Solving Samples of Math Problems Using CASIO FX-CG50 CALCULATOR



Done By Casio Middle East - GAKUHAN



Casio GAKUHAN – Education Department

The International Baccalaureate Diploma Program (IBDP) is a two-year educational program primarily aimed at 16 to 19 years old. The program provides an internationally accepted qualification for entry into higher education and is recognized by many universities worldwide

Mathematics: The subjects are, in order of increasing difficulty, Mathematical Studies SL, Mathematics SL, and Mathematics HL. Further Mathematics can be studied at SL in addition to a Mathematics HL course.

Algebra , Functions and equations , Circular functions and trigonometry ,Vectors ,Statistics and probability ,Calculus

| Course | Exam | Time limit | Description | # and type of questions | % of final mark | |
|-------------------|---------------------------------------|-----------------------|-------------|--------------------------------|-----------------------|--|
| | Paper 1 | 1 hour, 30 minutes | Section A | ~7 short response questions | 40% | |
| Mathematics | (no calculator) | | Section B | ~3 extended response questions | -070 | |
| SL | Paper 2 (GDC required) | 1 hour, 30 | Section A | ~8 short response questions | 40% | |
| | | minutes | Section B | ~3 extended response questions | 4070 | |
| Mathematics HL | Paper 1 (no calculator) Paper 2 | 2 hours | Section A | ~8 short response questions | 30% | |
| | | | Section B | ~4 extended response questions | | |
| | | | Section A | ~8 short response questions | 20% | |
| | (GDC required) | 2 hours | Section B | ~4 extended response questions | 30% | |
| | Paper 3 (GDC required) | 1 hour | | ~5 extended response questions | 20% | |

Q.1. Solve the equation |3x+5| = 1 over the set of real numbers.



Q.2. Find the angle between the two vectors u = 2i - 3j + 2k and v = i + 2j - 3k.



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Q.3. In triangle ABC, BC = 6, AC = 7 and $PA = 30^{\circ}$. Find all possible values of AB.



 $(PTN F4 F5 sin 3 0 \div 6 SHFT \bullet sin (X, \theta, T \div 7 \bullet (X, \theta, T \bullet 0 \bullet 1 8 0)) EXE EXIT$

Answer : angle b = 35.7 or 144.3 so that the angle c = 114.3 or 5.7 respectively .

| F5 sin 3 0 ÷ 6 SHFT • sin 5 • 7 ÷ (X,0,T) EXE EXIT F5 sin 3 0 | |
|--|--|
| ÷ 6 SHFT • sin 1 1 4 • 3 ÷ X.A.T) EXE EXIT | |

| HathDegNorm1 d/cReal |
|---|
| $\{1.191836997\}$ |
| SolveN(sin 30÷6=sin |
| [10.93063932] |
| |
| Solve $d/dx d^2/dx^2 \int dx$ SolveN \triangleright |

Answer : applying law of sin we got AB = { 1.19 or 10.936 }.

Q.4. Solve the equation $3\sin^2 x + 8\cos x - 7 = 0$, where $0^\circ \le x \le 180^\circ$, and express your answer(s) to the nearest degree.



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Q.6. Solve the cubic equations:

$$2x^3 - x^2 - 7x + 6 = 0$$



Q.7. Let
$$f(x) = \frac{2x}{x^2 + 1}$$
.

Find the area under the curve of f(x), from x = 0 to x = 2.



Q.8. Let $f(x) = \sin 2x + \cos x$.

Find the equation of the tangent of the graph of f at x = 0.

| | Math Rad | Norm1 | Real | | |
|--------------------------|----------|---------|------|--------|-----------|
| $\overline{\mathrm{Gr}}$ | aph | Fune | : | Y= | |
| Y 1 | : | | | | [] |
| Y 2 | : | | | | [] |
| Y 3 | 1 | | | | [] |
| Y 4 | ÷ | | | | [] |
| $\mathbf{Y}5$ | : | | | | [—] |
| Y 6 | | | | | [] |
| SEL | ECT DELI | TE TYPE | TOC |)L (MC | DIFY DRAW |







Answer : y=2x+1

Q.9. The radius of a sphere made from steel is 40 mm.

(a) Calculate the volume, in mm³, of the steel sphere.

The steel sphere is heated, and as a result the volume of the steel sphere increases by 0.1%.

(b) Calculate the radius of the steel sphere following this increase, correct to two decimal places.



- **Q.10.** The third term, *u*₃, of an arithmetic sequence is 7. The common difference of the sequence, *d*, is 3.
 - (a) Find u_1 , the first term of the sequence.
 - (b) Find u_{60} , the 60th term of the sequence.

Note: Arithmetic an = a1 + (n - 1)d and $sn = \frac{n}{2}[2a1 + (n - 1)d]$



Q.11. The third term in the expansion $(x + k)^8$ is $252x^6$. Find the possible values of k.

$$(x+y)^n = \sum_{k=0}^n \binom{n}{k} x^k y^{n-k}$$

Using Binomial theorem : $256x^6 = 28x^6k^2$



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- **Q.12.** The amount of sugar in 100 grams of grapes, *S*, follows a normal distribution with a mean of 16 grams and standard deviation 1 gram.
 - (a) Find the probability that 100 grams of grapes chosen at random contains between 15.5 grams and 16.2 grams of sugar.
 - (b) 90% of randomly chosen 100 gram portions of grapes contain less than k grams of sugar. Calculate the value of k.

| Rad Norm1 | d/c Real | |
|-----------|----------|--------------|
| Normal C. | D | |
| Data : | Variable | |
| Lower : | 0 | |
| Upper : | 0 | |
| σ : | 1 | |
| μ : | 0 | |
| Save Res: | None | \downarrow |
| List Var | | |

RadNorm1 d/cReal

 Norma1 C.D

 p
 =0.27072217

 z:Low=-0.5
 z:Up





| RadNorm1 d/c)Real | | | |
|-------------------|-----------|--------------|--|
| Inverse | Normal | | |
| Data | :Variable | | |
| Tail | ∶Left | | |
| Area | :0.9 | | |
| σ | :1 | | |
| μ | :16 | | |
| Save Res | s:None | \downarrow | |
| | | | |
| | | | |

| RadNorm1 d/c]Real Inverse Normal xInv=17.2815516 |
|--|
| |



Answer : (b) = 17.28

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Q.13. For what values of x is the following inequation true?

$$-7x^2 - 27x + 4 \ge 0$$











Q.13. Solve the following inequation



| 🖹 Math Deg | Norm1 | Real | |
|-------------|---------|------|-----------|
| Graph | Fune | :Y= | |
| Y 1: | | | [] |
| Y 2: | | | [] |
| Y 3: | | | [] |
| Y 4: | | | [] |
| Y 5: | | | [—] |
| Y6 : | | | [] |
| SELECT DELE | TE TYPE | TOOL | DIFY DRAW |











Answer : by using trace F1 and see where is the function negative the intervals of x are : $(-\infty, -10) \cup (-3, 1) \cup (4, \infty)$





Q.15. Solve the equation $e^{-x} - x + 1 = 0$







Q.17. The normal to the curve $y = x^2 - 4x$ at the point (3, -3) intersects the *x*-axis at point *P* and the *y*-axis at point *Q*. Find the equation of the normal and the coordinates of *P* and *Q*.



$[X,\theta,T]$ x^2 - 4 $[X,\theta,T]$ EXE EXE F4 F3 3 EXE EXE

Answer : y = -0.5x - 1.5

Q.18. Graph this function with different windows , the angles should be radians.

Consider the function
$$f(x) = \cos x - \frac{\sqrt{x}}{10}$$
.





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Q.19. Consider the function $f(x) = 3(1.4)^x$

- a. Sketch the graph of the function for the domain $0 \le x \le 3$.
- b. Write down the coordinates of the *y*-intercept.
- c. On the same grid, draw the graph of the function g(x) = 4 3x.
- d. For what values of x is f(x) = g(x)?



EXIT 4 - 3 (X,θ,T) EXE EXE F5 F5

Answer : (b) y-intercept = 3

(d) f(x)=g(x) at (0.246, 3.259)

Q.20. Consider the function $y = -x^2 + 2x + 5$.

(a) Find
$$\frac{dy}{dx}$$
.

- (b) Write down the value of the derivative at x = -1.
- (c) Find the equation of the tangent to the function at x = -1.
- (d) Find the equation of the normal to the function at x = -1.



Q.21. The shaded region is enclosed between the curves $y = 2x + 3\sin x + 1$ and y = 3x + 2 for $x \ge 0$.

- a. Write down the coordinates of the points of intersection.
- b. Find the area of the region.



2 (X,θ,T) + 3 sin (X,θ,T) + 1 EXE 3 (X,θ,T) + 2 EXE F6 F5 F5 (►) (►) F5 F6 F3 F3 (►) EXE

| Answer : (| (a) | (0.538.3.615) | |
|------------|-----|---------------|--|
| | (4) | (0.000,0.010) | |

(b) area = 0.5245

Q.22. Consider the function $f(x) = x(2x+3)^4$

- a. Solve the inequality $f(x) \ge 2x 1$
- b. Find the area enclosed between the curve representing f(x) and y = 2x 1.





Answer : (a) $(-2.1268, -0.8311) \cup (-0.0131, \infty)$

(b) area = 4.156

Notes: Angle radian not degree

To draw the derivative we put the interval [0,5] but we delete it from the main function

Q.23. The velocity of a particle in ms-1 is given by $v = e^{2\sin 2t} - 1$, for $0 \le t \le 5$.

- (a) Sketch the graph of v.
- (b) Write down the positive *t*-intercepts.
- (c) (i) Find the acceleration when t = 0.
 - (ii) When is the acceleration the most?



Q.24. The following data are for the age(in years) of 8 randomly chosen children and how fast they could run (in km/hr).

| Age: x | 2 | 4 | 7 | 12 | 4 | 8 | 9 | 2 |
|----------|---|---|----|----|----|----|----|---|
| Speed: y | 5 | 8 | 12 | 24 | 12 | 14 | 18 | 7 |

- a. Draw a scatter diagram of the data
- b. Write down the coordinates of the mean point (x, y).
- c. Write down the value of r, the Pearson's product-moment correlation and interpret it.
- d. Write down the regression equation and draw the line on your scatterplot.



Q.25. Which of the following is an equation for a line tangent to the graph of f(x)= e^{2x} when f'(x) = 10?

- (A) y = 10x 8.05
- (B) y = x 8.05
- (C) y = x 3.05
- (D) y = 10x 11.5
- (E) y = 10x 3.05

1- Need to solve the equation to know the value of x .

2- Graph the function and enter the value of x to got the tangent equation.



- **Q.25.** What is the area of the region bounded by $y = \sin x$, $y = \frac{1}{4}x 1$, and the *y*-axis?
 - (A) 0.772
 - (B) 2.815
 - (C) 3.926
 - (D) 5.552
 - (E) 34.882





Answer : (c) area = 3.926

Q.26. A random variable X has a probability density function

$$f(x) = \begin{cases} 1+2x+ax^2 & 0 \le x \le 1\\ 0 & otherwise \end{cases} \quad a \in \mathbb{R}$$

- a. Show that a = -3
- b. Find the median.
- c. Find the mean
- d. Find the standard deviation.
- e. Find the interquartile range.



(b) median = 0.403





(d) SD = 0.0597



a. Since this is a probability density function, then

$$\int_0^1 (1+2x+ax^2) dx = 1$$

Thus a = -3

b. Let the median be *m*, hence

 $\int_0^m (1+2x-3x^2) dx = 0.5$

Therefore the median is 0.403

c. The mean is also the expected value.

The value of the mean is $\mu = \int_{allx} xf(x)dx = \int_0^1 x(1+2x-3x^2)dx \approx 0.417$

d. We first find the variance.

$$Variance = \sigma^{2} = \int_{allx} x^{2} f(x) dx - (E(x))^{2}$$
$$= \int_{0}^{1} x^{2} (1 + 2x - 3x^{2}) dx - 0.417^{2} \approx 0.0597$$

e. Interquartile range = IQR = Q3 - Q1, where Q1, and Q3 are the 1st and 3rd quartiles.

Since $P(X \le Q3) = 0.75$ and $P(X \le Q1) = 0.25$, then we need to find *M* and *N* such that $\int_0^M (1+2x-3x^2) dx = 0.75$ and $\int_0^N (1+2x-3x^2) dx = 0.25$

Thus Q3 = 0.605 and Q1 = 0.214, and therefore IQR = 0.381