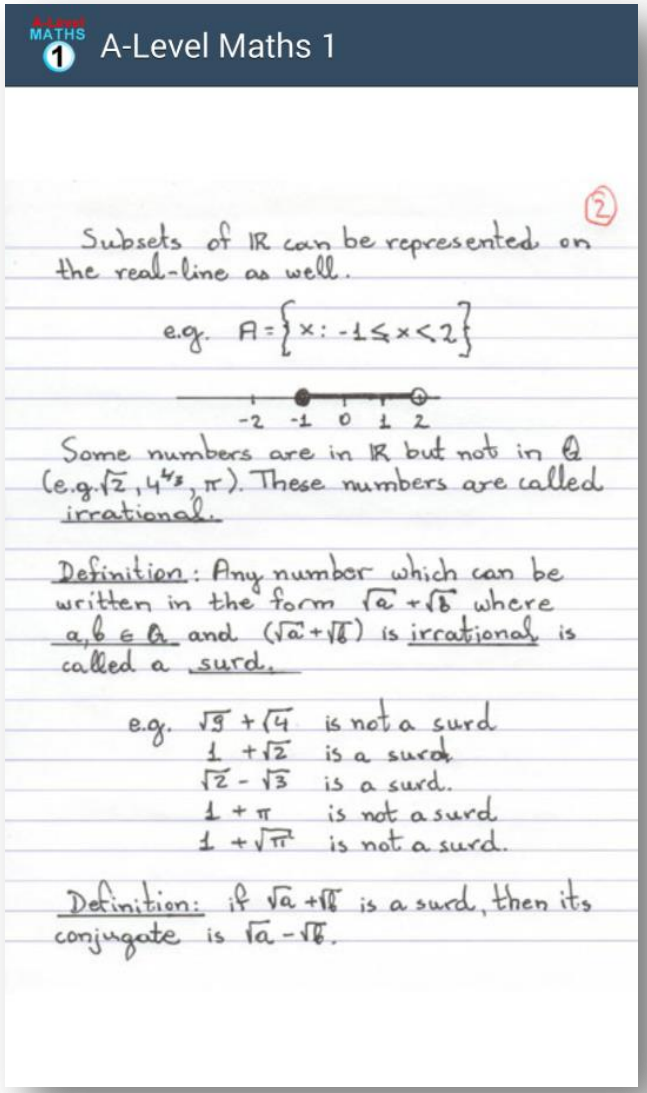
(b) Calculate the value of t when the velocity of P is perpendicular to the vector $2\mathbf{i} - \mathbf{j}$. [3]

(c) Show that the acceleration of P is constant and find its magnitude. [3]

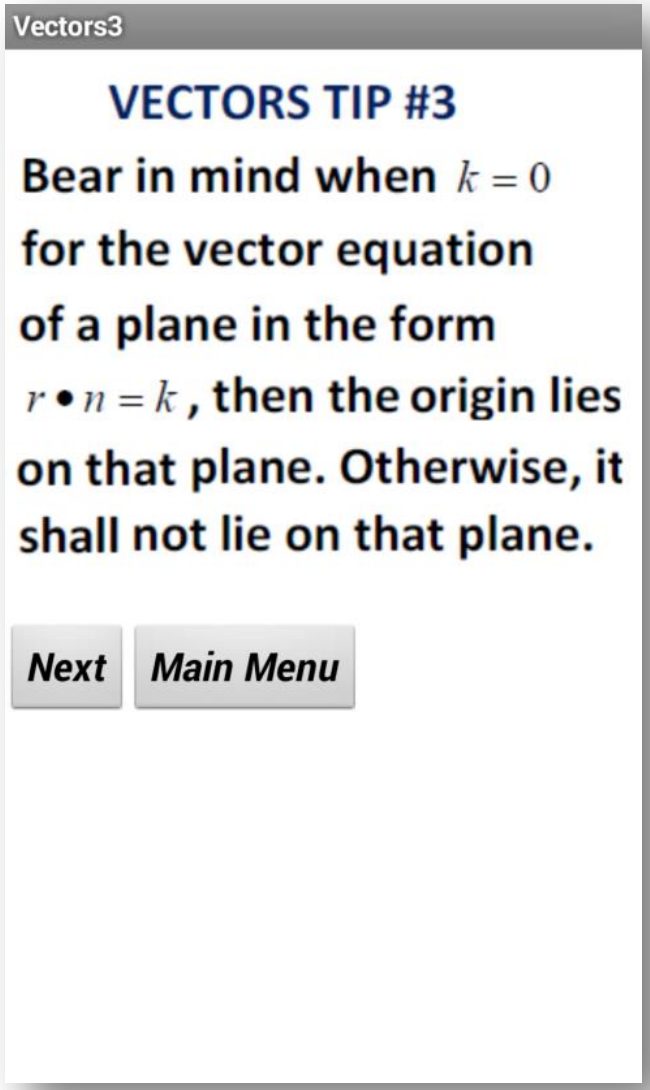
(d) Find the angle between the direction of the acceleration of P and the direction of the velocity of P when $t = 2$. [3]

Existing apps

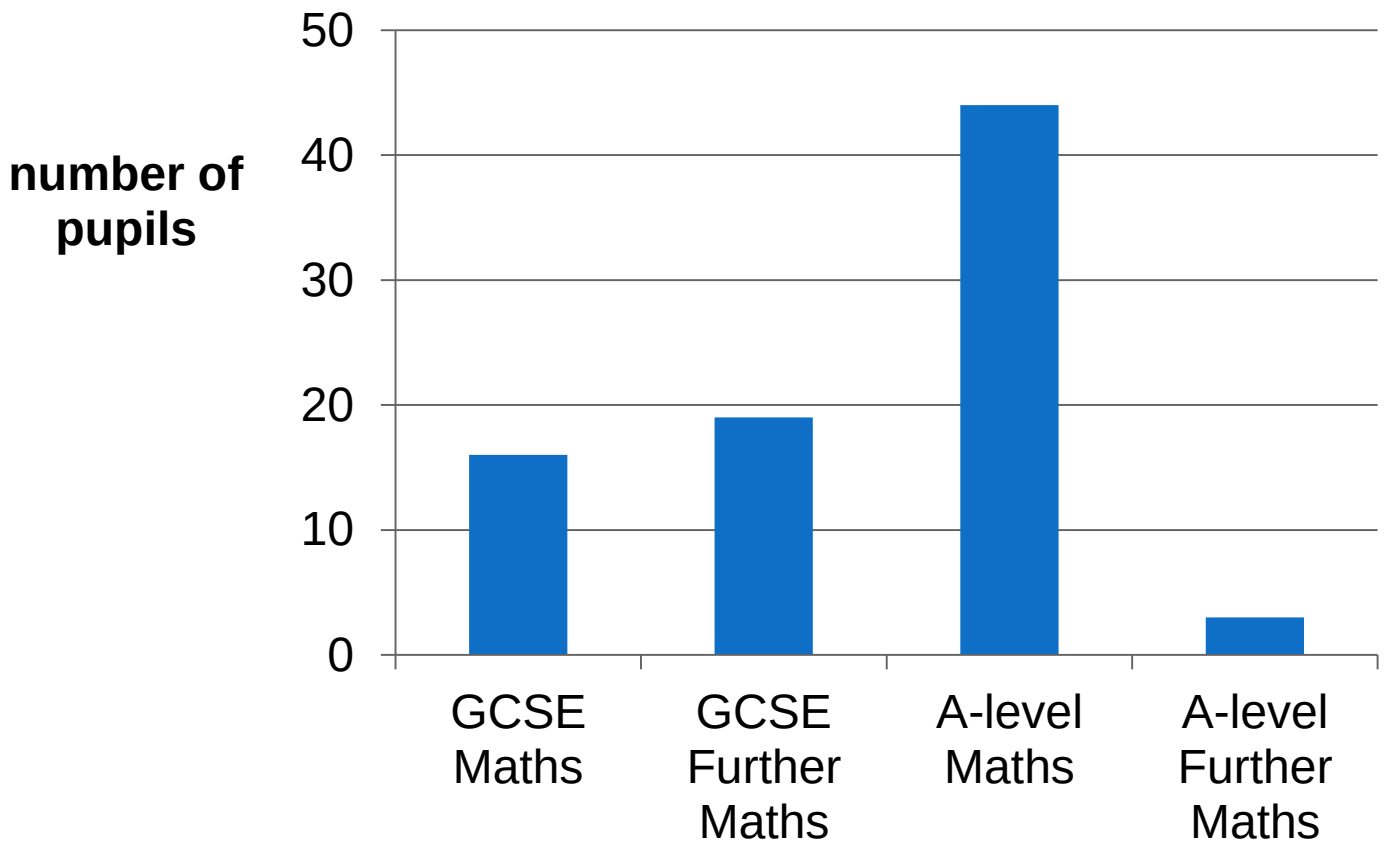




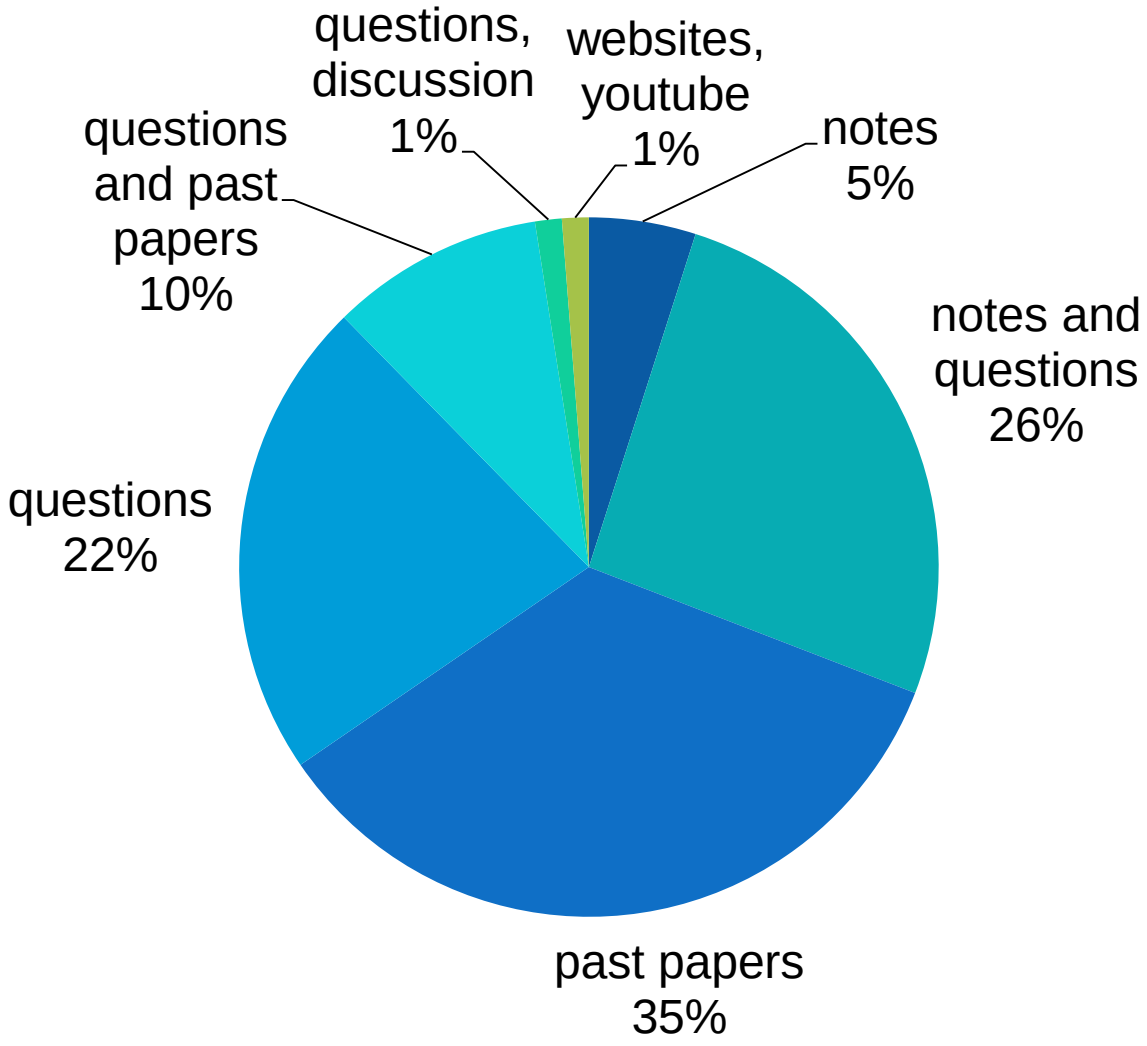
Existing apps



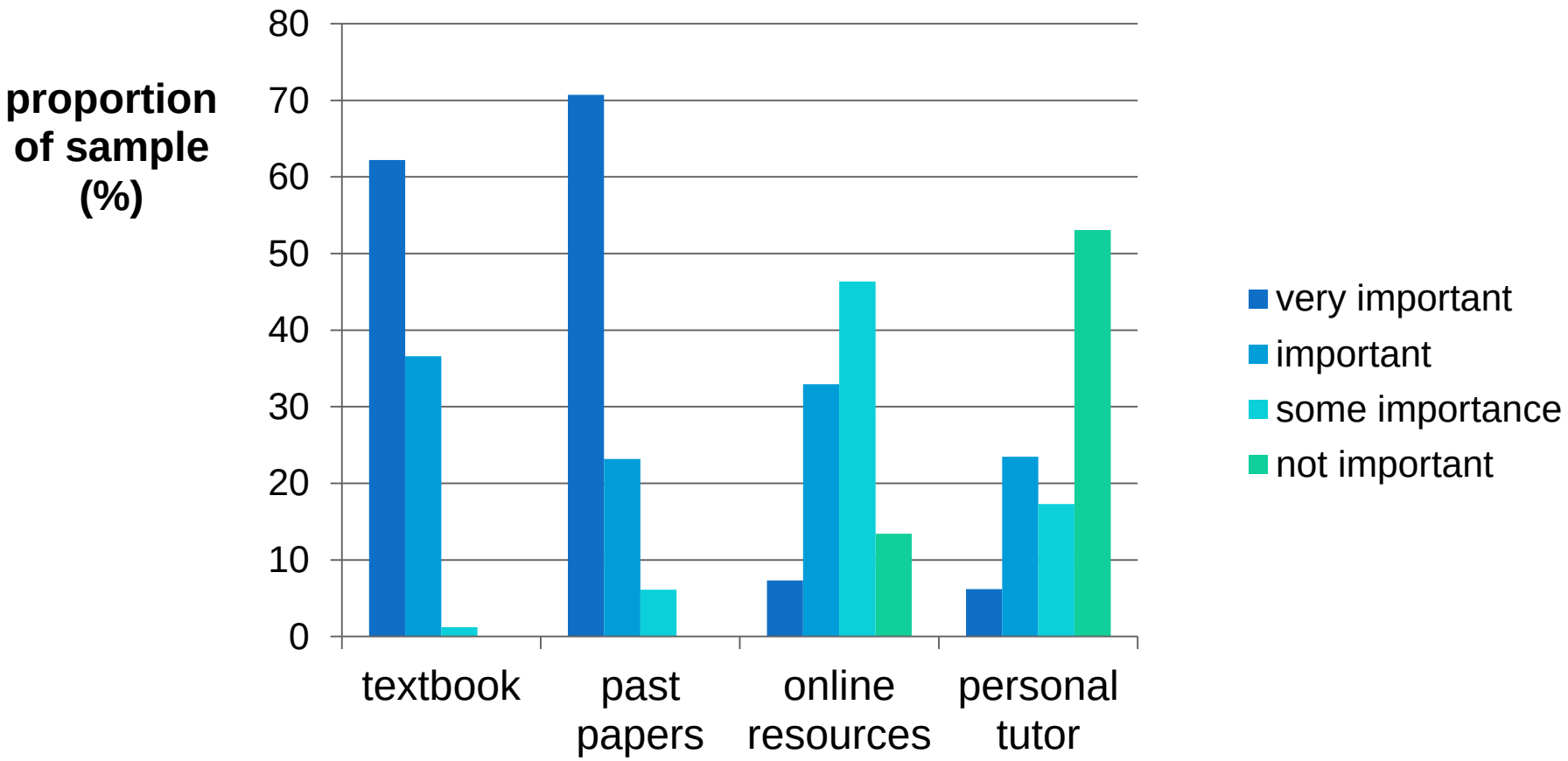
Market research



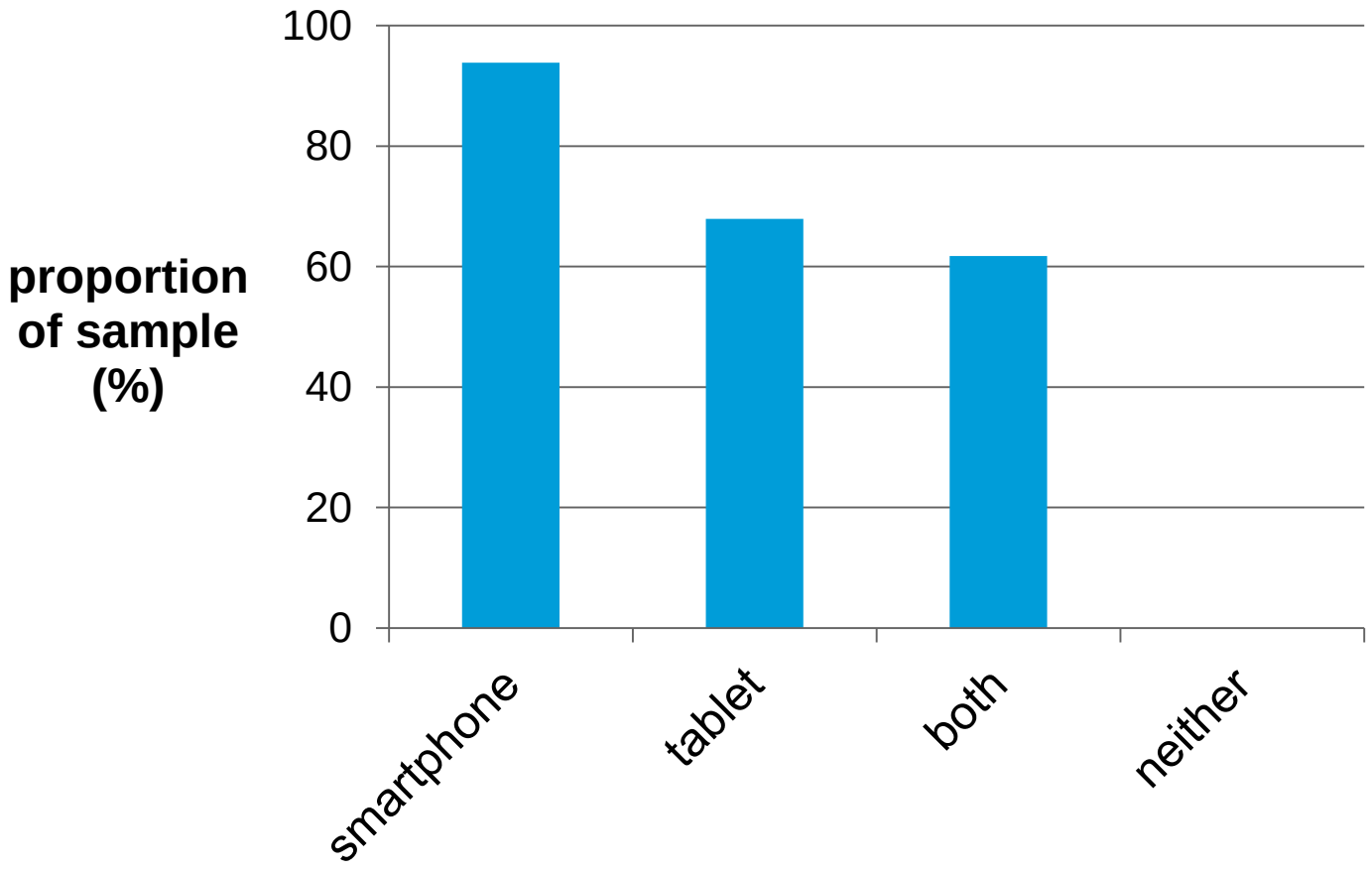
Current revision method



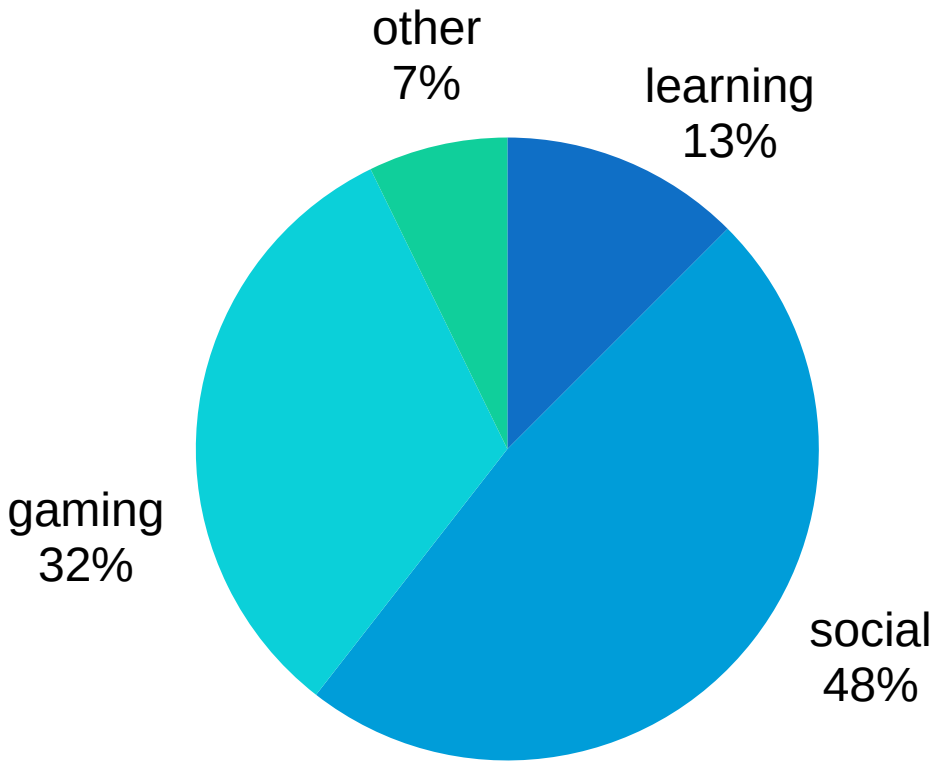
Importance of resources



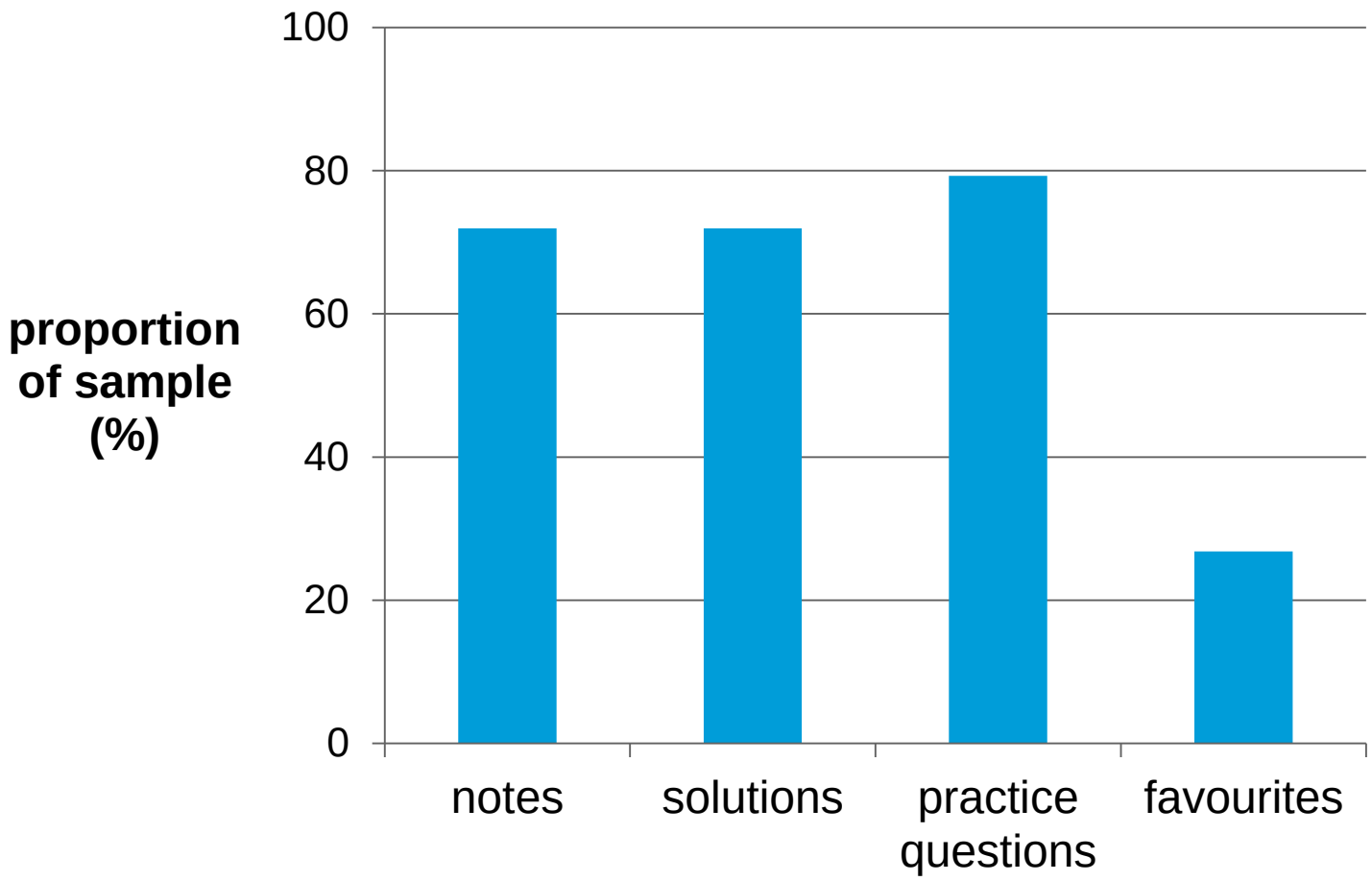
Smart device ownership



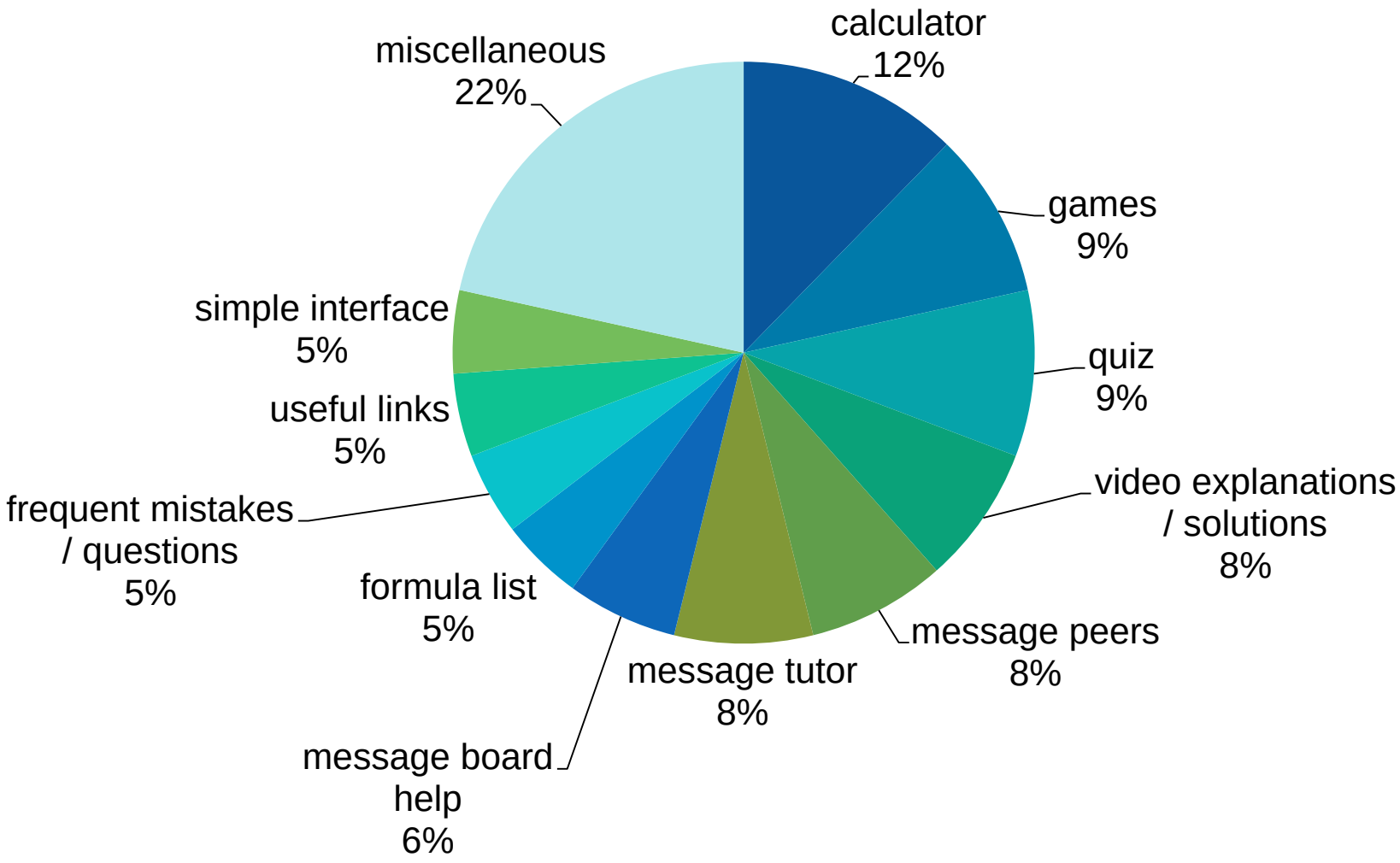
Smart device usage



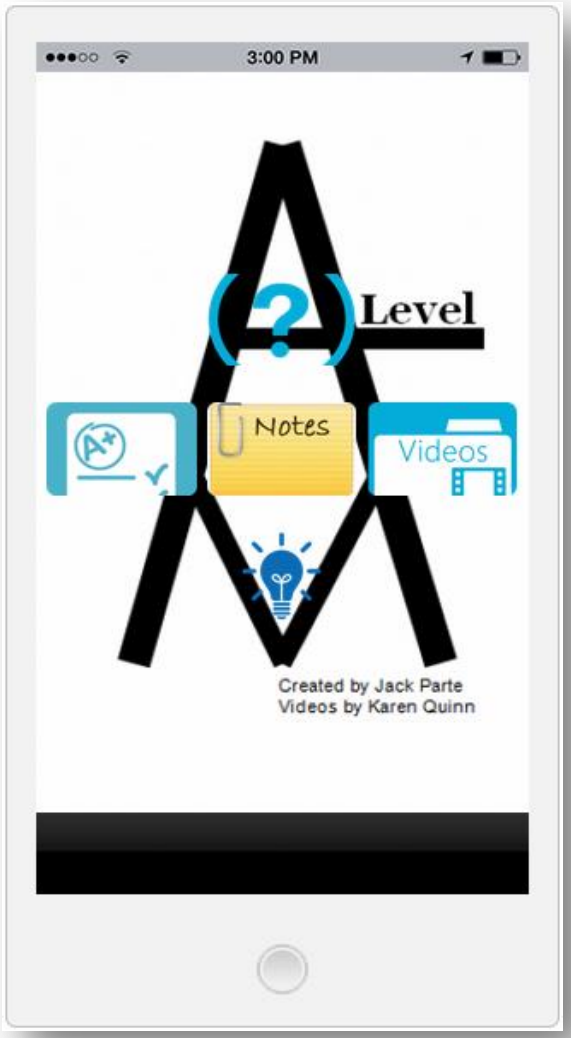
Preferred features for app



Preferred extra features

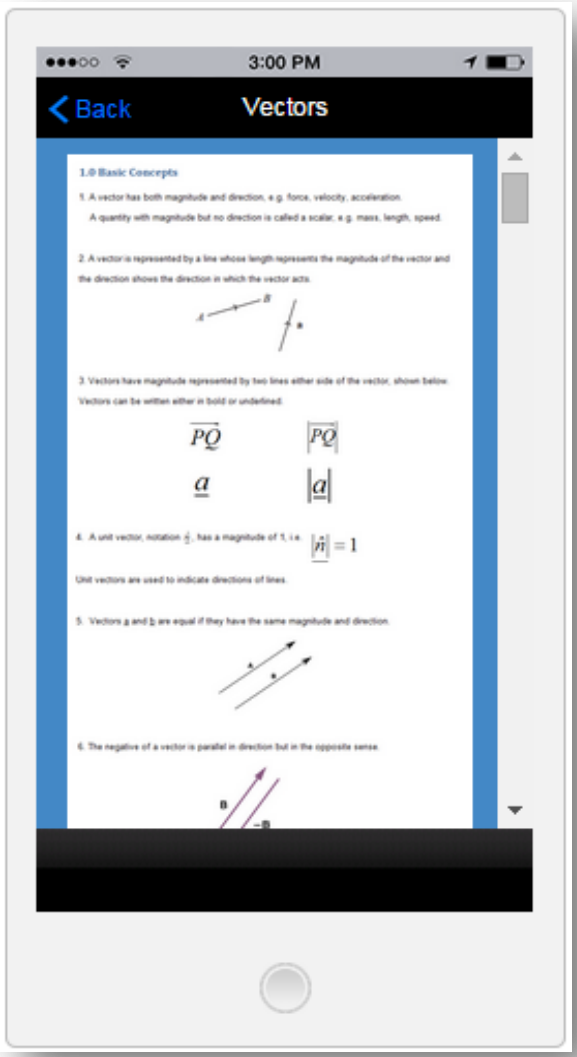


App development



iBuildApp

Notes, quiz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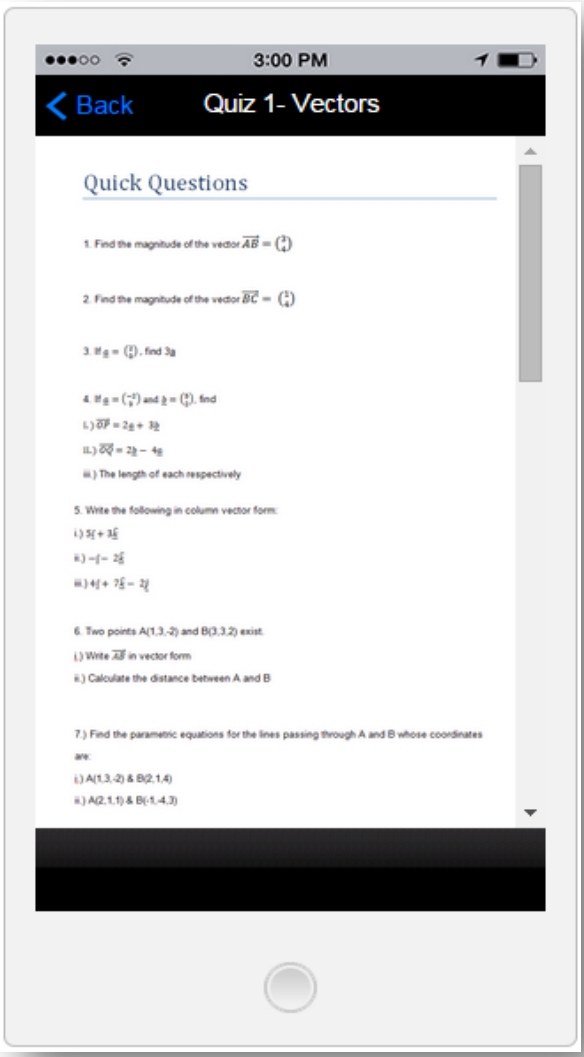
Back
Vectors
1.0 Basic Concepts
1. A vector has both magnitude and direction, e.g. force, velocity, acceleration.
A quantity with magnitude but no direction is called a scalar, e.g. mass, length, speed.
2. A vector is represented by a line whose length represents the magnitude of the vector and the direction shows the direction in which the vector acts.
3. Vectors have magnitude represented by two lines either side of the vector, shown below.
Vectors can be written either in bold or underlined.
4. A unit vector, notation $\hat{i}$, has a magnitude of 1, i.e. $|\hat{i}| = 1$
Unit vectors are used to indicate directions of lines.
5. Vectors a and b are equal if they have the same magnitude and direction.
6. The negative of a vector is parallel in direction but in the opposite sense.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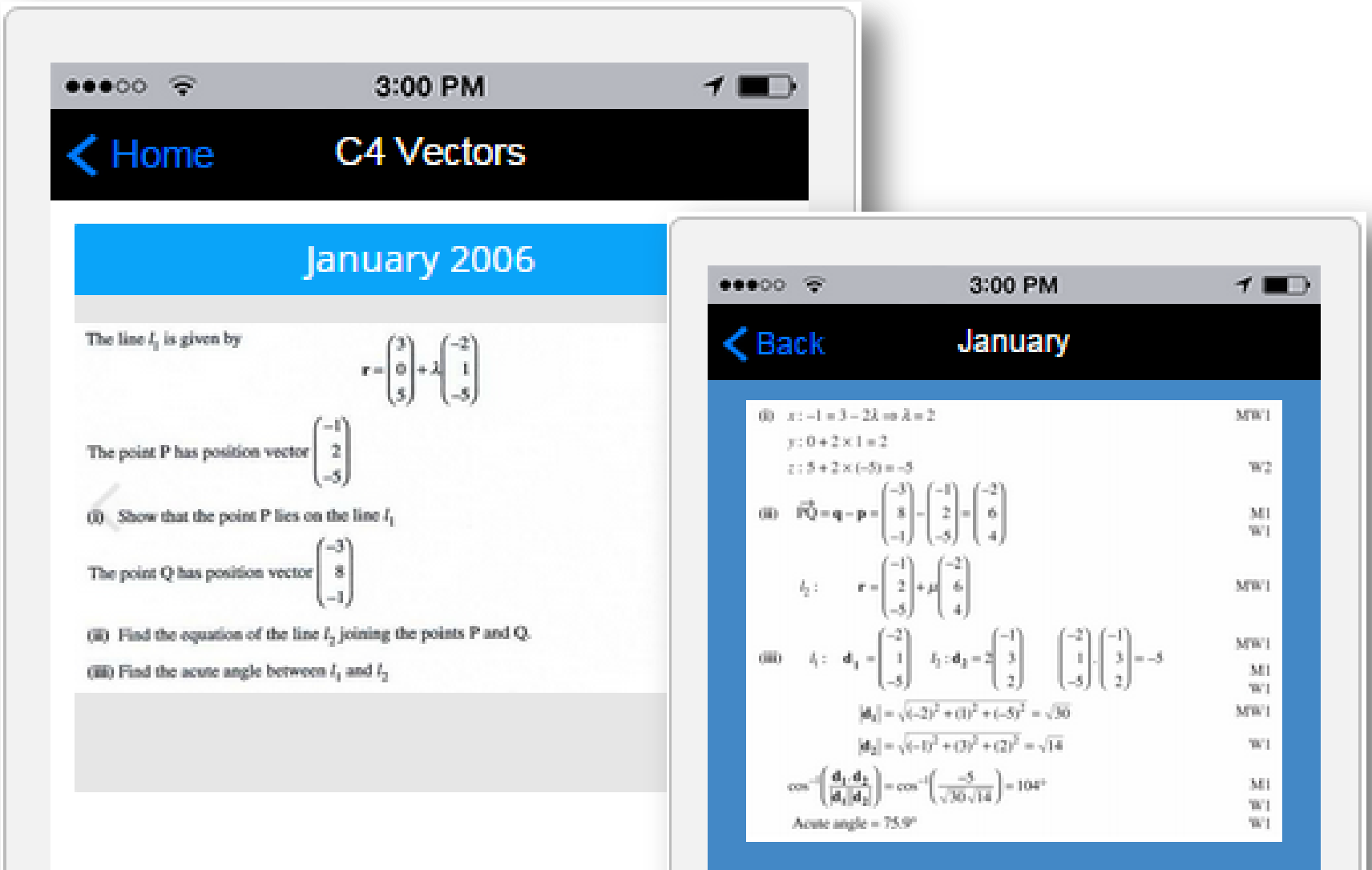
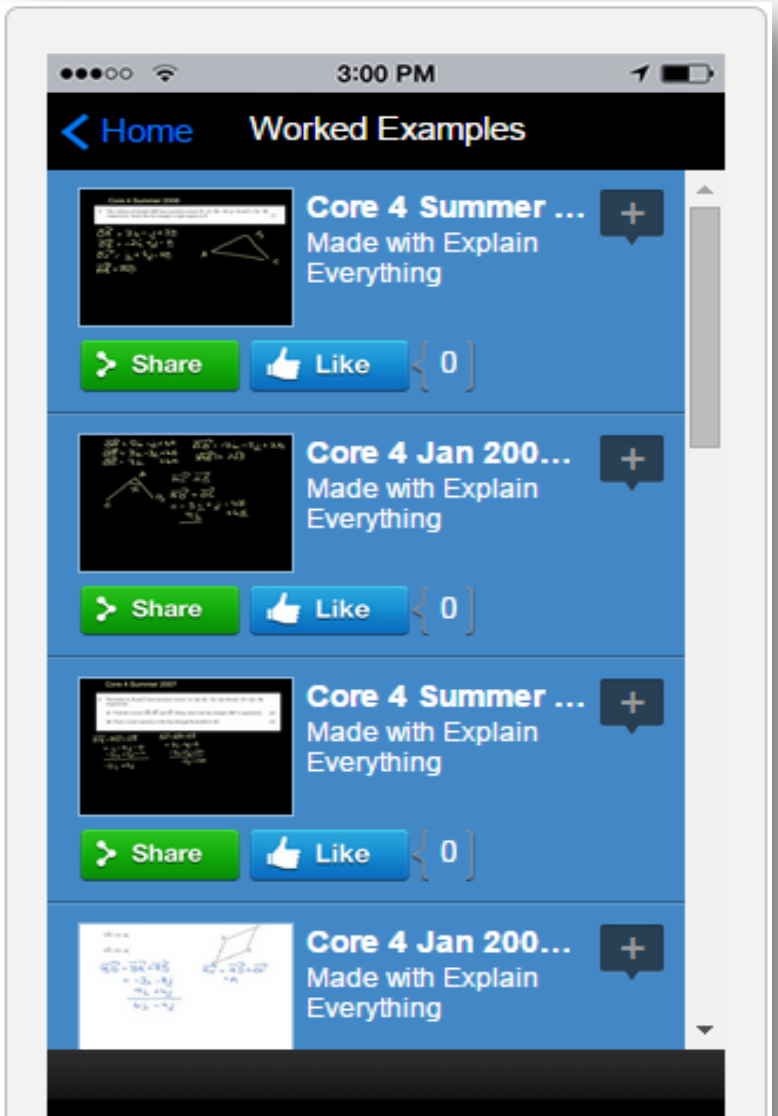
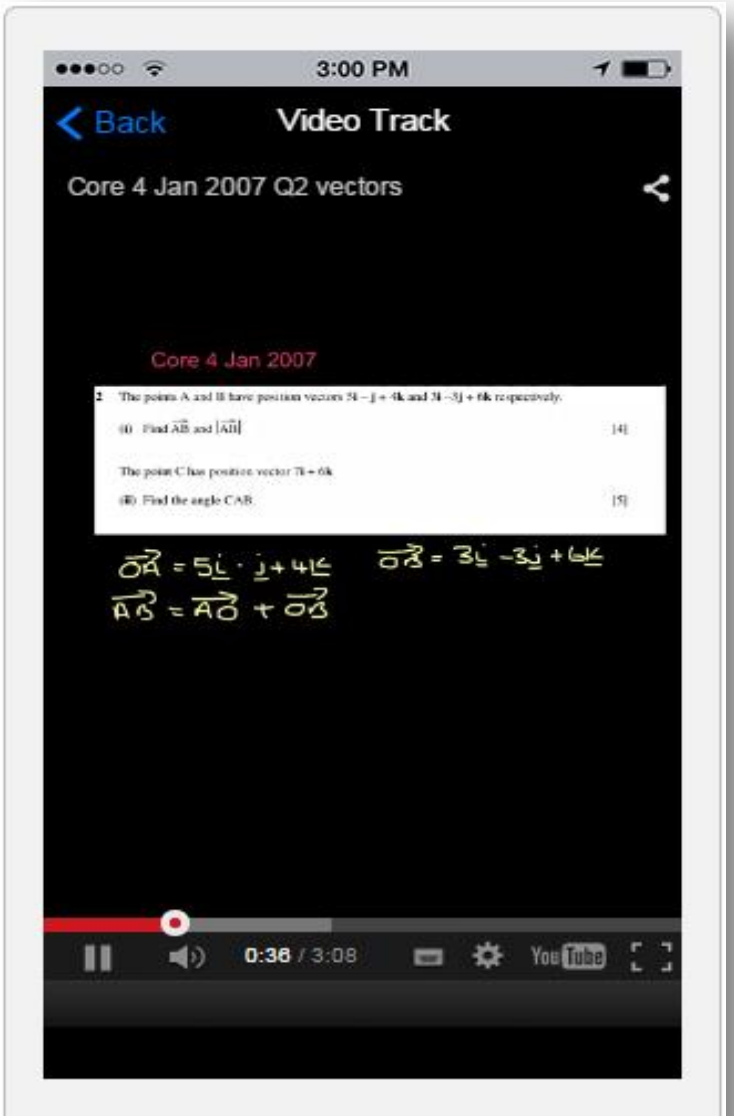
Quiz 1- Vectors
Quick Questions
1. Find the magnitude of the vector $\overrightarrow{AB} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$
2. Find the magnitude of the vector $\overrightarrow{BC} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$
3. If $\underline{a} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$, find $3\underline{a}$
4. If $\underline{a} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ and $\underline{b} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$, find
i.) $\overrightarrow{OP} = 2\underline{a} + 3\underline{b}$
ii.) $\overrightarrow{OQ} = 2\underline{b} - 4\underline{a}$
iii.) The length of each respectively
5. Write the following in column vector form:
i.) $5\underline{i} + 3\underline{k}$
ii.) $-\underline{i} - 2\underline{k}$
iii.) $4\underline{j} + 7\underline{k} - 2\underline{i}$
6. Two points A(1,3,-2) and B(3,3,2) exist.
i.) Write $\overrightarrow{AB}$ in vector form
ii.) Calculate the distance between A and B
7.) Find the parametric equations for the lines passing through A and B whose coordinates are:
i.) A(1,3,-2) & B(2,1,4)
ii.) A(2,1,1) & B(-1,-4,3)

Past exam papers, solutions

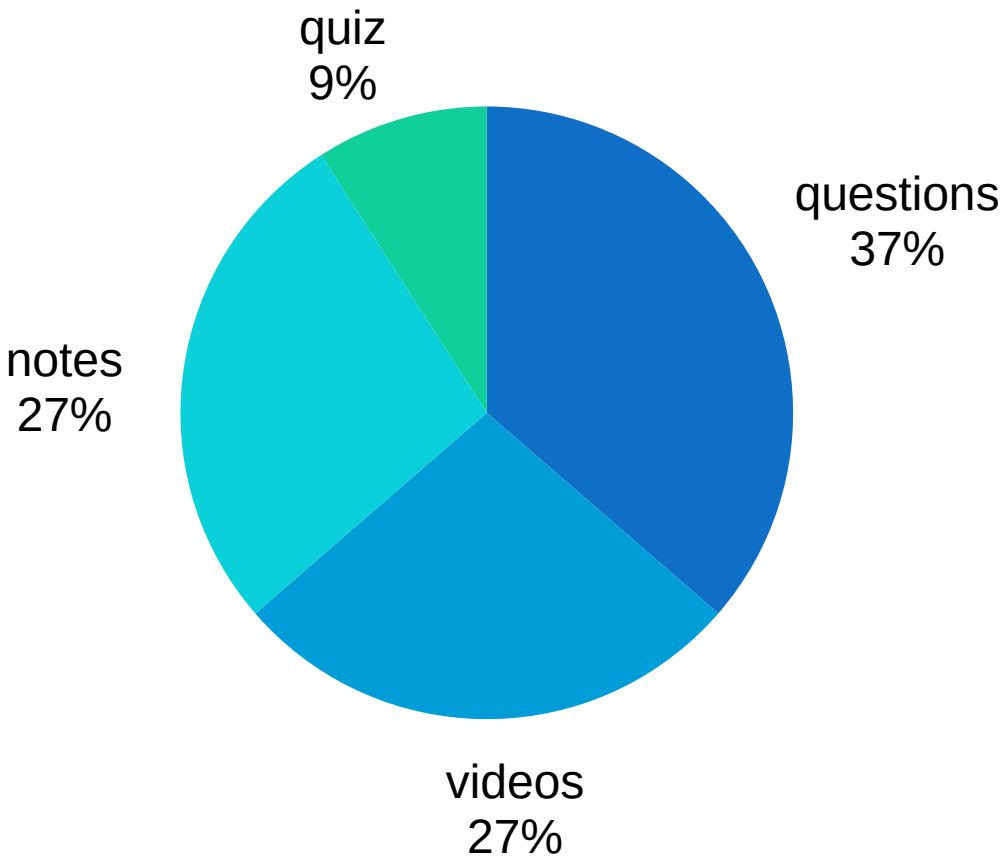


Video solutions for past exams





User feedback – most useful features



Conclusions

- ✓ *Opportunity to incorporate smart devices in classroom*
- ✓ *Current market place for A-level maths apps is limited*
- ✓ *Variety of resources – notes, quiz, past papers, solutions, videos*
- ✓ *Supplementing the teaching*
- ? *What resources should be encouraged?*
- × *Limitations*