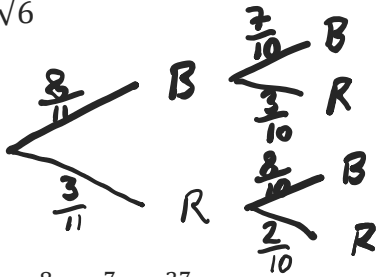


Shrewsbury 2021 16+ entrance

- 1) a)  $27p + 2q$   
 b)  $48x^2 + 22xy - 15y^2$   
 2) a)  $8h^3x^3(3h - 2x)$   
 b)  $(3p - 1)(p - 2)$   
 3) a) 64%  
 b) £316.80  
 c) £158  
 4) a)  $5\frac{1}{10}$   
 b)  $5\sqrt{6}$   
 5) a)



- b)  $1 - \frac{8}{11} \times \frac{7}{10} = \frac{27}{55}$   
 6) a) 66  
 b) 45  
 7) a) 12.5cm  
 b)  $32.6^\circ$   
 8) a) 2  
 b) 3.3  
 c) 5  
 9) a)  $C = \frac{R-5}{3}$   
 b)  $C = \frac{3}{U} + 1\frac{1}{2}$   
 10)  $\frac{2(x-2)}{x+1}$   
 B1) 1

Please turn over

B2)a)  $4! = 24$

b)  $\frac{4!}{4} = 3! = 6$

c) Options for layout (x, x same author, A, B, C, D other books):

x		x			
x			x		
x				x	
	x		x		
	x			x	
	x				x
		x		x	
		x			x
			x		x

9 options

x and x can be interchanged so multiply by 2

A, B, C, D can be interchanged so multiply by 4!

divide by 6 due to rotation:

$$\frac{(9 \times 2 \times 4!)}{6} = 72 \text{ options}$$

Or:  $\frac{6!}{6}$  ways of arranging 6 books in a circle. If two are by the same author then consider 5 units (one of which is two books), which can be arranged in  $\frac{5!}{5} = 24$  ways. Double because the two books can be two ways around:  $48. 120-48=72$ .

B3)a)  $x^2 - 2 + \frac{1}{x^2}$

b)  $u^2 + 2$

c)  $x^2 - x - 4 + \frac{1}{x} + \frac{1}{x^2}$   
 $= x^2 + \frac{1}{x^2} - \left(x - \frac{1}{x}\right) - 4$   
 $= u^2 + 2 - u - 4$   
 $= u^2 - u - 2$   
 $= (u - 2)(u + 1)$

So  $u = 2$  or  $u = -1$

$$x - \frac{1}{x} = 2 \text{ gives } x^2 - 2x - 1 = 0 \text{ so } x = 1 + \sqrt{2} \text{ or } x = 1 - \sqrt{2}$$

$$x - \frac{1}{x} = -1 \text{ gives } x^2 + x - 1 = 0 \text{ so } x = \frac{-(1+\sqrt{5})}{2} \text{ or } x = \frac{-(1-\sqrt{5})}{2}$$

d) Same as part c) except that  $y^2 = x$ .

$$\text{So } y^2 = 1 + \sqrt{2} \text{ or } y^2 = \frac{-1+\sqrt{5}}{2} \text{ (need positive values)}$$

$$\text{So } y = \pm\sqrt{1 + \sqrt{2}} \text{ or } y = \pm\sqrt{\frac{-1+\sqrt{5}}{2}}$$