



SeaHawk Tutors

Yr 11 Maths Paper 3 (1 hour)

1.

a. Rationalise the denominator of: $\frac{15}{\sqrt{3}}$ [2]

Handwritten solution: $\frac{15}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{15\sqrt{3}}{3}$ (M1)

Handwritten solution: $= 5\sqrt{3}$ (A1)

b. Show that $(\sqrt{7} + 2)(\sqrt{28} - 1)$ can be simplified as $3(4 + \sqrt{7})$. [3]

Handwritten solution:

$$\begin{aligned}(\sqrt{7} + 2)(\sqrt{28} - 1) &= \sqrt{7}\sqrt{28} - \sqrt{7} + 2\sqrt{28} - 2 \quad (M1) \\&= 14 - \sqrt{7} + 2 \times 2\sqrt{7} - 2 \quad (M1) \\&= 12 + 3\sqrt{7} = 3(4 + \sqrt{7}) \quad (A1)\end{aligned}$$

2. Show that 0.45 is equal to $\frac{5}{11}$. [2]

Handwritten solution:

$$\begin{aligned}x &= 0.45, \quad 100x = 45.45 \quad (M1) \\10x &= 4.54 \quad \rightarrow \quad x = 0.45 \quad (A1) \quad \rightarrow \quad 99x = 45 \quad x = \frac{45}{99} = \frac{5}{11}\end{aligned}$$

3. $\mathcal{E} = \{\text{children in Year 9 of a school}\}$

$A = \{\text{children taller than 120 cm}\}$

$B = \{\text{children whose birthday is in September, October or November}\}$

$C = \{\text{children in top set maths}\}$

A Year 9 student is selected at random. She is 115cm tall, with a birthday in April and she is in top set for maths.

(a) Write down the set, A, B or C, of which this student is a member. [1]

Handwritten answer: C

(b) Describe in words children that are members of the set $A \cup C$. [2]

Handwritten answer: Year 9 children taller than 120cm or in top set or both. (B2)

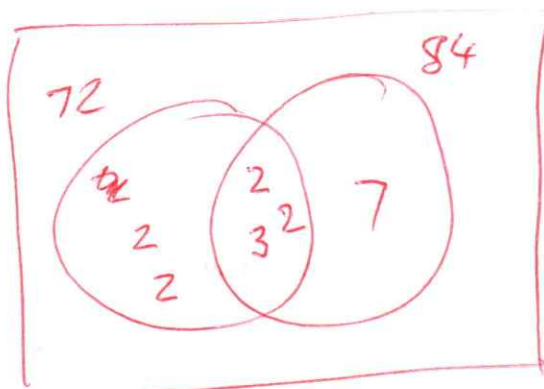
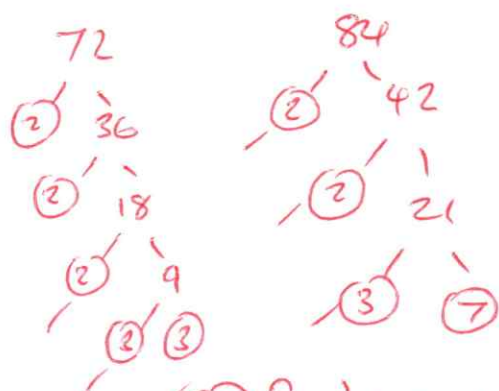
$B' \cap A = \emptyset$

(c) Explain what this statement tells us about the students in Year 9. [1]

Handwritten answer: No Year 9 students with birthdays December to ~~October~~ August are taller than 120cm. oe

4.

a. Find the HCF and LCM of 72 and 84 [3]



(M1) for Venn diagram or table

(M1) for 1 correct.

$$\text{HCF} = 2 \times 2 \times 3 = 12$$

$$\text{LCM} = 2 \times 2 \times 2 \times 2 \times 3 \times 7 = 336$$

(A1) for either correct

b. 37,800 can be written as $2^3 \times 3^3 \times 5^2 \times 7$. Write 378,000 as the product of its prime factors. [2]

$$\begin{aligned} 378,000 &= 37,800 \times 10 \\ &= 2^3 \times 3^3 \times 5^2 \times 7 \times 2 \times 5 \quad (\text{M1}) \\ &= 2^4 \times 3^3 \times 5^3 \times 7 \quad (\text{A1}) \end{aligned}$$

5. The diagram below shows the positions of Albaville (A) and Barkham (B) on a scale map.

a. How far is Albaville from Barkham? [2]

Measure 6.3 cm (M1)

$$6.3 \times 50 = 315 \text{ km} \quad (\text{A1}) \quad \text{Allow } 6.1 - 6.5 \text{ cm} = 305 - 325 \text{ km}$$

b. What is the bearing of Barkham from Albaville? [2]

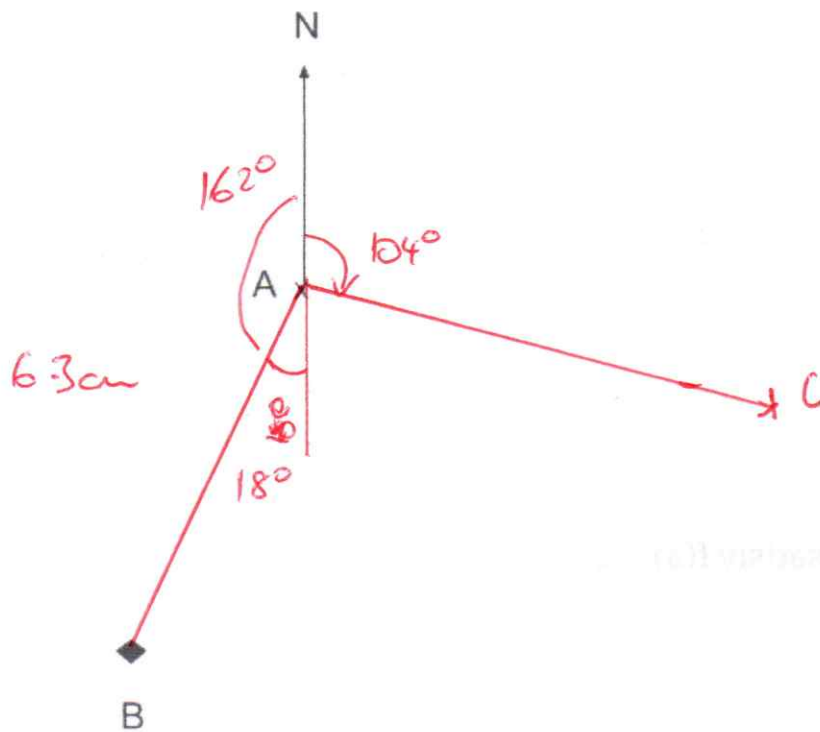
Measure either 180° or 162° (M1)

$$\text{Bearing} = 180 + 18^\circ \text{ OR } 360 - 162^\circ = 198^\circ \quad (\text{A1})$$

Allow $\pm 2^\circ$.

c. Culstead is 320 km from Albaville on a bearing of 104° . Mark the position of Culstead on the map. [2]

Scale: 1cm = 50km



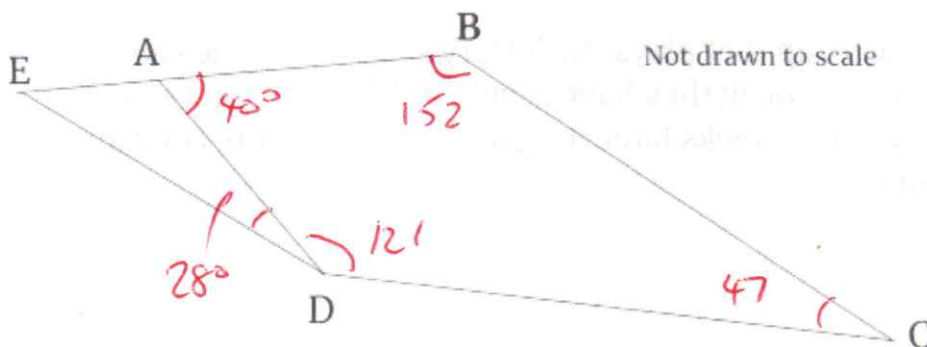
6. In the diagram, EAB is a straight line. ABCD is a quadrilateral with the following angles:

$$\angle ABC = 152^\circ$$

$$\angle BCD = 47^\circ$$

$$\angle ADC = 121^\circ$$

$$\angle EDC = 149^\circ$$



Find angle AED. Explain your working at each stage.

[3]

(M1) for either

$$\begin{cases} \angle ADE = 149 - 121 = 28^\circ \\ \angle BAD = 360 - (121 + 152 + 47) = 40^\circ \end{cases} \text{ [Angles in Quadrilateral} = 360^\circ \text{]} \quad \text{M1 for}$$

$$\angle EAD = 180 - 40 = 140^\circ \text{ [Angles on line} = 180^\circ \text{]} \quad \text{any 1}$$

$$\angle AED = 180 - (140 + 28) = 12^\circ \text{ [Angles in } \Delta = 180^\circ \text{]} \quad \text{Correct}$$

(A1)

7. $f(x) = 2(x - 12)$ and $g(x) = -x^2$ for $x \in \mathbb{R}$.

a. Write down the range of $g(x)$.

[1]

$$g(x) \leq 0$$

b. Find $gf(x)$.

[2]

$$- [2(x-12)]^2 = -4(x-12)^2$$

(B2) for
any correct
arrangement.

c. Find the values of a that satisfy $f(a) = g(a)$.

[3]

$$2(a-12) = -a^2 \quad (M1)$$

$$2a - 24 = -a^2$$

$$a^2 + 2a - 24 = 0 \quad (M1)$$

$$(a+6)(a-4) = 0$$

$$\underline{a = 4 \text{ or } -6}$$

(A1)

8. Three friends make a group that plays the lottery each week. They always split the prize in a fixed ratio. One week they have a win, and they each receive £30, £12 and £18 respectively. A few weeks later the group wins £7,000. How much does each receive this time?

[3]

	A	B	C		
£	30	12	18	= 60	(M1)
Ratio	5 : 2 : 3			(÷ 6) = 10	
£	3500	1400	2100	£7000	(x 70) (M1)

(A1)

9.

- a. In a class of 40 students there are 15 who play a musical instrument. What percentage of the class play an instrument? [2]

$$\frac{15}{40} \times 100\% \quad (MC) = 37.5\% \quad (A1)$$

- b. Bilal is a goalkeeper in a football team. Last season his team conceded 26 goals. This season they have conceded 22 goals. What is the percentage decrease in goals conceded, to the nearest 1%? [2]

$$26 - 22 = 4 \quad \frac{4}{26} \times 100\% = 15.4\% \quad (A1)$$

(MC)

- c. I put £50 into my bank account. It earns 5.3% interest per annum. How much money will I have in 6 years' time? [3]

$$(MC) \quad 50 \times (1.053)^6 \quad (MC) \text{ for } 1.053$$

$$= \underline{\underline{£68.16}} \quad (A1) \text{ must be 2 dp.}$$

10. The first four terms of an arithmetic sequence are 3, 7, 11, 15.

- a. Find an expression for the n th term of this sequence. [2]

$$u_n = 4n - 1 \quad (A1) \quad MC \text{ for either } 4n \text{ or } -1$$

- b. Write down the 100th term of the sequence. [1]

$$n = 100 \quad \therefore u_{100} = (4 \times 100) - 1 = \underline{\underline{399}} \quad (A1)$$

- c. Is 199 a term of the sequence? Explain your answer. [2]

$$4n - 1 = 199 \Rightarrow 4n = 200 \Rightarrow n = 50$$

n is an integer \Rightarrow YES (A1) (MC) for any correct proof.

- d. Find the sum of the first 16 terms of this sequence. [3]

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$n = 16 \quad S_{16} = \frac{16}{2} [2 \times 3 + (16-1) \times 4] \quad (MC)$$

$$a = 3$$

$$d = 4$$

$$= 8 [6 + (15 \times 4)] = 8 \times 66 \quad (MC) \text{ for correct process}$$

$$= \underline{\underline{528}} \quad (A1)$$