



Education
KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS

COMMON TEST

SEPTEMBER 2016

**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

MARKS: 75

TIME: 1½ hours

This question paper consists of 7 pages.

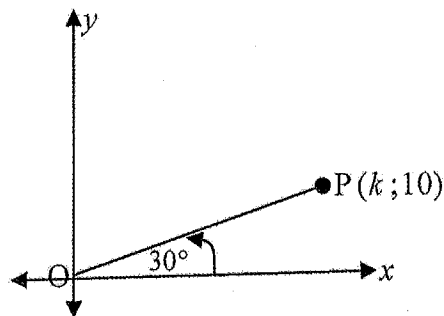
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This question paper consists of 6 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera, which you have used in determining the answers.
4. Answers only will not necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. Write neatly and legibly.

QUESTION 1

- 1.1 Determine, **without using a calculator**, the value of $\sqrt{2} \cos 45^\circ + \tan 30^\circ \cdot \operatorname{cosec} 60^\circ$. (4)
- 1.2 If $4 \tan \theta + 3 = 0$ and $\theta \in [90^\circ ; 270^\circ]$, determine with the aid of a diagram, and **without the use of a calculator**, the value of:
- 1.2.1 $\cos \theta$ (4)
- 1.2.2 $1 - \sin^2 \theta$ (3)
- 1.3 Use a calculator to solve for θ , where $2\theta \in [0^\circ ; 90^\circ]$:
 $\sin 2\theta + 5 = 5,83$ (3)
- 1.4 In the diagram below, $\hat{POX} = 30^\circ$. The coordinates of P are $(k ; 10)$.

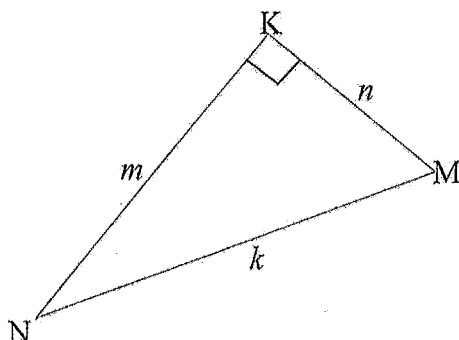


- 1.4.1 Write down the value of $\sin 30^\circ$. (1)
- 1.4.2 Hence, determine the length of OP. (1)
- 1.4.3 Calculate the value of k . (2)

[18]

QUESTION 2

2.1 In the diagram below, KMN is a right-angled triangle.



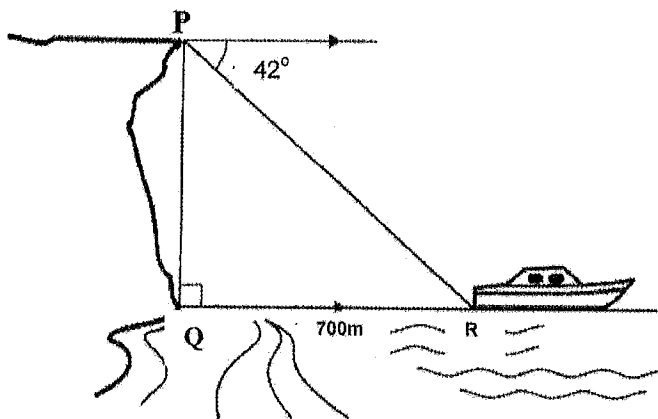
Use the diagram to complete the following trigonometric ratios:

2.1.1 $\cos N = \frac{\dots}{\dots}$ (1)

2.1.2 $\sec M = \frac{\dots}{\dots}$ (1)

2.1.3 $\dots = \frac{m}{n}$ (1)

2.2 In the diagram below, the angle of depression from the top of a cliff to a boat R at sea, in the same horizontal plane as Q, is 42° . The boat is 700m away from the foot of the cliff Q.



Calculate the height of the cliff, PQ, to the nearest metre.

(4)
[7]

QUESTION 3

- 3.1 Draw the graphs $f(x) = -2\sin x$ and $g(x) = \cos x - 2$ for $x \in [0^\circ; 360^\circ]$ on the same set of axes in your answer book. Indicate clearly the turning points and the intercepts with the axes. (6)

Use the graphs to answer the following questions for $x \in [0^\circ; 360^\circ]$:

- 3.2 Write down the range of g . (2)
- 3.3 Write down the amplitude of f . (1)
- 3.4 If the graph of f is reflected in the x -axis to form the graph of h , write down the equation of h . (1)

[10]

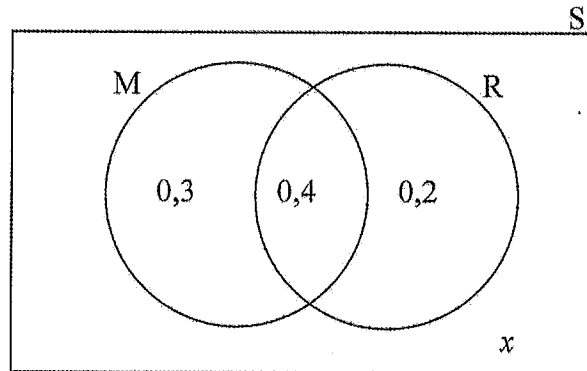
QUESTION 4

- 4.1 Ryan buys a double bed which costs R10 500 on hire purchase. He is charged a simple interest rate of 22,3% p.a. over five years.
- 4.1.1 Calculate the total amount that he will pay for the bed. (3)
- 4.1.2 How much interest will he pay over this period? (1)
- 4.1.3 Calculate his monthly instalment. (2)
- 4.2 The price of a loaf of white bread is currently R14 and the average annual inflation rate for South Africa over the past 15 years is estimated at 5,32%. Calculate what a loaf of white bread, made by the same baking company, cost 15 years ago. (4)

[10]

QUESTION 5

- 5.1 The probability that John will see a movie during the holidays is 0,7. The probability that he will go to a restaurant is 0,6. The probability of him seeing a movie and going to a restaurant is 0,4. The probabilities are represented in the Venn diagram below.



Use the Venn diagram to determine the probability that:

- 5.1.1 he doesn't go to a movie or a restaurant. (2)
- 5.1.2 he only goes to a movie. (1)
- 5.1.3 he doesn't go to a restaurant. (1)
- 5.1.4 he goes to a movie or a restaurant. (1)
- 5.2 Customers at a supermarket were asked if they had bought milk, meat or both. 150 were questioned and the answers were:
- 125 bought milk
 - 85 bought meat
 - 70 bought both meat and milk

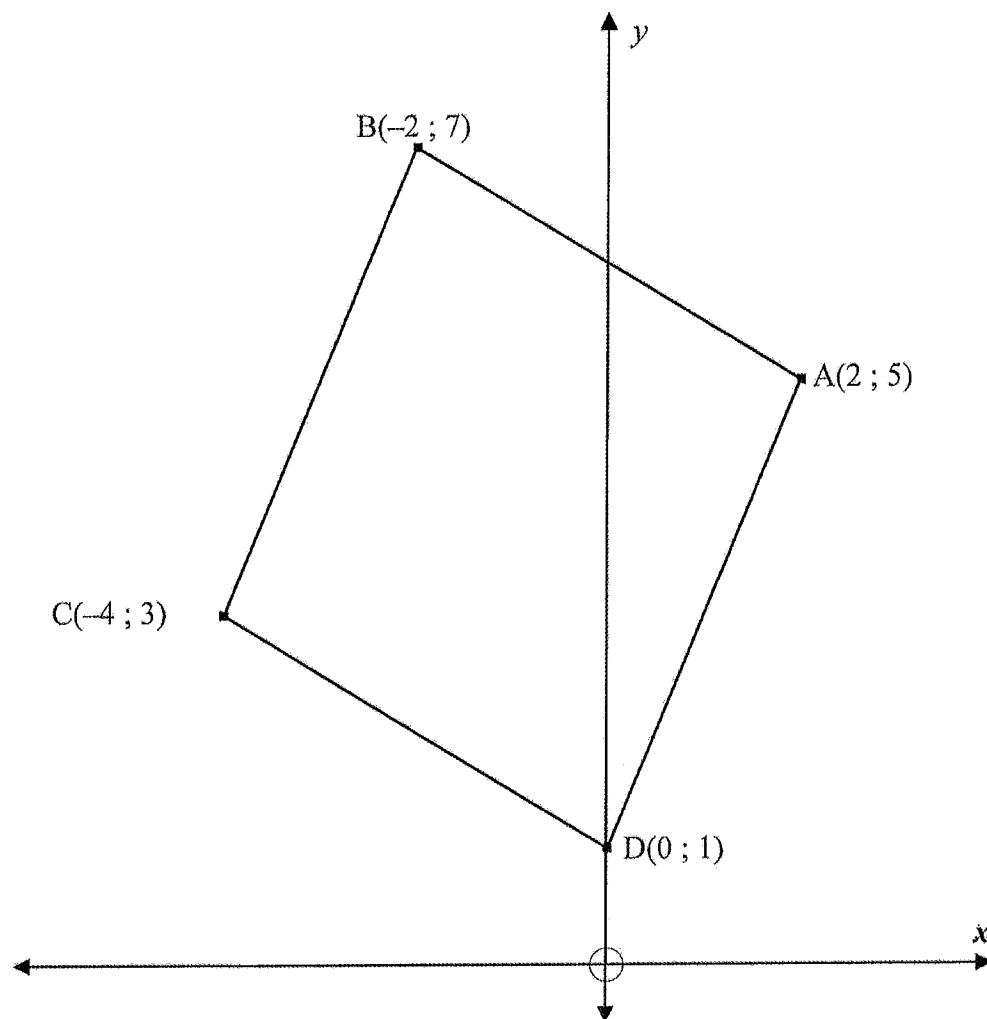
- 5.2.1 Represent this information in a Venn diagram. Let the event that the customer bought milk be A, and the event that the customer bought meat be B. (4)

Use the Venn Diagram to calculate the probability that a randomly chosen customer bought:

- 5.2.2 either meat or milk? (2)
- 5.2.3 meat only? (2)
- 5.2.4 neither meat nor milk? (2)
- [15]**

QUESTION 6

In the diagram below $A(2 ; 5)$, $B(-2 ; 7)$ and $C(-4 ; 3)$ and $D(0 ; 1)$ are the vertices of a quadrilateral.



- 6.1 Calculate the length of BD. (3)
- 6.2 Show that $AC = BD$. (2)
- 6.3 Show that the coordinates of M, the midpoint of BD, are $(-1 ; 4)$. (2)
- 6.4 Calculate the gradient of AM. (3)
- 6.5 Prove that $AM \perp BD$. (3)
- 6.6 Write down, giving a reason, what type of quadrilateral ABCD is. (2)

[15]**TOTAL: 75**





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QUESTION 1

1.1	$\sqrt{2} \cos 45^\circ + \tan 30^\circ \cdot \operatorname{cosec} 60^\circ$ $= \sqrt{2} \left(\frac{1}{\sqrt{2}} \right) + \frac{1}{\sqrt{3}} \cdot \frac{2}{\sqrt{3}}$ $= \frac{2}{3} + \frac{2}{3}$	<p>A A A</p> <p>✓✓ for each special angle value (must be these values as NO calculator to be used)</p> <p>✓ answer CA</p> <p>Answer only: no marks</p>	(4)
1.2.1	$4 \tan \theta + 3 = 0$ $\tan \theta = -\frac{3}{4}$ <p>(-4; 3)</p> $r^2 = (-4)^2 + (3)^2$ $r^2 = 25$ $r = 5$ $\cos \theta = -\frac{4}{5}$	<p>A</p> <p>✓ diagram in quadrant 2</p> <p>CA</p> <p>✓ r-value</p> <p>CA</p> <p>✓ answer</p>	(4)
1.2.2	$1 - \sin^2 \theta$ $= 1 - \left(\frac{3}{5} \right)^2$ $= \frac{25}{25} - \frac{9}{25}$ $= \frac{16}{25}$	<p>CA</p> <p>✓ simplification</p> <p>CA</p> <p>✓ answer</p>	(3)
1.3	$\sin 2\theta + 5 = 5,83$ $\sin 2\theta = 0,83$ $2\theta = 56,10^\circ$ $\theta = 28,05^\circ$	<p>A</p> <p>✓ subtraction</p> <p>✓ $2\theta = 56,10^\circ$ CA</p> <p>✓ answer CA</p>	(3)
1.4.1	$\frac{1}{2}$	<p>✓ answer A</p>	(1)
1.4.2	$\sin 30^\circ = \frac{10}{OP}$ $OP = 20 \text{ units}$	<p>A</p> <p>✓ answer</p>	(1)
1.4.3	$k^2 = (20)^2 - (10)^2$ $k = \sqrt{300} \text{ or } k = 17,32 \text{ or } 10\sqrt{3}$	<p>✓ using Pythagoras CA</p> <p>✓ answer CA</p>	(2)
			[18]

QUESTION 2

2.1.1	m	✓ answer A	(1)	
2.1.2	k	✓ answer A	(1)	
2.1.3	$\frac{k}{m}$	✓ answer A	(1)	
2.2	$\text{PRQ} = 42^\circ$ (parallel lines \therefore alt. \angle s \rightarrow) $\frac{PQ}{700} = \tan 42^\circ$ $PQ = 700 \tan 42^\circ$ $\therefore PQ = 630,28 \text{ m}$	$\text{OR} //$ $\tan 48^\circ = \frac{700}{h}$ $h = \frac{700}{\tan 48^\circ}$ $h = 630,28$	✓ $\text{PRQ} = 42^\circ$ A ✓ correct trigonometric ratio A ✓ simplification CA ✓ answer CA	(4)

QUESTION 3

3.1		$f(x) = -2 \sin x$ ✓ y-intercept (0; 0) ✓ x-intercepts ✓ turning points $g(x) = \cos x - 2$ ✓ y-intercept (0; -1) ✓ turning point ✓ shape	(6)
3.2	Range of g is $-3 \leq y \leq -1$ OR $y \in [-3; -1]$	✓ answer CA CA	(2)
3.3	Amplitude of f : 2	✓ answer A	(1)
3.4	$h(x) = 2 \sin x$	✓ answer A	(1)

[10]

QUESTION 4

4.1.1	$A = P(1 + in)$ $A = 10500(1 + 0,223(5))$ Total = R22 207,50	✓ correct formula A ✓ $10500(1 + 0,223(5))$ A ✓ answer CA	(3)	
4.1.2	Interest = R22 207,50 - R10 500 = R11 707,50	✓ answer CA	(1)	
4.1.3	Monthly instalments = $\frac{22207,50}{5 \times 12}$ = R370,13	✓ Total CA ✓ $\frac{22207,50}{5 \times 12}$ CA ✓ answer CA	(2)	
4.2	$A = P(1 + i)^n$ $14 = P(1 + 0,0532)^{15}$ $P = \frac{14}{(1 + 0,0532)^{15}}$ If cost R6,43	OR $A = P(1 + i)^n$ $= 14(1 + 0,0532)^{15}$ $= R6,43$	✓ correct formula A ✓ substitution A ✓ simplification CA ✓ answer CA	(4)

[10]

QUESTION 5

5.1.1	P(he doesn't go to a movie or a restaurant) = $1 - (0,3 + 0,4 + 0,2) = 0,1$	✓ $1 - (0,3 + 0,4 + 0,2)$ ✓ answer A Answer only: full marks (2)	A
5.1.2	P(he only goes to a movie) = 0,3	✓ answer A	(1)
5.1.3	P(he doesn't go to a restaurant) = 0,4	✓ answer A	(1)
5.1.4	P(he goes to a movie or a restaurant) = 0,9	✓ answer A	(1)
5.2.1		✓ 55 A ✓ 70 A ✓ 15 A ✓ 10 A	(4)
5.2.2	P(bought either meat or milk) = $\frac{55 + 70 + 15}{150} = \frac{14}{15}$ or 0,93	✓ numerator: 140 A ✓ answer CA	(2)
5.2.3	P(bought meat only) = $\frac{15}{150} = \frac{1}{10}$ or 0,1	✓ numerator: 15 A ✓ answer CA	(2)
5.2.4	P(bought neither meat nor milk) = $\frac{10}{150} = \frac{1}{15}$ or 0,07	✓ numerator: 10 A ✓ answer CA	(2)
			[15]

QUESTION 6

6.1	$BD = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(-2 - 0)^2 + (7 - 1)^2}$ $= \sqrt{40}$ $= 6,32 \quad / \quad 2 \sqrt{10}$	✓ distance formula A ✓ substitute into distance formula A ✓ answer CA	(3)
6.2	$AC = \sqrt{(2+4)^2 + (5-3)^2}$ $= \sqrt{40}$ $= 6,32 \quad / \quad 2 \sqrt{10}$ $\therefore AC = BD = 6,32$	✓ substitute into distance formula A ✓ answer CA	(2)
6.3	$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ $M\left(\frac{-2 + 0}{2}, \frac{7 + 1}{2}\right)$ $M(-1; 4)$	✓ midpoint formula A ✓ substitution into midpoint formula A	(2)
6.4	$m_{AM} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{5 - 4}{2 + 1}$ $= \frac{1}{3}$	✓ gradient formula A ✓ substitution into gradient formula A ✓ answer CA	(3)
6.5	$m_{BD} = \frac{7 - 1}{-2 - 0}$ $= -3$ $m_{AM} \times m_{BD} = \frac{1}{3} \times -3$ $= -1$ $\therefore \text{AML} \perp \text{BD}$	✓ substitution into gradient formula A ✓ $m_{BD} = -3$ CA ✓ product of gradients = -1 CA	(3)
6.6	Square The diagonals are equal and bisect at 90°	✓ answer A ✓ reason A	(2)
			[15]

20
 rhombus, diagonals bisect at 90°
 (if learners didn't kst for equal diagonals)

11/11/11

C

C