Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS

COMMON TEST

SEPTEMBER 2017

NATIONAL SENIOR CERTIFICATE

GRADE 10

MARKS: 75

TIME: 1½ hours

This question paper consists of 7 pages.

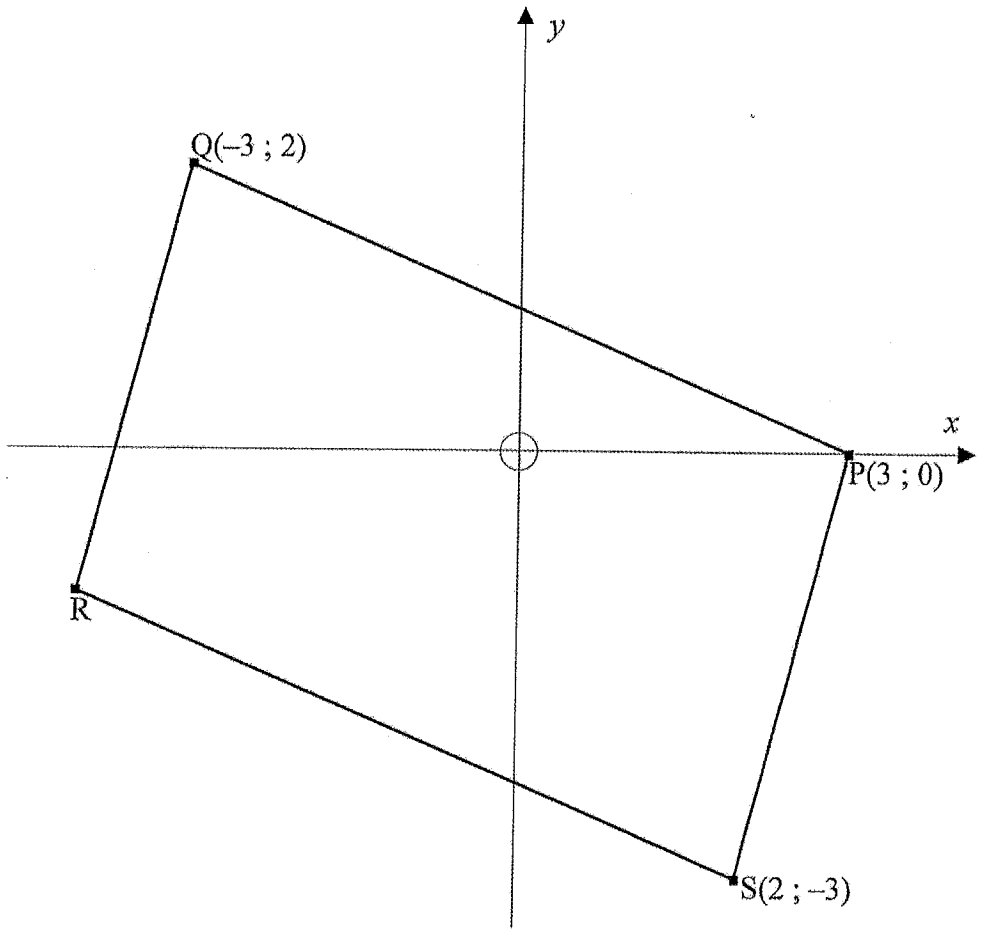
INSTRUCTIONS AND INFORMATION

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

In the diagram below P(3 ; 0), Q(–3 ; 2), R and S(2 ; –3) are four points in the Cartesian plane.



1.1 Calculate the gradient of PQ. (2)

1.2 Determine the equation of line RS which is parallel to line PQ. (4)

1.3 Determine the equation of a line that is perpendicular to line RS and passes through the point (0 ; –2). (2)

1.4 Calculate the length of PS. Leave your answer in surd form. (2)

1.5 Prove that QP ⊥ PS. (3)

1.6 Determine the co-ordinates of R if PQRS is a rectangle. (2)

[15]

QUESTION 2

31 students wrote a Grade 10 History test that was out of 60 marks.
Their marks are recorded in the stem and leaf diagram below.

1	2 3 4 5 6 6 7
2	0 0 1 2
3	0 1 2 5 7 9
4	4 6 8 9 9
5	0 2 2 6 6 8 8 8
6	0

2.1 Calculate the five number summary for the above data. (5)

2.2 Draw a box and whisker plot for the above data. (3)

2.3 Calculate the mean for the above data. (2)

2.4 What percentage of learners achieved a mark between 49 and 59? (2)
[12]

QUESTION 3

3.1 Brent Crude Oil cost $47,71 a barrel.

3.1.1 Calculate the cost in rand, of importing a barrel when the exchange rate is R13,39 to the dollar. (2)

3.1.2 If the rand weakens, will the cost of importing Brent crude oil increase or decrease? (1)

3.2 If the exchange rate is 1euro = R15,19 and 1 pound = R17,30 , determine the exchange rate between the euro and pound. (2)

3.3 R3 500 is invested and after 5 years there is R5 200 in the account. Interest is compounded annually. Determine the annual rate of interest, correct to two decimal places. (4)

3.4 Anne deposits R5 000 in an account and four years later she deposits R4 500 in the same account. If this account earns interest that is compounded annually at 9% p.a. for the first 3 years and 8% p.a. for the rest of the period, how much will Anne have in the account at the end of 10 years? (4)
[13]

QUESTION 4

4.1 Determine, **without using a calculator**, the value of $\frac{5}{\sqrt{3}}\sin 60°$. (2)

4.2 If $\theta = 33°$, use a calculator to determine the value of $2\sec\theta$. (2)

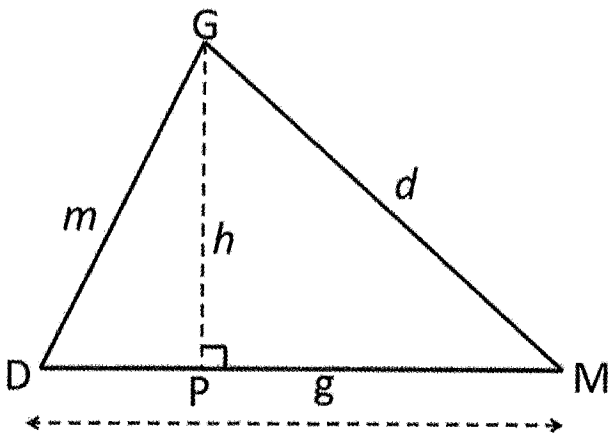
4.3 Use a calculator to solve for θ, where $\tan\frac{\theta}{2} = \frac{1}{\sqrt{3}}$ and $\theta \in [0° ; 90°]$. (2)

4.4 If $5\cos\theta = -3$ and $\theta \in [0° ; 180°]$, determine with the aid of a diagram, and **without the use of a calculator**, the value of $1 - \cot^2\theta$. (4)

[10]

QUESTION 5

5.1 In ΔGDM, GP = h units, GD = m units, GM = d units and DM = g units.

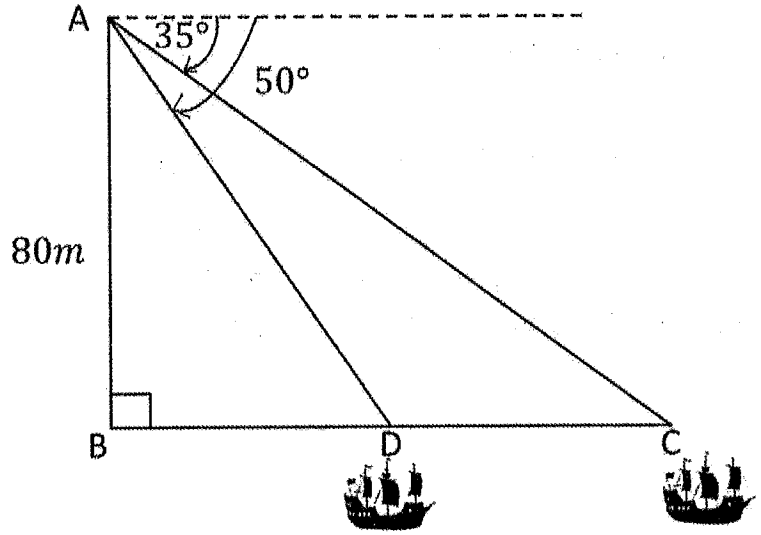


5.1.1 Determine sin D in terms of h and m. (1)

5.1.2 Determine sin M in terms of h and d. (1)

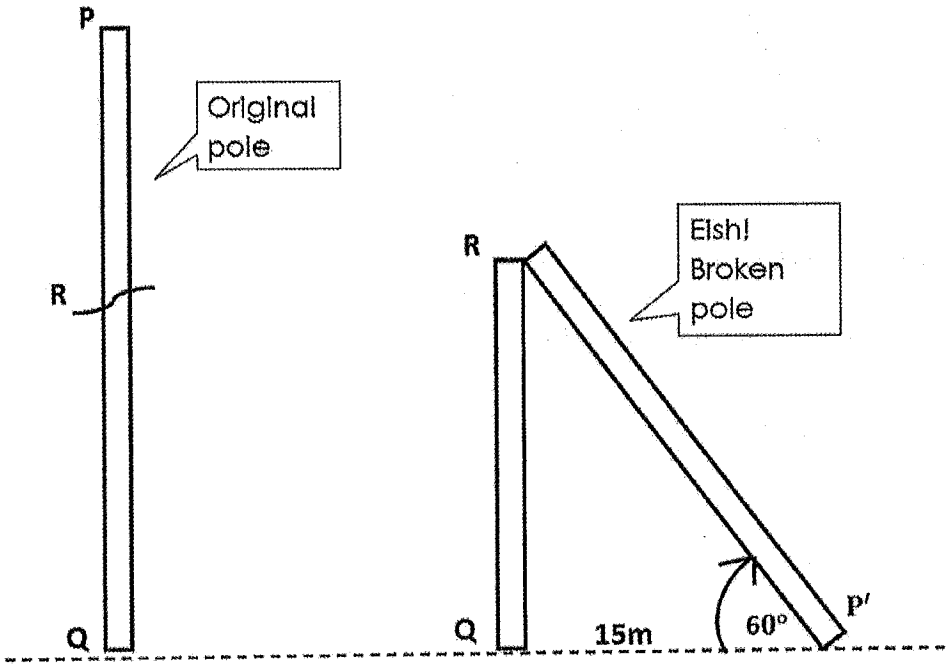
5.1.3 Hence, show that $\frac{\sin D}{d} = \frac{\sin M}{m}$. (3)

5.2 A sailor watching a pirate boat from a cliff notices that the angle of depression from the cliff to the boat changes from 35° to 50°. The height of the cliff is 80m.



Calculate the distance the pirate boat covered from point C to point D, while the sailor was watching it. (5)

5.3 A flag pole, PQ, broke at point R which resulted in the top portion of the pole, PR, forming an angle of 60° with the ground at P′, now 15 m away from Q, the foot of the pole.

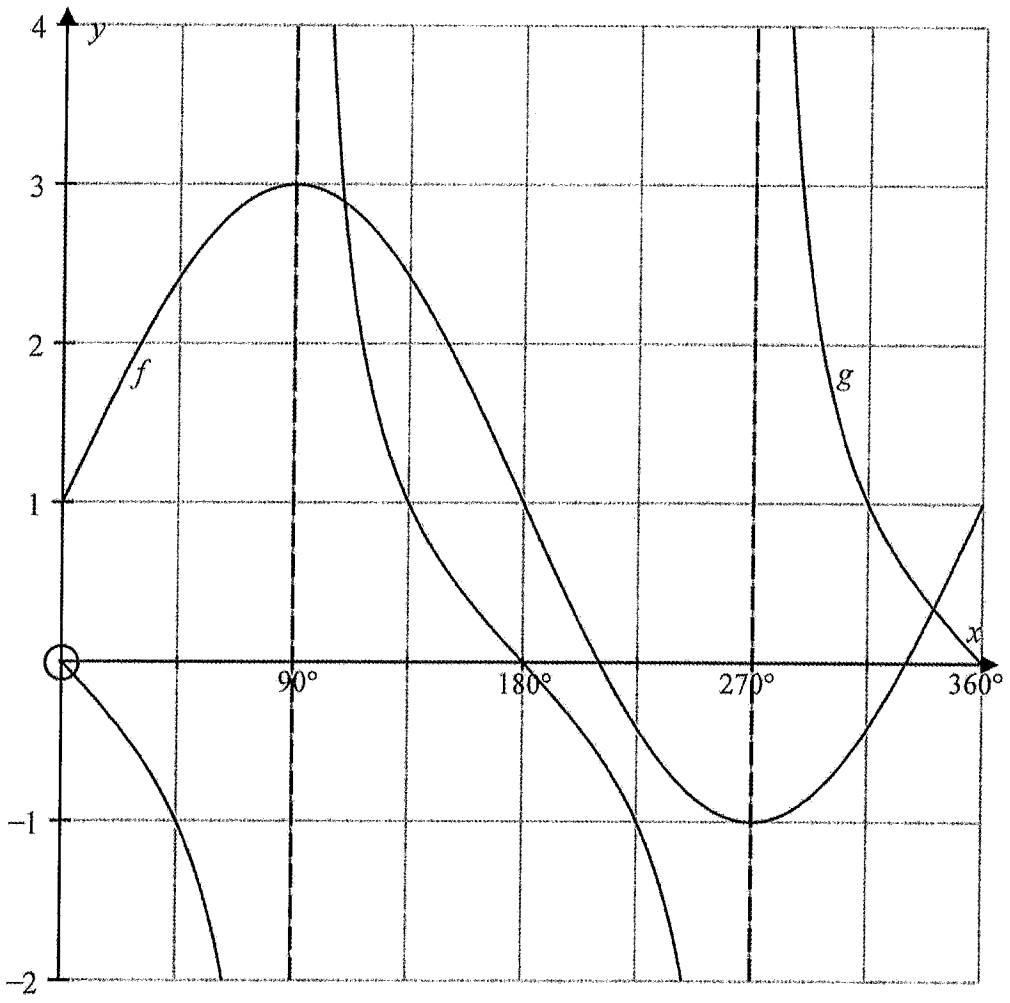


Calculate the original height, PQ, of the pole. (5)

[15]

QUESTION 6

The diagram below shows the graphs of $f(x) = a\sin x + b$ and $g(x) = c\tan x$ for $0° \leq x \leq 360°$.



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

6.1 Write down the values for a, b and c. (3)

6.2 Write down the range of f. (2)

6.3 Write down the period of g. (1)

6.4 Write down the equations of the asymptotes of g. (2)

6.5 For which values of x is the graph of f decreasing? (2)

[10]

TOTAL: 75

GR10 - MATH + MLIT

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MARKING GUIDELINE

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GRADE 10

MARKS: 75

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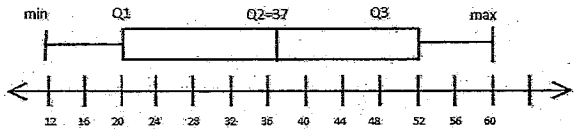
QUESTION 1

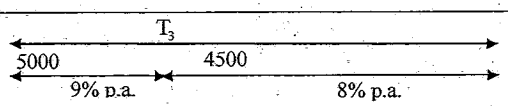
P(3 ; 0), Q(–3 ; 2), R and S(2 ; –3)

1.1	$m_{PQ}=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{2-0}{-3-3}$ $=-\frac{1}{3}$	✓ substitution into gradient formula ✓ answer (2)
1.2	$m_{RS}=m_{PQ}$ RS // PQ $y=-\frac{1}{3}x+c$ $-3=-\frac{1}{3}(2)+c$ $c=-2\frac{1}{3}$ $y=-\frac{1}{3}x-\frac{7}{3}$	✓= gradients ✓ subst. S(2 ; –3) ✓ value of c ✓ equation (4)
1.3	$m=-\frac{1}{m_{RS}}$ ⊥ lines $y=3x-2$	✓ value of m ✓ $c=-2$ (2)
1.4	$PS=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ $=\sqrt{(3-2)^2+(0-(-3))^2}$ $=\sqrt{10}$	✓ substitute into distance formula ✓answer (2)
1.5	$m_{PS}=\frac{-3-0}{2-3}$ $=3$ $m_{QP}\times m_{PS}=-\frac{1}{3}\times 3$ $=-1$ $\therefore QP \perp PS$	✓ substitution into gradient formula ✓ $m_{PS}=3$ ✓product of gradients = –1 (3)
1.6	M(–4 ; –1)	✓ $x=-4$ ✓ $y=-1$ (2)
		[15]

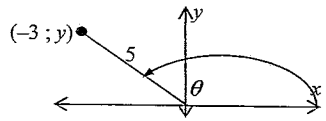
QUESTION 2

2.1	Minimum value = 12 Lower quartile, Q_1, = 20 Mean, Q_2, = 37 Upper quartile, Q_3, = 52 Maximum value = 60	✓ Minimum value = 12 ✓ Lower quartile, Q_1, = 20 ✓ Mean, Q_2, = 37 ✓ Upper quartile, Q_3, = 52 ✓ Maximum value = 60 (5)
2.2		✓ box: Q_1, Q_2 and Q_3 ✓ whisker: min and max values ✓ scale (3)
2.3	Mean $= \frac{1126}{31}$ $= 36{,}32$	✓ $\frac{1126}{31}$ ✓ answer (2)
2.4	Percentage $= \frac{8}{31} \times 100$ $= 25{,}81\%$	✓ $\frac{8}{31} \times 100$ ✓ answer (2)
		[12]

QUESTION 3

3.1.1	Cost = 47,71 × 13,39 = R638,84	✓multiplication ✓answer (2)
3.1.2	It will cost **more**	✓ answer (1)
3.2	Exchange rate $= \frac{1}{15{,}19} \times 17{,}30$ 1 pound = 1,14 euro **OR** Exchange rate $= \frac{1}{17{,}30} \times 15{,}19$ 1 euro = 0,88 pounds	✓ $\frac{1}{15{,}19} \times 17{,}30$ ✓ answer (2) ✓ $\frac{1}{17{,}30} \times 15{,}19$ ✓ answer (2)
3.3	$A = P(1+i)^n$ $5200 = 3500(1+i)^5$ $\sqrt[5]{\frac{52}{35}} - 1 = i$ $i = 0{,}082\ldots$ $r = 8{,}24\%$	✓subst. into correct formula ✓simplification ✓ i ✓answer (4)
3.4	 $A = 5000(1+0{,}09)^3(1+0{,}08)^7 + 4500(1+0{,}08)^6$ = R18 238,20	✓ $5000(1+0{,}09)^3$ ✓ $(1+0{,}08)^7$ ✓ $4500(1+0{,}08)^6$ ✓answer (4)
		[13]

QUESTION 4

4.1	$\frac{5}{\sqrt{3}}\sin 60°$ $=\frac{5}{\sqrt{3}}\cdot\frac{\sqrt{3}}{2}$ $=2\frac{1}{2}$	✓ $\sin 60° = \frac{\sqrt{3}}{2}$ ✓ answer **NOTE: Answer only: no marks** (2)
4.2	$2\sec 33° = 2\left(\frac{1}{\cos 33°}\right)$ $= 2{,}38$	✓ $\sec 33° = \frac{1}{\cos 33°}$ ✓ answer **NOTE: Answer only: full marks** (2)
4.3	$\tan\frac{\theta}{2} = \frac{1}{\sqrt{3}}$ $\frac{\theta}{2} = 30°$ $\theta = 60°$	✓ $\frac{\theta}{2} = 30°$ ✓ answer **NOTE: Answer only: full marks** (2)
4.4	$5\cos\theta = -3$ $\cos\theta = -\frac{3}{5}$  $y^2 = (5)^2 - (-3)^2$ $y^2 = 16$ $y = 4$ $1 - \cot^2\theta = 1 - \left(\frac{-3}{4}\right)^2$ $= \frac{7}{16}$	✓ diagram in quadrant 2 ✓ y – value ✓ substitution ✓ answer (4)
		[10]

QUESTION 5

5.1.1	$\sin D = \frac{h}{m}$	✓ answer (1)
5.1.2	$\sin M = \frac{h}{d}$	✓ answer (1)
5.1.3	$h = m\sin D$ and $h = d\sin M$ $m\sin D = d\sin M$ $\frac{\sin D}{d} = \frac{\sin M}{m}$	✓ making h the subject of formula ✓ equating ✓ dividing throughout by dm (3)
5.2	In ΔABD: $\frac{BD}{80} = \tan 40°$ **OR** $BD = \frac{80}{\tan 50°}$ $BD = 80\tan 40°$ $BD = 67{,}127\ldots$ In ΔABC: $\frac{BC}{80} = \tan 55°$ **OR** $BC = \frac{80}{\tan 35°}$ $BC = 80\tan 55°$ $BC = 114{,}251\ldots$ $\therefore DC = BC - BD$ $= 114{,}251\ldots - 67{,}127\ldots$ $= 47{,}12$ m	✓ correct trigonometric ratio ✓ BD ✓ correct trigonometric ratio ✓ BC ✓ answer (5)
5.3	$\frac{RQ}{15} = \tan 60°$ **OR** $\tan 30° = \frac{15}{RQ}$ $RQ = 15\tan 60°$ $\therefore RQ = 25{,}980\ldots$ $\frac{RP'}{15} = \sec 60°$ **OR** $\frac{15}{RP'} = \cos 60°$ **OR** $\frac{15}{RP'} = \sin 30°$ $RP' = 15\sec 60°$ $\therefore RP' = 30$ $\therefore PQ = 25{,}980\ldots + 30$ $= 55{,}98$ m	✓ correct trigonometric ratio ✓ RQ ✓ correct trigonometric ratio ✓ RP' ✓ answer (5)
		[15]

QUESTION 6

6.1	$a = 2$ $b = 1$ $c = -1$	✓ answer ✓ answer ✓ answer (3)
6.2	Range of f is $-1 \leq y \leq 3$ **OR** $y \in [-1\,;3]$	✓✓ answer (2) ✓✓ answer (2)
6.3	Period of g : 180°	✓ answer (1)
6.4	$x = 90°$ or $x = 270°$	✓✓ answer (2)
6.5	$90° < x < 270°$ **OR** $x \in (90°\,;270°)$	✓✓ answer (2) ✓✓ answer (2)
		[10]

TOTAL: 75