# Certificat MEP 2022 : Corrigés

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## Partie 1

1.a) Énergie cinétique : $E = \frac{1}{2} m v^2$

$= \frac{1}{2} \cdot 1200 \left(\frac{100}{3.6}\right)^2 = 462\,962,96$ J

$P = \frac{E}{t} = \frac{462\,962,96}{5.5} \simeq 84\,175$ W $= \underline{84,175}$ kW

b) masse d'essence consommée :

$m = \varphi_{essence} \cdot V_{essence} = 725 \cdot 0.8 \cdot 10^{-3} = 0.58$ kg

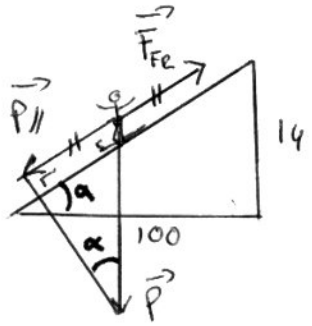
$E_{chim} = m \cdot H = 0.58 \cdot 45 \cdot 10^6 = \underline{2,61 \cdot 10^7}$ J

$E_{pot} = m \cdot g \cdot \Delta h = 1200 \cdot 10 \cdot (1086 - 589) =$
$5,964 \cdot 10^5$ J

$\eta = \frac{E_{ut}}{E_{cons}} = \frac{5,964 \cdot 10^5}{2,61 \cdot 10^7} = 0,2285 = \underline{22,85}\,\%$

2.

a)



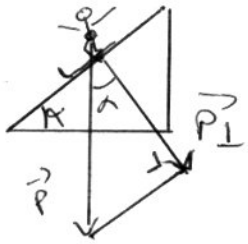

$\tan(\alpha) = \frac{14}{100}$

$\Rightarrow \alpha = 7,9696°$

Vitesse constante $\Rightarrow F_{Fr} = P_{//} = m \cdot g \cdot \sin(\alpha)$

$= 85 \cdot 10 \cdot \sin(7,9696) = \underline{117.85\,N}$

b)




$P_\perp = m \cdot g \cdot \cos(\alpha) = 85 \cdot 10 \cdot \cos(7.9696)$

$= 841.75\,N$

$F_{Fr} = \mu_s \cdot P_\perp \Rightarrow \mu_s = \frac{F_{Fr}}{P_\perp}$

$= \frac{117.85}{841.75} = \underline{0.140}$

3.

$m_{métal} \cdot C_{métal} (T_{i\,métal} - T_e) = m_{eau} \cdot C_{eau} \cdot (T_e - T_{i\,eau})$

$2.4 \cdot C_{métal} \cdot (94.8 - 12.3) = 5.7 \cdot 4180 (12.3 - 9.1)$

$198 \cdot C_{métal} = 76243,2 \Rightarrow$

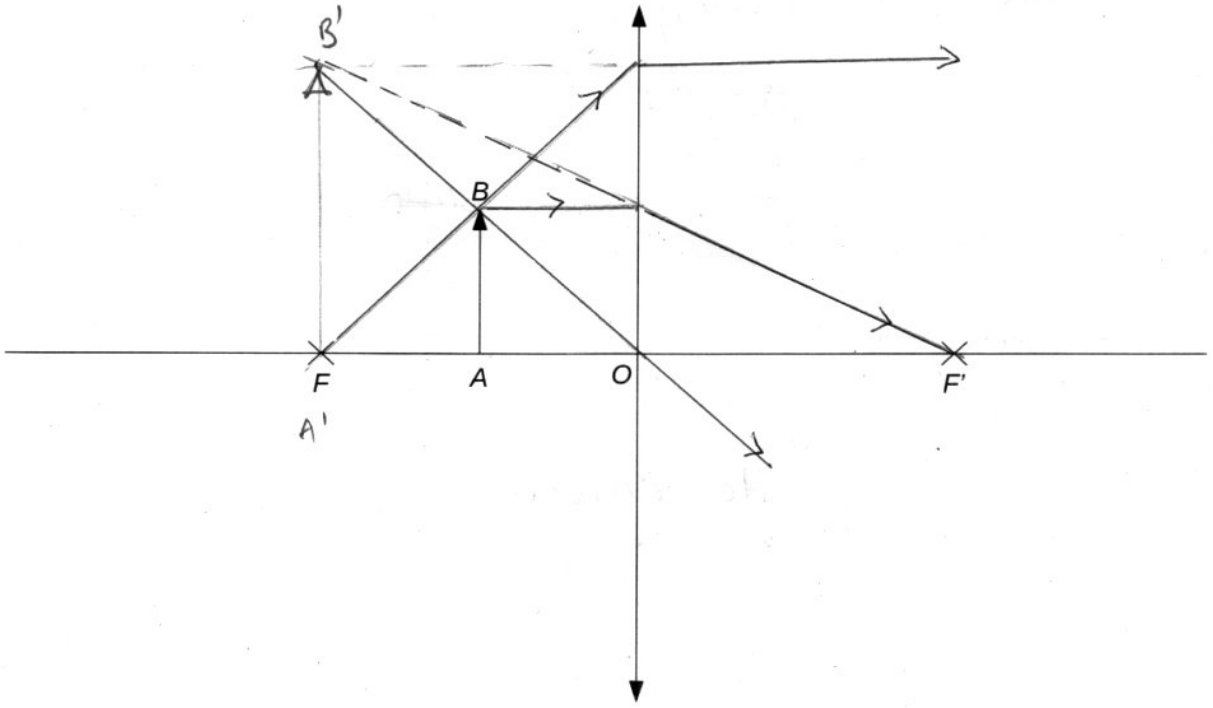
$C_{métal} = \frac{76243.2}{198} = \underline{385.07\ J \cdot kg^{-1} \cdot °C^{-1}}$

$\Rightarrow$ il s'agit de Cuivre

4.

a) Image réelle $\Rightarrow p > f \Rightarrow p > 200$ mm

b) On place un objet *AB* à gauche de la lentille. La figure ci-dessous représente la situation :



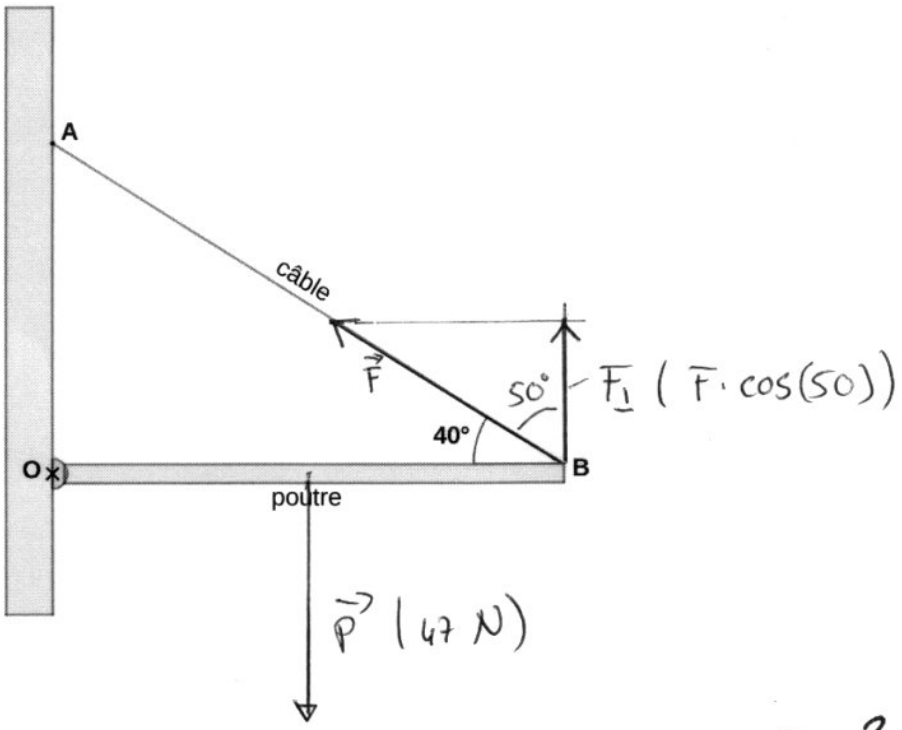

c) L'image est virtuelle.

d) $\frac{1}{f} = \frac{1}{p} + \frac{1}{p'} \Rightarrow \frac{1}{p'} = \frac{1}{f} - \frac{1}{p} = \frac{1}{200} - \frac{1}{100} = -\frac{1}{200}$

$\Rightarrow p' = 200 \Rightarrow$ à 20 cm à gauche de la lentille

e) $\left|\frac{p'}{p}\right| = \left|\frac{g'}{g}\right| = \left|\frac{-200}{100}\right| = \underline{\underline{2}}$

5.




moments : $F \cdot \cos(50) \cdot 2.3 = p \cdot \frac{2,3}{2}$

$F \cdot \cos(50) = \frac{47 \cdot 2.3}{2 \cdot 2.3} = 23.5$ N

$F = \frac{23.5}{\cos(50)} = \underline{\underline{36.56 \text{ N}}}$

Partie 2

Q.1.

a) $y = ax + b$ ; $a_\perp \cdot a = -1 \Rightarrow a_\perp \cdot \frac{1}{3} = -1$

$\Rightarrow a_\perp = 3$

perpendiculaire : $-3x + b$ ; $A \in (p)$

$\Rightarrow 4 = -3 \cdot (-2) + b = 6 + b \Rightarrow b = -2$

$\Rightarrow$ $\underline{y = -3x - 2}$

b) $d \begin{cases} \frac{x}{3} - 1 = y \\ p \end{cases} \Rightarrow \frac{x}{3} - 1 = -3x - 2 \quad \Big| \cdot 3$

$p \begin{cases} -3x - 2 = y \end{cases}$

$x - 3 = -9x - 6 \Rightarrow 10x = -3 \Rightarrow x = \frac{-3}{10}$

$p$ : $-3 \cdot \frac{-3}{10} - 2 = y$

$\frac{9}{10} - 2 = y = -\frac{11}{10}$ $\Rightarrow$ $\underline{H\left(\frac{-3}{10} ; \frac{-11}{10}\right)}$

Q2.

a) $0 = (m-1)^2 \cdot 0 + 0m + m^2 - 4 = m^2 - 4 > 0$

$\Rightarrow (m-2)(m+2) = 0 \Rightarrow m \in \{-2; 2\}$

b) même pente :

$(m-1)^2+m = 2-m$

$m+(m-1)(m-1) = 2-m$

$m + m^2 - 2m + 1 = 2 - m$

$m + m^2 - 2m + 1 + m = 2 - 1$

$m^2 = 1 \Rightarrow m = \pm\sqrt{1} = \pm 1$

- Si $m = -1$ :

$f(x) : x \mapsto (-1-1)^2 x - 1x + (-1)^2 - 4 = 4x - x + 1 - 4$

$= 3x - 3$

$g(x) \quad x \mapsto 2x - (-1)x + 3(-1) = 3x - 3$

$\Rightarrow$ f et g confondues

- Si $m = 1$

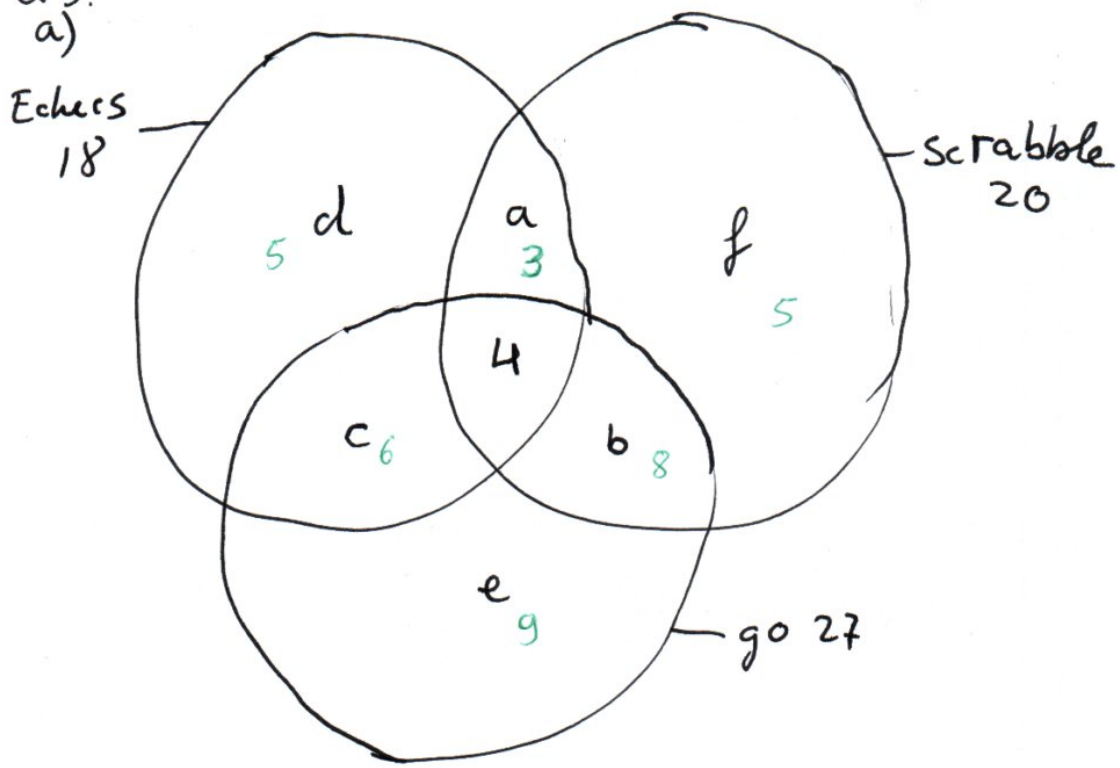
$f(x) : x \mapsto (1-1)^2 x + 1 \cdot x + 1^2 - 4 = x - 3$

$g(x) : x \mapsto 2x - 1x + 3 = x + 3$

Les 2 droites sont parallèles

$\Rightarrow$ si $m = 1$

Q3.
a)




$a = 7 - 4 = 3$

$b = 12 - 4 = 8$

$f = 20 - 4 - a - b = 20 - 4 - 3 - 8 = 5$

$a + b + c + d + e + f + 4 = 40$

$3 + 8 + c + d + e + 5 + 4 = 40$

① $c + d + e = 20$

$d = 18 - a - 4 - c \Rightarrow d = 11 - c$ ② → dans ①

$e = 27 - c - 4 - b \Rightarrow e = 15 - c$ ③ → dans ①

① : $c + 11 - c + 15 - c = 20$

$26 - c = 20$

$c = 6$

② $d = 11 - 6 = 5$

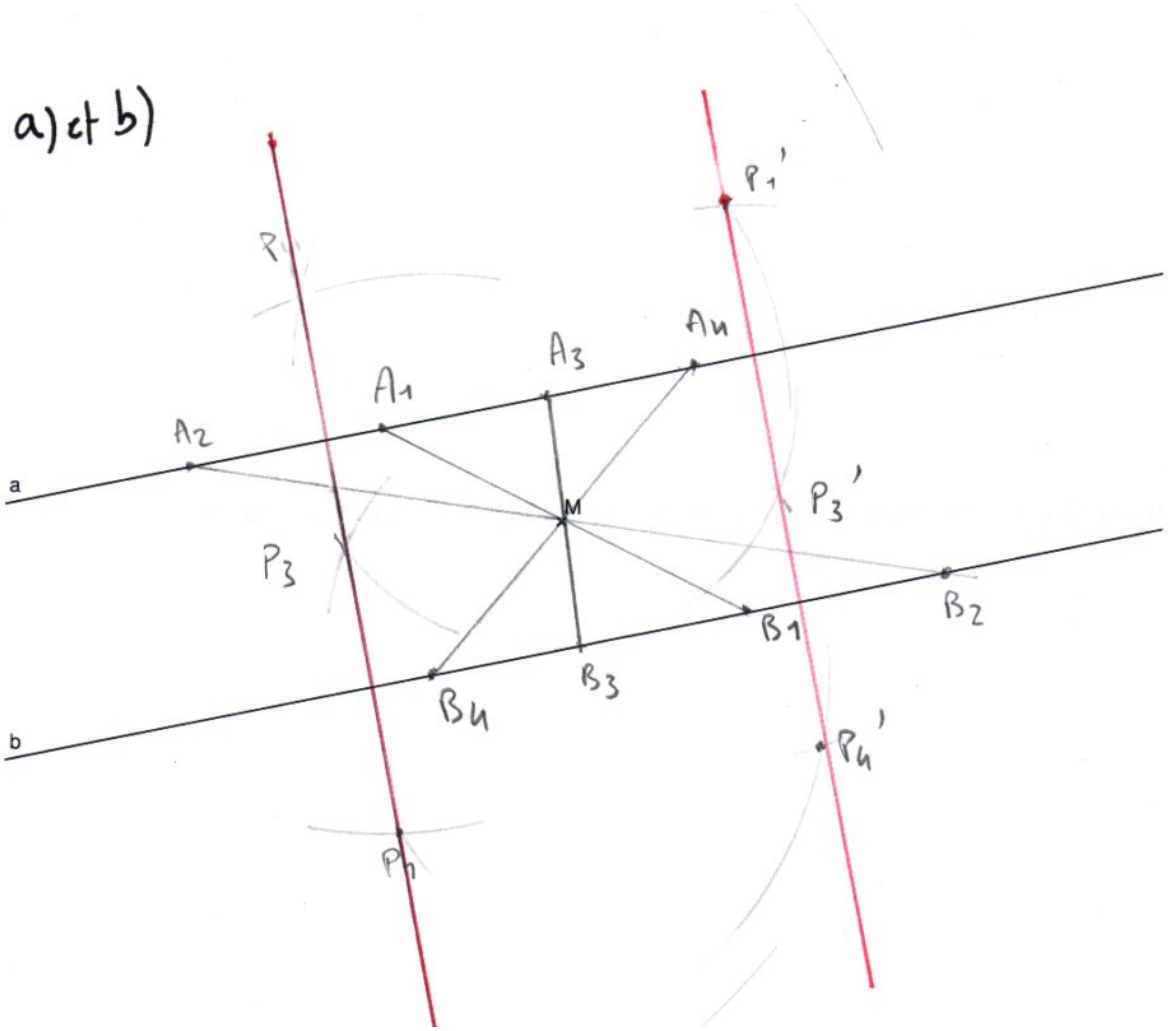
③ $e = 15 - 6 = 9$

b) $\frac{5+4+3+6}{40} = 0.45 = 45\,\%$

c) $\frac{6+4}{40} = 0.25 = 25\,\%$

d) $\frac{5+3+4+6+8+9}{40} = \frac{35}{40} = 0,875 = 87.5\,\%$

a) et b)



c) 2 droites perpendiculaires à a et b

5.

une solution si $\Delta = 0$

$a = 1$, $b = -(m+2)$, $c = 3m-2$

$\Delta = b^2 - 4ac = 0$

$(-(m+2))^2 - 4 \cdot 1 (3m-2) = 0$

$m^2 + 4m + 4 - 12m + 8 = 0$

$m^2 - 8m + 12 = 0$

$(m-6)(m-2) = 0$

$\Rightarrow$ si $m \in \{-6; -2\}$