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Result Number 1

Old Higher Maths
(1989-2015) 1992
Paper 1, Question 01,
Source: ©Higher Still
Additional Question
Bank. (#2190).

Find the equation of the tangent to the curve with equation $y = 5x^3 - 6x^2$ at the point where $x = 1$.

[Click the image for a larger version \(opens in new frame\).](#)

Answer: $y = 3x - 4$

[4 View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Equation of a tangent to a curve

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

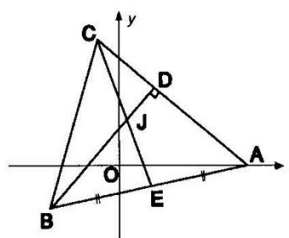
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Result Number 2

Old Higher Maths
(1989-2015) 1992
Paper 1, Question 02,
Source: ©Higher Still
Additional Question
Bank. (#2208).

In the diagram A is the point (7,0), B is (-3,-2) and C(-1,8). The median CE and the altitude BD intersect at J.

- Find the equations of CE and BD.
- Find the co-ordinates of J.



Answer: (a) $y = 5 - 3x$
 $y = x + 1$ (b) (1, 2)

[6 View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Intersection of straight lines
- Higher Altitudes, medians, perpendicular bisectors

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 3

Old Higher Maths
(1989-2015) 1992
Paper 1, Question 03,
Source: ©Higher Still
Additional Question

Find k if $x - 2$ is a factor of $x^3 + kx^2 - 4x - 12$.

[Click the image for a larger version \(opens in new frame\).](#)

3 Answer: $k = 3$

[View full mark scheme \(opens in new frame\).](#)

Bank. (#2209).

Topics in this question:

- Higher Cubic expressions/equations: when told root or factor, identify coefficients

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 4

Old Higher Maths (1989-2015) 1992 Paper 1, Question 04, Source: ©Higher Still Additional Question Bank. (#2210).

A curve for which $\frac{dy}{dx} = 3x^2 + 1$ passes through the point $(-1, 2)$.

Express y in terms of x .

[Click the image for a larger version \(opens in new frame\).](#)

Answer: $y = x^3 + x + 4$

4

[View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Differential equation

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 5

Old Higher Maths (1989-2015) 1992 Paper 1, Question 05, Source: ©Higher Still Additional Question Bank. (#2211).

Find, correct to one decimal place, the value of x between 180 and 270 which satisfies the equation $3\cos(2x - 40)^\circ - 1 = 0$.

[Click the image for a larger version \(opens in new frame\).](#)

Answer: $x = 235.25$

5

[View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Basic trig equation (no formulae required) in radians or degrees

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 6

Old Higher Maths (1989-2015) 1992 Paper 1, Question 06, Source: ©Higher Still Additional Question Bank. (#2212).

On a suitable set of real numbers, functions f and g are defined by

$$f(x) = \frac{1}{x+2} \quad \text{and} \quad g(x) = \frac{1}{x} - 2.$$

Find $f(g(x))$ in its simplest form.

[Click the image for a larger version \(opens in new frame\).](#)

Answer: $f(g(x)) = x$

[View full mark scheme \(opens in new frame\).](#)

3

Topics in this question:

- Higher Composite functions

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 7

Old Higher Maths (1989-2015) 1992 Paper 1, Question 07, Source: ©Higher Still Additional Question

(a) Express $\sin x^\circ - 3\cos x^\circ$ in the form $k\sin(x - a)^\circ$ where $k > 0$ and $0 \leq a < 360$. Find the values of k and a .

(b) Find the maximum value of $5 + \sin x^\circ - 3\cos x^\circ$ and state a value of x for which this maximum occurs.

Answer: (a) $k = \sqrt{10}$, $a = 71.6$ (b) maximum is $5 + \sqrt{10}$ when $x = 161.6^\circ$

4

2

Bank. (#2213).

[Click the image for a larger version \(opens in new frame\).](#)

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Topics in this question:

- Higher Wave function ($y = a \sin x \pm b \cos x$)
- Higher Identifying/sketching graphs of related functions (trigonometric)

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 8

Old Higher Maths (1989-2015) 1992 Paper 1, Question 08, Source: ©Higher Still Additional Question Bank. (#2214).

Evaluate $\int_1^9 \frac{x+1}{\sqrt{x}} dx$

[Click the image for a larger version \(opens in new frame\).](#)

Answer: 64/3
5 [View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Integrate or evaluate definite integral: polynomial

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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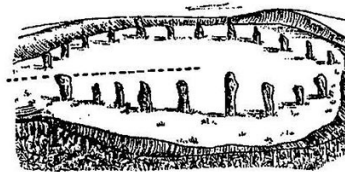
Result Number 9

Old Higher Maths (1989-2015) 1992 Paper 1, Question 09, Source: ©Higher Still Additional Question Bank. (#2215).

An ancient Stone Circle has a processional pathway from the Heelstone to the centre of the Stone Circle. In the picture above, the Heelstone is on the left and the dotted line represents the processional pathway. With suitable axes and using the heelstone as the origin, the equation of the Stone Circle is

$$x^2 + y^2 - 8x - 6y + 21 = 0.$$

Given that 1 unit represents 15metres, calculate the distance in metres from the Heelstone to the nearest point on the edge of the Circle.



Answer: 45m
[View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Miscellaneous - not covered by any other subcategory

In the opinion of Dynamic Maths, this question is **non-routine** and **not interleaved**.

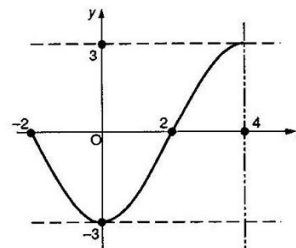
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Result Number 10

Old Higher Maths (1989-2015) 1992 Paper 1, Question 10, Source: ©Higher Still Additional Question Bank. (#2216).

The sketch shows the graph of $y = f(x)$ for $-2 \leq x \leq 4$. The function $g(x)$ has the line $x = 4$ as an axis of symmetry and $g(x) = f(x)$ for $-2 \leq x \leq 4$.

- On separate sketches indicate
- $y = g(x)$ for $-2 \leq x \leq 10$
 - $y = -2g(x)$ for $0 \leq x \leq 8$



Answer: sketches complete
[View full mark scheme \(opens in new frame\).](#)

2
2

Topics in this question:

- Higher Identifying/sketching graphs of related functions (non-trigonometric)

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 11

Old Higher Maths

Differentiate $2x^{\frac{3}{2}} + \sin^2 x$ with respect to x .

[Click the image for a larger version \(opens in new frame\).](#)

Answer: $3x^{\frac{1}{2}} + 2\sin x \cos x$

(1989-2015) 1992
Paper 1, Question 11,
Source: ©Higher Still
Additional Question
Bank. (#2217).

[View full mark scheme](#)
(opens in new frame).

Topics in this question:

- Higher Integrate or evaluate definite integral: $(px + q)^n$ [bracket]
- Higher Integrate or evaluate definite integral: polynomial
- Higher Integrate or evaluate definite integral: trigonometric expression

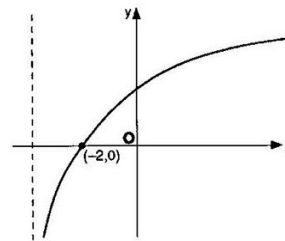
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Result Number 12

Old Higher Maths
(1989-2015) 1992
Paper 1, Question 12,
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Additional Question
Bank. (#2218).

An incomplete sketch (not drawn to scale) of the graph of $\log_{10}(x + a)$ is shown. Find the value of a .



Answer: $a = 3$

2 [View full mark scheme](#)
(opens in new frame).

Topics in this question:

- Higher Graphs of logarithmic or exponential functions

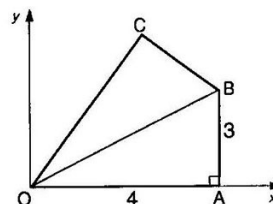
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Result Number 13

Old Higher Maths
(1989-2015) 1992
Paper 1, Question 13,
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Additional Question
Bank. (#2219).

The diagram shows a kite OABC.
A is the point $(4, 0)$ and B is the point $(4, 3)$.
Calculate the gradient of OC correct to two decimal places.



Answer: 3.428

3 [View full mark scheme](#)
(opens in new frame).

Topics in this question:

- Higher Angles and straight lines: $m = \tan \theta$

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 14

Old Higher Maths
(1989-2015) 1992
Paper 1, Question 14,
Source: ©Higher Still
Additional Question
Bank. (#2220).

(a) Evaluate $\int_0^{\frac{\pi}{2}} \cos 2x \, dx$.

(b) Draw a sketch and explain your answer.

[Click the image for a larger version \(opens in new frame\).](#)

Answer: (a) 0 (b) sketch complete

2 [View full mark scheme](#)
(opens in new frame).

Topics in this question:

- Higher Integrate or evaluate definite integral: trigonometric expression
- Higher Areas using integration

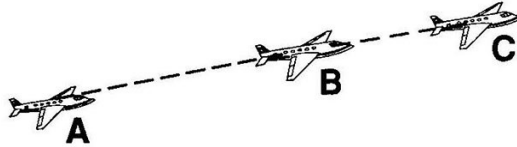
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Result Number 15

Old Higher Maths (1989-2015) 1992 Paper 1, Question 15, Source: ©Higher Still Additional Question Bank. (#2221).

An aircraft flying at a constant speed on a straight flight path takes 2 minutes to fly from A to B and 1 minute to fly from B to C. Relative to a suitable set of axes, A is the point $(-1, 3, 4)$ and B is the point $(3, 1, -2)$. Find the co-ordinates of the point C.



[Click the image for a larger version \(opens in new frame\).](#)

Topics in this question:

- Higher Ratio in which one point divides two others

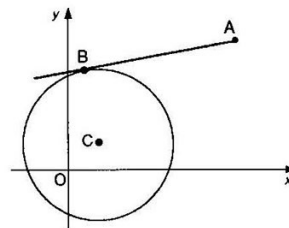
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Result Number 16

Old Higher Maths (1989-2015) 1992 Paper 1, Question 16, Source: ©Higher Still Additional Question Bank. (#2222).

AB is a tangent at B to the circle with centre C and equation $(x-2)^2 + (y-2)^2 = 25$. The point A has co-ordinates $(10, 8)$. Find the area of triangle ABC.



[Click the image for a larger version \(opens in new frame\).](#)

Topics in this question:

- Higher Circle equation from radius/centre or vice versa

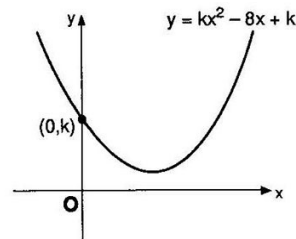
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Result Number 17

Old Higher Maths (1989-2015) 1992 Paper 1, Question 17, Source: ©Higher Still Additional Question Bank. (#2223).

Calculate the least positive integer value of k so that the graph of $y = kx^2 - 8x + k$ does not cut or touch the x -axis.



[Click the image for a larger version \(opens in new frame\).](#)

Topics in this question:

- Higher Discriminant and Quadratics
- Higher Quadratic inequations

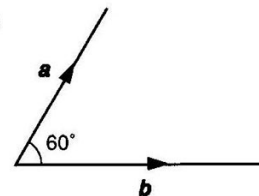
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Result Number 18

Old Higher Maths (1989-2015) 1992 Paper 1, Question 18, Source: ©Higher Still Additional Question Bank. (#2224).

The diagram shows representatives of two vectors, a and b , inclined at an angle of 60° . If $|a| = 2$ and $|b| = 3$, evaluate $a \cdot (a + b)$



[Click the image for a larger version \(opens in new frame\).](#)

Topics in this question:

- Higher Using the distributive law with the scalar product

Answer: $(5, 0, -5)$

3 [View full mark scheme \(opens in new frame\).](#)

Answer: $(25/2)\sqrt{3}$ units²

5 [View full mark scheme \(opens in new frame\).](#)

Answer: $k = 5$

4 [View full mark scheme \(opens in new frame\).](#)

Answer: 4

3 [View full mark scheme \(opens in new frame\).](#)

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 19

Old Higher Maths (1989-2015) 1992 Paper 1, Question 19, Source: ©Higher Still Additional Question Bank. (#2225).

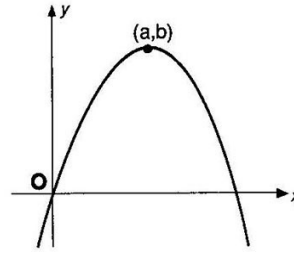
Topics in this question:

- Higher The graph of the derived function

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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The line with equation $y = x$ is a tangent at the origin to the parabola with equation $y = f(x)$. The parabola has a maximum turning point at (a, b) . Sketch the graph of $y = f'(x)$.



[Click the image for a larger version \(opens in new frame\).](#)

Answer: sketch complete

4 [View full mark scheme \(opens in new frame\).](#)



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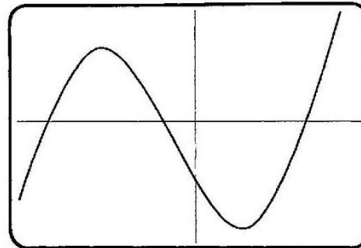
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Result Number 1

Old Higher Maths
(1989-2015) 1992
Paper 2, Question 01,
Source: ©Higher Still
Additional Question
Bank. (#2226).

The diagram shows part of the graph of the curve with equation

$$f(x) = x^3 + x^2 - 16x - 16.$$



Answer: (a) $f(x) = (x + 1)(x - 4)(x + 4)$ (b) $(-1, 0)$ $(4, 0)$ $(-4, 0)$ $(0, -16)$ (c) minimum at $(2, -36)$ and maximum at $(-8/3, 400/27)$

[View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Cubic expressions/equations: factorise or solve
- Higher Find stationary points and determine nature

- (a) Factorise $f(x)$. (3)
- (b) Write down the co-ordinates of the four points where the curve crosses the x and y axes. (2)
- (c) Find the turning points and justify their nature. (6)

[Click the image for a larger version \(opens in new frame\).](#)

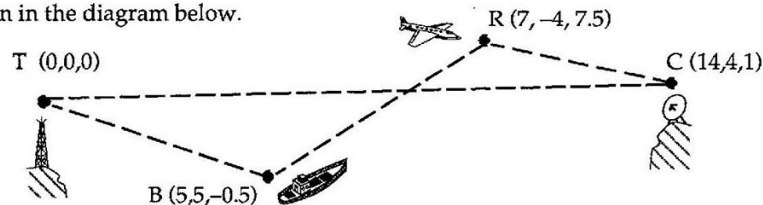
In the opinion of Dynamic Maths, this question is **routine** and contains **interleaved topics**.

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Result Number 2

Old Higher Maths
(1989-2015) 1992
Paper 2, Question 02,
Source: ©Higher Still
Additional Question
Bank. (#2227).

Relative to a suitable set of co-ordinate axes with a scale of 1 unit to 2 kilometres, the positions of a transmitter mast, ship, aircraft and satellite dish are shown in the diagram below.



Answer: (a) $\sqrt{69}$ (b) 429.4 km/h (c) result shown (d) 36.7°

[View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Miscellaneous - not covered by any other subcategory
- Higher Perpendicular vectors and the scalar product
- Higher Calculating an angle using the scalar product

The top T of the transmitter mast is the origin, the bridge B on the ship is the point $(5, 5, -0.5)$, the centre C of the dish on the top of a mountain is the point $(14, 4, 1)$ and the reflector R on the aircraft is the point $(7, -4, 7.5)$.

- (a) Find the distance from the bridge of the ship to the reflector on the aircraft. (3)
- (b) Three minutes earlier the aircraft was at the point $M(-2, 4, 8.5)$. Find the speed of the aircraft in kilometres per hour. (2)
- (c) Prove that the direction of the beam TC is perpendicular to the direction of the beam BR. (3)
- (d) Calculate the size of angle TCR. (5)

In the opinion of Dynamic Maths, this question is **non-routine** and contains **interleaved topics**.

Remove this Question from Search Results

Result Number 3

Old Higher Maths (1989-2015) 1992
Paper 2, Question 03,
Source: ©Higher Still
Additional Question
Bank. (#2228).

Topics in this question:

- Higher Limits of recurrence relations
- Higher Write a recurrence relation formula from a real-life situation

In the opinion of Dynamic Maths, this question is **non-routine** and **not interleaved**.

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[Click the image for a larger version \(opens in new frame\).](#)

Biologists calculate that when the concentration of a particular chemical in a sea loch reaches 5 milligrams per litre (mg/l) the level of pollution endangers the life of the fish.

A factory wishes to release waste containing this chemical into the loch. It is claimed that the discharge will not endanger the fish.

The Local Authority is supplied with the following information:

1. The loch contains none of this chemical at present.
2. The factory manager has applied to discharge effluent once per week which will result in an increase in concentration of 2.5 mg/l of the chemical in the loch.
3. The natural tidal action will remove 40% of the chemical from the loch every week.

(a) Show that this level of discharge would result in fish being endangered. (3)

When this result is announced, the company agrees to install a cleaning process that reduces the concentration of chemical released into the loch by 30%.

(b) Show the calculations you would use to check this revised application. Should the Local Authority grant permission? (5)

[Click the image for a larger version \(opens in new frame\).](#)

(a) For a particular radioactive substance the mass m (in grams) at time t (in years) is given by

$$m = m_0 e^{-0.02t}$$
 where m_0 is the original mass.

If the original mass is 500 grams, find the mass after 10 years. (2)

(b) The half-life of any material is the time taken for half of the mass to decay. Find the half-life of this substance. (3)

(c) Illustrate **ALL** of the above information on a graph. (3)

[Click the image for a larger version \(opens in new frame\).](#)

Answer: (a) result shown (b) 4:375 leading to conclusion

[View full mark scheme \(opens in new frame\).](#)

Answer: (a) 409.37g
(b) 34.7 years (c) graph complete

[View full mark scheme \(opens in new frame\).](#)

Result Number 4

Old Higher Maths (1989-2015) 1992
Paper 2, Question 04,
Source: ©Higher Still
Additional Question
Bank. (#2229).

Topics in this question:

- Higher Solving equations where the unknown is in the exponent
- Higher Graphs of logarithmic or exponential functions

In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 5

Old Higher Maths (1989-2015) 1992
Paper 2, Question 05,
Source: ©Higher Still
Additional Question
Bank. (#2230).

Topics in this question:

- Higher Optimisation
- Higher Deriving a formula

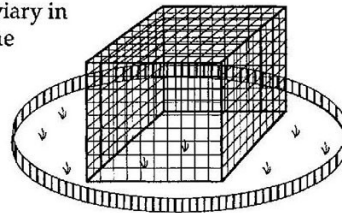
In the opinion of Dynamic Maths, this question is **routine** and **not interleaved**.

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Result Number 6

Old Higher Maths (1989-2015) 1992
Paper 2, Question 06,
Source: ©Higher Still
Additional Question

The owners of a zoo intend to build a new aviary in the shape of a cuboid with a square floor. The volume of the aviary will be 500 m³.



(a) If x metres is the length of one edge of the floor, show that the area A square metres of netting required is given by

$$A = x^2 + \frac{2000}{x}$$

(b) Find the dimensions of the aviary to ensure that the cost of netting is minimised. (4)

[Click the image for a larger version \(opens in new frame\).](#)

Answer: (a) result shown (b) 10m by 10m by 5m

[View full mark scheme \(opens in new frame\).](#)

Answer: (a) (2 3 4) written as a column (b) perpendicular to both a and b

[View full mark scheme \(opens in new frame\).](#)

Bank. (#2231).

The *vector product*, $a \times b$, of two vectors a and b is defined by

$$a \times b = \begin{pmatrix} a_2b_3 - a_3b_2 \\ a_3b_1 - a_1b_3 \\ a_1b_2 - a_2b_1 \end{pmatrix} \text{ where } a = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix} \text{ and } b = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$$

EXAMPLE

$$\text{when } a = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \text{ and } b = \begin{pmatrix} -1 \\ 0 \\ 2 \end{pmatrix} \text{ then } a \times b = \begin{pmatrix} 2 \times 2 - 3 \times 0 \\ 3 \times (-1) - 1 \times 2 \\ 1 \times 0 - 2 \times (-1) \end{pmatrix} = \begin{pmatrix} 4 \\ -5 \\ 2 \end{pmatrix}$$

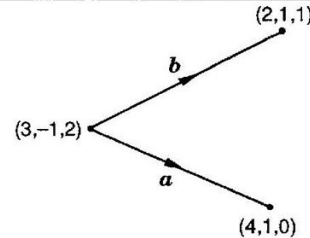
Topics in this question:

- Higher (Old Higher) Questions where pupils explore an intentionally unfamiliar topic
- Higher Perpendicular vectors and the scalar product

In the opinion of Dynamic Maths, this question is **non-routine** and **contains interleaved topics**.

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(a) If a and b are as shown in the diagram and $c = a \times b$, evaluate c .



(b) By considering $a \cdot c$ and $b \cdot c$, what can be concluded about c ?

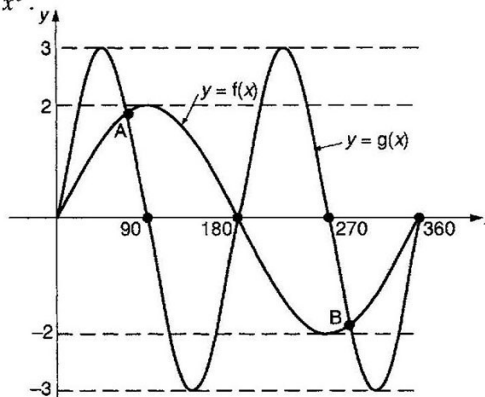
[Click the image for a larger version \(opens in new frame\).](#)

(a) Solve the equation $3\sin 2x^\circ = 2\sin x^\circ$ for $0 \leq x \leq 360$

(b) The diagram below shows parts of the graphs of sine functions f and g . State expressions for $f(x)$ and $g(x)$.

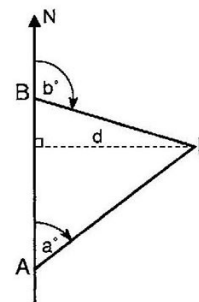
(c) Use your answers to part (a) to find the co-ordinates of A and B.

(d) Hence state the values of x in the interval $0 \leq x \leq 360$ for which $3\sin 2x^\circ < 2\sin x^\circ$.



[Click the image for a larger version \(opens in new frame\).](#)

A ship is sailing due north at a constant speed. When at position A, lighthouse L is observed on a bearing of a° . One hour later, when the ship is at position B, the lighthouse is on a bearing of b° . The shortest distance between the ship and the lighthouse during this hour was d miles.



(a) Prove that $AB = \frac{d}{\tan a^\circ} - \frac{d}{\tan b^\circ}$.

(b) Hence prove that $AB = \frac{d \sin(b-a)^\circ}{\sin a^\circ \sin b^\circ}$.

(c) Calculate the shortest distance from the ship to the lighthouse when the bearings a° and b° are 060° and 135° respectively and the constant speed of the ship is 14 miles per hour.

[Click the image for a larger version \(opens in new frame\).](#)

Result Number 7

Old Higher Maths (1989-2015) 1992 Paper 2, Question 07, Source: ©Higher Still Additional Question Bank. (#2232).

Topics in this question:

- Higher Solving a trigonometric equation using formula for $\sin(2x)$
- Higher Identifying/sketching graphs of related functions (trigonometric)

In the opinion of Dynamic Maths, this question is **non-routine** and **contains interleaved topics**.

Remove this Question from Search Results

Result Number 8

Old Higher Maths (1989-2015) 1992 Paper 2, Question 08, Source: ©Higher Still Additional Question Bank. (#2276).

Topics in this question:

- Higher Miscellaneous - not covered by any other subcategory

In the opinion of Dynamic Maths, this question is **non-routine** and **contains interleaved topics**.

Remove this Question from Search Results

Result Number 9

Old Higher Maths (1989-2015) 1992 Paper 2, Question 09, Source: ©Higher Still Additional Question

(3)

(4)

- (4) **Answer:** (a) $x = 0, 70.5, 170, 289.5, 360$
 (b) $f(x) = 2\sin x^\circ, g(x) = 3\sin 2x^\circ$ (c) A(70.5, 1.89) B(289.5, -1.89)
 (2) (d) $70.5 < x < 180, 289.5 < x < 360$

(3) [View full mark scheme \(opens in new frame\).](#)

Answer: (a) result shown (b) result shown (c) 8.9 miles

[View full mark scheme \(opens in new frame\).](#)

(2)

(3)

(3)

Answer: (a) $y = (4/3)x - 50$ (b) $x^2 + y^2 = 900$ (c) (24, -18)

[View full mark scheme \(opens in new frame\).](#)

Bank. (#2277).

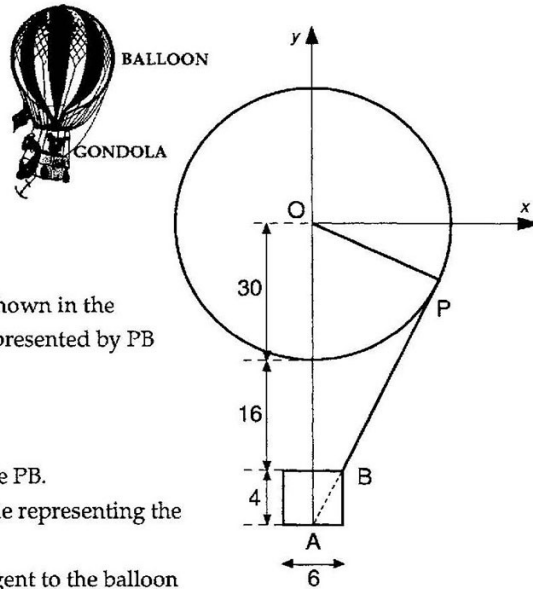
Topics in this question:

- Higher Circle equation from radius/centre or vice versa
- Higher Intersections of lines and circles (including showing tangency)

In the opinion of Dynamic Maths, this question is **non-routine** and **not interleaved**.

Remove this Question from Search Results

A spherical hot-air balloon has radius 30 feet. Cables join the balloon to the gondola which is cylindrical with diameter 6 feet and height 4 feet. The top of the gondola is 16 feet below the bottom of the balloon.



Co-ordinate axes are chosen as shown in the diagram. One of the cables is represented by PB and PBA is a straight line.

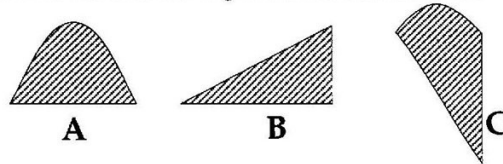
- (a) Find the equation of the cable PB. (3)
- (b) State the equation of the circle representing the balloon. (1)
- (c) Prove that this cable is a tangent to the balloon and find the co-ordinates of the point P. (5)

[Click the image for a larger version \(opens in new frame\).](#)

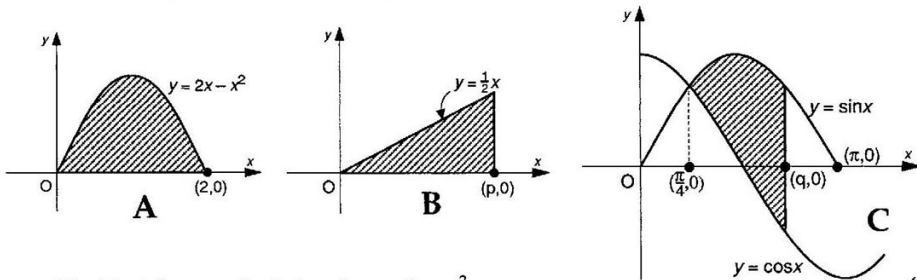
Result Number 10

Old Higher Maths (1989-2015) 1992 Paper 2, Question 10, Source: ©Higher Still Additional Question Bank. (#2278).

An artist has been asked to design a window made from pieces of coloured glass with different shapes. To preserve a balance of colour each shape must have the **same area**. Three of the shapes used are drawn below.



Relative to x,y -axes, the shapes are positioned as shown below.



- (a) Find the area shaded under $y = 2x - x^2$. (4)
- (b) Use the area found in part (a) to find the value of p . (2)
- (c) Prove that q satisfies the equation $\cos q + \sin q = 0.081$ and hence find the value of q to 2 significant figures. (10)

[Click the image for a larger version \(opens in new frame\).](#)

Answer: (a) $4/3$ units²
(b) $p = 4/\sqrt{3}$ (c) $q = 2.3$

[View full mark scheme \(opens in new frame\).](#)

Topics in this question:

- Higher Areas using integration
- Higher Wave function ($y = a \sin x \pm b \cos x$)
- Higher Basic trig equation (no formulae required) in radians or degrees

In the opinion of Dynamic Maths, this question is **non-routine** and **contains interleaved topics**.

Remove this Question from Search Results