TEMPERATURE

1. Temperature measured in degrees Celsius and degrees Fahrenheit have a linear dependence, therefore, it is:

$F = kC + n$
$32 = 0k + n$
$n = 32$

$F = kC + n$
$212 = 100k + n$
$100k = 180$
$k = 1.8 = \frac{9}{5}$

✓ $F = \frac{9}{5}C + 32$

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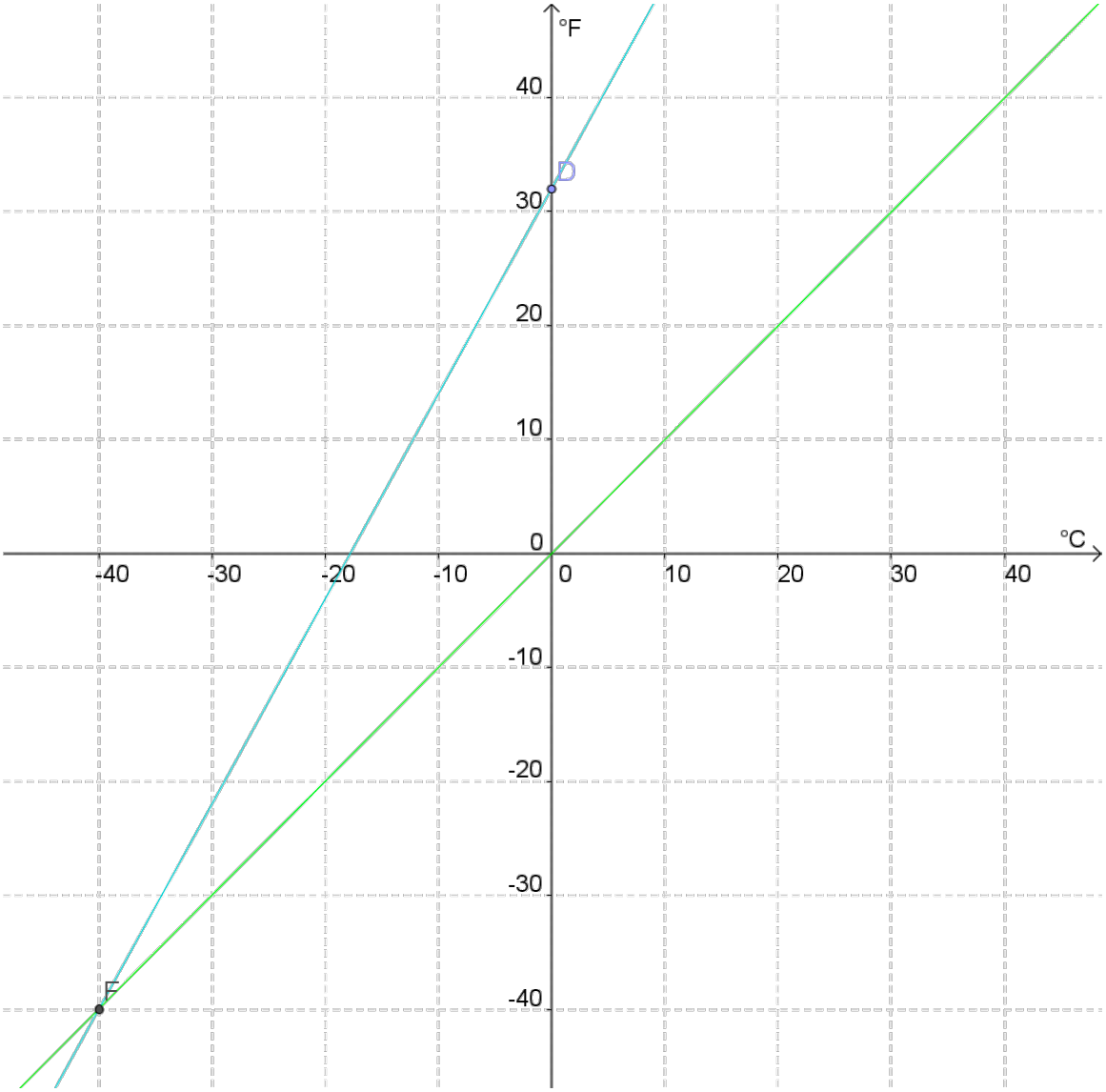
2. Is there a temperature at which Celsius and Fahrenheit readings are the same?

$F = C$
$\frac{9}{5}C + 32 = C$
$\frac{4}{5}C = -32$
$C = -40$

$F = \frac{5}{9}F - \frac{160}{9}$
$9F = 5F - 160$
$4F = -160$
$F = -40$

✓ Yes, the readings for degree Celsius and degree Fahrenheit are the same at -40 degrees.



- Can you describe a way of converting Faherenheit readings into Celsius?

✓ $F = \frac{9}{5}C + 32$ ← with this equation we can convert °**C** to °**F**.

- Can you describe a way of converting Celsius readings into Fahrenheit?

✓ $C = \frac{5}{9}F - \frac{160}{9}$ ← with this equation we can convert °**F** to °**C**.

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3. Is there a temperature at which the Fahrenheit reading is 20 degrees higher than reading?

$$F = C + 20$$

$$F = \frac{5}{9}F - \frac{160}{9} + 20 \quad |\cdot 9$$

$$9F = 5F\ 160 + 180$$

$$4F = 2O$$

$$F = 5°$$

$$C = \frac{5}{9}F - \frac{160}{9} \quad |\cdot 9$$

$$9C = 5F - 160$$

$$9C = 5 \cdot 5 \ -160$$

$$9C = 25 - 160$$

$$9C = -135$$

$$C = -15°$$

✓ We found, that there exist two temperatures, where the Fahrenheit readings is 20 degrees higher than the Celsius readings, namely at **5°F and -15°C**.

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4. Is there a temperature at which the Celsius reading is 20 degrees higher than the reading?

$$C = F + 20$$

$$C = \frac{9}{5}C + 32 + 20$$

$$-\frac{4}{5}C = 52 \quad |\cdot 5$$

$$-4C = 260$$

$$C = -65°$$

$$F = \frac{9}{5}C + 32$$

$$F = \frac{9}{5} \cdot (-65) + 32$$

$$F = -117 + 32$$

$$F = -85°$$

✓ We found, that there exist two temperatures, where the Celsius readings is 20 degrees higher than the Fahrenheit readings, namely at **-85°F and -65°C.**

An extension challenge

Scientists often use the Kelvin scale of temperature, where the freezing point of water is $273.15°K$ and the boiling point of water is $373.15°K$.

1. Is there a temperature at which Kelvin and Fahrenheit readings are the same?

$$F = Kk + n$$
$$32 = 273.15 \cdot k + n$$
$$n = 32 - 273.15k$$
$$n = 32 - 491.67$$
$$n = -459.67$$

$$F = Kk + (32 - 273.15k)$$
$$212 = 373.15k + 32 - 273.15k$$
$$212 = 100k + 32$$
$$k = 1.8 = \frac{9}{5}$$

✓ $F = \frac{9}{5}K - 459.67$

$$F = K$$
$$\frac{9}{5}K - 459.67 = K$$
$$\frac{4}{5}K = 495.67$$
$$K = 574.5875$$

$$K = kF + n$$
$$273.15 = 32k + n$$
$$n = 273.15 - 32k$$
$$n = 273\frac{15}{100} - \frac{160}{9}$$
$$n = 273\frac{135}{900} - 17\frac{700}{900}$$
$$n = 255\frac{335}{900}$$

$$K = kF + (273.15 - 32k)$$
$$373.15 = 212K + 273.15 - 32k$$
$$180k = 100$$
$$k = \frac{5}{9}$$

✓ $K = \frac{5}{9}F + 255\frac{335}{900}$

$$K = F$$

$$\frac{5}{9}F + 255\frac{335}{900} = F$$

$$255\frac{335}{900} = \frac{4}{9}F$$

$$F = 574.5875$$

✓ Yes, that temparature is 574.**5875** °

When converting Fahrenheit into Kelvin, we first take te general equation of one-way funtion y = kx + n, secondly we insert F = kK + n, nekt we take temperature for melting point and boiling point of water. Finally, we equalize equations.

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2. Can you describe ways of converting Kelvin readings into Fahrenheit and Celsius readings?

Equation of one-way funtion for Kelvin is $K = \frac{5}{9}F + 255\frac{335}{900}$ and equation of one-way funtion for Celsius is $C = \frac{5}{9}F - \frac{160}{9}$. Both functions K and C have the same slope $\frac{5}{9}$ and we can see that lines are parallel and have no common point.