TRIGONOMETRY

Every question, eight papers

DBE · National Senior Certificate · Mathematics Paper 2

November 2021 - 2024 and May/June 2021, 2022, 2024, 2025

28 questions · 385 marks · 8 papers

Each question is a clip of the original DBE page. The wording, the mark allocations and the diagrams are exactly as they were printed - nothing has been retyped or redrawn. Only the blank answer space has been removed, so work in a separate book.

How it is arranged

One chapter per topic, so you can work through a whole skill at a time.

Inside a chapter the questions run from fewest marks to most. That is an order by size, not by difficulty: unlike the IEB, the DBE does not split its papers into an easier and a harder section, and its marking guidelines carry no cognitive-level tags. Nothing in these papers ranks one question as harder than another, so this booklet does not pretend otherwise.

Contents

Reduction, identities and general solutions

The no-calculator half of the topic, and the biggest thing in Paper 2. One ratio is given with its quadrant, or one expression has to be cut down to a single term, or an identity has to be proved and the values where it fails named. Reduction formulae, the compound and double angle formulae, and knowing which quadrant makes a sign negative.

12 questions · 229 marks

12 to 31 marks each

1. Simplify to one ratio, then a sum of two sines

DBE NSC Paper 2 · May/June 2022 · Q6 · 12 marks

QUESTION 6

6.1 **Without using a calculator**, simplify the following expression to a single trigonometric term:

$$\frac{\sin 10°}{\cos 440°} + \tan(360° - \theta).\sin 2\theta$$ (6)

6.2 Given: $\sin(60° + 2x) + \sin(60° - 2x)$

6.2.1 Calculate the value of k if $\sin(60° + 2x) + \sin(60° - 2x) = k \cos 2x$. (3)

6.2.2 If $\cos x = \sqrt{t}$, **without using a calculator**, determine the value of $\tan 60°[\sin(60° + 2x) + \sin(60° - 2x)]$ in terms of t. (3)

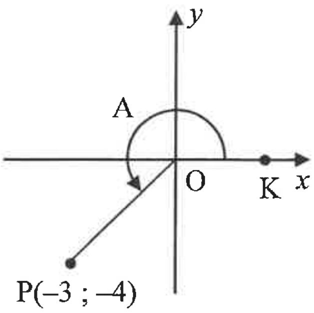
[12]

2. cos A from a point, then the double and compound angles

DBE NSC Paper 2 · November 2024 · Q5 · 12 marks

QUESTION 5

5.1 In the diagram, line OP is given with P(–3 ; –4). $\hat{KOP} = A$.



Determine, **without using a calculator**, the value of:

5.1.1 $\cos A$ (2)

5.1.2 $\cos 2A$ (2)

5.1.3 $\sin(A - B)$, if it is further given that $\sin B = \frac{4}{5}$ and $90° < B < 360°$ (4)

5.2 If $\cos\alpha = p$, express the following expression in terms of p:

$$\frac{\cos\left(\frac{\alpha}{2} - 45°\right)\sin\left(\frac{\alpha}{2} - 45°\right)}{2}$$ (4)

[12]

3. Two identities to prove, one of them a difference of sines

DBE NSC Paper 2 · May/June 2025 · Q6 · 13 marks

QUESTION 6

6.1 Prove that $2\cos^2(45° + x) = 1 - \sin 2x$. (4)

6.2 Consider the expression: $\sin(A - B) - \sin(A + B)$

6.2.1 Prove that $\sin(A - B) - \sin(A + B) = -2\cos A \sin B$. (2)

6.2.2 Simplify the following expression to a single term: $\sin 4x - \sin 10x$ (2)

6.2.3 Hence, determine the solution for $\sin 4x - \sin 10x = \sin 3x$ for $x \in [0° ; 30°]$. (5)

[13]

4. Derive cos(alpha + beta), then use it to simplify

DBE NSC Paper 2 · November 2021 · Q6 · 15 marks

QUESTION 6

6.1 Given: $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

6.1.1 Use the given identity to derive a formula for $\cos(\alpha + \beta)$ (3)

6.1.2 Simplify completely: $2\cos 6x \cos 4x - \cos 10x + 2\sin^2 x$ (5)

6.2 Determine the general solution of $\tan x = 2\sin 2x$ where $\cos x < 0$. (7)

[15]

5. Reduce to a single ratio, then prove an identity

DBE NSC Paper 2 · November 2021 · Q5 · 17 marks

QUESTION 5

5.1 **Without using a calculator**, simplify the following expression to ONE trigonometric ratio:

$$\frac{\sin 140°.\sin(360° - x)}{\cos 50°.\tan(-x)}$$ (6)

5.2 Prove the identity: $\dfrac{-2\sin^2 x + \cos x + 1}{1 - \cos(540° - x)} = 2\cos x - 1$ (4)

5.3 Given: $\sin 36° = \sqrt{1 - p^2}$

Without using a calculator, determine EACH of the following in terms of p:

5.3.1 $\tan 36°$ (3)

5.3.2 $\cos 108°$ (4)

[17]

6. Simplify, then everything in terms of cos 35 = m

DBE NSC Paper 2 · May/June 2021 · Q5 · 18 marks

QUESTION 5

5.1 Simplify the expression to a **single trigonometric term:**

$$\tan(-x).\cos x.\sin(x - 180°) - 1$$ (5)

5.2 Given: $\cos 35° = m$

Without using a calculator, determine the value of EACH of the following in terms of m:

5.2.1 $\cos 215°$ (2)

5.2.2 $\sin 20°$ (3)

5.3 Determine the general solution of:

$$\cos 4x.\cos x + \sin x.\sin 4x = -0{,}7$$ (4)

5.4 Prove the identity: $\dfrac{\sin 4x.\cos 2x - 2\cos 4x.\sin x.\cos x}{\tan 2x} = \cos^2 x - \sin^2 x$ (4)

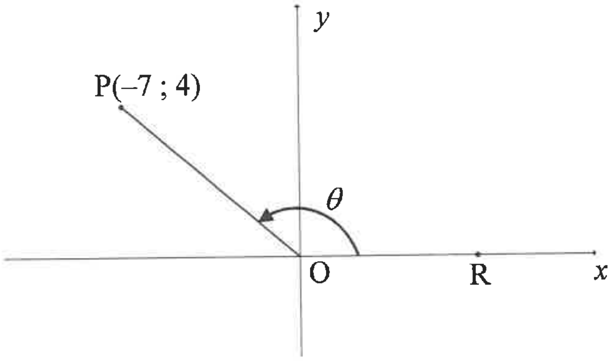
[18]

7. A point in the second quadrant, and the ratios it fixes

DBE NSC Paper 2 · May/June 2022 · Q5 · 18 marks

QUESTION 5

5.1 In the diagram below, P(–7 ; 4) is a point in the Cartesian plane. R is a point on the positive x-axis such that obtuse $P\hat{O}R = \theta$.



Calculate, **without using a calculator**, the:

5.1.1 Length OP (2)

5.1.2 Value of:

(a) $\tan\theta$ (1)

(b) $\cos(\theta - 180°)$ (2)

5.2 Determine the general solution of: $\sin x\cos x + \sin x = 3\cos^2 x + 3\cos x$ (7)

5.3 Given the identity: $\dfrac{\sin 3x}{1-\cos 3x} = \dfrac{1+\cos 3x}{\sin 3x}$

5.3.1 Prove the identity given above. (3)

5.3.2 Determine the values of x, in the interval $x \in [0° ; 60°]$, for which the identity will be undefined. (3)

[18]

8. Derive cos(x + y) from the identity given, then apply it

DBE NSC Paper 2 · November 2024 · Q6 · 18 marks

QUESTION 6

6.1 Given the identity: $\cos(x-y)=\cos x\cos y+\sin x\sin y$

6.1.1 Use the compound angle identity given above to derive a formula for $\cos(x+y)$. (2)

6.1.2 Hence, or otherwise, show that:

$$\frac{\cos(90°-x)\cos y+\sin(-y)\cos(180°+x)}{\cos x\cos(360°+y)+\sin(360°-x)\sin y}=\tan(x+y)$$ (6)

6.2 Given: $f(x)=\sqrt{6\sin^2 x-11\cos(90°+x)+7}$

Solve for x in the interval $x\in(0°\ ;\ 360°)$ if $f(x)=2$. (6)

6.3 Consider the function: $g(x)=\dfrac{4-8\sin^2 x}{3}$

6.3.1 Calculate the maximum value of g. (3)

6.3.2 Write down the smallest possible value of x for which g will have a maximum value in the interval $x\in(0°\ ;\ 360°]$. (1)

[18]

9. cos theta = 5/13 with the quadrant given, then a simplification

DBE NSC Paper 2 · May/June 2025 · Q5 · 19 marks

QUESTION 5

5.1 If $\cos\theta=-\dfrac{5}{13}$ where $180°<\theta<360°$, determine, **without using a calculator**, the value of:

5.1.1 $\sin^2\theta$ (3)

5.1.2 $\tan(360°-\theta)$ (2)

5.1.3 $\cos(\theta-135°)$ (4)

5.2 Simplify the expression to a single trigonometric term: $\dfrac{2\cos(180°-x)\sin(-x)}{1-2\cos^2(90°-x)}$ (6)

5.3 Calculate the value of the following expression **without using a calculator**:
$(\tan 92°)(\tan 94°)(\tan 96°)\ ...\ (\tan 176°)(\tan 178°)$ (4)

[19]

10. Everything in terms of sin 40 = p, then an identity to prove

DBE NSC Paper 2 · May/June 2024 · Q5 · 26 marks

QUESTION 5

5.1 If $\sin 40° = p$, write EACH of the following in terms of p.

5.1.1 $\sin 220°$ (2)

5.1.2 $\cos^2 50°$ (2)

5.1.3 $\cos(-80°)$ (3)

5.2 Given: $\tan x(1-\cos^2 x)+\cos^2 x = \dfrac{(\sin x+\cos x)(1-\sin x\cos x)}{\cos x}$

5.2.1 Prove the above identity. (5)

5.2.2 For which values of x, in the interval $x \in [-180°\,;180°]$, will the identity be undefined? (3)

5.3 Given the expression: $\dfrac{\sin 150° + \cos^2 x - 1}{2}$

5.3.1 **Without using a calculator**, simplify the expression given above to a single trigonometric term in terms of $\cos 2x$. (6)

5.3.2 Hence, determine the general solution of $\dfrac{\sin 150° + \cos^2 x - 1}{2} = \dfrac{1}{25}$ (5)

[26]

11. 13 sin x + 3 = 0, and the whole chain that follows from it

DBE NSC Paper 2 · November 2022 · Q5 · 30 marks

QUESTION 5

5.1 Given that $\sqrt{13}\sin x + 3 = 0$, where $x \in (90°\,;\,270°)$.

Without using a calculator, determine the value of:

5.1.1 $\sin(360° + x)$ (2)

5.1.2 $\tan x$ (3)

5.1.3 $\cos(180° + x)$ (2)

5.2 Determine the value of the following expression, **without using a calculator**:

$$\frac{\cos(90° + \theta)}{\sin(\theta - 180°) + 3\sin(-\theta)}$$ (5)

5.3 Determine the general solution of the following equation:

$(\cos x + 2\sin x)(3\sin 2x - 1) = 0$ (6)

5.4 Given the identity: $\cos(x + y).\cos(x - y) = 1 - \sin^2 x - \sin^2 y$

5.4.1 Prove the identity. (4)

5.4.2 Hence, determine the value of $1 - \sin^2 45° - \sin^2 15°$, **without using a calculator**. (3)

5.5 Consider the trigonometric expression: $16\sin x.\cos^3 x - 8\sin x.\cos x$

5.5.1 Rewrite the expression as a single trigonometric ratio. (4)

5.5.2 For which value of x in the interval $x \in [0°\,;\,90°]$ will $16\sin x.\cos^3 x - 8\sin x.\cos x$ have its minimum value? (1)

[30]

12. sin beta given with its quadrant - the longest question in the book

DBE NSC Paper 2 · November 2023 · Q5 · 31 marks

QUESTION 5

5.1 Given: $\sin\beta = \frac{1}{3}$, where $\beta \in (90°\ ;\ 270°)$

Without using a calculator, determine each of the following:

5.1.1 $\cos\beta$ (3)

5.1.2 $\sin 2\beta$ (3)

5.1.3 $\cos(450° - \beta)$ (3)

5.2 Given: $\frac{\cos^4 x + \sin^2 x.\cos^2 x}{1+\sin x}$

5.2.1 Prove that $\frac{\cos^4 x + \sin^2 x.\cos^2 x}{1+\sin x} = 1 - \sin x$ (4)

5.2.2 For what value(s) of x in the interval $x \in [0°\ ;\ 360°]$ is $\frac{\cos^4 x + \sin^2 x.\cos^2 x}{1+\sin x}$ undefined? (2)

5.2.3 Write down the minimum value of the function defined by $y = \frac{\cos^4 x + \sin^2 x.\cos^2 x}{1+\sin x}$ (2)

5.3 Given: $\cos(A - B) = \cos A \cos B + \sin A \sin B$

5.3.1 Use the above identity to deduce that $\sin(A - B) = \sin A \cos B - \cos A \sin B$ (3)

5.3.2 Hence, or otherwise, determine the general solution of the equation $\sin 48° \cos x - \cos 48° \sin x = \cos 2x$ (5)

5.4 Simplify $\frac{\sin 3x + \sin x}{\cos 2x + 1}$ to a single trigonometric ratio. (6)

[31]

The graphs of sin, cos and tan

Two of the three functions drawn on one set of axes, usually over -180 to 180 degrees. Period, amplitude and asymptotes first, then the questions DBE really wants: where do they intersect, for which x is one above the other, and what happens if one of them is shifted.

8 questions · 84 marks

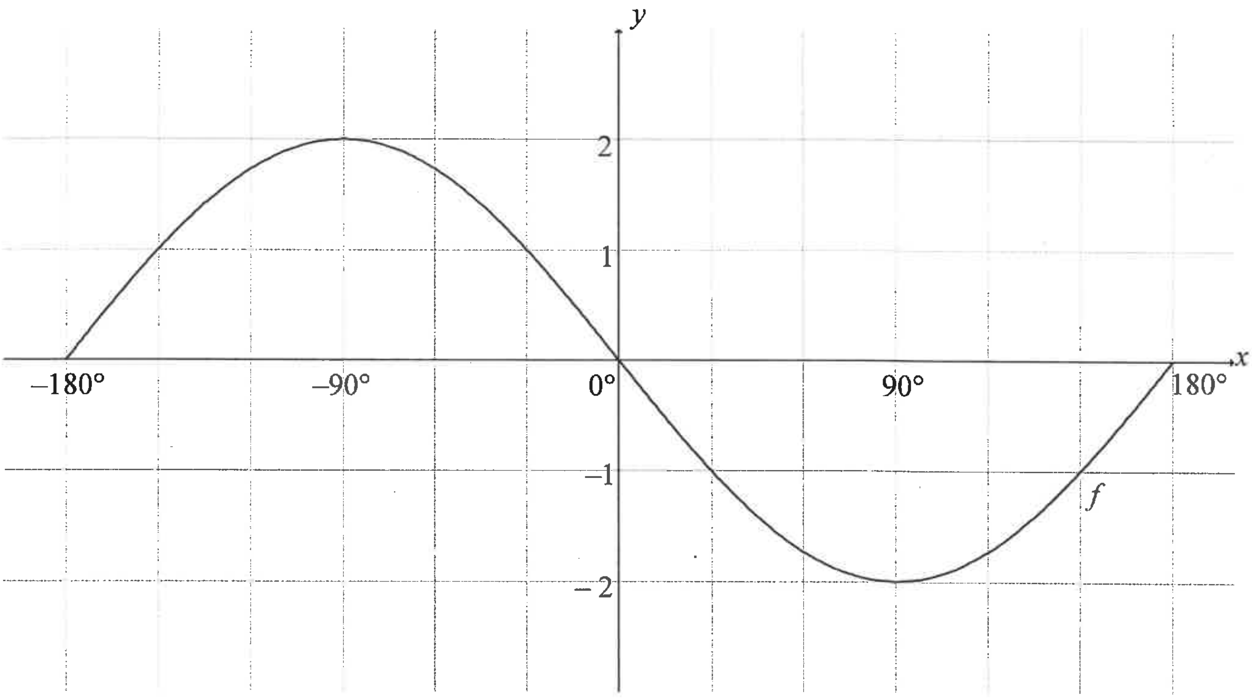
8 to 13 marks each

13. Draw a cosine onto a sine that is already sketched

DBE NSC Paper 2 · November 2021 · Q7 · 8 marks

QUESTION 7

In the diagram below, the graph of $f(x) = -2\sin x$ is drawn for the interval $x \in [-180°\,;\,180°]$.



7.1 On the grid provided in the ANSWER BOOK, draw the graph of $g(x) = \cos(x - 60°)$ for $x \in [-180°\,;\,180°]$. Clearly show ALL intercepts with the axes and turning points of the graph. (3)

7.2 Write down the period of $f(3x)$. (2)

7.3 **Use the graphs** to determine the value of x in the interval $x \in [-180°\,;\,180°]$ for which $f(x) - g(x) = 1$. (1)

7.4 Write down the range of k, if $k(x) = \frac{1}{2}g(x) + 1$. (2)

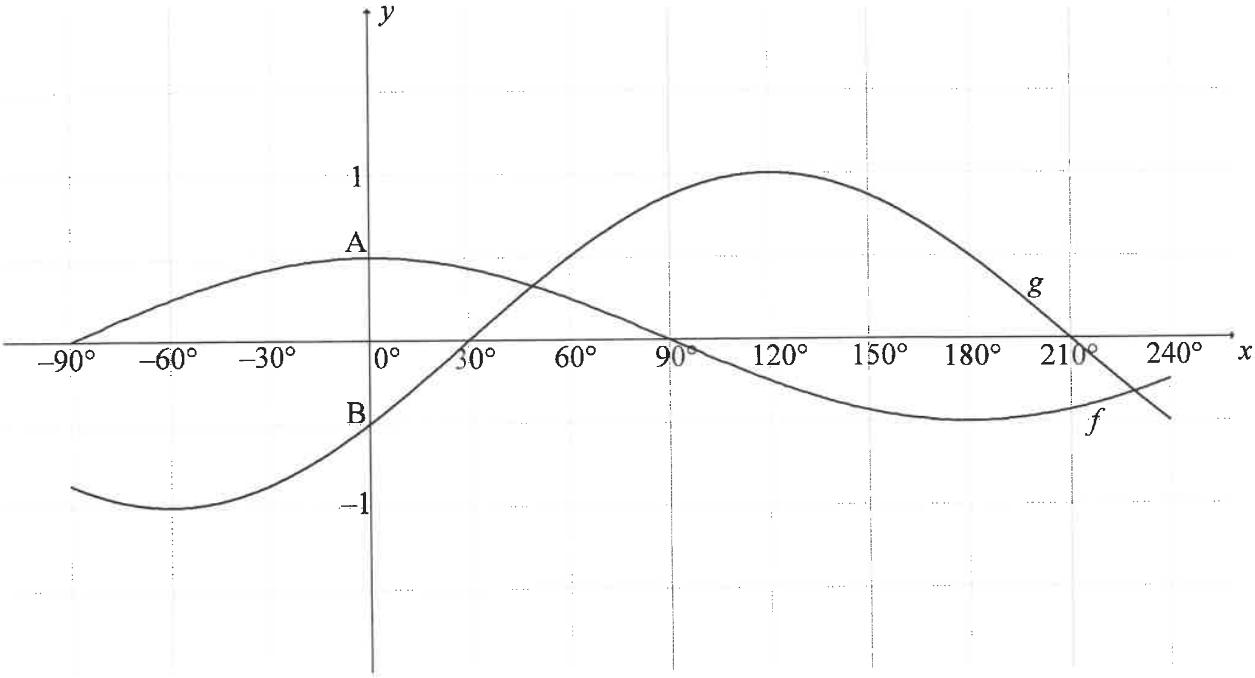
[8]

14. A cosine and a shifted sine on one set of axes

DBE NSC Paper 2 · May/June 2022 · Q7 · 10 marks

QUESTION 7

In the diagram below, the graphs of $f(x)=\frac{1}{2}\cos x$ and $g(x)=\sin(x-30°)$ are drawn for the interval $x\in[-90°\,;\,240°]$. A and B are the y-intercepts of f and g respectively.



7.1 Determine the length of AB. (2)

7.2 Write down the range of $3f(x)+2$. (2)

7.3 Read off from the graphs a value of x for which $g(x)-f(x)=\frac{\sqrt{3}}{2}$. (2)

7.4 For which values of x, in the interval $x\in[-90°\,;\,240°]$, will:

7.4.1 $f(x).g(x)>0$ (2)

7.4.2 $g'(x-5°)>0$ (2)

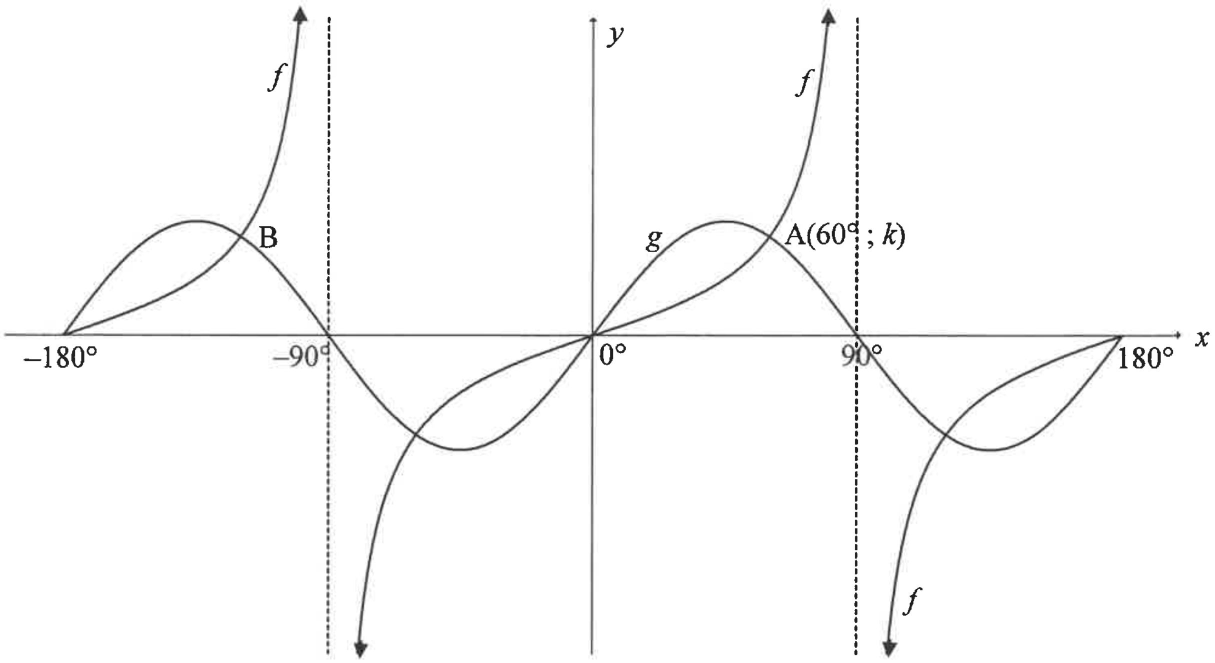
[10]

15. tan x against 2 sin 2x, and where the two cross

DBE NSC Paper 2 · November 2022 · Q6 · 10 marks

QUESTION 6

In the diagram below, the graphs of $f(x) = \tan x$ and $g(x) = 2\sin 2x$ are drawn for the interval $x \in [-180° ; 180°]$ A$(60° ; k)$ and B are two points of intersection of f and g.



6.1 Write down the period of g. (1)

6.2 Calculate the:

6.2.1 Value of k (1)

6.2.2 Coordinates of B (1)

6.3 Write down the range of $2g(x)$. (2)

6.4 For which values of x will $g(x+5°) - f(x+5°) \leq 0$ in the interval $x \in [-90° ; 0°]$? (2)

6.5 Determine the values of p for which $\sin x.\cos x = p$ will have exactly two real roots in the interval $x \in [-180° ; 180°]$. (3)

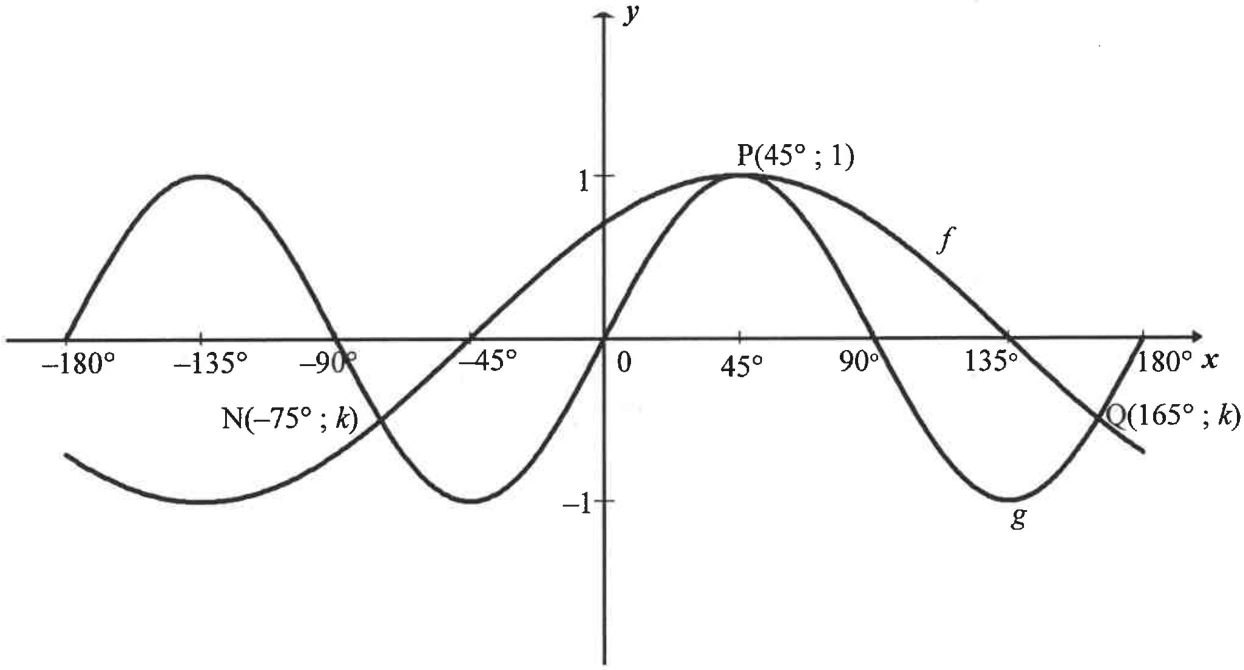
[10]

16. Find a from where cos(x + a) meets sin 2x

DBE NSC Paper 2 · May/June 2024 · Q6 · 10 marks

QUESTION 6

In the diagram, the graphs of $f(x)=\cos(x+a)$ and $g(x)=\sin 2x$ are drawn for the interval $x\in[-180°;180°]$. The graphs intersect at N$(-75°\,;k)$, P$(45°\,;1)$ and Q$(165°\,;k)$. P is also a turning point of both graphs.



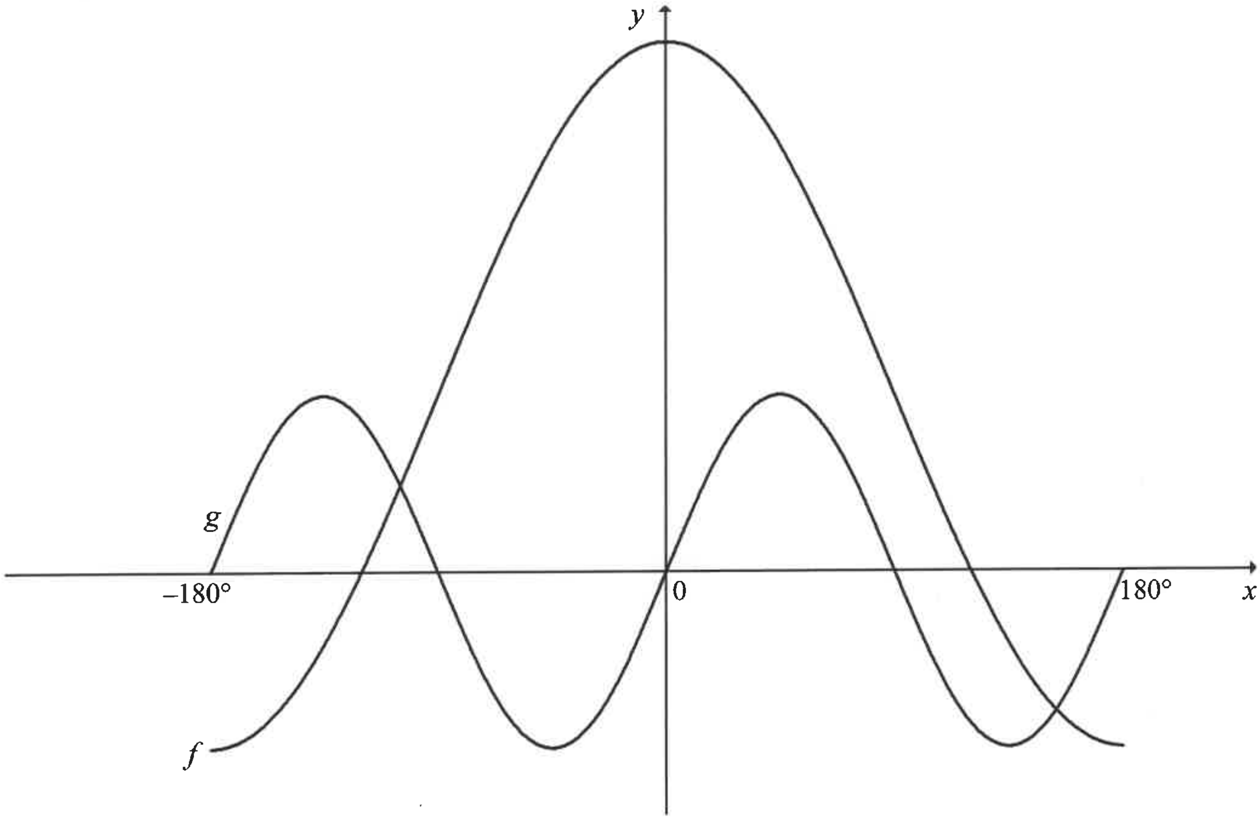
6.1	Write down the period of f.	(1)
6.2	Write down the amplitude of g.	(1)
6.3	Write down the value of a.	(1)
6.4	Calculate the value of k, the y-coordinate of N and Q, **without the use of a calculator**.	(2)
6.5	Calculate the value of x if $g(x+60°)=f(x+60°)$ and $x\in[-45°\,;0°]$.	(1)
6.6	**Without using a calculator**, determine the number of solutions the equation $\sqrt{2}\sin 2x=\sin x+\cos x$ has in the interval $x\in[-90°\,;90°]$. Clearly show ALL working.	(4)
		[10]

17. Range, period, and where 2 cos x + 1 meets sin 2x

DBE NSC Paper 2 · May/June 2025 · Q7 · 10 marks

QUESTION 7

In the diagram, the graphs of $f(x) = 2\cos x + 1$ and $g(x) = \sin 2x$ are drawn for the interval $x \in [-180°; 180°]$.



7.1 Write down the range of f. (1)

7.2 Write down the period of g. (1)

7.3 For which values of x, in the interval $x \in [-180°; 180°]$, is f increasing? (1)

7.4 Use the graphs to determine the values of x, in the interval $x \in [-180°; 180°]$, for which:

7.4.1 $g(x) . f'(x) < 0$ (2)

7.4.2 $\cos x \leq -\frac{1}{2}$ (3)

7.5 Graph g is shifted $45°$ to the right to obtain a new graph h. Determine the equation of h in its simplest form. (2)

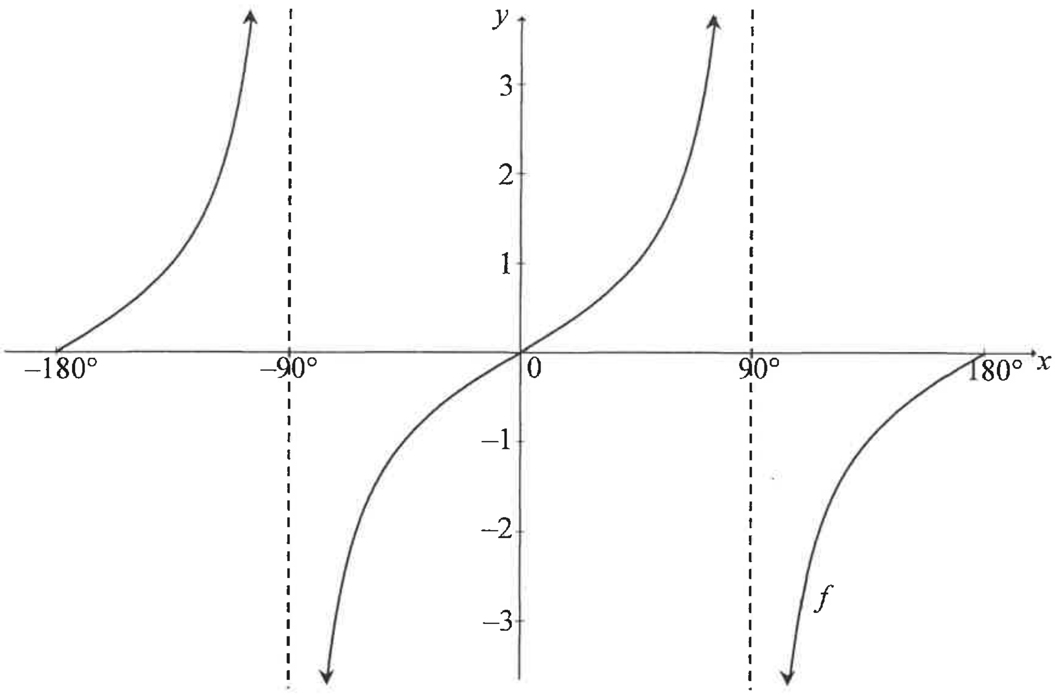
[10]

18. The asymptote of tan x, and reading the graph around it

DBE NSC Paper 2 · November 2024 · Q7 · 11 marks

QUESTION 7

In the diagram below, the graph of $f(x) = \tan x$ is drawn for the interval $x \in [-180° ; 180°]$.



7.1 Write down the equation of the asymptote of f in the interval $x \in [0° ; 180°]$. (1)

7.2 Write down the values of x in the interval $x \in [-180° ; 0°]$ for which $f(x) \leq 0$. (2)

7.3 Given: $g(x) = \cos 2x + 1$

7.3.1 Write down the period of g. (1)

7.3.2 On the grid given in the ANSWER BOOK, draw the graph of $g(x) = \cos 2x + 1$ for the interval $x \in [-180° ; 180°]$. Clearly show the intercepts with the axes as well as the coordinates of the turning points. (3)

7.4 Use the graphs to determine the general solution of $2\cos^3 x - \sin x = 0$. (4)

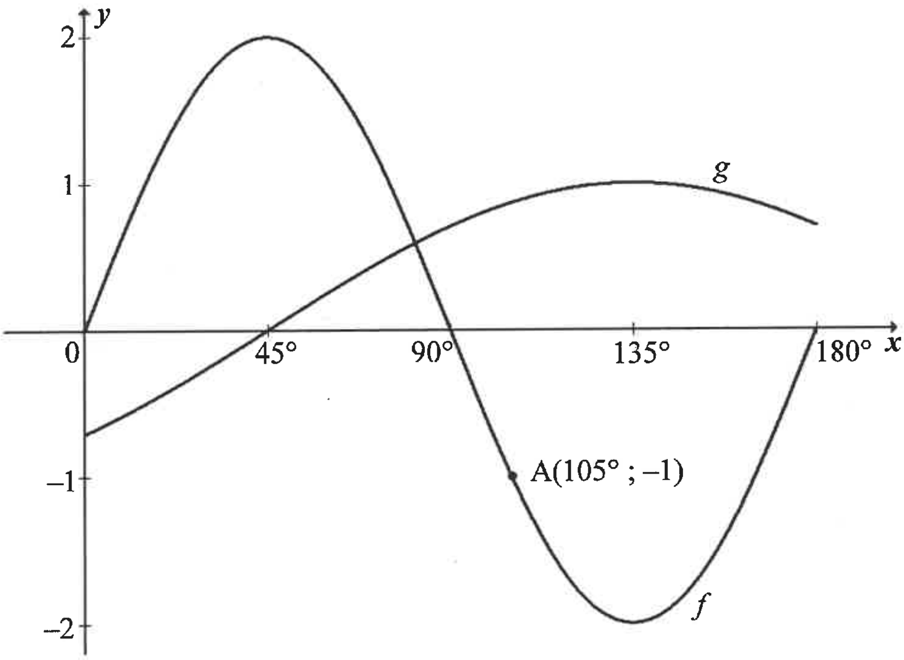
[11]

19. Period, amplitude, and a point that lies on f

DBE NSC Paper 2 · November 2023 · Q6 · 12 marks

QUESTION 6

In the diagram, the graphs of $f(x)=2\sin 2x$ and $g(x)=-\cos(x+45°)$ are drawn for the interval $x\in[0°\,;180°]$. A(105° ; –1) lies on f.



6.1 Write down the period of f. (1)

6.2 Determine the range of g in the interval $x \in [0°\,;180°]$. (2)

6.3 Determine the values of x, in the interval $x \in [0°\,;180°]$, for which:

6.3.1 $f(x).g(x)>0$ (2)

6.3.2 $f(x)+1\le 0$ (2)

6.4 Another graph p is defined as $p(x)=-f(x)$. D(k ; –1) lies on p. Determine the value(s) of k in the interval $x \in [0°\,;180°]$. (3)

6.5 Graph h is obtained when g is translated 45° to the left. Determine the equation of h. Write your answer in its simplest form. (2)

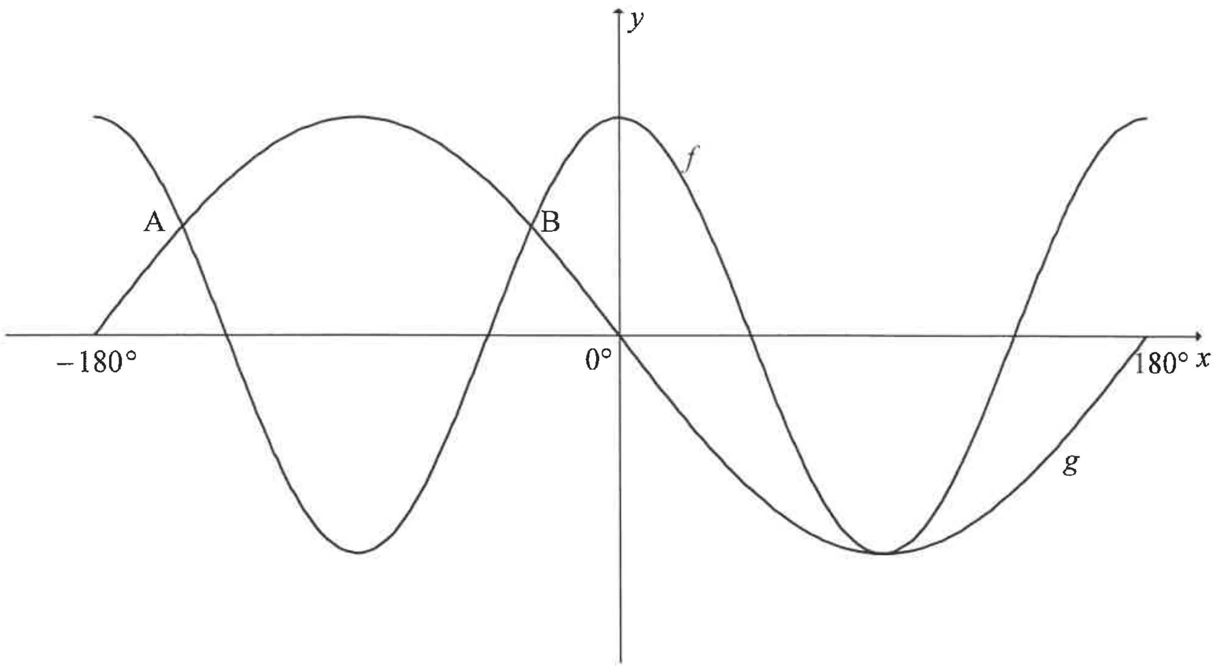
[12]

20. cos 2x against minus sin x, without a calculator

DBE NSC Paper 2 · May/June 2021 · Q6 · 13 marks

QUESTION 6

In the diagram below, the graphs of $f(x)=\cos 2x$ and $g(x)=-\sin x$ are drawn for the interval $x \in [-180°\ ;\ 180°]$ A and B are two points of intersection of f and g.



6.1 **Without using a calculator**, determine the values of x for which $\cos 2x = -\sin x$ in the interval $x \in [-180°\ ;\ 180°]$. (6)

6.2 Use the graphs above to answer the following questions:

6.2.1 How many degrees apart are points A and B from each other? (2)

6.2.2 For which values of x in the given interval will $f'(x).g'(x) > 0$? (2)

6.2.3 Determine the values of k for which $\cos 2x + 3 = k$ will have no solution. (3)

[13]

Two and three dimensions: the sine, cosine and area rules

A diagram with a height, a distance, and angles of elevation or depression - a flagpole, a ramp, a tower, a hook on a ceiling. Choose the sine rule, the cosine rule or the area rule, and the answer usually has to be left in terms of the letters given rather than as a number.

8 questions · 72 marks

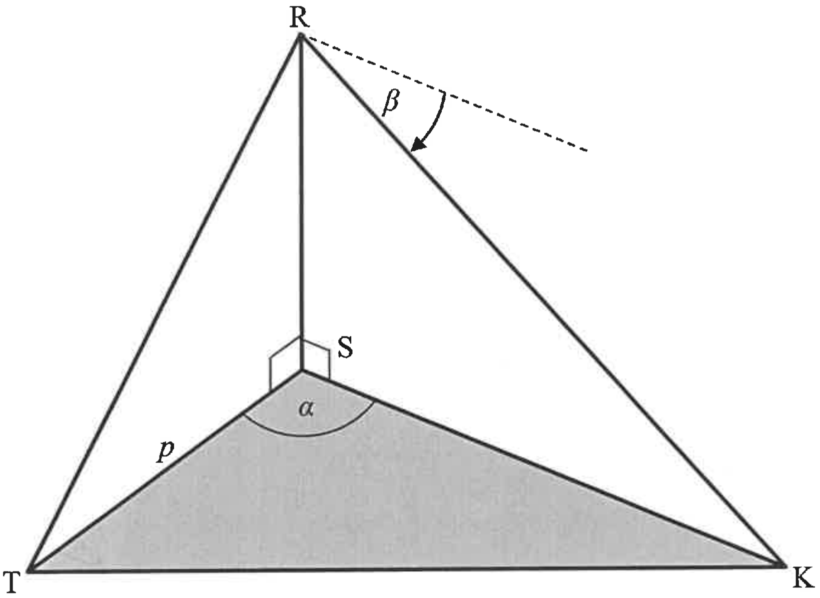
7 to 11 marks each

21. A vertical tower, an angle of depression, and an area q

DBE NSC Paper 2 · November 2023 · Q7 · 7 marks

QUESTION 7

In the diagram, S, T and K lie in the same horizontal plane. RS is a vertical tower. The angle of depression from R to K is β. $T\hat{S}K = \alpha$, TS = p metres and the area of ΔSTK is q m^2.



7.1 Determine the length of SK in terms of p, q and α. (2)

7.2 Show that $RS = \dfrac{2q\tan\beta}{p\sin\alpha}$ (2)

7.3 Calculate the size of α if $\alpha < 90°$ and RS = 70 m, $p = 80$ m, $q = 2\ 500$ m^2 and $\beta = 42°$. (3)

[7]

22. A ramp into a building: its height, its angle and its length

DBE NSC Paper 2 · May/June 2022 · Q8 · 8 marks

QUESTION 8

FIGURE I shows a ramp leading to the entrance of a building. B, C and D lie on the same horizontal plane. The perpendicular height (AC) of the ramp is 0,5 m and the angle of elevation from B to A is 15°. The entrance of the building (AE) is 0,915 m wide.

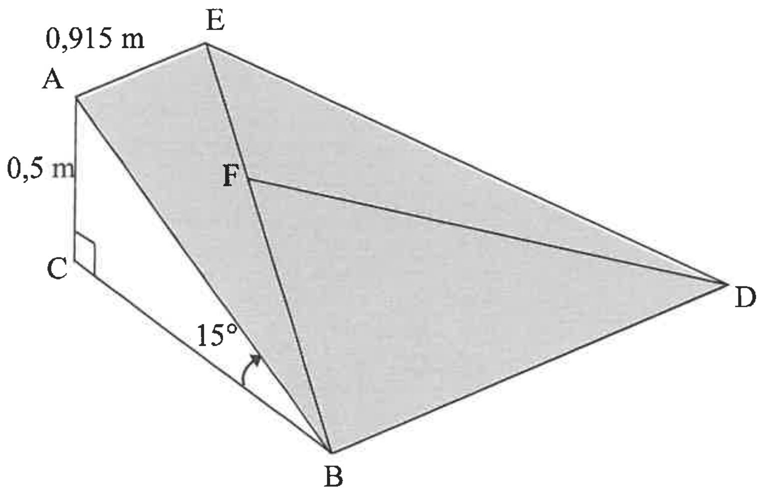


FIGURE I

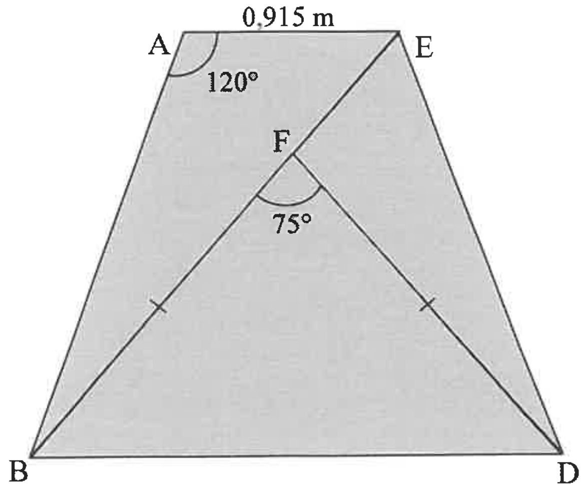


FIGURE II (top view)

8.1 Calculate the length of AB. (2)

8.2 Figure II shows the top view of the ramp. The area of the top of the ramp is divided into three triangles, as shown in the diagram.

If $B\hat{A}E = 120°$, calculate the length of BE. (3)

8.3 Calculate the area of ΔBFD if $B\hat{F}D = 75°$, $BF = FD$ and $BF = \frac{5}{7}BE$. (3)

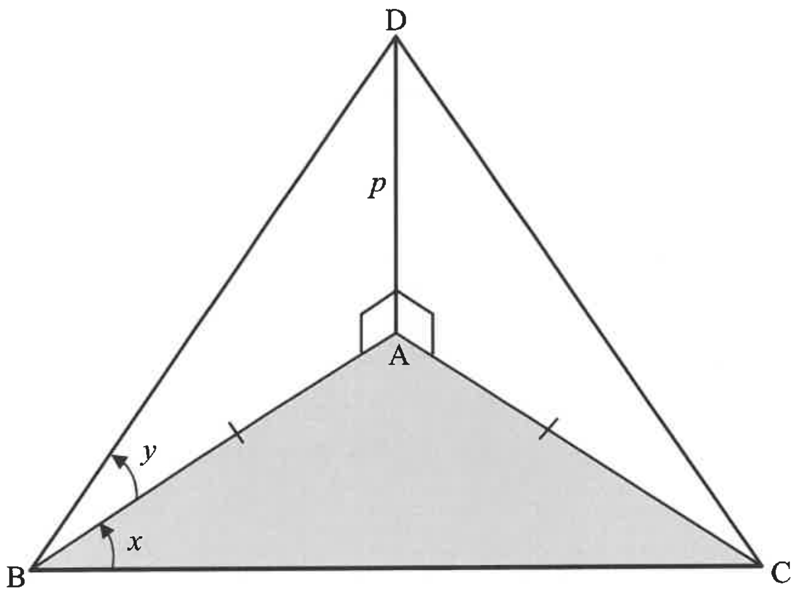
[8]

23. A point directly above a triangle, with 2AD = BC

DBE NSC Paper 2 · May/June 2025 · Q8 · 8 marks

QUESTION 8

In the diagram, A, B and C lie in the same horizontal plane with AB = AC. D is directly above A such that 2AD = BC. Also, $AD = p$, $A\hat{B}C = x$ and $D\hat{B}A = y$.



8.1	Determine AB in terms of p and y.	(2)
8.2	Show that $\cos x = \tan y$.	(4)
8.3	If $x = 60°$, calculate the size of y.	(2) **[8]**

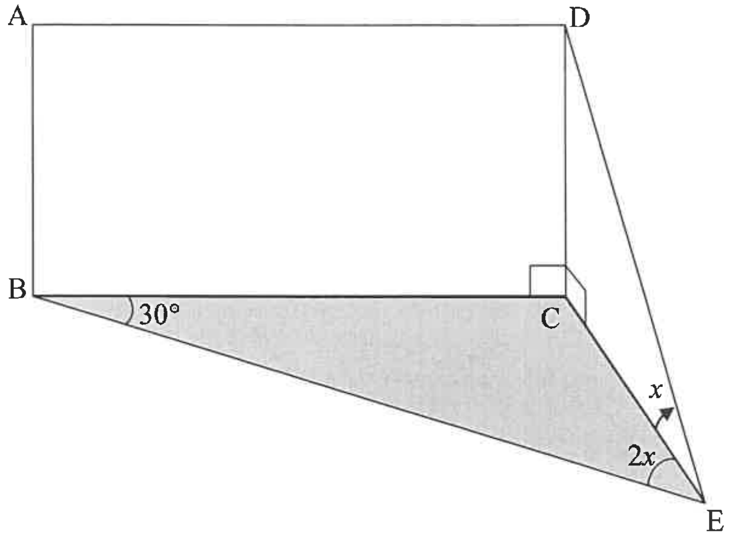
Provide reasons for your statements in QUESTIONS 9 and 10.

24. Two boards meeting at right angles

DBE NSC Paper 2 · May/June 2021 · Q7 · 9 marks

QUESTION 7

Points B, C and E lie in the same horizontal plane. ABCD is a rectangular piece of board. CDE is a triangular piece of board having a right angle at C. Each piece of board is placed perpendicular to the horizontal plane and joined along DC, as shown in the diagram. The angle of elevation from E to D is x. $B\hat{E}C = 2x$ and $E\hat{B}C = 30°$.



7.1 Show that $DC = \dfrac{BC}{4\cos^2 x}$ (6)

7.2 If $x = 30°$, show that the area of $ABCD = 3AB^2$. (3)

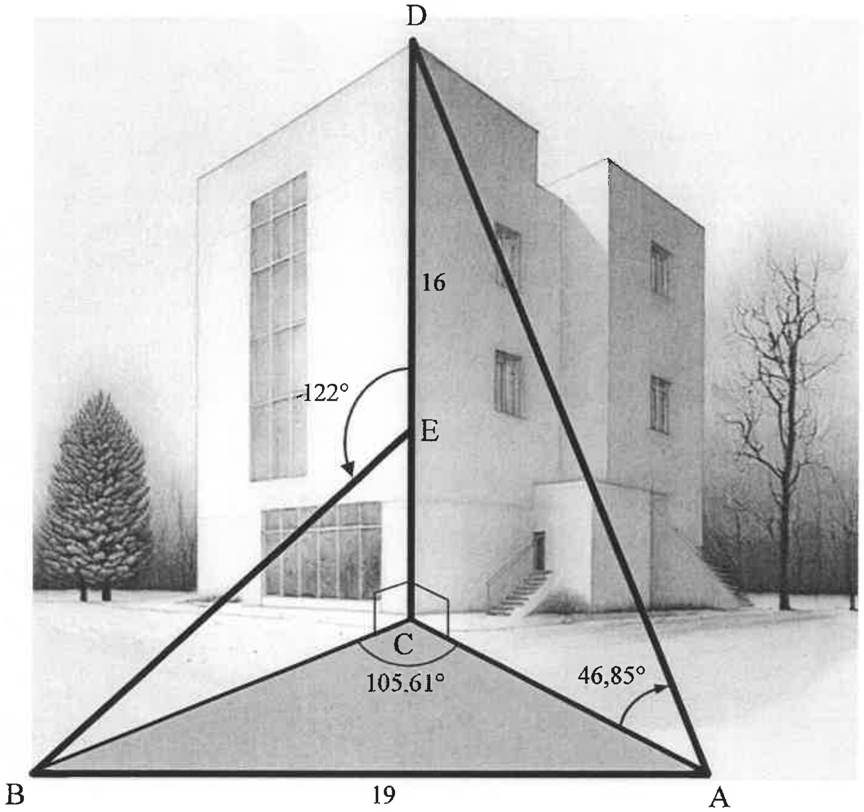
[9]

25. Two observers 19 m apart, and a building 16 m high

DBE NSC Paper 2 · November 2024 · Q8 · 9 marks

QUESTION 8

In the diagram, C is the foot of a vertical building and D is the top of the same building. The height of the building, CD, is 16 m. Two observers are standing 19 m apart at points A and B, where A, B and C lie in the same horizontal plane. A painter is working at point E on the building. The angle of elevation of D from A is 46,85°. $D\hat{E}B = 122°$ and $B\hat{C}A = 105,61°$.



8.1 Calculate the length of AC, the distance between the observer at A and the foot of the building. (2)

8.2 Calculate how far the painter at E is from the top of the building. (7)

[9]

Provide reasons for your statements in QUESTIONS 9, 10 and 11.

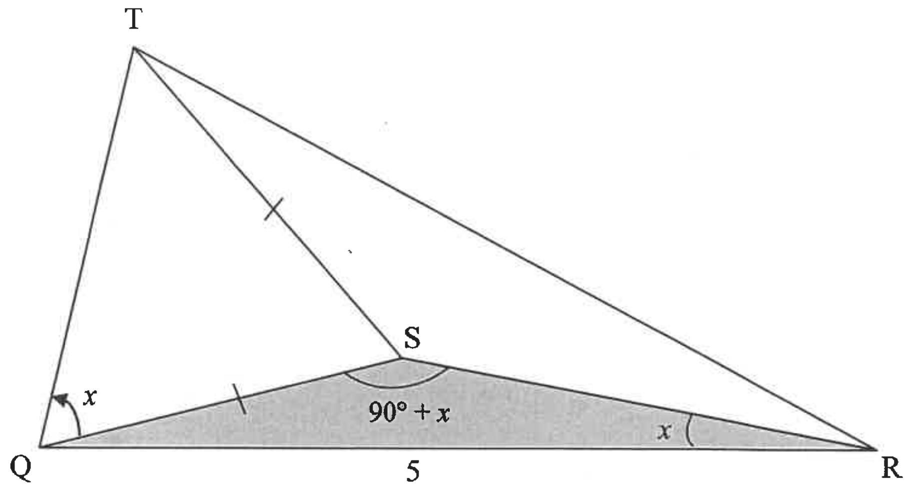
26. A hook on a gallery ceiling, seen from three points

DBE NSC Paper 2 · November 2021 · Q8 · 10 marks

QUESTION 8

In the diagram below, T is a hook on the ceiling of an art gallery. Points Q, S and R are on the same horizontal plane from where three people are observing the hook T. The angle of elevation from Q to T is x.

$Q\hat{S}R = 90° + x$, $Q\hat{R}S = x$, QR = 5 units and TS = SQ.



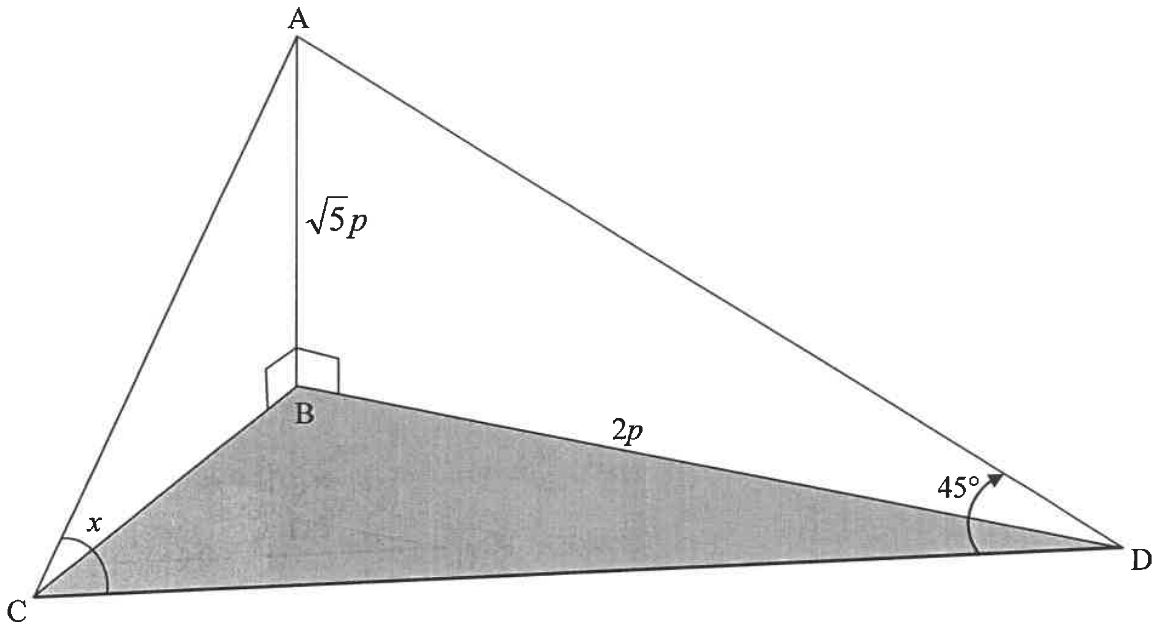
8.1	Prove that $QS = 5 \tan x$	(3)
8.2	Prove that the length of $QT = 10 \sin x$	(5)
8.3	Calculate the area of ΔTQR if $T\hat{Q}R = 70°$ and $x = 25°$.	(2)
		[10]

27. A flagpole and the two cables anchoring it

DBE NSC Paper 2 · November 2022 · Q7 · 10 marks

QUESTION 7

AB is a vertical flagpole that is $\sqrt{5}p$ metres long. AC and AD are two cables anchoring the flagpole. B, C and D are in the same horizontal plane.
BD $= 2p$ metres, $A\hat{C}D = x$ and $A\hat{D}C = 45°$.



7.1 Determine the length of AD in terms of p. (2)

7.2 Show that the length of $CD = \dfrac{3p(\sin x + \cos x)}{\sqrt{2}\sin x}$. (5)

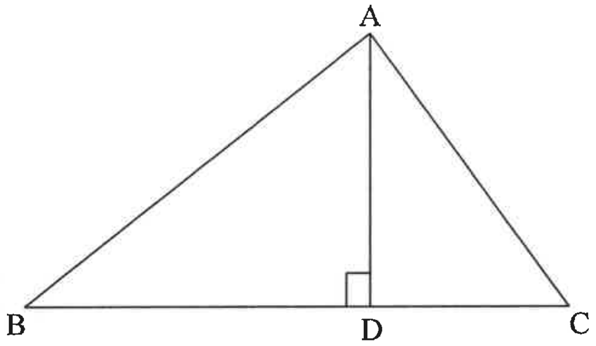
7.3 If it is further given that $p = 10$ and $x = 110°$, calculate the area of ΔADC. (3)
[10]

28. Derive the area rule, then put it to work

DBE NSC Paper 2 · May/June 2024 · Q7 · 11 marks

QUESTION 7

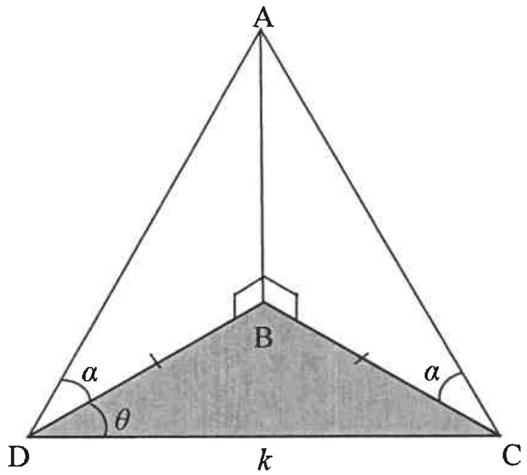
7.1 In the diagram, ΔABC is drawn. AD is drawn such that $AD \perp BC$.



7.1.1 Use the diagram above to determine AD in terms of $\sin \hat{B}$ (2)

7.1.2 Hence, prove that the area of $\Delta ABC = \frac{1}{2}(BC)(AB)\sin \hat{B}$ (1)

7.2 In the diagram, points B, C and D lie in the same horizontal plane. $A\hat{D}B = A\hat{C}B = \alpha$, $C\hat{D}B = \theta$ and $DC = k$ units. $BD = BC$.



7.2.1 Prove that $AD = AC$ (2)

7.2.2 Prove that $BD = \dfrac{k}{2\cos\theta}$ (3)

7.2.3 Determine the area of ΔBCD in terms of k and a single trigonometric ratio of θ. (3)

[11]

Index by paper

Every trigonometry question in each paper, and where it sits in this booklet.

Index by topic

A question appears under every topic it uses, so it can be found even when it is filed in another chapter.

Angles of elevation and depression — 4 questions

Where these came from

So that "every trigonometry question" is a claim you can check.

Eight DBE NSC Mathematics Paper 2 papers were read end to end:
November 2021, 2022, 2023, 2024 and May/June 2021, 2022, 2024, 2025.

All 338 questions in them were classified. These papers are scans - they carry no text layer at all - so the structure was rebuilt by reading them with OCR, and then checked three ways: every paper adds back up to exactly 150, the Afrikaans paper matches the English question for question, and the official marking guideline, which IS ordinary text, agrees with the marks read off every question.

DBE publishes an official marking guideline for every one of these papers. The companion file "CAPS_P2_Trigonometry_Solutions.pdf" carries the guideline for each question here, in the same order and under the same numbers.