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Miscellaneous Topics

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Converting Air Temperatures 1

▶ In Fahrenheit, water freezes at $32°$F and boils at $212°$F. It follows that the exact conversion formula is

$$C = \frac{5}{9}(F - 32).$$

▶ However, we would like to have a simpler approximation formula that we can convert easily in our head. Such a formula will only work well for a certain interval, and we will first consider air temperatures.

▶ We will explore the simpler formula

$$c = \frac{1}{2}(f - 30).$$

Converting Air Temperatures 2

▶ When is this formula exact? We have

$$\frac{1}{2}(F - 30) = \frac{5}{9}(F - 32)$$

$$9(F - 30) = 10(F - 32)$$

$$320 - 270 = F$$

$$F = 50,$$

so 50°F gives 10°C with both formulas.

Converting Air Temperatures 3

▶ If F increases by 18°F, then the exact formula increases by 10°C, while the approximation formula increases by 9°C.

▶ So if you are converting temperatures between 30°C = 10°C + 2 · 10°C and −10°C = 10°C − 2 · 10°C, then the approximation formula will never be more than 2°C off.

Converting Oven Temperatures 1

▶ However, if you are converting oven temperatures for baking, this is not a useful interval. We instead try the formula

$$c = \frac{1}{2}f.$$

▶ Now the fixed point is

$$\frac{1}{2}f = \frac{5}{9}(f - 32)$$
$$9f = 1098(f - 32)$$
$$320 = f,$$

so $320°$F gives $160°C$ with both formulas.

▶ The same argument as above, shows that if you are converting temperatures between
$60°C = 160°C - 10 \cdot 10°C$ and
$260°C = 160°C + 10 \cdot 10°C$, the approximation formula will never be more than $10°C$ off.