Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS

COMMON TEST

MARCH 2021

MARKS: 75

TIME: 1½ hours

This question paper consists of 6 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, etc. which you have used in determining your 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 correct to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Write neatly and legibly.

QUESTION 1

1.1 Determine the product of the following and simplify fully:

1.1.1 $ab^2\left(-2a^2+4b\right)$ (2)

1.1.2 $(x-2)\left(x^2+2x+8\right)$ (3)

1.2 Factorise the following expressions fully:

1.2.1 $2x^2+7x-4$ (2)

1.2.2 $a^2x-ay-b^2x+by$ (3)

1.2.3 $125-27m^3$ (2)

1.3 Simplify the following expressions fully:

1.3.1 $25x^4y^{-2}\times\left(5x^3y^0\right)^{-2}$ (3)

1.3.2 $\dfrac{x^2+7x+10}{x+5}\div\dfrac{x+2}{5}$ (4)

1.3.3 $\dfrac{9.3^{x+2}+5.3^x}{3^x-3^{x+1}}$ (4)

[23]

QUESTION 2

2.1 Solve for x in each of the following equations:

2.1.1 $1-5x=6$ (2)

2.1.2 $(x+2)(x-4)=0$ (2)

2.1.3 $g=\dfrac{1+2x}{x}$ (3)

2.1.4 $3.7^{x-1}+7=154$ (3)

2.2 Solve for x : $3(2x+4)-3(x-3)<0$. Represent your answer in interval notation. (3)

2.3 Solve for x and y simultaneously:

$4x-2y=6$
$2y+3x=8$ (5)

[18]

QUESTION 3

3.1 Simplify the following expression:

3.1.1 $\frac{x-2}{3}-\frac{x+4}{6}$ (3)

3.1.2 Hence, determine the value of x if: $\frac{x-2}{3}-\frac{x+4}{6}=2$ (2)

3.2 **Without using a calculator,** simplify the following expression fully:

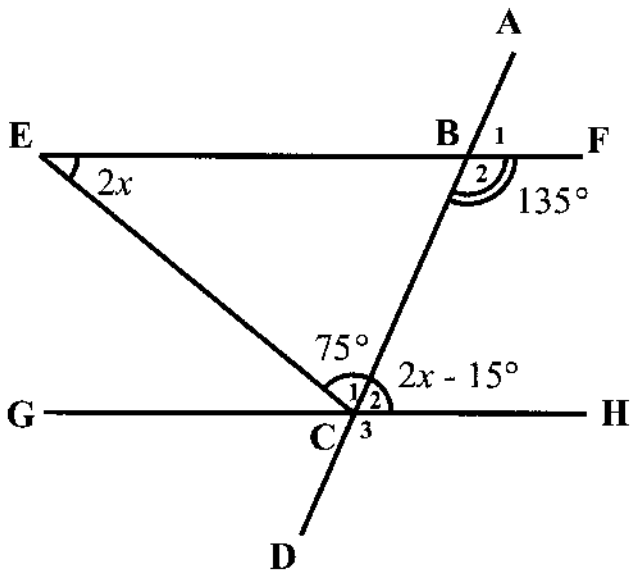
$$\frac{2021}{1-2020^2}$$ (3)

[8]

Give reasons for your statements in the answers to QUESTIONS 4, 5 and 6.

QUESTION 4

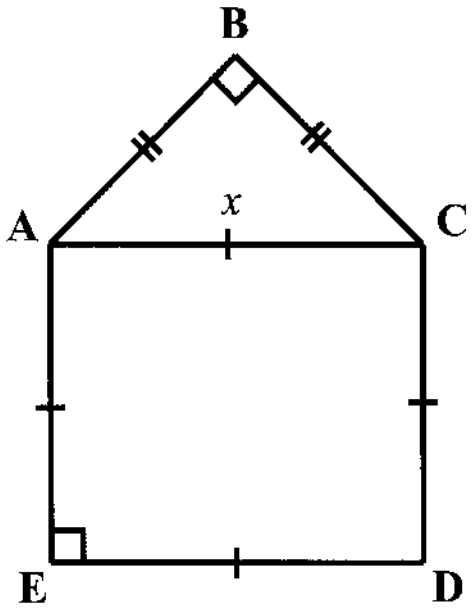
4.1 In the diagram below, $\hat{E}=2x$, $\hat{C}_1=75°$, $\hat{C}_2=2x-15°$ and $\hat{B}_2=135°$.



4.1.1 Determine the value of x. (3)

4.1.2 Determine if EF // GH. Motivate your answer. (3)

4.2 In the diagram below, square $ACDE$ has an area of 256 cm^2 and $AB = BC$.



4.2.1 Determine the length of AC. (Let $AC = x$) (3)

4.2.2 Hence, determine the length of AB. (Correct to TWO decimal places). (3)
[12]

QUESTION 5

5.1 The angles of a certain quadrilateral are in the ratio 2 : 3 : 4 : 6.

Calculate the size of the largest angle. (2)

5.2 Complete the statements below for the properties of a **rhombus**:
(write the question number and missing word / term only)

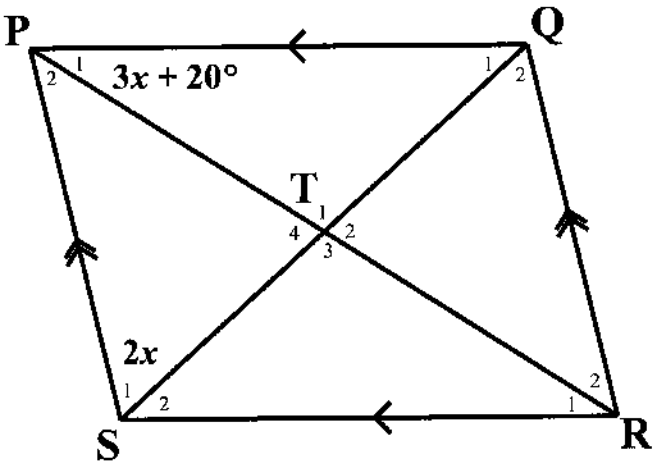
5.2.1 Opposite angles are …….. (1)

5.2.2 All sides are …….. and, opposite sides are parallel to each other. (1)

5.2.3 Diagonals bisect each other at …….. degrees. (1)

5.3 The diagonals of rhombus $PQRS$ intersect at T.

$\hat{S}_1 = 2x$ and $\hat{P}_1 = 3x + 20°$

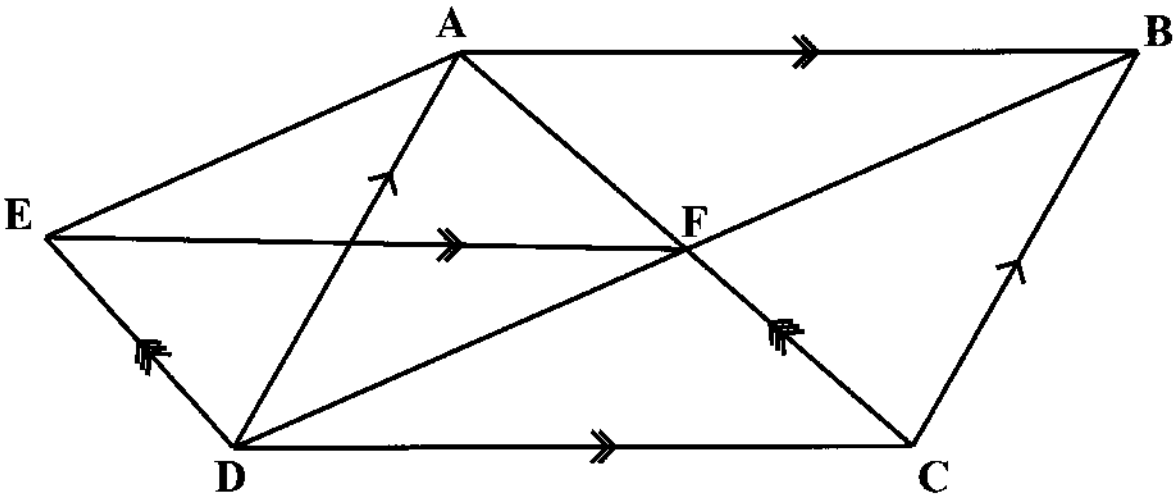


5.3.1 State the value of $\hat{Q}_1$, in terms of x. (1)

5.3.2 Hence, calculate the value of x. (3)
[9]

QUESTION 6

In the diagram below, $ABCD$ and $EFCD$ are parallelograms.



Prove that $AFDE$ is a parallelogram. **[5]**

TOTAL: 75

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MARKING GUIDELINE

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This memorandum consists of 7 pages.

QUESTION 1

1.1	1.1.1	$ab^2\left(-2a^2+4b\right)$ $=-2a^3b^2+4ab^3$	✓ $-2a^3b^2$ ✓ $4ab^3$	(2)
	1.1.2	$(x-2)(x^2+2x+8)$ $=x^3+2x^2+8x-2x^2-4x-16$ $=x^3+4x-16$	✓ x^3+2x^2+8x ✓ $-2x^2-4x-16$ ✓ CA	(3)
1.2	1.2.1	$2x^2+7x-4$ $=(2x-1)(x+4)$	✓ $(2x-1)$ ✓ $(x+4)$	(2)
	1.2.2	$a^2x-ay-b^2x+by$ $=a^2x-b^2x-ay+by$ $=x(a^2-b^2)-y(a-b)$ $=x(a-b)(a+b)-y(a-b)$ $=(a-b)[x(a+b)-y]$ $=(a-b)(ax+bx-y)$	✓ common factors ✓ $(a-b)(a+b)$ ✓ CA	(3)
	1.2.3	$125-27m^3$ $=(5-3m)(25+15m+9m^2)$	✓ $(5-3m)$ ✓ $(25+15m+9m^2)$	(2)
1.3	1.3.1	$25x^4y^{-2}\times\left(5x^3y^{11}\right)^{-2}$ $=5^2x^4y^{-2}.5^{-2}x^{-6}y^{-22}$ $=5^{2-2}x^{4-6}y^{-2-22}$ $=5^0x^{-2}y^{-24}$ $=\frac{1}{x^2y^{24}}$	✓ $5^{-2}x^{-6}y^{22}$ ✓ simplification of indices ✓ $\frac{1}{x^2y^{24}}$	(3)
	1.3.2	$\frac{x^2+7x+10}{x+5}\div\frac{x+2}{5}$ $=\frac{(x+5)(x+2)}{x+5}\times\frac{5}{x+2}$ $=5$	✓✓ both factors ✓ $\times\frac{5}{x+2}$ ✓ ca	(4)
	1.3.3	$\frac{9.3^{x+2}+5.3^x}{3^x-3^{x+1}}$ $=\frac{9.3^x.3^2+5.3^x}{3^x-3^x.3}$ $=\frac{3^x(81+5)}{3^x(1-3)}$ $=\frac{86}{-2}$ $=-43$	✓ $3^x.3^2$ ✓ $3^x.3$ ✓ factorisation of 3^x ✓ ca	(4)
				[23]

QUESTION 2

2.1	2.1.1	$1-5x=6$ $-5x=6-1$ $-5x=5$ $x=-1$ Answer only: 2/2	✓ simplification ✓ answer	(2)
	2.1.2	$(x+2)(x-4)=0$ $x=-2$ *or* $x=4$	✓✓ answers	(2)
	2.1.3	$g=\frac{1+2x}{x}$ $gx=1+2x$ $gx-2x=1$ $x(g-2)=1$ $x=\frac{1}{g-2}$	✓ gx on LHS ✓ factorisation ✓ answer	(3)
	2.1.4	$3.7^{x-1}+7=154$ $3.7^{x-1}=147$ $7^{x-1}=\frac{147}{3}$ $7^{x-1}=49$ $7^{x-1}=7^2$ $\therefore x-1=2$ $\therefore x=3$ Answer only: 1/3	✓ $\frac{147}{3}$ ✓ prime base ✓ answer	(3)
2.2		$3(2x+4)-3(x-3)<0$ $6x+12-3x+9<0$ $3x+21<0$ $3x<-21$ $x<-7$ $\therefore x\in(-\infty;-7)$	✓ simplification ✓ $x<-7$ ✓ answer	(3)
2.3		$4x-2y=6$ *Eq*1 $2y+3x=8$ *Eq*2 *Eq*1+*Eq*2: $7x=14$ $x=2$ *Sub* $x=2$: $4(2)-2y=6$ $-2y=-2$ $y=1$ OR	✓ *Eq*1+*Eq*2 (elimination) ✓ $7x=14$ ✓ $x=2$ ✓ substitution of $x=2$ ✓ $y=1$	(5)

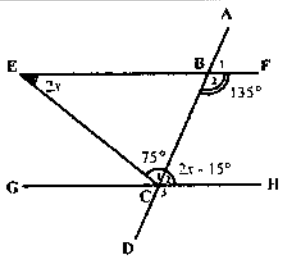
	$4x-2y=6$ *Eq*1 $2y+3x=8$ *Eq*2 *Eq*1→*Eq*3: $2y=4x-6$ $y=2x-3$ *Sub Eq*3 into *Eq*2: $2(2x-3)+3x=8$ $4x-6+3x=8$ $7x=14$ $x=2$ *Sub* $x=2$: $4(2)-2y=6$ $-2y=-2$ $y=1$	✓ *Eq*1→*Eq*3 ✓ Substitution of (*Eq* 3) into (*Eq* 2) ✓ $x=2$ ✓ substitution of $x=2$ ✓ $y=1$	(5)
			[18]

QUESTION 3

3.1	3.1.1	$\frac{x-2}{3}-\frac{x+4}{6}$ *LCD*:6 $=\frac{2(x-2)}{6}-\frac{(x+4)}{6}$ $=\frac{2x-4-x-4}{6}$ $=\frac{x-8}{6}$	✓ LCD = 6 ✓ $-x-4$ ✓ answer	(3)
	3.1.2	$\frac{x-2}{3}-\frac{x+4}{6}=2$ $\therefore \frac{x-8}{6}=2$ $x-8=12$ $x=20$	✓ substitution of answer from 3.1.1 ✓ ca	(2)
3.2		$\frac{2021}{1-2020^2}$ $=\frac{2021}{(1-2020)(1+2020)}$ $=\frac{2021}{(-2019)(2021)}$ $=-\frac{1}{2019}$	✓ factorisation ✓ simplification ✓ answer	(3)
				[8]

QUESTION 4

4.1



4.1.1

$\hat{B}_2 = \hat{E} + \hat{C}_1$ (*ext ∠ of* △)
$135° = 2x + 75°$
$2x = 135° - 75°$
$2x = 60°$
$x = 30°$

✓ S
✓ R
✓ answer

(3)

4.1.2

$\hat{C}_2 = 2(30°) - 15°$
$\hat{C}_2 = 45°$
$\hat{B}_2 + \hat{C}_2 = 135° + 45° = 180°$
$\therefore EF$ △ (co-int ∠s supplementary)

OR

$\hat{C}_2 = 2(30°) - 15°$
$\hat{C}_2 = 45°$
$E\hat{B}C = 45°$ (∠s on straight line)
$\therefore \hat{C}_2 = E\hat{B}C$
$\therefore EF$ △ (alternate ∠s equal)

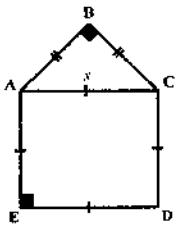
✓ $\hat{C}_2 = 45°$
✓ statement
✓ reason

✓ $\hat{C}_2 = 45°$
✓ statement
✓ reason

(3)

4.2 **4.2.1**

Area of △ $= AC \times AE$
$AC = AE = x$
$\therefore x^2 = 256cm^2$
$\therefore x = 16cm$



✓ S
✓ $x^2 = 256cm^2$
✓ answer

(3)

4.2.2

In △ $AB = BC$ (*given*)
and $AB^2 + BC^2 = AC^2$ (*pythag*)
$2AB^2 = 16^2$
$AB^2 = 128$
$AB = 8\sqrt{2}\,cm$
$AB = 11,31cm$

✓ S/R
✓ $2AB^2 = x^2$
✓ ca

(3)

[12]

QUESTION 5

5.1

$2x + 3x + 4x + 6x = 360°$ (sum of ∠s in quad)
$15x = 360°$
$x = 24°$
$\therefore$ largest angle $= 6 \times 24° = 144°$

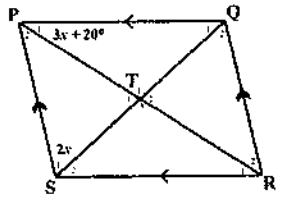
✓ *x* value
✓ ca

(2)

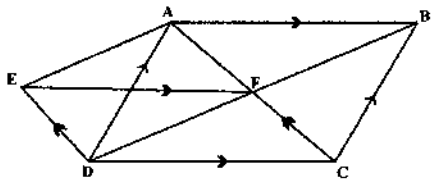
5.2 **5.2.1** equal ✓ answer (1)

5.2.2 equal ✓ answer (1)

5.2.3 90 ✓ answer (1)

5.3					
	5.3.1	$\hat{Q}_1 = 2x$ (angles opp = sides)	✓	S	(1)
	5.3.2	$\hat{T}_1 = 90°$ (diags of rhombus) In $\triangle$ $3x + 20° + 90° + 2x = 180°$ $5x = 70°$ $x = 14°$	✓ ✓ ✓	S/R S/R answer	(3)
		OR			
		$\hat{P}_2 = 3x + 20°$ (diags of rhombus) In $\triangle$ $6x + 40° + 2x + 2x = 180°$ $10x = 140°$ $x = 14°$	✓ ✓ ✓	S/R S/R answer	(3)
					[9]

QUESTION 6

				
$ED = FC$	(opp sides of parm EFCD =)	✓ ✓	S/R S/R	
$AF = FC$	(diags of parm ABCD)			
$\therefore$ $ED = AF$		✓	S/R	
but ED $\parallel$		✓	S/R	
$\therefore$ $AFDE$ is a parallelogram	(2 opposite sides equal and parallel)	✓	R	[5]

TOTAL: 75

