

GCSE MATHEMATICS (9-1) — COMPLETE REVISION & PRACTICE

Grade 9 Mathematics

(Higher Tier)

Higher Tier Tutorials, Common Mistake Warnings, Exam Practice, Mixed Reviews & Answers

- **Higher Tier Concept Notes**, Diagrams & "Common Mistake" Warnings
- **Model Worked Examples** & 6 Edexcel Higher Questions per topic
- **Calculator & Non-Calculator Badges** across all examples & questions
- **2 Interleaved Mixed Review Sets** + Full Answer Key Appendix

Student Name: _____

Class / Teacher: _____

Target Grade: _____



SCAN FOR ONLINE PRACTICE & WORKED SOLUTIONS

BreakingDownMaths.com

Interactive Step-by-Step GCSE Mathematics Mastery

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ALGEBRA — ALGEBRAIC PROOF

Algebraic Proof

1 Setting up Proofs

□ CORE CONCEPT & METHOD

To prove something algebraically, you must use letters instead of numbers.

- Any integer: n
- An even number: $2n$
- An odd number: $2n + 1$
- Consecutive integers: $n, n + 1, n + 2$
- Consecutive even numbers: $2n, 2n + 2, 2n + 4$

COMMON MISTAKE: Never use $2n$ and $2m$ for consecutive even integers — link both to the SAME integer n (use $2n$ and $2n + 2$ for evens, or $2n + 1$ and $2n + 3$ for consecutive odds).

MODEL WORKED EXAMPLES

EXAMPLE 1.1

✎ Non-Calculator

Prove algebraically that the sum of any five consecutive integers is always a multiple of 5.

STEP-BY-STEP SOLUTION:

Let the five consecutive integers be $n, n + 1, n + 2, n + 3$, and $n + 4$.

Sum = $n + (n + 1) + (n + 2) + (n + 3) + (n + 4) = 5n + 10$

Factorise: $5(n + 2)$

Since it is a multiple of 5, the statement is proven.

2 Expanding to Prove

□ CORE CONCEPT & METHOD

Most algebraic proofs just require you to **expand all brackets and simplify**.

If you are asked to prove an expression is a multiple of 12, your final simplified expression will usually look like $12n$.

COMMON MISTAKE: Do not stop at $8n^2 + 8n + 4$ — to prove a multiple of k , you MUST factor k out explicitly as $4(2n^2 + 2n + 1)$ and write a brief concluding statement.

MODEL WORKED EXAMPLES

EXAMPLE 2.1

✎ Non-Calculator

Prove that $(n + 3)^2 - (n - 3)^2$ is always a multiple of 12.

STEP-BY-STEP SOLUTION:

Expand both brackets:

$(n^2 + 6n + 9) - (n^2 - 6n + 9)$

Simplify:

$n^2 + 6n + 9 - n^2 + 6n - 9 = 12n$

Since $12n$ is a multiple of 12 for any integer n , the statement is proven.

EDEXCEL GCSE EXAM PRACTICE

Total: 19 marks

Algebraic Proof — Practice Questions

Check the Calculator or Non-Calculator label on each question before you start. Show your working clearly in the box.

Question 1 Non-Calculator

(3 marks)

Prove algebraically that the sum of the squares of any two consecutive even integers is always a multiple of 4.

WORKING & PROOF SPACE

Question 2 Non-Calculator

(3 marks)

Prove algebraically that the difference between the squares of any two consecutive odd integers is always a multiple of 8.

WORKING & PROOF SPACE

Question 3 Non-Calculator

(3 marks)

Prove algebraically that the sum of the squares of any two consecutive integers is always an odd number.

WORKING & PROOF SPACE

Question 4 Non-Calculator

(3 marks)

Prove algebraically that $(5n + 3)^2 - (5n - 3)^2$ is always a multiple of 60 for all positive integer values of n .

WORKING & PROOF SPACE

Question 5 **Non-Calculator****(3 marks)**

Prove algebraically that $(n + 5)(n - 1) + 9$ is always a square number for all integer values of n .

WORKING & PROOF SPACE

Question 6 **Non-Calculator****(4 marks)**

Prove algebraically that the square of any odd integer is always 1 more than a multiple of 8.

WORKING & PROOF SPACE

Equation of a Circle

1 Centre and Radius

□ CORE CONCEPT & METHOD

The equation of a circle centered at the origin $(0, 0)$ is $x^2 + y^2 = r^2$, where r is the radius. Remember to **square root** the number to find r !

COMMON MISTAKE: In $x^2 + y^2 = r^2$, the constant on the right is r^2 , NOT r — always take the positive square root to find the radius (e.g. $x^2 + y^2 = 225 \implies r = 15$).

MODEL WORKED EXAMPLES

EXAMPLE 1.1

 **Non-Calculator**

A circle has the equation $x^2 + y^2 = 81$. Find the radius.

STEP-BY-STEP SOLUTION:

$$r^2 = 81, \text{ so } r = \sqrt{81} = 9.$$

9

2 Points on a Circle

□ CORE CONCEPT & METHOD

To check if a point (x, y) lies on the circle $x^2 + y^2 = r^2$, **substitute** the coordinates into the equation and check if it equals r^2 .

COMMON MISTAKE: Always wrap negative coordinates in brackets before squaring: $(-8)^2 + 15^2 = +64 + 225 = 289$, NEVER $-64 + 225$.

MODEL WORKED EXAMPLES

EXAMPLE 2.1

 **Non-Calculator**

Show that $(6, 8)$ lies on $x^2 + y^2 = 100$.

STEP-BY-STEP SOLUTION:

$$6^2 + 8^2 = 36 + 64 = 100. \text{ This equals the radius squared, so it lies on the circle.}$$

100

3 Area and Circumference

□ CORE CONCEPT & METHOD

Once you know r^2 , you can easily find the area (πr^2)! You don't even need to square root it first.

COMMON MISTAKE: Check whether the question asks for exact AREA (πr^2 , using r^2 directly) or CIRCUMFERENCE ($2\pi r$, square-rooting r^2 first), and leave π in your answer.

MODEL WORKED EXAMPLES

EXAMPLE 3.1

 Non-Calculator

Find the exact area of the circle $x^2 + y^2 = 49$.

STEP-BY-STEP SOLUTION:

Here, $r^2 = 49$.

Area = $\pi r^2 = 49\pi$.

$$49\pi$$

4 Translations

 CORE CONCEPT & METHOD

If a circle centered at $(0, 0)$ is translated by a vector $\begin{pmatrix} a \\ b \end{pmatrix}$, the new centre becomes (a, b) .

COMMON MISTAKE: Translating a circle moves its CENTRE $(0, 0) \rightarrow (a, b)$ without changing its radius r , and inside $(x - a)^2 + (y - b)^2 = r^2$ the signs are OPPOSITE to (a, b) .

MODEL WORKED EXAMPLES

EXAMPLE 4.1

 Non-Calculator

A circle centered at $(0, 0)$ is translated by $\begin{pmatrix} -4 \\ 7 \end{pmatrix}$. What is its new centre?

STEP-BY-STEP SOLUTION:

The centre moves 4 units left and 7 units up.

New centre: $(-4, 7)$.

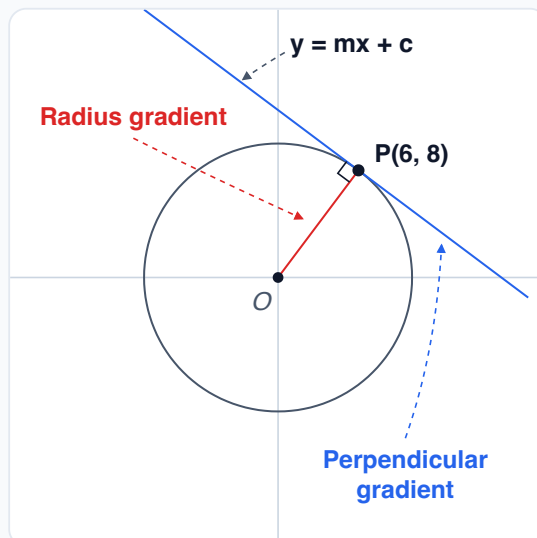
$$(-4, 7)$$

5 Tangents to Circles

CORE CONCEPT & METHOD

To find the **equation of a tangent**, follow 3 steps:

1. Find the gradient of the radius (from the origin to the point).
2. Find the perpendicular gradient (negative reciprocal).
3. Substitute the coordinates into $y = mx + c$ to find c !



COMMON MISTAKE: A tangent is PERPENDICULAR to the radius — after finding $m_{\text{radius}} = \frac{y_1}{x_1}$, take the negative reciprocal $m_{\text{tangent}} = -\frac{x_1}{y_1}$ before substituting (x_1, y_1) .

MODEL WORKED EXAMPLES

EXAMPLE 5.1

Non-Calculator

Find the equation of the tangent to the circle $x^2 + y^2 = 100$ at the point $(6, 8)$.

STEP-BY-STEP SOLUTION:

1. **Radius gradient:** The centre is $(0, 0)$. The gradient to $(6, 8)$ is $\frac{8}{6} = \frac{4}{3}$.

2. **Tangent gradient:** The negative reciprocal is $m = -\frac{3}{4}$.

3. **Find c :** Substitute $x = 6, y = 8$ into $y = -\frac{3}{4}x + c$:

$$8 = -\frac{3}{4}(6) + c$$

$$8 = -\frac{9}{2} + c$$

$$c = 8 + \frac{9}{2} = \frac{25}{2}$$

$$\text{Equation: } y = -\frac{3}{4}x + \frac{25}{2}.$$

$$y = -\frac{3}{4}x + \frac{25}{2}$$

EXAMPLE 5.2 **Non-Calculator**

Find the equation of the tangent to the circle $x^2 + y^2 = 289$ at the point $(-8, 15)$.

STEP-BY-STEP SOLUTION:

1. **Radius gradient:** The gradient to $(-8, 15)$ is $\frac{15}{-8} = -\frac{15}{8}$.

2. **Tangent gradient:** The negative reciprocal is $m = \frac{8}{15}$.

3. **Find c:** Substitute $x = -8, y = 15$ into $y = \frac{8}{15}x + c$:

$$15 = \frac{8}{15}(-8) + c$$

$$15 = -\frac{64}{15} + c$$

$$c = 15 + \frac{64}{15} = \frac{289}{15}$$

Equation: $y = \frac{8}{15}x + \frac{289}{15}$.

$$y = \frac{8}{15}x + \frac{289}{15}$$

EDEXCEL GCSE EXAM PRACTICE

Total: 17 marks

Equation of a Circle — Practice Questions

Check the Calculator or Non-Calculator label on each question before you start. Show your working clearly in the box.

Question 1 Non-Calculator

(1 mark)

A circle has the equation $x^2 + y^2 = 225$.

Find the radius of the circle.

WORKING OUT SPACE

Answer:

Question 2 Calculator

(2 marks)

A circle has the equation $x^2 + y^2 = 289$.

Prove that the point $(-8, 15)$ lies on the circle.

WORKING & PROOF SPACE

Question 3 Non-Calculator

(2 marks)

A circle has the equation $x^2 + y^2 = 225$.

Calculate the exact area of the circle in terms of π .

WORKING OUT SPACE

Answer:

Question 4 Non-Calculator

(3 marks)

The point $P(4, k)$, where $k > 0$, lies on the circle with equation $x^2 + y^2 = 52$.

(a) Find the value of k .

(b) Work out the gradient of the radius OP .

WORKING OUT SPACE

(a) $k =$ (b) Gradient =

Question 5 **Calculator****(4 marks)**

A circle has the equation $x^2 + y^2 = 289$.

Find the equation of the tangent to the circle at the point $(8, 15)$.

WORKING OUT SPACE

Answer:**Question 6** **Calculator****(5 marks)**

A circle has the equation $x^2 + y^2 = 169$.

The tangent to the circle at the point $(5, 12)$ meets the y -axis at the point A and the x -axis at the point B .

- (a) Find the equation of the tangent in the form $y = mx + c$.
(b) Work out the exact area of triangle OAB , where O is the origin.

WORKING OUT SPACE

(a) **(b) Area =**

Gradients & Rates of Change

1 Acceleration on Curves

□ CORE CONCEPT & METHOD

If a velocity-time or distance-time graph is curved, the rate of change is constantly changing.

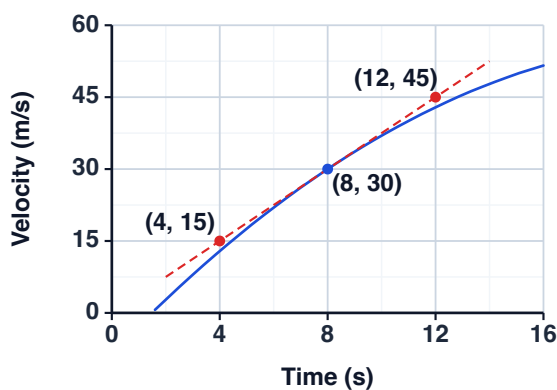
To find the **instantaneous rate of change** at a specific time t , use the **tangent line** touching the curve at that point and calculate its gradient $\left(\frac{y_2 - y_1}{x_2 - x_1}\right)$.

COMMON MISTAKE: Find the gradient of the TANGENT using two widely spaced points (t_1, v_1) and (t_2, v_2) ON the tangent line — never divide $v \div t$ from a single point on the curve.

MODEL WORKED EXAMPLES

EXAMPLE 1.1

 Non-Calculator



A curved velocity-time graph shows a car accelerating. A tangent is drawn at $t = 8$ s, passing through the points $(4, 15)$ and $(12, 45)$.

Find the instantaneous acceleration at $t = 8$ s.

STEP-BY-STEP SOLUTION:

The instantaneous acceleration is the **gradient of the tangent** at $t = 8$ s.

$$a = \frac{\text{change in } v}{\text{change in } t} = \frac{45 - 15}{12 - 4} = \frac{30}{8} = 3.75 \text{ m/s}^2$$

Note: Because the graph is curved, the tangent gives the exact *instantaneous* rate of change at $t = 8$ s.

2 Distance on Curves (Trapezium Rule)

□ CORE CONCEPT & METHOD

To estimate the distance travelled under a curved velocity-time graph, we split the area into vertical strips of equal width h and treat them as **trapeziums**.

Area of each strip $= \frac{1}{2}(a + b)h$, where a and b are the vertical velocities at the left and right edges of the strip.

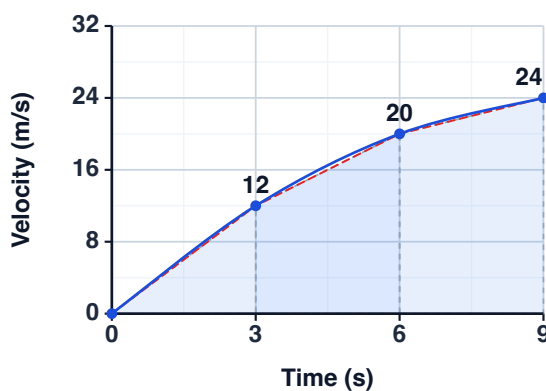
Overestimate or Underestimate? Compare the straight top chord of each trapezium with the curve: if the curve bends downwards (concave down, decreasing acceleration), the chords lie **below** the curve so the estimate is an **underestimate**; if the curve bends upwards (concave up, increasing acceleration), the chords lie **above** the curve so it is an **overestimate**.

COMMON MISTAKE: Count the STRIPS (gaps), not the vertical lines, to get strip width h , and justify under/overestimates geometrically ("chords lie below/above the curve").

MODEL WORKED EXAMPLES

EXAMPLE 2.1

 **Calculator**



The curved velocity-time graph has been split into 3 strips of equal width $h = 3$ s. The velocities at each boundary are $v_0 = 0$, $v_1 = 12$, $v_2 = 20$, and $v_3 = 24$ m/s.

Use the trapezium rule to estimate the total distance travelled.

STEP-BY-STEP SOLUTION:

Area of each trapezium strip $= \frac{1}{2}(a + b) \times h$, where $h = 3$ s:

$$\text{Strip 1: } \frac{1}{2}(0 + 12) \times 3 = 18 \text{ m}$$

$$\text{Strip 2: } \frac{1}{2}(12 + 20) \times 3 = 48 \text{ m}$$

$$\text{Strip 3: } \frac{1}{2}(20 + 24) \times 3 = 66 \text{ m}$$

$$\text{Total distance} \approx 18 + 48 + 66 = 132 \text{ m}$$

EDEXCEL GCSE EXAM PRACTICE

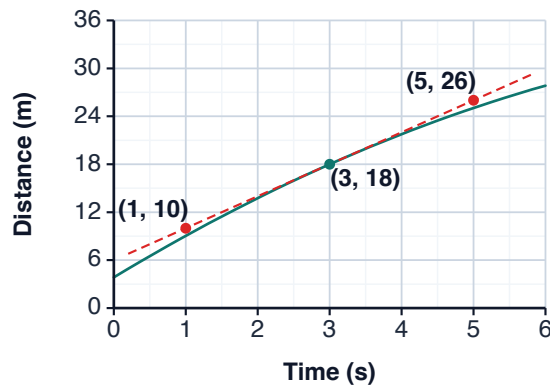
Total: 16 marks

Gradients & Rates of Change — Practice Questions

Check the Calculator or Non-Calculator label on each question before you start. Show your working clearly in the box.

Question 1 Non-Calculator

(2 marks)



The curved distance-time graph shows the distance travelled by a cyclist. A tangent to the curve has been drawn at $t = 3$ s, passing through (1, 10) and (5, 26).

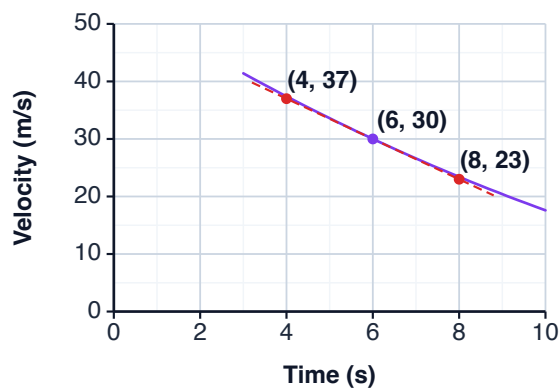
Work out the **instantaneous speed** of the cyclist at $t = 3$ s in m/s.

WORKING OUT SPACE

Answer:

Question 2 Calculator

(2 marks)

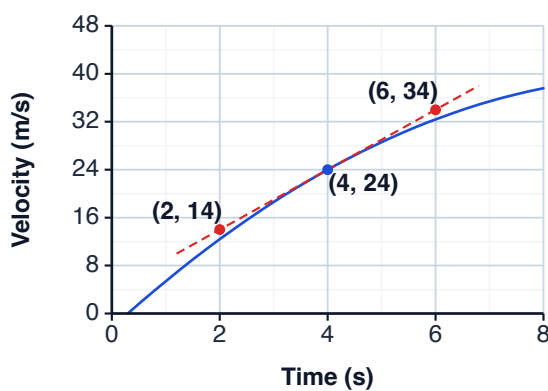


The velocity-time graph shows a vehicle slowing down. A tangent to the curve is drawn at $t = 6$ s, passing through (4, 37) and (8, 23).

Calculate the **rate of deceleration** (as a positive value) at $t = 6$ s in m/s^2 .

WORKING OUT SPACE

Answer:

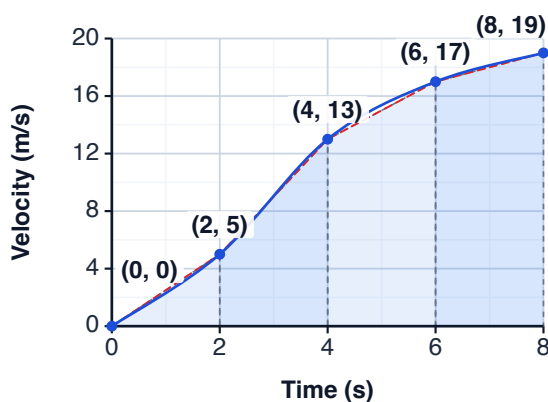
Question 3 Non-Calculator**(2 marks)**

The curved velocity-time graph shows the motion of a car. A tangent to the curve has been drawn at $t = 4$ s, passing through $(2, 14)$ and $(6, 34)$.

Calculate the **instantaneous acceleration** of the car at $t = 4$ s in m/s^2 .

WORKING OUT SPACE

Answer:

Question 4 Calculator**(3 marks)**

The velocity-time graph shows the motion of an object over 8 seconds. The area under the curve has been divided into **4 strips of equal width** ($h = 2$ s).

Use the **trapezium rule** to work out an estimate for the total distance travelled in the 8 seconds in metres.

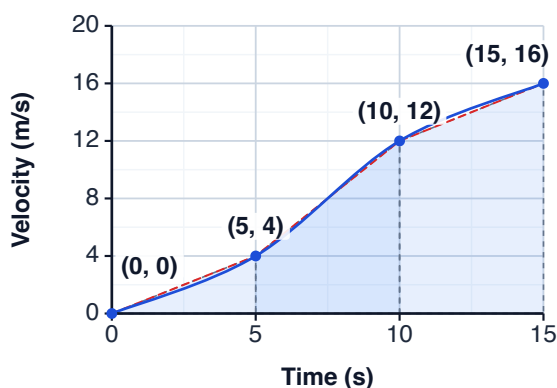
WORKING OUT SPACE

Answer:

Question 5

Calculator

(3 marks)



The velocity-time graph shows the motion of a train over 15 seconds. The area under the curve has been divided into **3 strips of equal width** ($h = 5$ s).

Use the **trapezium rule** to work out an estimate for the **average speed** of the train over the 15 seconds in m/s.

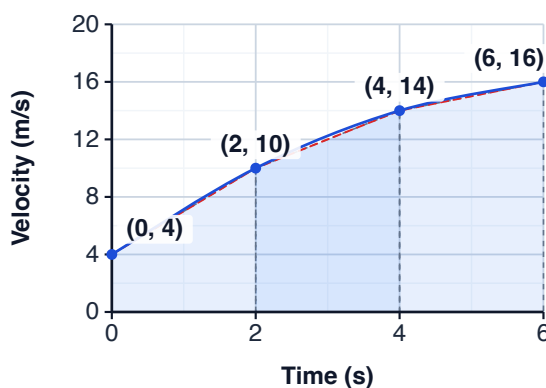
WORKING OUT SPACE

Answer:

Question 6

Non-Calculator

(4 marks)



The velocity-time graph shows a speedboat accelerating from an initial velocity of 4 m/s over 6 seconds. The area under the curve has been divided into **3 trapezium strips of equal width** ($h = 2$ s).

- (a) Work out an estimate for the distance travelled by the speedboat in the 6 seconds in metres.
 (b) State whether your answer to part (a) is an underestimate or an overestimate of the actual distance travelled. Give a reason for your answer.

WORKING OUT SPACE

(a) m

(b) Reason:

Vector Proofs

1 Vectors in Triangles

□ CORE CONCEPT & METHOD

To find a position vector like $\vec{OZ}$, first find the vector for the whole line (e.g., $\vec{XY}$). Then use the given ratio to find $\vec{XZ}$, and finally use $\vec{OZ} = \vec{OX} + \vec{XZ}$.

COMMON MISTAKE: Watch arrow directions: $\vec{AB} = \vec{OB} - \vec{OA} = -\vec{OA} + \vec{OB}$, and remember $AP : PB = 3 : 2$ means $AP = \frac{3}{5}AB$, NOT $\frac{3}{2}AB$.

MODEL WORKED EXAMPLES

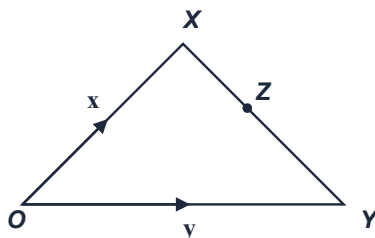
EXAMPLE 1.1

Non-Calculator

In triangle OXY , $\vec{OX} = \mathbf{x}$ and $\vec{OY} = \mathbf{y}$.

Z is the point on XY such that $XZ : ZY = 3 : 4$.

$\vec{OZ} = k(4\mathbf{x} + 3\mathbf{y})$. Find the value of k .



STEP-BY-STEP SOLUTION:

1. Find $\vec{XY}$:

$$\vec{XY} = -\mathbf{x} + \mathbf{y}$$

2. Find $\vec{XZ}$:

The ratio is $3 : 4$, so XZ is $\frac{3}{7}$ of the line.

$$\vec{XZ} = \frac{3}{7}(-\mathbf{x} + \mathbf{y}) = -\frac{3}{7}\mathbf{x} + \frac{3}{7}\mathbf{y}$$

3. Find $\vec{OZ}$:

$$\vec{OZ} = \vec{OX} + \vec{XZ}$$

$$\vec{OZ} = \mathbf{x} - \frac{3}{7}\mathbf{x} + \frac{3}{7}\mathbf{y} = \frac{4}{7}\mathbf{x} + \frac{3}{7}\mathbf{y}$$

4. Find k :

Factorise out $\frac{1}{7}$:

$$\vec{OZ} = \frac{1}{7}(4\mathbf{x} + 3\mathbf{y})$$

$$\text{So, } k = \frac{1}{7}.$$

$$\frac{1}{7}$$

2 Proving Collinearity

CORE CONCEPT & METHOD

To prove three points X , Y and Z are on the same straight line (collinear), you must prove that the vectors $\vec{XY}$ and $\vec{XZ}$ (or $\vec{YZ}$) are parallel. You do this by showing one is a **scalar multiple** of the other, e.g. $\vec{XZ} = 2\vec{XY}$.

COMMON MISTAKE: Showing $\vec{CD} = 4\vec{CM}$ only proves the vectors are PARALLEL — you MUST also write "and they share the common point C , so C, M, D are collinear".

MODEL WORKED EXAMPLES

EXAMPLE 2.1

Non-Calculator

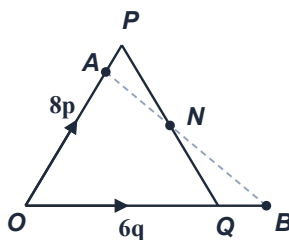
In the diagram, $\vec{OP} = 8\mathbf{p}$ and $\vec{OQ} = 6\mathbf{q}$.

A is the point on OP such that $OA : AP = 3 : 1$.

N is the midpoint of PQ .

B is the point on OQ extended such that $OQ : QB = 2 : 1$.

Show that A , N and B are on the same straight line.



STEP-BY-STEP SOLUTION:

1. Find $\vec{AN}$:

$$\vec{PQ} = -8\mathbf{p} + 6\mathbf{q}$$

$$\vec{PN} = \frac{1}{2}(-8\mathbf{p} + 6\mathbf{q}) = -4\mathbf{p} + 3\mathbf{q}$$

$$\vec{AP} = 2\mathbf{p} \text{ (since ratio is } 3 : 1, OP = 8\mathbf{p}\text{)}$$

$$\vec{AN} = \vec{AP} + \vec{PN} = 2\mathbf{p} - 4\mathbf{p} + 3\mathbf{q} = -2\mathbf{p} + 3\mathbf{q}$$

2. Find $\vec{AB}$:

$$\vec{AB} = \vec{AO} + \vec{OB}$$

$$\vec{AO} = -6\mathbf{p}$$

$$OB \text{ is } \frac{3}{2} \text{ of } OQ \text{ (ratio } 2 : 1\text{), so } \vec{OB} = 9\mathbf{q}$$

$$\vec{AB} = -6\mathbf{p} + 9\mathbf{q}$$

3. Compare vectors:

$$\vec{AN} = -2\mathbf{p} + 3\mathbf{q}$$

$$\vec{AB} = 3(-2\mathbf{p} + 3\mathbf{q})$$

Since $\vec{AB}$ is a scalar multiple of $\vec{AN}$ (specifically, $\vec{AB} = 3\vec{AN}$) and they share the common point A , they must lie on the same straight line.

Proven

3 Parallelogram Proofs

CORE CONCEPT & METHOD

In a parallelogram, opposite sides are equal and parallel. So if $\vec{OP} = \mathbf{p}$ and $\vec{OQ} = \mathbf{q}$, then $\vec{QR} = \mathbf{p}$ and $\vec{PR} = \mathbf{q}$. Use these parallel pathways to find your vectors!

COMMON MISTAKE: Check vertex order around the parallelogram carefully: in $OACB$, $\vec{OC} = \vec{OA} + \vec{OB}$ is the diagonal, whereas in $OABC$, $\vec{OB}$ is the diagonal.

MODEL WORKED EXAMPLES

EXAMPLE 3.1

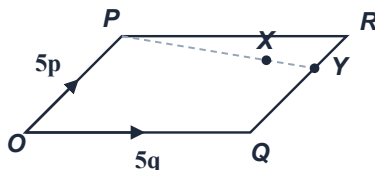
Non-Calculator

The diagram shows a parallelogram $OPRQ$. $\vec{OP} = 5\mathbf{p}$ and $\vec{OQ} = 5\mathbf{q}$.

X is the point on OR such that $OX : XR = 4 : 1$.

Y is the point on QR such that $QY : YR = 3 : 1$.

Show that P , X and Y are on the same straight line.



STEP-BY-STEP SOLUTION:

1. Find $\vec{PX}$:

$$\vec{OR} = \vec{OP} + \vec{PR} = 5\mathbf{p} + 5\mathbf{q}$$

$$\vec{OX} = \frac{4}{5}\vec{OR} = 4\mathbf{p} + 4\mathbf{q}$$

$$\vec{PX} = \vec{PO} + \vec{OX} = -5\mathbf{p} + 4\mathbf{p} + 4\mathbf{q} = -\mathbf{p} + 4\mathbf{q}$$

2. Find $\vec{PY}$:

Y is on QR ($QY : YR = 3 : 1$). $\vec{QR} = \vec{OP} = 5\mathbf{p}$.

$$\vec{QY} = \frac{3}{4}\vec{QR} = \frac{15}{4}\mathbf{p}$$

$$\vec{PY} = \vec{PQ} + \vec{QY} = (-5\mathbf{p} + 5\mathbf{q}) + \frac{15}{4}\mathbf{p}$$

$$\vec{PY} = -\frac{5}{4}\mathbf{p} + 5\mathbf{q}$$

3. Compare:

$$\vec{PX} = 1(-\mathbf{p} + 4\mathbf{q})$$

$$\vec{PY} = \frac{5}{4}(-\mathbf{p} + 4\mathbf{q})$$

Since $\vec{PY} = \frac{5}{4}\vec{PX}$ and they share point P , they are collinear.

Proven

4 Finding Unknown Extensions

CORE CONCEPT & METHOD

If you are told points are collinear, you can set an unknown line extension (like $\vec{OC}$) to be a multiple of its direction vector, e.g. $\vec{OC} = k\mathbf{y}$. Then equate the scalar multiples of $\mathbf{x}$ and $\mathbf{y}$ to solve for k !

COMMON MISTAKE: Never try to divide vectors — write the collinear vector in TWO independent ways using scalars (e.g. k and μ), then equate coefficients of $\mathbf{a}$ and $\mathbf{b}$ separately.

MODEL WORKED EXAMPLES

EXAMPLE 4.1

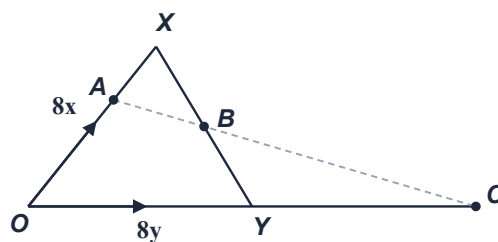
Non-Calculator

In the diagram, $\vec{OX} = 8\mathbf{x}$ and $\vec{OY} = 8\mathbf{y}$.

A is on OX such that $OA : AX = 3 : 1$.

B is the midpoint of XY .

The line OY is extended to point C . Given that A , B and C are on the same straight line, find $\vec{YC}$.



STEP-BY-STEP SOLUTION:

1. Find $\vec{AB}$:

$$\vec{XY} = -8\mathbf{x} + 8\mathbf{y}$$

$$\vec{XB} = \frac{1}{2}\vec{XY} = -4\mathbf{x} + 4\mathbf{y}$$

$$\vec{AX} = 2\mathbf{x}$$

$$\vec{AB} = \vec{AX} + \vec{XB} = 2\mathbf{x} - 4\mathbf{x} + 4\mathbf{y} = -2\mathbf{x} + 4\mathbf{y}$$

2. Express $\vec{AC}$:

$$\text{Let } \vec{OC} = k\mathbf{y}.$$

$$\vec{AC} = \vec{AO} + \vec{OC} = -6\mathbf{x} + k\mathbf{y}$$

3. Solve for k :

Since A , B , C are collinear, $\vec{AC}$ is a multiple of $\vec{AB}$.

$$\vec{AB} = -2\mathbf{x} + 4\mathbf{y}$$

$$\vec{AC} = -6\mathbf{x} + k\mathbf{y}$$

The x-component is multiplied by 3 (from -2 to -6).

So the y-component must also be multiplied by 3.

$$k = 4 \times 3 = 12.$$

$$\text{So } \vec{OC} = 12\mathbf{y}.$$

$$\vec{YC} = \vec{YO} + \vec{OC} = -8\mathbf{y} + 12\mathbf{y} = 4\mathbf{y}.$$

4y

EDEXCEL GCSE EXAM PRACTICE

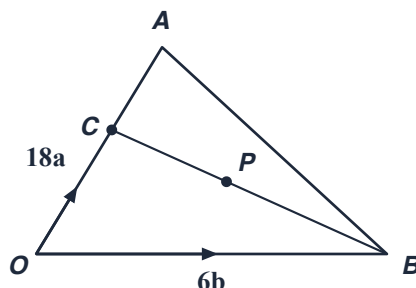
Total: 26 marks

Vector Proofs — Practice Questions

Check the Calculator or Non-Calculator label on each question before you start. Show your working clearly in the box.

Question 1 Non-Calculator

(4 marks)

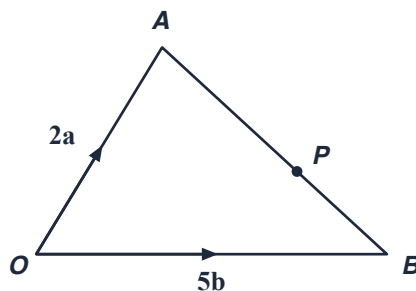
In the diagram, OAB is a triangle with $\vec{OA} = 18\mathbf{a}$ and $\vec{OB} = 6\mathbf{b}$. C is the midpoint of OA , and P is the point on CB such that $CP : PB = 1 : 2$.Find $\vec{OP}$ in terms of $\mathbf{a}$ and $\mathbf{b}$ in its simplest form.

WORKING OUT SPACE

Answer:

Question 2 Non-Calculator

(4 marks)

In the diagram, OAB is a triangle with $\vec{OA} = 2\mathbf{a}$ and $\vec{OB} = 5\mathbf{b}$. P is the point on AB such that $AP : PB = 3 : 2$.Given that $\vec{OP} = k(4\mathbf{a} + 15\mathbf{b})$, find the value of k .

WORKING OUT SPACE

 $k =$

Question 3 Non-Calculator**(5 marks)**

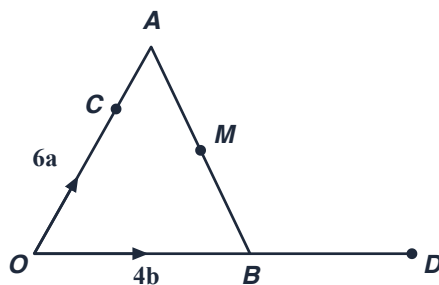
In the diagram, OAB is a triangle with $\vec{OA} = 6\mathbf{a}$ and $\vec{OB} = 4\mathbf{b}$.

C is the point on OA such that $OC : CA = 2 : 1$.

M is the midpoint of AB .

D is the point on OB extended such that $OB : BD = 1 : 1$.

Prove that C , M , and D lie on a straight line.



WORKING & PROOF SPACE

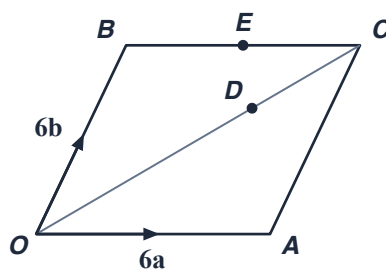
Question 4 Non-Calculator**(4 marks)**

The diagram shows a parallelogram $OACB$ with $\vec{OA} = 6\mathbf{a}$ and $\vec{OB} = 6\mathbf{b}$.

D is the point on OC such that $OD : DC = 2 : 1$.

E is the midpoint of BC .

Prove that A , D , and E lie on a straight line.



WORKING & PROOF SPACE

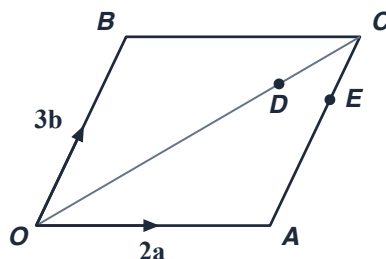
Question 5 Non-Calculator**(4 marks)**

The diagram shows a parallelogram $OACB$ with $\vec{OA} = 2\mathbf{a}$ and $\vec{OB} = 3\mathbf{b}$.

D is the point on OC such that $OD : DC = 3 : 1$.

E is a point on AC such that B, D , and E lie on a straight line.

Find the ratio $AE : EC$ in its simplest form.



WORKING OUT SPACE

Answer:

Question 6 Calculator**(5 marks)**

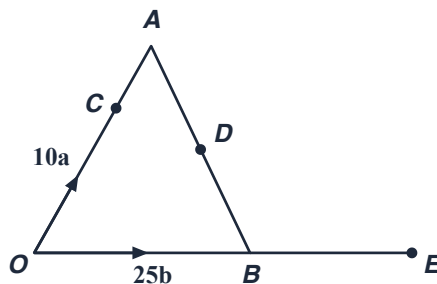
In the diagram, OAB is a triangle with $\vec{OA} = 10\mathbf{a}$ and $\vec{OB} = 25\mathbf{b}$.

C is the point on OA such that $OC : CA = 1 : 1$.

D is the point on AB such that $AD : DB = 3 : 2$.

The line OB is extended to a point E such that C, D , and E lie on a straight line.

Find the vector $\vec{BE}$ in terms of $\mathbf{b}$.



WORKING OUT SPACE

Answer:

Probability Equations

1 Equations from Ratios

□ CORE CONCEPT & METHOD

If you are given a ratio like 2:1, use algebra! Let the number of marbles be $2x$ and x . The total is $3x$.

Then, set up your standard 'without replacement' probability fractions and solve the equation for x .

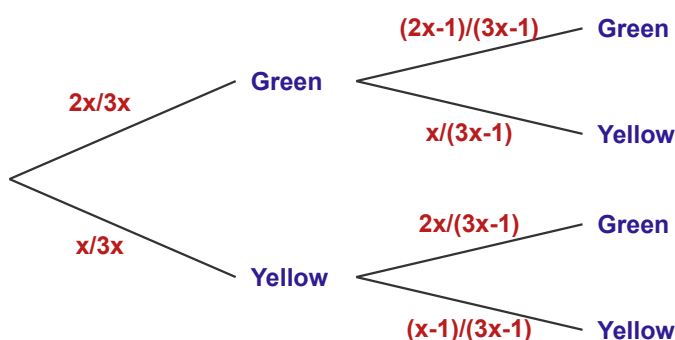
COMMON MISTAKE: When picking WITHOUT replacement, reduce BOTH the numerator (if same colour) AND the total denominator by 1 on the second pick — e.g. $\frac{2x}{5x} \times \frac{2x-1}{5x-1}$.

MODEL WORKED EXAMPLES

EXAMPLE 1.1

✎ Non-Calculator

A box contains green and yellow marbles in the ratio 2:1. Two marbles are taken **without replacement**. The probability of picking two green marbles is $\frac{2}{5}$. How many marbles are in the box in total?



STEP-BY-STEP SOLUTION:

Step 1: Set up variables. Let the number of green marbles be $2x$ and yellow be x . Total = $3x$.

Step 2: Write the probability equation.

$$\frac{2x}{3x} \times \frac{2x-1}{3x-1} = \frac{2}{5}$$

Simplify $\frac{2x}{3x} = \frac{2}{3}$:

$$\frac{2}{3} \times \frac{2x-1}{3x-1} = \frac{2}{5}$$

Step 3: Cross-multiply and solve.

$$\begin{aligned} 2(2x-1) \times 5 &= 2 \times 3(3x-1) \\ 10(2x-1) &= 6(3x-1) \\ 20x-10 &= 18x-6 \\ 2x &= 4 \implies x = 2 \end{aligned}$$

Total marbles = $3x = 6$.

2 Equations With Replacement

□ CORE CONCEPT & METHOD

If the item is **replaced**, the fractions are identical. For example, if there are 4 purple and y white beads, the probability of picking two purples is:

$$\frac{4}{4+y} \times \frac{4}{4+y}$$

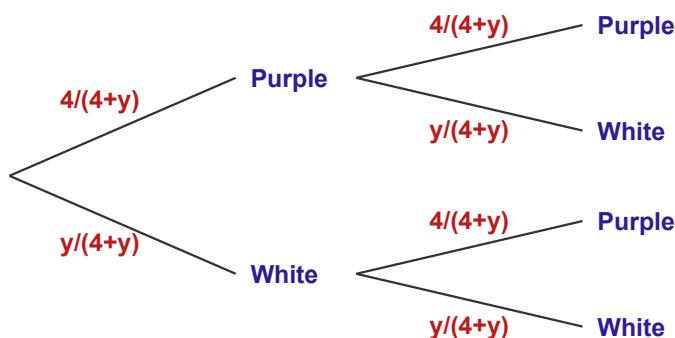
COMMON MISTAKE: For "one of each colour" (e.g. one red and one blue), remember to add BOTH orders (RB + BR) unless the question specifies "first red, then blue".

MODEL WORKED EXAMPLES

EXAMPLE 2.1

 Non-Calculator

A jar contains 4 purple and y white beads. A bead is picked, its colour noted, and then **replaced**. This is done twice. The probability of picking purple both times is $\frac{16}{81}$. Find y .



STEP-BY-STEP SOLUTION:

Because the bead is replaced, the total stays the same for both picks.

The probability of picking purple twice is:

$$\frac{4}{4+y} \times \frac{4}{4+y} = \frac{16}{81}$$

So:

$$\left(\frac{4}{4+y} \right)^2 = \frac{16}{81}$$

Take the square root of both sides:

$$\frac{4}{4+y} = \frac{4}{9}$$

Therefore $4 + y = 9$, giving $y = 5$.

3 Quadratic Probability Equations

□ CORE CONCEPT & METHOD

For 'without replacement' problems with an unknown total n , you will often need to expand brackets and form a quadratic equation (e.g., $n^2 - 13n - 30 = 0$), then factorise it to find n .

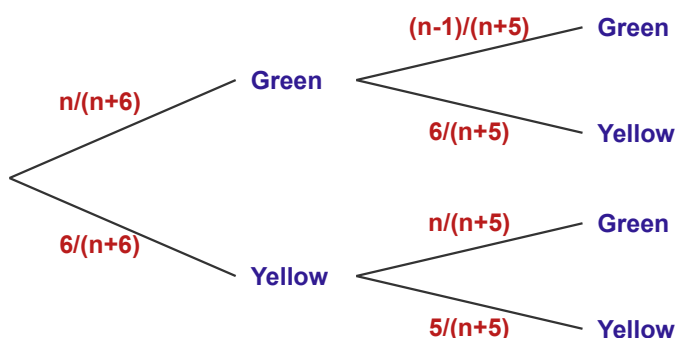
COMMON MISTAKE: Cross-multiply carefully, rearrange to $an^2 + bn + c = 0$ before factorising, and always reject negative or non-integer roots since a count n must be a positive integer.

MODEL WORKED EXAMPLES

EXAMPLE 3.1

 **Calculator**

A box contains n green counters and 6 yellow counters. Two counters are drawn at random **without replacement**. The probability that both counters are green is $\frac{1}{2}$. Show that $n^2 - 13n - 30 = 0$, and hence find the value of n .



STEP-BY-STEP SOLUTION:

First draw: Total counters = $n + 6$.

$$P(\text{Green}_1) = \frac{n}{n+6}$$

Second draw: One green counter is removed, so $n - 1$ greens remain out of a total of $n + 5$.

$$P(\text{Green}_2) = \frac{n-1}{n+5}$$

Equation:

$$\begin{aligned} \frac{n}{n+6} \times \frac{n-1}{n+5} &= \frac{1}{2} \\ \frac{n(n-1)}{(n+6)(n+5)} &= \frac{1}{2} \\ 2(n^2 - n) &= (n+6)(n+5) \end{aligned}$$

$$2n^2 - 2n = n^2 + 11n + 30$$

$$n^2 - 13n - 30 = 0$$

Factorise and solve:

$$(n - 15)(n + 2) = 0$$

Since $n > 0$, $n = 15$.

EDEXCEL GCSE EXAM PRACTICE

Total: 19 marks

Probability Equations — Practice Questions

Check the Calculator or Non-Calculator label on each question before you start. Show your working clearly in the box.

Question 1 Non-Calculator

(3 marks)

There are only red counters and yellow counters in a bag in the ratio 2 : 3.

Two counters are taken at random from the bag without replacement.

The probability that both counters are red is $\frac{2}{15}$.

Work out the total number of counters in the bag before any were removed.

WORKING OUT SPACE

Answer:

Question 2 Calculator

(4 marks)

There are only blue counters, green counters and white counters in a bag.

There are 3 times as many blue counters as green counters.

There are 4 white counters.

Two counters are taken at random from the bag without replacement.

The probability that both counters are green is $\frac{1}{40}$.

Work out the number of **blue** counters in the bag.

WORKING OUT SPACE

Answer:

Question 3 Non-Calculator**(3 marks)**

A bag contains 6 green counters and y white counters.

A counter is taken at random from the bag, its colour is noted, and it is **replaced** in the bag.
A second counter is then taken at random.

The probability that the first counter is green and the second counter is white is $\frac{2}{9}$.

Given that $y > 6$, work out the value of y .

WORKING OUT SPACE

Answer:**Question 4** Non-Calculator**(3 marks)**

A bag contains x green marbles and $(x + 3)$ purple marbles.

Two marbles are taken at random from the bag without replacement.

The probability that both marbles are green is $\frac{5}{39}$.

Work out the value of x .

WORKING OUT SPACE

Answer:

Question 5 **Calculator****(3 marks)**

There are n counters in a bag.

6 of the counters are red and the rest are blue.

Two counters are taken at random from the bag without replacement.

The probability that both counters are the **same colour** is $\frac{1}{2}$.

Given that more than half of the counters in the bag are blue, work out the value of n .

WORKING OUT SPACE

Answer:**Question 6** **Calculator****(3 marks)**

A box contains 4 black pens and x blue pens.

Two pens are taken at random from the box without replacement.

The probability that one pen of each colour is taken is $\frac{8}{15}$.

Given that $x > 4$, work out the value of x .

WORKING OUT SPACE

Answer:

EDEXCEL GCSE HIGHER PAPER 1 — NON-CALCULATOR (GRADE 9)

Mixed Review 1 of 2

Mixed Review 1 — Choosing the Right Method (Non-Calculator)

Total: 43 marks

These 15 unseen Grade 9 questions are mixed across topics with no topic headings — just like a real Edexcel Paper 1 exam. Identify the underlying method first, set out full algebraic or geometric working, and give exact simplified answers.

Question 1 Non-Calculator

(3 marks)

A circle has the equation $x^2 + y^2 = 225$.

Calculate the exact circumference of the circle in terms of π .

WORKING OUT SPACE

Answer:

Question 2 Non-Calculator

(3 marks)

Prove algebraically that $(n + 3)^2 - (n - 2)^2$ is always a multiple of 5 for all integer values of n .

WORKING & PROOF SPACE

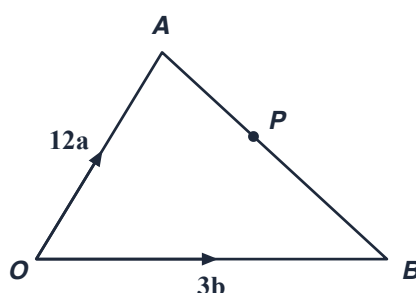
Question 3 Non-Calculator

(4 marks)

In the diagram, OAB is a triangle with $\vec{OA} = 12\mathbf{a}$ and $\vec{OB} = 3\mathbf{b}$.

P is the point on AB such that $AP : PB = 1 : 2$.

Find $\vec{OP}$ in terms of $\mathbf{a}$ and $\mathbf{b}$ in its simplest form.



WORKING OUT SPACE

Answer:

Question 4 ✎ Non-Calculator**(2 marks)**

A tin contains green and orange sweets in the ratio 3 : 2.

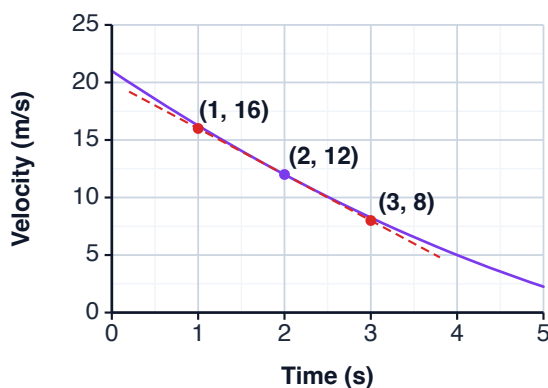
Two sweets are taken at random from the tin without replacement.

The probability that both sweets are orange is $\frac{1}{7}$.

Work out the total number of sweets in the tin before any were removed.

WORKING OUT SPACE

Answer:

Question 5 ✎ Non-Calculator**(2 marks)**

The velocity-time graph shows a vehicle slowing down. A tangent to the curve is drawn at $t = 2$ s, passing through (1, 16) and (3, 8).

Calculate the **rate of deceleration** (as a positive value) at $t = 2$ s in m/s^2 .

WORKING OUT SPACE

Answer:

Question 6 ✎ Non-Calculator**(2 marks)**

A circle has the equation $x^2 + y^2 = 225$.

Prove that the point (9, -12) lies on the circle.

WORKING & PROOF SPACE

Question 7 ✎ Non-Calculator**(2 marks)**

Prove algebraically that $(3n + 2)^2 - (3n - 2)^2$ is always a multiple of 24 for all positive integer values of n .

WORKING & PROOF SPACE

Question 8 ✎ Non-Calculator**(2 marks)**

A jar contains 5 purple beads and y silver beads.

A bead is taken at random from the jar, its colour is noted, and it is **replaced** in the jar.

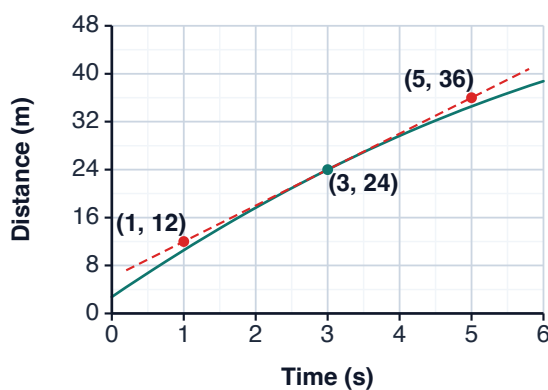
A second bead is then taken at random.

The probability that both beads are purple is $\frac{25}{144}$.

Work out the value of y .

WORKING OUT SPACE

Answer:

Question 9 ✎ Non-Calculator**(2 marks)**

The curved distance-time graph shows the distance travelled by a cyclist. A tangent to the curve has been drawn at $t = 3$ s, passing through $(1, 12)$ and $(5, 36)$.

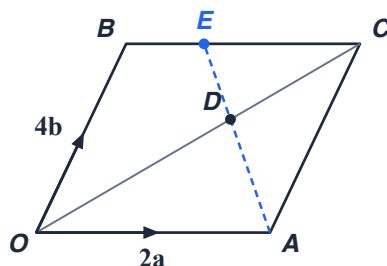
Work out the **instantaneous speed** of the cyclist at $t = 3$ s in m/s.

WORKING OUT SPACE

Answer:

Question 10 ✎ Non-Calculator**(4 marks)**

The diagram shows a parallelogram $OACB$ with $\vec{OA} = 2\mathbf{a}$ and $\vec{OB} = 4\mathbf{b}$.
 D is the point on OC such that $OD : DC = 3 : 2$.
 E is a point on BC such that A , D , and E lie on a straight line.
 Find the ratio $BE : EC$ in its simplest form.



WORKING OUT SPACE

Answer:

Question 11 ✎ Non-Calculator**(2 marks)**

Prove algebraically that the sum of the squares of any two consecutive odd integers leaves a remainder of 2 when divided by 8.

WORKING & PROOF SPACE

Question 12 ✎ Non-Calculator**(3 marks)**

A bag contains x red counters and $(x + 2)$ yellow counters.

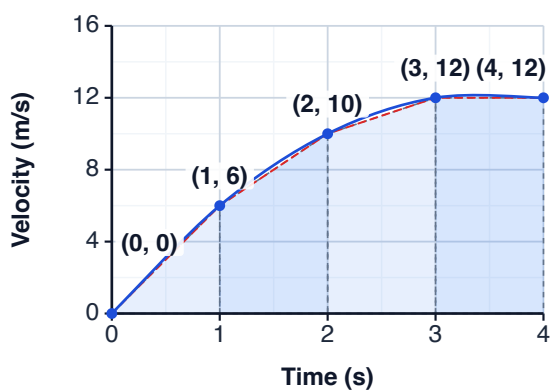
Two counters are taken at random from the bag without replacement.

The probability that both counters are red is $\frac{2}{15}$.

Work out the value of x .

WORKING OUT SPACE

Answer:

Question 13 ✎ Non-Calculator**(3 marks)**

The velocity-time graph shows the motion of an object over 4 seconds. The area under the curve has been divided into **4 strips of equal width** ($h = 1$ s).

Use the **trapezium rule** to work out an estimate for the total distance travelled in the 4 seconds in metres.

WORKING OUT SPACE

Answer:

Question 14 ✎ Non-Calculator**(4 marks)**

A circle has the equation $x^2 + y^2 = 100$.

Find the equation of the tangent to the circle at the point $(-6, 8)$.

WORKING OUT SPACE

Answer:

Question 15 ✖ Non-Calculator**(5 marks)**

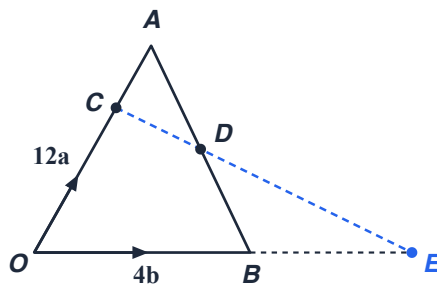
In the diagram, OAB is a triangle with $\vec{OA} = 12\mathbf{a}$ and $\vec{OB} = 4\mathbf{b}$.

C is the point on OA such that $OC : CA = 1 : 2$.

D is the point on AB such that $AD : DB = 3 : 1$.

The line OB is extended to a point E such that C , D , and E lie on a straight line.

Find the vector $\vec{BE}$ in terms of $\mathbf{b}$.



WORKING OUT SPACE

Answer:

Mixed Review 2 — Choosing the Right Method (Calculator)**Total: 46 marks**

These 15 unseen Grade 9 questions are interleaved across topics to test method selection under Paper 2/3 conditions. Write down every equation, substitution, or area calculation clearly before rounding your final answer.

Question 1 **Calculator****(1 mark)**

A circular radar boundary is modelled by $x^2 + y^2 = 361$.
What is the radius of the boundary in km?

WORKING OUT SPACE

Answer:**Question 2** **Calculator****(3 marks)**

There are n counters in a bag.
6 of the counters are white and the rest are blue.

Two counters are taken at random from the bag without replacement.

The probability that both counters are white is $\frac{3}{38}$.

Work out the value of n .

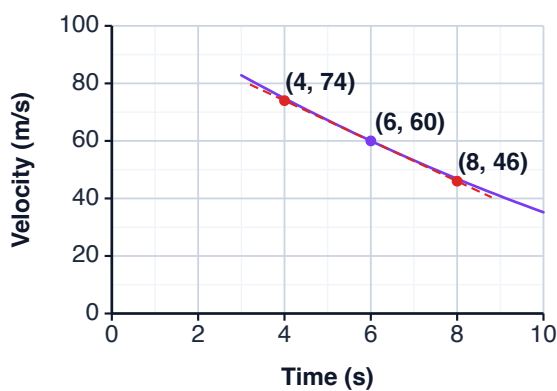
WORKING OUT SPACE

Answer:

Question 3

 Calculator

(2 marks)



The velocity-time graph shows a vehicle slowing down. A tangent to the curve is drawn at $t = 6$ s, passing through $(4, 74)$ and $(8, 46)$.

Calculate the **rate of deceleration** (as a positive value) at $t = 6$ s in m/s^2 .

WORKING OUT SPACE

Answer:

Question 4

 Calculator

(2 marks)

Prove algebraically that the sum of $n(n + 1)$ and $n + 1$ is always a square number.

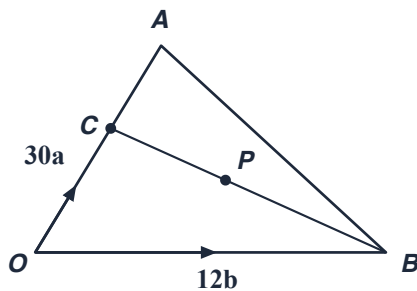
WORKING & PROOF SPACE

Question 5 **Calculator****(4 marks)**

In the diagram, OAB is a triangle with $\vec{OA} = 30\mathbf{a}$ and $\vec{OB} = 12\mathbf{b}$.

C is the midpoint of OA , and P is the point on CB such that $CP : PB = 1 : 2$.

Find $\vec{OP}$ in terms of $\mathbf{a}$ and $\mathbf{b}$ in its simplest form.



WORKING OUT SPACE

Answer:

Question 6 **Calculator****(4 marks)**

A circle has the equation $x^2 + y^2 = 169$.

Find the equation of the tangent to the circle at the point $(-5, 12)$.

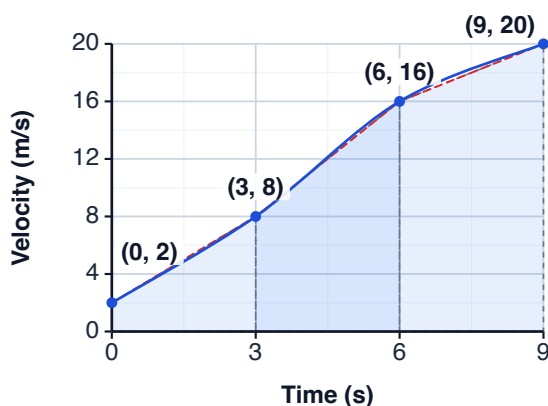
WORKING OUT SPACE

Answer:

Question 7

Calculator

(3 marks)



The velocity-time graph shows the motion of an object over 9 seconds. The area under the curve has been divided into **3 strips of equal width** ($h = 3$ s).

Use the **trapezium rule** to work out an estimate for the total distance travelled in the 9 seconds in metres.

WORKING OUT SPACE

Answer:

Question 8

Calculator

(3 marks)

There are only red counters, yellow counters and black counters in a bag.
 There are **2** times as many red counters as yellow counters.
 There are **3** black counters.

Two counters are taken at random from the bag without replacement.

The probability that both counters are yellow is $\frac{2}{35}$.

Work out the number of **red** counters in the bag.

WORKING OUT SPACE

Answer:

Question 9

Calculator

(2 marks)

Prove algebraically that $(5n + 5)^2 - (5n - 5)^2$ is always a multiple of 100 for all positive integer values of n .

WORKING & PROOF SPACE

Question 10



(5 marks)

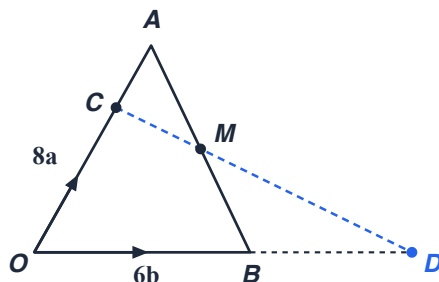
In the diagram, OAB is a triangle with $\vec{OA} = 8\mathbf{a}$ and $\vec{OB} = 6\mathbf{b}$.

C is the point on OA such that $\vec{OC} = 6\mathbf{a}$.

M is the midpoint of AB .

D is the point on OB extended such that C , M , and D lie on a straight line.

Find the vector $\vec{OD}$ in terms of $\mathbf{b}$.



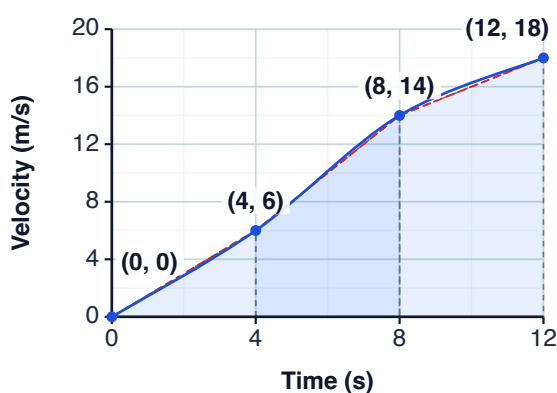
WORKING OUT SPACE

Answer:

Question 11



(3 marks)



The velocity-time graph shows the motion of an object over 12 seconds. The area under the curve has been divided into **3 strips of equal width** ($h = 4$ s).

Use the **trapezium rule** to work out an estimate for the total distance travelled in the 12 seconds in metres.

WORKING OUT SPACE

Answer:

Question 12 **Calculator****(2 marks)**

Prove algebraically that $(2n + 2)^2 + (2n + 4)^2$ is always a multiple of 4 for all integer values of n .

WORKING & PROOF SPACE

Question 13 **Calculator****(4 marks)**

A circle has the equation $x^2 + y^2 = 289$.

Find the equation of the tangent to the circle at the point $(15, -8)$.

WORKING OUT SPACE

Answer:**Question 14** **Calculator****(3 marks)**

A bag contains $(x + 1)$ red counters and $(2x - 1)$ yellow counters.

Two counters are taken at random from the bag without replacement.

The probability that the first counter is red and the second counter is yellow is $\frac{5}{18}$.

Work out the total number of counters in the bag before any were removed.

WORKING OUT SPACE

Answer:

Question 15

 Calculator

(5 marks)

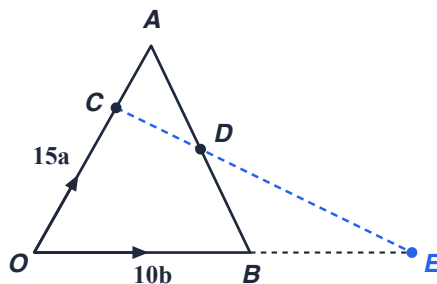
In the diagram, OAB is a triangle with $\vec{OA} = 15\mathbf{a}$ and $\vec{OB} = 10\mathbf{b}$.

C is the point on OA such that $OC : CA = 1 : 2$.

D is the point on AB such that $AD : DB = 4 : 1$.

The line OB is extended to a point E such that C , D , and E lie on a straight line.

Find the vector $\vec{BE}$ in terms of $\mathbf{b}$.



WORKING OUT SPACE

Answer:

APPENDIX

Answers & Mark Schemes

Complete Edexcel Higher answers, required factorised algebraic forms, and Mixed Review topic guides.

Topic 1: Algebraic Proof

- Q1 (Non-Calc): $8n^2 + 8n + 4 = 4(2n^2 + 2n + 1)$ [3m]
- Q2 (Non-Calc): $8n + 8 = 8(n + 1)$ [3m]
- Q3 (Non-Calc): $2n^2 + 2n + 1 = 2(n^2 + n) + 1$ [3m]
- Q4 (Non-Calc): $60n$ (multiple of 60) [3m]
- Q5 (Non-Calc): $n^2 + 4n + 4 = (n + 2)^2$ [3m]
- Q6 (Non-Calc): $4n^2 + 4n + 1 = 4n(n + 1) + 1 = 8k + 1$ [4m]

Topic 2: Equation of a Circle

- Q1 (Non-Calc): 15 [1m]
- Q2 (Calc): $(-8)^2 + 15^2 = 64 + 225 = 289$ [2m]
- Q3 (Non-Calc): 225π [2m]
- Q4 (Non-Calc): (a) $k = 6$, (b) $\frac{3}{2}$ [3m]
- Q5 (Calc): $y = -\frac{8}{15}x + \frac{289}{15}$ [4m]
- Q6 (Calc): (a) $y = -\frac{5}{12}x + \frac{169}{12}$
(b) $\frac{28561}{120}$ [5m]

Topic 3: Gradients & Rates of Change

- Q1 (Non-Calc): 4 [2m]
- Q2 (Calc): 3.5 [2m]
- Q3 (Non-Calc): 5 [2m]
- Q4 (Calc): 89 [3m]
- Q5 (Calc): 8 [3m]
- Q6 (Non-Calc): (a) 68 m
(b) Underestimate (chords below curve) [4m]

Topic 4: Vector Proofs

- Q1 (Non-Calc): $6\mathbf{a} + 2\mathbf{b}$ [4m]
- Q2 (Non-Calc): $k = \frac{1}{5}$ [4m]
- Q3 (Non-Calc): $\overrightarrow{CD} = 4\overrightarrow{CM} = -4\mathbf{a} + 8\mathbf{b}$
(common point C) [5m]
- Q4 (Non-Calc): $\overrightarrow{AE} = \frac{3}{2}\overrightarrow{AD} = -3\mathbf{a} + 6\mathbf{b}$
(common point A) [4m]
- Q5 (Non-Calc): 2:1 [4m]
- Q6 (Calc): 50b [5m]

Topic 5: Probability Equations

- Q1 (Non-Calc): 10 [3m]
- Q2 (Calc): 9 [4m]
- Q3 (Non-Calc): 12 [3m]
- Q4 (Non-Calc): 5 [3m]
- Q5 (Calc): 16 [3m]
- Q6 (Calc): 6 [3m]

Mixed Review 1 — Choosing the Right Method (Non-Calculator) — Answers & Topic Guide

Q1 (Equation of a Circle, Non-Calc):	30π [3m]	Q2 (Algebraic Proof, Non-Calc):	$10n + 5 = 5(2n + 1)$ [3m]
Q3 (Vector Proofs, Non-Calc):	$8a + b$ [4m]	Q4 (Probability Equations, Non-Calc):	15 [2m]
Q5 (Gradients & Rates, Non-Calc):	4 [2m]	Q6 (Equation of a Circle, Non-Calc):	$9^2 + (-12)^2 = 81 + 144 = 225$ [2m]
Q7 (Algebraic Proof, Non-Calc):	$24n$ (multiple of 24) [2m]	Q8 (Probability Equations, Non-Calc):	7 [2m]
Q9 (Gradients & Rates, Non-Calc):	6 [2m]	Q10 (Vector Proofs, Non-Calc):	1:2 [4m]
Q11 (Algebraic Proof, Non-Calc):	$8n^2 + 16n + 10 = 8(n^2 + 2n + 1) + 2$ [2m]	Q12 (Probability Equations, Non-Calc):	4 [3m]
Q13 (Gradients & Rates, Non-Calc):	34 [3m]	Q14 (Equation of a Circle, Non-Calc):	$y = \frac{3}{4}x + \frac{25}{2}$ [4m]
Q15 (Vector Proofs, Non-Calc):	8b [5m]		

Mixed Review 2 — Choosing the Right Method (Calculator) — Answers & Topic Guide

Q1 (Equation of a Circle, Calc):	19 [1m]	Q2 (Probability Equations, Calc):	20 [3m]
Q3 (Gradients & Rates, Calc):	7 [2m]	Q4 (Algebraic Proof, Calc):	$n^2 + 2n + 1 = (n + 1)^2$ [2m]
Q5 (Vector Proofs, Calc):	$10a + 4b$ [4m]	Q6 (Equation of a Circle, Calc):	$y = \frac{5}{12}x + \frac{169}{12}$ [4m]
Q7 (Gradients & Rates, Calc):	105 [3m]	Q8 (Probability Equations, Calc):	8 [3m]
Q9 (Algebraic Proof, Calc):	$100n$ (multiple of 100) [2m]	Q10 (Vector Proofs, Calc):	9b [5m]
Q11 (Gradients & Rates, Calc):	116 [3m]	Q12 (Algebraic Proof, Calc):	$8n^2 + 24n + 20 = 4(2n^2 + 6n + 5)$ [2m]
Q13 (Equation of a Circle, Calc):	$y = \frac{15}{8}x - \frac{289}{8}$ [4m]	Q14 (Probability Equations, Calc):	9 [3m]
Q15 (Vector Proofs, Calc):	10b [5m]		