Problem of the Week: Week 1 (Summer 2): Year 9: Number: Standard form, decimal to fraction conversion

- Interpret and compare numbers in standard form, where n is a positive or negative integer or zero
- Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 and 3/8)

Problem 1:

a. An average adult has a resting heart rate of between 60 and 100 beats per minute (bpm). How may beats will an adult's heart have made in a year? You could explore for 60bpm, 70bpm, 80bpm, etc. Write your answers in standard form.

Solution:

Beats per minute	60	Standard Form	70	Standard Form	80	Standard Form	90	Standard Form	100	Standard Form
beats per hour	3600	3.6×10^3	4200	4.2×10^3	4800	4.8×10^3	5400	5.4×10^3	6000	6×10^3
beats per day	86400	8.64×10^4	100800	1.008×10^5	115200	1.152×10^5	129600	1.296×10^5	144000	1.44×10^5
per week	604800	6.048×10^5	705600	7.056×10^5	806400	8.064×10^5	907200	9.072×10^5	1008000	1.008×10^6
per year	31449600	3.14496×10^7	36691200	3.66912×10^7	41932800	4.19328×10^7	47174400	4.71744×10^7	52416000	5.2416×10^7

b. Choose a value between 60 and 100bpm, in 10, 20, 30, 40 years how many beats will the heart have made? Record answers in standard form.

Solution:

Use the value for the beats per minute per year and multiply by 10, 20, 30, 40.

Beats per minute	60	Standard Form	70	Standard Form	80	Standard Form	90	Standard Form	100	Standard Form
per year	31449600	3.14496×10^7	36691200	3.66912×10^7	41932800	4.19328×10^7	47174400	4.71744×10^7	52416000	5.2416×10^7
10 years	314496000	3.14496×10^8	366912000	3.66912×10^8	419328000	4.19328×10^8	471744000	4.71744×10^8	524160000	5.2416×10^8
20 years	628992000	6.28992×10^8	733824000	7.33824×10^8	838656000	8.38656×10^8	943488000	9.43488×10^8	1048320000	1.04832×10^9
30 years	943488000	9.43488×10^8	1100736000	1.100736×10^9	1257984000	1.257984×10^9	1415232000	1.415232×10^9	1572480000	1.57248×10^9
40 years	1257984000	1.257984×10^9	1467648000	1.467648×10^9	1677312000	1.677312×10^9	1886976000	1.886976×10^9	2096640000	2.09664×10^9

c. A tortoise has a heart rate of 10bpm
A hummingbird has a heart rate of 1260bpm
How many beats will their hearts make in one year? Answers in Standard From
Tortoise = 10 x 60 x 24 x 7 x 52
= 5 241 600
= 5.2416×10^6

Hummingbird = 1260 x 60 x 24 x 7 x 52
= 660 441 600
= 6.604416×10^8

Problem 2

Match the equivalent values

$0.04 \div 0.1$	0.0004	4×10^{-1}	$0.04 \div 100$
40	4×10^{-4}	0.4	4000
400×10^{-3}	$40 \div 0.01$	0.4×10^{2}	4×10^{1}
0.04×10^{-2}	0.04×10^{5}	4×10^{3}	$4000 \div 100$

$40 = 4x10^1 = 0.4x10^2 = 4000 \div 100$

$4000 = 4x10^3 = 0.04x10^5 = 40 \div 0.01$

$0.4 = 4x10^{-1} = 400x10^{-3} = 0.04 \div 0.1$

$0.0004 = 4x10^{-4} = 0.04x10^{-2} = 0.04 \div 100$

Problem 3:

Terminating or Not

A terminating decimal is a decimal which has a finite number of decimal places, such as 0.25, 0.047 or 0.7734

Look at the fractions below

$$\frac{2}{3} \quad \frac{4}{5} \quad \frac{17}{50} \quad \frac{3}{16} \quad \frac{7}{12} \quad \frac{5}{8} \quad \frac{11}{14} \quad \frac{8}{15}$$

Which ones do you think can be written as a terminating decimal?

Test your predictions by converting the fractions to decimals.

Solution:

Fraction	Decimal	Type of Decimal	Denominator
2/3	0.666...	R	3
4/5	0.8	T	5
17/50	0.34	T	50
3/16	0.1875	T	16
7/12	0.5833...	R	12
5/8	0.625	T	8
11/14	0.7857….	R	14
8/15	0.5333...	R	15

Choose some fractions, convert them to decimals. Sort into terminating and recurring decimals. What do the terminating decimals have in common?

Can you explain a method you could use to identify fractions which can be written as terminating decimals?

Solution

When a fraction is in its simplest form, if the prime factors of the denominator are just 2, 5 or a combination of both, the decimal equivalent will be a terminating decimal. If the denominator is a power of ten the decimal equivalent terminates.

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