

2D and 3d motion analysis
Mazarik university
BMX trick

length of the skate :

I calibrated the system of pixel putting the coordinates of two points (upper and lower points of the skate) in the calibration section of excel.

-on the video : 1,53cm

-real length : 60cm

$$60/1,53=\underline{\underline{39,21}}$$

=>so each distance must be multiplicate by 39,21 to become true

Length of the jump :



1st picture :

distance from the skate : 3,94cm

real distance : $3,94 \times 39,21 = 154,5\text{cm}$

2nd picture :

distance from the skate : 2,04cm

real distance : 80cm

Total length of the jump :

$154,5 + 80 = 234,5\text{cm}$

=> **2,345 metres**

Speed

Time in the air :

I took the time written on the video at the beginning of the jump and then at the end.

Time at the first frame of the jump : 2,20 sec

Time at the last frame of the jump : 3,00 sec

Total time in the air :

$3,00 - 2,20 = 0,80\text{ sec}$

Speed in the air :

$2,345 / 0,80 = 2,93$

2,93 m/s

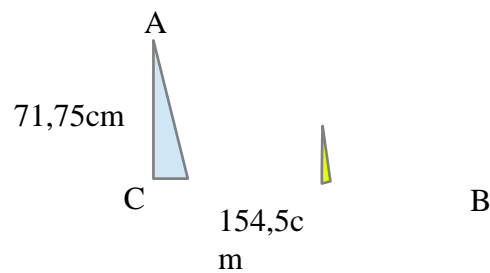
and 10,55 km/h

Height



high of the jump : 1,83cm
 real high : **71,75cm**

Angle of the jump



A= the highest
 B= the

point of the jump
 beginning of the jump

We need the angle B
 $\text{Tan}(B) = 71,75 / 154,5$
 so $\text{Tan}(B) = 0,464$
 so $B = \mathbf{24.89^\circ}$