Lycée Des Arts

/40

Name / Nom: ……………...……………………………………………………...……

Class / Classe: *Gr8* Section: ………. Date: ……………………

Exam in / Examen de: ***Math*** ***Midterm***

يمنع استعمال الآلة الحاسبة

Exercise I: (13pts)

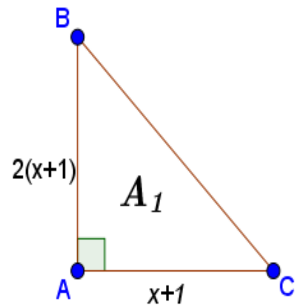
The following parts are independent:

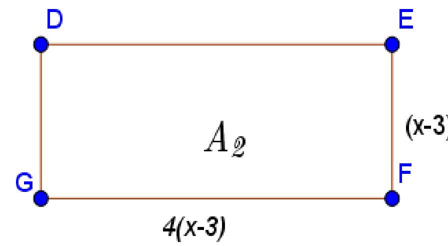
Part A: (3½pts)

In the adjacent figures we have:

- $\boldsymbol{ABC}$ is a right triangle at $\boldsymbol{A}$ such that:
  $\boldsymbol{AB} = 2(x+1)$ and $AC = x+1$
- $\boldsymbol{DEFG}$ is a rectangle of dimensions

  $4(x-3)$ and $x-3$;
  $(x > 3$ *and the unit of length is cm*$)$





Designate by A_1 the area of the triangle ABC and by A_2 the area of the rectangle $DEFG$.

Calculate $\boldsymbol{x}$ when $A_1 = A_2$.

Part B (5½pts)

ABC is any triangle such that:

- $\boldsymbol{AB} = \frac{2\frac{1}{4}+\frac{3}{2}}{1+\frac{1}{1+\frac{1}{2}}} \times 2^2 cm$. (*where* $2\frac{1}{4}$ is a mixed number.)
- $\boldsymbol{I}$ is any point on $[\boldsymbol{AB}]$ such that:
- $\boldsymbol{AI} = \frac{16^2+24^3}{128\times 22} - \frac{1}{2} cm.$

1) Given $\boldsymbol{x} = 2\frac{1}{4} + \frac{3}{2}$ *and* $y = 1 + \frac{1}{1+\frac{1}{2}}$.

   a) Prove that $x = \frac{15}{4}$ and $y = \frac{5}{3}$.(1½pts)

   b) Calculate $\frac{\boldsymbol{x}}{\boldsymbol{y}}$. Deduce $\boldsymbol{AB}$. (1pt)

2) Show that $AI = \frac{AB}{2} = \frac{9}{2}$. (1pt)

3) The **parallel** drawn from I to (BC) cuts $[AC]$ at J. What is the relative position of point J with respect to segment $[AC]$? Justify. (2pts)

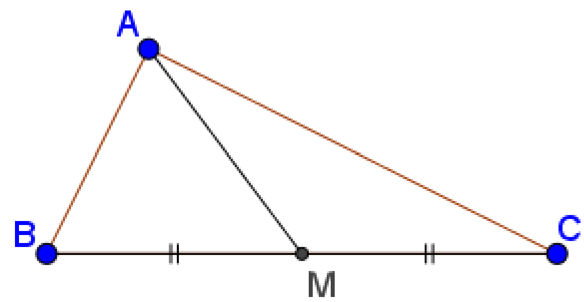
Part C: (4pts)

ABC is any triangle such that:

- *M* is the midpoint of segment [*BC*].
- **BC** $= (2x+1)^2 - \frac{1}{2}x(8x-1) + \frac{3}{2}x + 3$
- **AM** $= x(-9x+3) + (3x-1)(3x+1) + 3$

  ($x > -\frac{2}{3}$ and the unit of length is in cm)

  1) Show that *BC* is the double of *AM*. (2½pts)
  2) Deduce the nature of the triangle *ABC*. (1½pts)



Exercise II: (15¼pts)

1) **Given the two polynomials:**

   $Q(x) = (3x-6)(x+1) - x^2 + 4x - 4$ and $P(x) = (m-2)x^2 - 8 + 3(2-x)(x-1)$

   a) Develop and reduce $\boldsymbol{Q(x)}$ then deduce its degree. (1¼pts)
   b) What does $\boldsymbol{Q(x)}$ represent? and for what values of x is it defined?. (1pt)
   c) Is $x = -1$ a root of $Q(x)$? Justify. (1pt)
   d) Write $Q(x)$ in form of product of two factors. (1pt)
   e) Define a root of a polynomial then deduce the roots of $\boldsymbol{Q(x)}$. (1½pts)
2) Calculate **m** such that **2** is a root of $\boldsymbol{P(x)}$. (1pt)
3) In what follows we consider that ***m* = 4**

   a) Prove that $P(x)$ can be written in the form $ax^2 + bx + c$, where a, b & c are integers to be determined. (1½pt)
   b) Solve $\boldsymbol{P(x)} = -14$ (1pt)
   c) Calculate $P(-\frac{1}{2})$ (1pt)
   d) Show that $\boldsymbol{P(x)} = (x-2)(-x+7)$ (1pts)
4) Let $F(x) = \frac{(x-2)(-x+7)}{(x-2)(2x+5)}$

   a) What does $F(x)$ represent? Justify. (¾pt)
   b) Given the following table:

$\boldsymbol{x}$	$\boldsymbol{F(x)}$
2	………
3	……….
$\boldsymbol{\frac{-5}{2}}$	………..

Complete the following table showing your justification for each answer. What **conclusion** can you conclude? (2¼pts)

   c) Simplify $\boldsymbol{F(x)}$ then solve $\boldsymbol{F(x)} = \frac{1}{2}$. (1pt)

Exercise III: (11 ¾pts)

ABC is an **isosceles triangle** at A such that:

$$AB = \frac{1.05 \times 10^2 \times 20}{420}\ cm \qquad \text{and} \qquad BC = \frac{28}{75} \times \frac{45}{21} - 5^{-1} + 3\frac{2}{5}\ cm$$

1) Show that $AB = 5$ cm. (1½pts)
2) a) Verify that BC is a power of 2. (1¾pts)
   b) Calculate the perimeter of the triangle ABC then give the answer in **scientific notation.** (1¼pts)
3) a) Trace the triangle ABC such that $AB = 5$cm and $BC = 4$cm. (¼pt)
   b) $[BM]$ and $[CN]$ are two heights relative to $[AC]$ and $[AB]$ respectively.
   By using two **congruent triangles**, show that $BN = CM$. (1½pts)
   c) What is the nature of the triangle AMN ?Justify(1pt)
4) Show that $MNBC$ is an isosceles trapezoid. (¾pt)
5) a) The parallel (Bx) from B to (NC) cuts the perpendicular that issued from C to (NC) at K.
   What is the nature of the quadrilateral $NBKC$? (1½pts)
   b) Deduce the nature of the triangle MCK? (¾pt)
6) let O be the center of the rectangle $BNCK$, and F be the orthogonal projection of O on $[NC]$. Show that $OF = \frac{MC}{2}$.(1½pts)

GOOD WORK