

GCSE MATHS

1A

Reversing vectors and using ratios

Hints

Q1

1. Count the total number of parts in AC .
2. For BD , use the route B to C to D .

Q2

1. Check the direction of the given vector first.
2. AD is the negative of n ; divide it into six parts.

Q3

1. First split the whole vector AD in the stated ratio.
2. Find BC , then use A to B to C .

Q4

1. The given vector represents two ratio parts, not the whole line.
2. A is beyond B ; the route A to D goes through B and C .

1B

Vector routes in triangles

Hints

Q5

1. Find AB before taking a fraction of it.
2. AP is one quarter of AB ; PB is three quarters.

Q6

1. A route may pass through O even when the required segment does not.
2. Use $\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$.

Q7

1. The given side vectors are $2\mathbf{m}$ and $3\mathbf{n}$.
2. Use the route M to A to P .

Q8

1. You can travel from D through A or through C .
2. For the route through C , use $\overrightarrow{DC} = \frac{1}{3}\overrightarrow{BC}$ and $\overrightarrow{CE} = -\frac{3}{4}\overrightarrow{AC}$.

1C

Diagonals, midpoints and extensions

Hints

Q9

1. OB is a diagonal, not a side.
2. Find OP and OQ , then subtract OP from OQ .

Q10

1. Find BC by travelling B to A to D to C .
2. BN is one third of BC . $\overrightarrow{MN} = \overrightarrow{AN} - \overrightarrow{AM}$.

Q11

1. Find $\overrightarrow{AE}$ by adding the extension to $\overrightarrow{AC}$.
2. Find $\overrightarrow{DE}$, then halve it to get $\overrightarrow{DF}$. Use the route A to D to F .

Q12

1. Find OM and ON before using the midpoint information.
2. Compare OT with the whole diagonal OB .

2A

Finding unknown coefficients

Hints

Q13

1. Compare the coefficients of m and n separately.
2. The coefficient of n on the right is negative.

Q14

1. What is the coefficient of n on the right?
2. It is zero, so $3 - q = 0$.

Q15

1. Substitute $y = 3$ before expanding the brackets.
2. Compare the coefficients of m to get $x + 3 = 7$.

Q16

1. Substitute $n = 2m$ first.
2. This gives $x + 2y = 6$. Use $y = 1$ in part (a) and $y = 2$ in part (b).

2B

Forming simultaneous equations

Hints

Q17

1. Simplify the coefficients before solving any equations.
2. The coefficient of n from the second bracket is $-2y$.

Q18

1. Simplify the coefficients before solving any equations.
2. Keep the negative coefficient -5.

Q19

1. Simplify the coefficients before solving any equations.
2. The minus sign before y changes both terms in that bracket.

Q20

1. Simplify the coefficients before solving any equations.
2. Collect every contribution to m before collecting every contribution to n .

2C

Parallel vectors: length and direction

Hints

Q21

1. Introduce a multiplier before comparing coefficients.
2. A negative multiplier is allowed; it reverses direction.

Q22

1. Introduce a multiplier before comparing coefficients.
2. A negative multiplier is allowed; it reverses direction.

Q23

1. Introduce a multiplier before comparing coefficients.
2. A negative multiplier is allowed; it reverses direction.

Q24

1. Write $\mathbf{u} = \lambda \mathbf{v}$ before comparing coefficients.
2. For part (c), compare $\mathbf{u} = -\mathbf{v}$ with $\mathbf{u} = \lambda \mathbf{v}$.

3A

Finding ratios using parallel lines

Hints

Q25

1. Write AP as an unknown fraction of the whole AB .
2. MP is parallel to n , so its m coefficient is zero.

Q26

1. Find OP using O to A to P .
2. Compare coefficients to obtain $2 - 2t = 1 + s$ and $3t = 2s + 1$.

Q27

1. Write OX using an unknown fraction along AC .
2. A multiple of $(m + n)$ has equal coefficients of m and n .

Q28

1. Use an unknown number for the fraction AE/AC .
2. The coefficient of m gives k ; use the coefficient of n to find E .

3B

Finding where two lines intersect

Hints

Q29

1. Describe OR using the two lines through R .
2. Use separate fractions for AR/AQ and BR/BP .

Q30

1. Find AF from the division of BC , and AE from the division of AD .
2. Introduce $\overrightarrow{AP} = t\overrightarrow{AF}$ and $\overrightarrow{BP} = s\overrightarrow{BE}$, then compare AP in terms of m and n .

Q31

1. Find AD and AE , then express AP in two ways.
2. One route is directly along AD ; the other is A to B to P .

Q32

1. A multiplier can be negative or greater than one when a line is extended.
2. Use $\overrightarrow{AP} = \overrightarrow{AC} + t\overrightarrow{CD}$ and $\overrightarrow{AP} = \overrightarrow{AB} + s\overrightarrow{BE}$. Think about what the sign of s tells you.

3C

Finding a second intersection

Hints

Q33

1. Find the position of P before introducing Q .
2. Once AP is known, express AQ using A to B to Q and set its m coefficient to zero.

Q34

1. Find P from AE and BF , then use C to P to reach Q .
2. For Q on AB , the n coefficient of AQ must be zero.

Q35

1. Find OP first, then treat the two lines through P separately.
2. Use the zero coefficient on each side of the triangle; finally compare QR with AB .

Q36

1. For part (a), the position of Q is already known. Use BQ and DE to locate P .
2. Once AP is known, extend its direction until the n coefficient is 1; that locates F on DC .