



Wits Mathematics Competition

Grade 8-9

9 May 2018

Time Limit: 75 Minutes

Full Name:

E-mail:

Seat Number:

School:

Grade:

Instructions

This exam consists of 3 sections. Section A contains 10 multiple choice questions for 3 marks each. Section B consists of 10 single answer questions for 5 marks each. Section C consists of two questions which require full workings, each for 10 marks. You should answer Sections A and B on this page and section C on the sheets the questions are printed on.

Scores

| Section | Mark | Perfect |
|---------|------|---------|
| A | | 30 |
| B | | 50 |
| C | | 20 |
| Total | | 100 |

Problems worthy of attack prove their worth by fighting back - Piet Hein.

Section A [30 Marks]

| Multiple Choice Questions | | | | | |
|---------------------------|---|---|---|---|---|
| 1 | A | B | C | D | E |
| 2 | A | B | C | D | E |
| 3 | A | B | C | D | E |
| 4 | A | B | C | D | E |
| 5 | A | B | C | D | E |
| 6 | A | B | C | D | E |
| 7 | A | B | C | D | E |
| 8 | A | B | C | D | E |
| 9 | A | B | C | D | E |
| 10 | A | B | C | D | E |

Section B [50 Marks]

| Single Answer Questions | |
|-------------------------|--|
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |
| 19 | |
| 20 | |

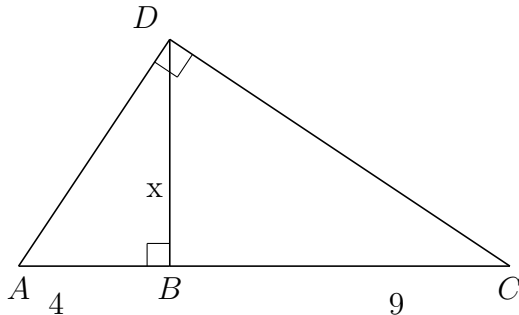
A. Multiple Choice

- The sum of $29 + 14 + 21$ is:
 - 32^2
 - 2^6
 - 1^{64}
 - 64^0
 - 3^4
- If $x = 4$ and $y = -3$, then the value of $\frac{x-2y}{x+y}$ is:
 - $-\frac{1}{2}$
 - -2
 - $\frac{10}{7}$
 - $-\frac{2}{7}$
 - 10
- If 5 % of a number is 8, what is 25 % of the same number?
 - 40
 - 0, 1
 - 320
 - 10
 - 200
- Find x given $\frac{1}{x+\frac{1}{5}} = \frac{5}{3}$
 - $-\frac{2}{5}$
 - $\frac{1}{5}$
 - $\frac{5}{2}$
 - $\frac{2}{5}$
 - $\frac{5}{4}$
- Find the value of $\sqrt{36\sqrt{16}}$
 - 9
 - 6
 - 24
 - 12
 - 144

6. If $\frac{x}{3} = 12$, determine the value of $\frac{x}{4}$.
- A. 1
 - B. 16
 - C. 9
 - D. 144
 - E. 64
7. A glass of water weighs 800g. When half the water is poured out it weighs 500g. Find the weight of the glass when empty.
- A. 100g
 - B. 200g
 - C. 300g
 - D. 400g
 - E. 500g
8. Tian measured her steps and found that it took her 625 steps to walk 500 m. If she walks 10000 steps at this same rate, what distance will she walk?
- A. 6,4 km
 - B. 10 km
 - C. 7,2 km
 - D. 12,5 km
 - E. 8 km
9. A Sweet Company has 8362 fizzers to package. They place exactly 12 fizzers in each package. How many fizzers remain after the maximum possible number of packages are filled?
- A. 2
 - B. 4
 - C. 6
 - D. 8
 - E. 10
10. Three fair coins are flipped at the same time. Find the probability that exactly two land as heads.
- A. 0
 - B. $\frac{1}{3}$
 - C. $\frac{3}{8}$
 - D. $\frac{3}{4}$
 - E. 1
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B. Single Answer

11. A small bottle of shampoo can hold 35 millilitres of shampoo, whereas a large bottle can hold 500 millilitres of shampoo. Jasmine wants to buy the minimum number of small bottles necessary to fill a large bottle. How many bottles must she buy?
12. Find the value of x , if \hat{ADC} and \hat{ABD} are right angles.



13. The surface area of a cube is 96cm^2 . Determine the volume of the cube in cm^3 .
14. Tyrone had 97 marbles and Eric had 11 marbles. Tyrone then gave some of his marbles to Eric so that Tyrone ended with twice as many marbles as Eric. How many marbles did Tyrone give to Eric?
15. In the Pascal family, each child has at least 2 brothers and at least 1 sister. What is the smallest possible number of children in this family?
16. The area of a circle with circumference 24π is $k\pi$. Determine the value of k .
17. If $a^2 + 3b = 33$, where a and b are positive integers, what is the value of ab ?
18. Three generations of the Wen family are going to the movies, two from each generation. The two members of the youngest generation receive a 50% discount as children. The two members of the oldest generation receive a 25% discount as senior citizens. The two members of the middle generation receive no discount. Grandfather Wen, whose senior ticket costs R6,00, is paying for everyone. How many rands must he pay?
19. Find the number of subsets of $\{1, 2, 3, 4, 5, 6, 7, 8\}$ that are subsets of neither $\{1, 2, 3, 4, 5\}$ nor $\{4, 5, 6, 7, 8\}$.
20. Find the number of positive integers less than or equal to 2018 whose base-three representation contains no digit equal to 0.

C. Proof Questions

21. You have 9 coins, one of which is fake. The 8 real coins all weigh the same but the fake one is slightly lighter. You have a balance scale, which you may use only twice. A balance scale works by letting you compare the weights of two coins (or two groups of coins). It will either tell you that the two groups weigh the same or that one is heavier. Explain how you'd find the fake coin.



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22. An octagonal swimming pool has sides which are, consecutively 10 m, 20 m, 30 m, 40 m, 50 m, 60 m, 70 m and 80 m. All the pool's angles are right angles. Find the top surface area of the pool, in square metres. Show your work and justify all steps.