

MEI Conference, Reading University, July 2007

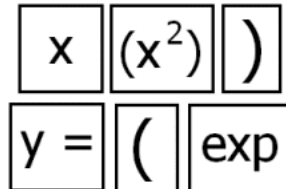
www.risps.net

Rich Starting Points – for A Level Pure Mathematics

Written as part of a Gatsby Teacher Fellowship for 2005-6

Risp 38: Differentiation Rules OK

You are given the following six cards:



How many ways can you place them ALL into an equation that makes sense?
(No repeats and none left over!)

For each equation, find y' and the value of y' when $x = 1$.

How many different $y'(1)$ values can you find?

Risp 24: The 3-Fact Triangles

A 3-Fact Triangle is one where three of the following facts are true.

- | | |
|----------------------------|---|
| 1. One side is 3cm. | 2. One angle is 90°. |
| 3. One side is 4cm. | 4. One angle is 30°. |

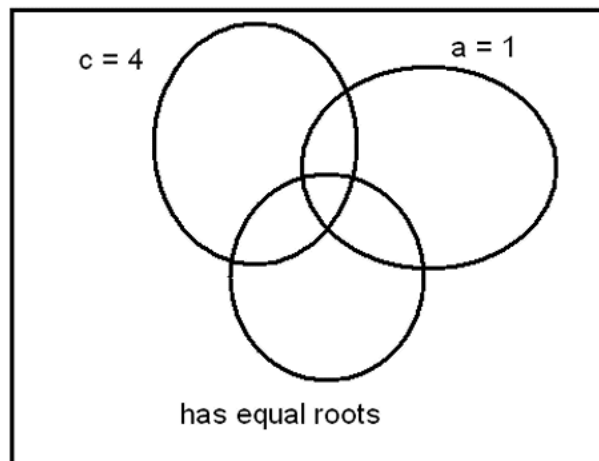
How many 3-Fact triangles are there?

(I might ask students to do the following!)

Find the area and perimeter of each one.

Risp 10: Venn Diagrams

all quadratic equations $ax^2 + bx + c = 0$



Can you find a quadratic equation for each of the eight regions above?

Risp 19: Extending the Binomial Theorem

Pick an odd number greater than 1, and call it n .

Take the numbers 1, -1 , and n , and place them into the square below in some order. (No repeats!)

$$\left(\square + \square x \right)^{\frac{1}{\square}}$$

How many orders are there?

Write down an expression for each order.

Find the first two terms of the expansion of each expression. (That is, find the constant term and the term in x .)

Now add your expansions together to give, let's say, $A + Bx$.

Work out $A/B + n$. What do you get?

Will this always work? Can you prove it?

Risp 29: Odd One Out

For each triplet, try to think of ways in which each member could be the odd one out.

For example, given the triplet 2, 3, 9:

2 could be the odd one out because it is even and the others are odd.

3 could be the odd one out because it is the only triangle number.

9 could be the odd one out because it is composite and the others are prime.

Triplet 1: $\sin x$, $\cos x$, $\tan x$

Triplet 2: e^x , $\ln x$, x^2

Triplet 3: $\sqrt{2}i$, $i + j$, $(1-\sqrt{2})i + j$

Triplet 4: $\cos 2x$, $\sin 2x$, $\cos x + \sin x$

Triplet 5: x , x^2 , x^3

Triplet 6: $(\cos t, 1 + \sin t)$, $(t, t^2 + 3)$, $(t, 3t)$

Triplet 8: $\sec^2 x$, -1 , $\tan^2 x$

Triplet 9: i , $i.j$, $i.j.k$

Risp 2: Sequence Tiles

Arrange these tiles to define a sequence in as many different ways as you can.

| | | | |
|---------|-----|--------|-----|
| $U_n =$ | n |) | n |
| 1 | (| \div | $-$ |

How do these different sequences behave?

What happens if we add in the following tiles?

| | |
|-----------|-----------|
| U_{n-1} | U_{n-2} |
|-----------|-----------|

Are there other tiles you can add in to get other types of sequence?

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| Activities that might take place in your A Level Maths classroom during the Autumn term | % of time you might spend on this | % of time you would like to spend on this | On the whole, how much do you enjoy doing this? (In rank order , 1 = enjoy most) |
|--|-----------------------------------|---|--|
| Teacher-led plenary: Exposition of theory | | | |
| Teacher-led plenary: Going over homework/test | | | |
| Students working on exercises from the textbook, discussion in pairs/groups | | | |
| Investigatory, problem-solving, open-ended discussion work (may include use of ICT) | | | |
| Tests | | | |
| Student-led plenary, presenting or feeding back on a topic | | | |
| Other 1: | | | |
| Other 2: | | | |

