education

Department:
Education
PROVINCE OF KWAZULU-NATAL

NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS

COMMON TEST

MARCH 2020

MARKS: 75

TIME: $1^{1}/_{2}$ Hours

This question paper consists of 8 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 Factorise the following expressions fully:

1.1.1 $xy^2 + 3x^2y$ (1)

1.1.2 $x^2 - 7x - 18$ (2)

1.1.3 $x^2y - 16 + 4y - 4x^2$ (3)

1.2 Simplify the following expressions fully:

1.2.1 $(2x-1)(x^2 - 3x + 1)$ (3)

1.2.2 $\dfrac{x^2-1}{(x+2)+x(x+2)} \div \dfrac{x-1}{2x+4}$ (4)

1.2.3 $\dfrac{2^{-2n}.3^{-3n}}{2^{2n}.4^{n-1}.12^{-3n}}$ (4)

[17]

QUESTION 2

2.1 Solve for x:

2.1.1 $x(2x-5) = 0$ (2)

2.1.2 $3x^2 - 2x - 8 = 0$ (3)

2.1.3 $5^{2x-1} - 1 = 0$ (2)

2.1.4 $x = y + xy$ (3)

2.1.5 $\dfrac{8x^3 - 1}{2x - 1} = 1$ (4)

2.2 The following inequality is given: $-11 < -2x + 1 < -9$; where $x \in \mathbb{R}$.

2.2.1 Solve for x. (3)

2.2.2 Hence, and without the use of a calculator, show that $x = \sqrt{29}$ would satisfy the above inequality. (2)

[19]

QUESTION 3

3.1 Solve for x and y simultaneously:

$$2x - y = 3$$
$$3x + 2y = 8$$

(5)

3.2 Given that $M = 2^{0,2}$ and $M^b = 16$, determine the value of b. (3)

[8]

QUESTION 4

Various options are provided as possible answers to the following questions. Write down the question number (4.1 – 4.5) and choose the answer by writing the letter (A–D) next to the question number (4.1 – 4.5) in your answer book, for example: 4.6) D

4.1 Which description below does NOT guarantee that a quadrilateral is a square?

A. Quadrilateral is both a rectangle and a rhombus

B. Quadrilateral is a parallelogram with perpendicular diagonals

C. Quadrilateral has all sides equal and all angles equal

D. Quadrilateral has all right angles and has all sides equal (1)

4.2 Which of the following statements is true?

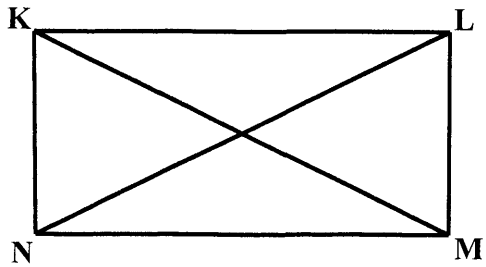
A. All quadrilaterals are rectangles

B. All quadrilaterals are squares

C. All rectangles are quadrilaterals

D. All quadrilaterals are parallelograms (1)

4.3 In the diagram below rectangle KLMN has KM = $6x + 16$ and LN = 49. Find the value of x.



A. $x = 5,5$

B. $x = 33$

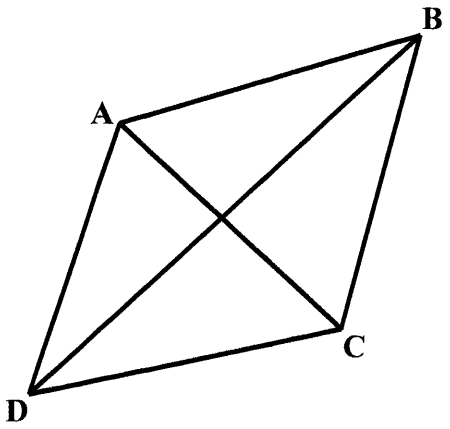
C. $x = 4,5$

D. $x = 6,5$ (1)

4.4 A quadrilateral with only one pair of opposite sides parallel is called a:

A. Trapezium
B. Square
C. Kite
D. Rhombus (1)

4.5 In quadrilateral $ABCD$, $A\hat{C}D = 2x + 4$ and $A\hat{C}B = 5x - 11$.
For what value of x is $ABCD$ a rhombus?

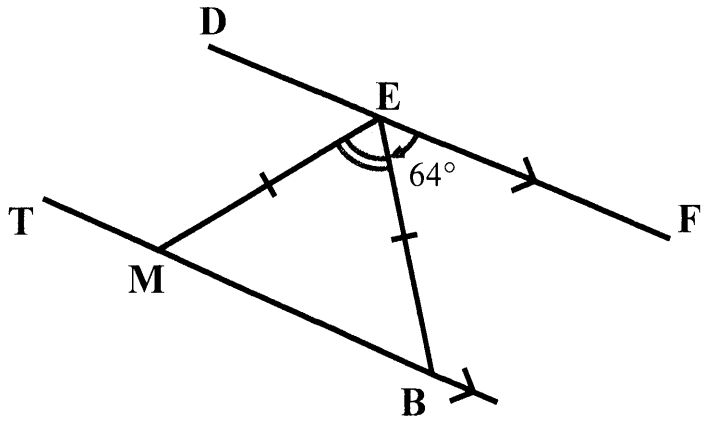


A. $x = 4$
B. $x = 5$
C. $x = 6$
D. $x = 7$ (1)
[5]

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

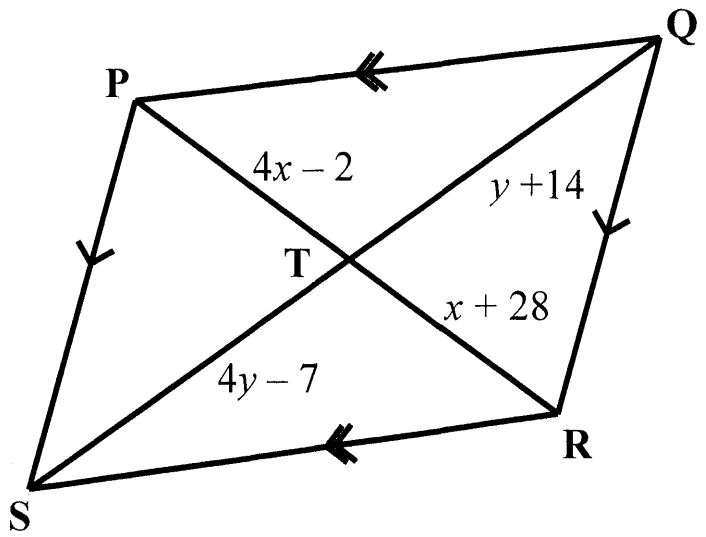
QUESTION 5

5.1 In the diagram below, straight lines *DEF* and *TMB* are parallel to each other.
It is also given that $EM = EB$ and $B\hat{E}F = 64°$.



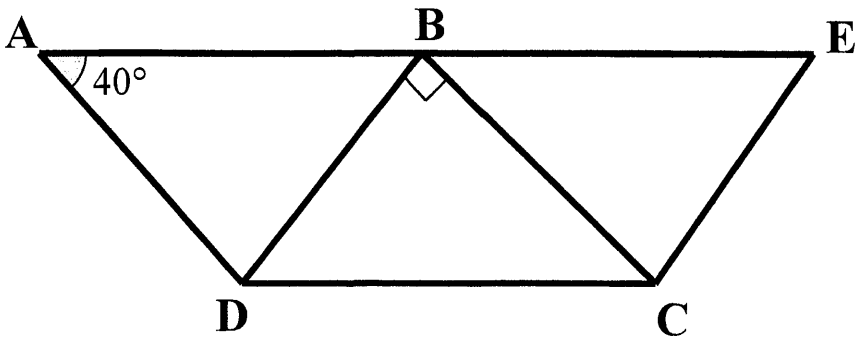
Calculate the size of $M\hat{E}B$. (4)

5.2 In the diagram below, *PQRS* is a parallelogram.
PT = $4x - 2$, TR = $x + 28$, ST = $4y - 7$ and TQ = $y + 14$.



Determine, with reasons, the values of x and y. (4)

5.3 In the diagram below, *ABCD* and *BECD* are parallelograms with common base *DC*. $BC \perp BD$ and $D\hat{A}B = 40°$.

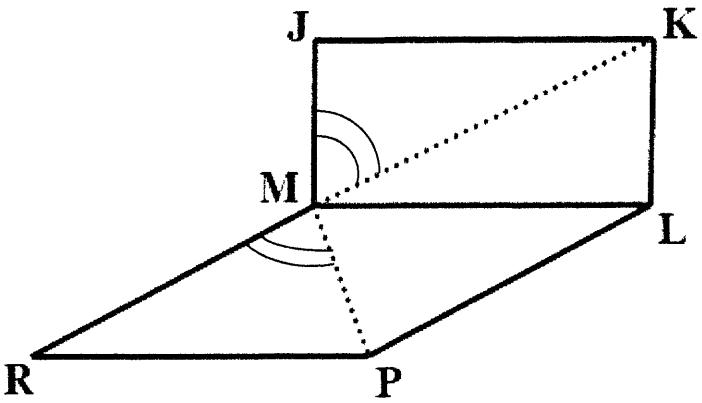


Determine the size of $B\hat{E}C$. (4) **[12]**

QUESTION 6

6.1 In the diagram below, JKLM is a rectangle. MLPR is a rhombus.

$J\hat{M}K = R\hat{M}P$; $J\hat{M}K = 55°$ *and* $M\hat{R}P = 70°$



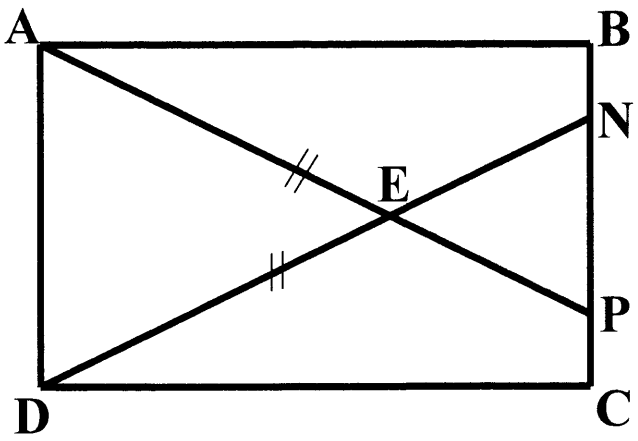
Using the diagram, and giving reasons, determine:

6.1.1 $M\hat{P}R$ (2)

6.1.2 $K\hat{M}L$ (1)

6.1.3 $K\hat{L}P$ (3)

6.2 In the diagram below rectangle $ABCD$ is given with $AP = DN$.



6.2.1 Prove that $\Delta ABP \equiv \Delta DCN$. (4)

6.2.2 Prove that $AE = DE$. (4)
[14]

GRAND TOTAL: [75]

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MARKING GUIDELINES

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This marking guideline consists of 5 pages.

QUESTION 1

1.1.1	xy^2+3x^2y $=xy(y+3x)$	✓ answer	(1)
1.1.2	$x^2-7x-18$ $=(x-9)(x+2)$	✓ $(x-9)$ ✓ $(x+2)$	(2)
1.1.3	$x^2y-16+4y-4x^2$ $=x^2y+4y-4x^2-16$ $=y(x^2+4)-4(x^2+4)$ $=(x^2+4)(y-4)$	✓ grouping ✓ common bracket ✓ answer	(3)
1.2.1	$(2x-1)(x^2-3x+1)$ $=2x^3-6x^2+2x-x^2+3x-1$ $=2x^3-7x^2+5x-1$	✓ correct expansion ✓ $-7x^2$ ✓ $+5x$	(3)
1.2.2	$\frac{x^2-1}{(x+2)+x(x+2)}\div\frac{x-1}{2x+4}$ $=\frac{(x-1)(x+1)}{(x+2)(1+x)}\times\frac{2(x+2)}{x-1}$ $=2$	✓ factorising of D.O.T.S ✓ factorising of common bracket ✓ changing ÷ ✓ answer	(4)
1.2.3	$\frac{2^{-2n}.3^{-3n}}{2^{2n}.4^{n-1}.12^{-3n}}$ $=\frac{2^{-2n}.3^{-3n}}{2^{2n}.2^{2n-2}.(2^2.3)^{-3n}}$ $=\frac{2^{-2n-2n-2n+2}.3^{-3n}}{2^{-6n}.3^{-3n}}$ $=2^{-6n+2+6n}.3^{-3n+3n}$ $=2^2$ $=4$	✓ prime bases ✓ raising powers ✓ simplification ✓ answer	(4)
			[17]

2.1.1	$x(2x-5)=0$ $\therefore x=0 \text{ or } x=\frac{5}{2}$	✓ $x=0$ ✓ $x=\frac{5}{2}$	(2)
2.1.2	$3x^2-2x-8=0$ $(3x+4)(x-2)=0$ $\therefore x=-\frac{4}{3} \text{ or } x=2$	✓ correct factors ✓ $x=-\frac{4}{3}$ ✓ $x=2$	(3)

2.1.3	$5^{2x-1}-1=0$ $5^{2x-1}=5^0$ $\therefore 2x-1=0$ $\therefore x=\frac{1}{2}$	✓ ✓	5^0 answer	(2)
2.1.4	$x=y+xy$ $x-xy=y$ $x(1-y)=y$ $x=\frac{y}{1-y}$	✓ ✓ ✓	isolate x terms factorise x answer	(3)
2.1.5	$\frac{8x^3-1}{2x-1}=1$ Restriction : $x\neq\frac{1}{2}$ $\frac{(2x-1)(4x^2+2x+1)}{2x-1}=1$ $4x^2+2x+1=1$ $4x^2+2x=0$ $2x(2x+1)=0$ $\therefore x=0$ *or* $x=-\frac{1}{2}$	 ✓ ✓ ✓	 factorising simplification factors both x values	(4)
2.2.1	$-11<-2x+1<-9$ $-12<-2x<-10$ $-6<-x<-5$ $\therefore 5<x<6$	 ✓ ✓	 $-12<-2x<-10$ values inequality "flip"	(3)
2.2.2	$25<29<36$ $\sqrt{25}<\sqrt{29}<\sqrt{36}$ $\therefore 5<\sqrt{29}<6$ Therefore $\sqrt{29}$ satisfies the inequality in 2.2.1	✓	creating inequality $\sqrt{25}<\sqrt{29}<\sqrt{36}$	(2)
				[19]

QUESTION 3

3.1	$2x-y=3 \quad Eq1$ $3x+2y=8 \quad Eq2$ $Eq1\times 2: \quad 4x-2y=6$ $Eq2: \quad 3x+2y=8$ $Eq1+Eq2: \quad 7x=14$ $x=2$ *Sub* $x=2$ into $Eq1: \quad 2(2)-y=3$ $-y=-1$ $y=1$ OR $2x-y=3 \quad Eq1$ $3x+2y=8 \quad Eq2$ $Eq1\rightarrow Eq3: \quad y=2x-3$ *Sub* $Eq3$ into $Eq2: \quad 3x+2(2x-3)=8$ $3x+4x-6=8$ $7x=14$ $x=2$ *Sub* $x=2$ into $Eq3: \quad y=2(2)-3$ $y=1$	✓ setting up equations ✓ elimination to solve for x or y ✓ $x=2$ ✓ substitution ✓ $y=1$ ✓ setting up equation ✓ substitution ✓ $x=2$ ✓ substitution ✓ $y=1$	(5) (5)
3.2	$M^b=16$ $\therefore M^b=2^4$ *but* $M=2^{0,2}$ $\therefore \quad (2^{0,2})^b=2^4$ $\therefore \quad 0,2b=4$ $\therefore \quad b=20$	✓ $16 = 2^4$ ✓ $(2^{0,2})^b=2^4$ ✓ answer	(3)
			[8]

QUESTION 4

4.1	B	✓ answer	(1)
4.2	C	✓ answer	(1)
4.3	A	✓ answer	(1)
4.4	A	✓ answer	(1)
4.5	B	✓ answer	(1)
			[5]

QUESTION 5

5.1	$B\hat{E}F = 64°$ (*given*) $\therefore T\hat{B}E = 64°$ (*alt ∠s, DF ∥ TB*) $\therefore E\hat{M}B = 64°$ (*∠s opp = sides*) $\therefore M\hat{E}B = 52°$ (*sum ∠s Δ*)	✓ S ✓ R ✓ S/R ✓ S/R	(4)
5.2	$4x - 2 = x + 28$ (*diagonals of parm*) $3x = 30$ $x = 10$ $4y - 7 = y + 14$ (*diagonals of parm*) $3y = 21$ $y = 3$	✓ S/R ✓ $x = 10$ ✓ S/R ✓ $y = 3$	(4)
5.3	$E\hat{B}C = 40°$ (*corresponding ∠s; AD ∥ BC*) $B\hat{C}E = 90°$ (*alternate ∠s; BD ∥ EC*) $\therefore B\hat{E}C = 50°$ (*sum ∠s Δ*)	✓ S ✓ R ✓ S/R ✓ S/R	(4)
			[12]

QUESTION 6

6.1.1	$M\hat{P}R = 55°$ (*∠s opp = sides*)	✓ S ✓ R	(2)
6.1.2	$K\hat{M}L = 35°$ (adj comp ∠s)	✓ S/R	(1)
6.1.3	$M\hat{L}P = 90°$ (*prop of rect*) $M\hat{L}P = 70°$ (*opp ∠s* rhombus) $\therefore K\hat{L}P = 160°$	✓ S/R ✓ S/R ✓ S	(3)
6.2.1	*In ΔABP and ΔDCN* 1. $\hat{B} = \hat{C} = 90°$ (*prop of rect*) 2. $AP = DN$ (*given*) 3. $AB = DC$ (*opp sides of rect*) $\therefore$ ΔABP *and* ΔDCN (*RHS*)	✓ S/R ✓ S/R ✓ S/R ✓ S/R	(4)
6.2.2	$B\hat{A}P = N\hat{D}C$ (*congruent Δs proved*) $\therefore D\hat{A}E = A\hat{D}E$ (*adj compl ∠s*) $\therefore AE = DE$ (*sides opp = ∠s*)	✓ S/R ✓ S ✓ R ✓ S/R	(4)
			[14]
		TOTAL MARKS:	**75**