

# MATHSWEEK STUDENT QUIZ SOLUTIONS

## QUESTION 1 (20 marks)

$$\frac{33\frac{1}{3}}{60} = 0.555 \dots \text{ revolutions per second}$$

$$\frac{1}{0.555\dots} = 1.8 \text{ seconds per revolution}$$

$$20 \times 60 = 1200 \text{ seconds}$$

$$\frac{1200}{1.8} = 666.666 \dots \text{ revolutions in total}$$

$$\frac{2\pi(14.5) + 2\pi(6)}{2} = 64.402 \dots \text{ cm (average circumference)}$$

$$64.402 \dots \times 666.666 \dots \approx 42,935 \text{ cm (total distance)}$$

$$\frac{42,935}{100} = 429.35 \approx 430 \text{ metres (total distance)}$$

**Answer is B: 430 metres**

## QUESTION 2 (20 marks)

$$\text{If } 2 @ 3 \% 6 = 4$$

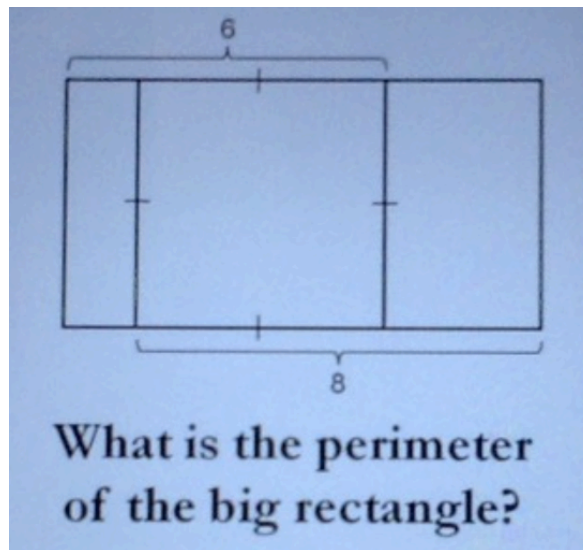
$$2 \div 3 \times 6 = 4$$

What is the value of  $100 @ 4 \% 3$ ?

$$100 \div 4 \times 3 = 75$$

**Answer is 75.**

**QUESTION 3 (20 marks)**



Let length unmarked on left of large rectangle =  $x$ .

Let length unmarked on top right of large rectangle =  $y$ .

Large rectangle has perimeter of  $2(6 + y) + 2x = 2x + 2y + 12$ .

Let length unmarked on bottom left of large rectangle =  $z$ .

$6 + y = z + 8$  (top length overall = bottom length overall).

$y = z + 2$ .

$6 - z = x$  (top length square = left length square).

Large rectangle perimeter =  $2(6 - z) + 2(z + 2) + 12 = 12 - 2z + 2z + 4 + 12 = 28$ .

**Answer is 28.**

## QUESTION 4 (20 marks)

Method 3:

Simulate the experiment using computer programming.

Go to:

<https://www.programiz.com/python-programming/online-compiler/>

Then, copy and paste the following code. Then, click **Run**:

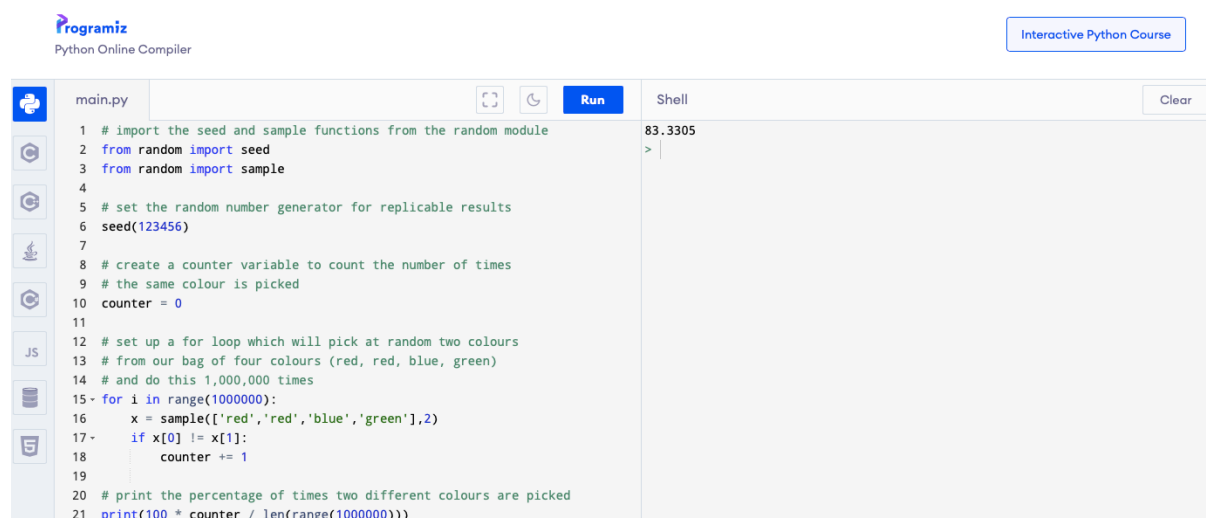
```
# import the seed and sample functions from the random module
from random import seed
from random import sample

# set the random number generator for replicable results
seed(123456)

# create a counter variable to count the number of times
# the same colour is picked
counter = 0

# set up a for loop which will pick at random two colours
# from our bag of four colours (red, red, blue, green)
# and do this 1,000,000 times
for i in range(1000000):
    x = sample(['red','red','blue','green'],2)
    if x[0] != x[1]:
        counter += 1

# print the percentage of times two different colours are picked
print(100 * counter / len(range(1000000)))
```



The screenshot shows the Programiz Python Online Compiler interface. The main editor displays the Python code from the previous block. The Shell window on the right shows the output of the code, which is 83.3305. The interface includes a 'Run' button and a 'Clear' button in the Shell window.

The Shell window (top right) prints 83.3305.

OR Method 2:

Use the multiplication rule and the  $P(\text{not event}) = 1 - P(\text{event})$  rules in probability.

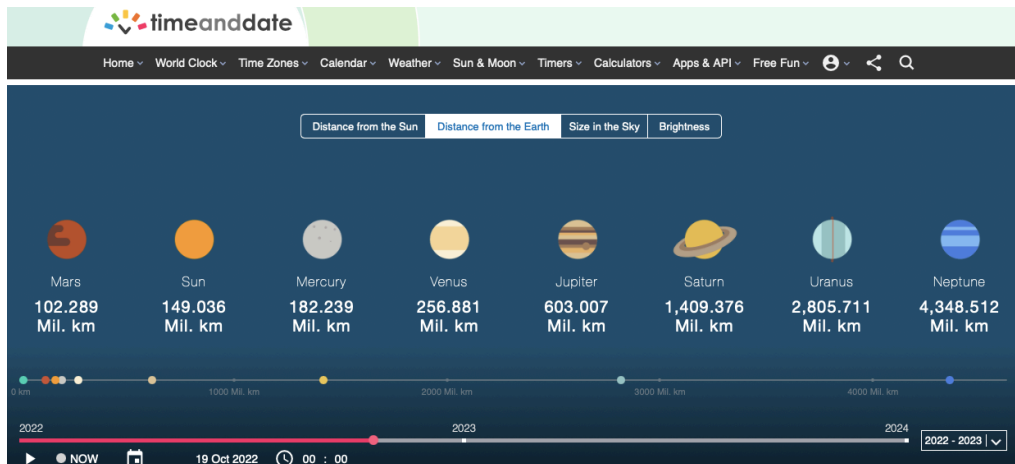
For same colours, we need RED, RED.

The probability of this happening is  $\frac{2}{4} \times \frac{1}{3} = \frac{1}{6}$ .

The probability of this not happening is therefore  $1 - \frac{1}{6} = \frac{5}{6} \approx 83\%$ .

**Answer is 83.**

## QUESTION 5 (20 marks)



$$\frac{4,348.512}{603.007} = 7.211 \dots \approx 7.$$

Answer is 7.

## Tiebreaker Question (1 mark)

Call:

```
lm(formula = lc_exam ~ nov_exam + mock_exam, data = my_df)
```

Residuals:

Min	1Q	Median	3Q	Max
-15.4890	-3.0965	0.7406	5.6043	11.8149

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	23.8767	10.7344	2.224	0.0400 *
nov_exam	0.2642	0.1749	1.510	0.1493
mock_exam	0.4894	0.2333	2.098	0.0512 .

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 8.805 on 17 degrees of freedom

Multiple R-squared: 0.6163, Adjusted R-squared: 0.5712

F-statistic: 13.65 on 2 and 17 DF, p-value: 0.0002909

$$lc\_exam = 23.8767 + 0.2642(nov\_exam) + 0.4894(mock\_exam)$$

$$lc\_exam = 23.8767 + 0.2642(50) + 0.4894(70)$$

$$lc\_exam = 71.344\dots$$

Answer is 71.34.