

**HIGHER TIER
MINI PRACTICE EXAM 4**



metatutor

**NON-CALCULATOR
20 MINUTES ALLOWED**

1.

Radcliffe High School and Eccles College are schools.

The ratio of boys to girls at both schools is 3:2.

Radcliffe High School has 282 boys.

Eccles College has 216 girls.

Work out the total number of students at the schools.

$$3 \overline{) 282}$$

$$\begin{aligned} \text{Radcliffe} &= 282 \div 3 = 94 \\ &94 \times 5 = 470 \text{ students} \end{aligned}$$

$$\begin{array}{r} 94 \\ \times 5 \\ \hline 470 \end{array}$$

$$\begin{aligned} \text{Eccles} &: 216 \div 2 = 108 \\ &108 \times 5 = 540 \text{ students} \end{aligned}$$

$$\text{Total} = 540 + 470 = \underline{1,010} \text{ students}$$

(4)

2.

The first four terms of a linear sequence are 3, 9, 15 and 21.

Carly says "169 is a term in the sequence".

Is Carly correct?

$$n\text{th term} = 6n - 3$$

$$\begin{array}{r} 6n - 3 = 169 \\ +3 \quad \quad \quad +3 \\ \hline 6n = 172 \end{array}$$

$$n = 28. \dots$$

$$6 \overline{) 172} \begin{array}{l} 28 \text{ r } 4 \end{array}$$

No

(3)

3.

Show that $\tan(30) \times \sin(60) = \cos(60)$.

$$\tan 30 = \frac{\sqrt{3}}{3} \quad \cos 60 = \frac{1}{2}$$

$$\sin 60 = \frac{\sqrt{3}}{2}$$

$$\frac{\sqrt{3}}{3} \times \frac{\sqrt{3}}{2} = \frac{3}{6} = \frac{1}{2} = \cos 60$$

(4)

4.

Prove that $4(x+2)^2 - x(3x+8)$ is a square number for all values of x .

$$4(x^2 + 4x + 4) - 3x^2 - 8x$$

$$4x^2 + 16x + 16 - 3x^2 - 8x$$

$$x^2 + 8x + 16$$

$$(x+4)(x+4)$$

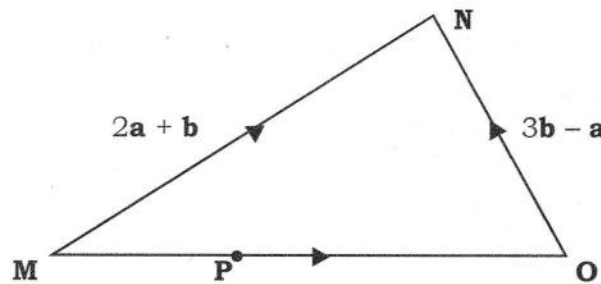
$(x+4)^2$ therefore it is a square number.

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5.

MNO is a triangle.

P is the point on MO such that $MP : PO = 1 : 3$.



Find the vector \overrightarrow{PN} in terms of \mathbf{a} and \mathbf{b} .

$$\overrightarrow{MO} = 2\mathbf{a} + \mathbf{b} - 3\mathbf{b} + \mathbf{a} = 3\mathbf{a} - 2\mathbf{b}$$

$$\overrightarrow{PO} = \frac{3\mathbf{a} - 2\mathbf{b}}{4} \times 3 = \frac{9\mathbf{a} - 6\mathbf{b}}{4} = \frac{9\mathbf{a}}{4} - \frac{3\mathbf{b}}{2}$$

$$\overrightarrow{PN} = \overrightarrow{PO} + \overrightarrow{ON}$$

$$= \frac{9\mathbf{a}}{4} - \frac{3\mathbf{b}}{2} + 3\mathbf{b} - \mathbf{a} = \frac{9\mathbf{a}}{4} - \frac{4\mathbf{a}}{4} - \frac{3\mathbf{b}}{2} + \frac{6\mathbf{b}}{2}$$

$$= \frac{5\mathbf{a}}{4} + \frac{3\mathbf{b}}{2}$$

(5)