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Centre for Education in
Mathematics and Computing

Grade 7/8, Math Circles

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Jeopardy Solutions

Introduction

Today I will be testing your knowledge of the topics that we have covered over the past few months in Math Circles. We will be playing a game of Jeopardy which will have questions varying in difficulty that cover each of the topics that were taught in class. The game is broken into 6 categories with five questions each ranging from easiest ($100) to hardest ($500).

Mental Math

$100 What is 86×11?

Solution: $8(8+6)6$
$8(14)6$
946

$200 Is $1,771,561$ divisible by 11?

Solution: Yes because $1-7+7-1+5-6+1=0$ which is divisible by 11

$300 What is $516.38 \div 5$?

Solution: 516.3×2
1032.76
103.276

$400 Evaluate 988^2

Solution: $988 + 12 = 1000$
$988 - 12 = 976$
$12^2 = 144$
$1000 \times 976 + 144$
976,144

$500 Calculate $[(185 \times 15) \div 5] \times 9$

Solution: $[(2775) \div 5] \times 9$
555×9
4995

Circuits

$100 In a string of lights, if one burns out and the rest stay on, what type of circuit are the lights connected in?

Solution: Parallel

$200 If you have several lights connected in a series circuit and you add one more light to the circuit, what will happen to the overall brightness of the lights?

Solution: The brightness will decrease

$300 In a parallel circuit there is a 20 volt battery with 2 light bulbs that each have 5 amps of current running through them. What is the total resistance in the circuit?

Solution:
V total = 20V
I total = 5A + 5A = 10A
R total = $20 \div 10 = 2\Omega$

$400 A series circuit with two light bulbs has a total current of 4 amps. If light one has 12 volts and light two has a resistance of 9 ohms, what is the total voltage in the circuit?

Solution:

I total $= 4$A

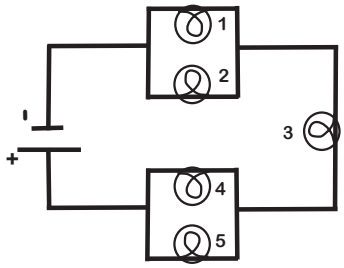
R1 $= \frac{12}{4} = 3\Omega$

R2 $= 9\Omega$

R total $= 9 + 3 = 12\Omega$

V total $= 4 \times 12 = 48V$

$500 Fill out the missing information from the table below:



$V_{total} =$	$V_1 = 6$V	$V_2 = 6$V	$V_3 = 15$V	$V_4 = 3$V	$V_5 = 3$V
$I_{total} = 15$A	$I_1 = 7$A	$I_2 =$	$I_3 =$	$I_4 = 8$A	$I_5 =$
$R_{total} =$	$R_1 =$	$R_2 =$	$R_3 =$	$R_4 =$	$R_5 =$

Solution:

$V_{total} = 24V$	$V_1 = 6$V	$V_2 = 6$V	$V_3 = 15$V	$V_4 = 3$V	$V_5 = 3$V
$I_{total} = 15$A	$I_1 = 7$A	$I_2 = 8$A	$I_3 = 15$A	$I_4 = 8$A	$I_5 = 7$A
$R_{total} = \frac{8}{5}\Omega$	$R_1 = \frac{6}{7}\Omega$	$R_2 = \frac{3}{4}\Omega$	$R_3 = 1\Omega$	$R_4 = \frac{3}{8}\Omega$	$R_5 = \frac{3}{7}\Omega$

3D Geometry

$100 Find the volume of a cube that has a side length of $7cm$.

Solution:

$V = lwh$

$= 7^3$

$= 343cm^3$

$200 What is the formula for the volume of a cylinder?

Solution:

V= Area of the base $\times$ Height

V= $\pi r^2 h$

\$300 Find the surface area of a rectangular prism with $l = 6m, w = 4m$, and $h = 8m$

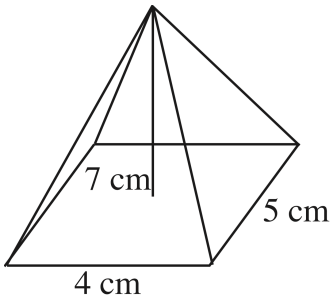
Solution:

SA= $2lw + 2(l + w)h$

=$2(6)(4) + 2(6 + 4)8$

SA= $208m^2$

\$400 What is the slant height of the following rectangular pyramid along the $4cm$ side?



Solution:

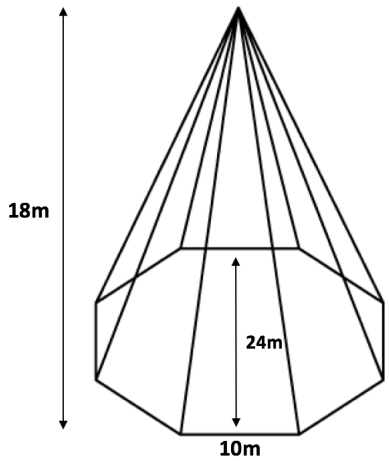
$s^2 = a^2 + (\frac{b}{2})^2$

$s^2 = 7^2 + (\frac{4}{2})^2$

$s = \sqrt{49 + 4}$

$s = 7.28$

\$500 Find the volume of the regular octagonal pyramid below.



Solution: $V = \frac{1}{3} \times$ Area of the Base $\times$ Height

Area of the base $= \frac{10(12)}{2}(8) = 60(8) = 480m^2$

$V = \frac{1}{3}(480)(18) = 480(6) = 2880m^3$

Math of Voting

$100 Who wins the following election using the plurality method and with how many votes?

Number of voters	17	3	14	5	11	12
1st	Ronaldo	Ronaldo	Neymar	Neymar	Messi	Messi
2nd	Neymar	Messi	Ronaldo	Messi	Ronaldo	Neymar
3rd	Messi	Neymar	Messi	Ronaldo	Neymar	Ronaldo

Solution: Messi (23 votes)

$200 Who wins the following election using the borda count method and with how many points?

Number of voters	3	1	2
1st (15 pts)	C	A	B
2nd (10 pts)	A	B	C
3rd (5 pts)	B	C	A

Solution: C (with 70 points) beats A (55) and B (45)

$300 Who wins the following election using the plurality with elimination method and with how many votes?

Number of voters	17	3	14	5	11	12
1st	Ronaldo	Ronaldo	Neymar	Neymar	Messi	Messi
2nd	Neymar	Messi	Ronaldo	Messi	Ronaldo	Neymar
3rd	Messi	Neymar	Messi	Ronaldo	Neymar	Ronaldo

Solution: Ronaldo (34 votes)

$400 Who wins the following election using the pairwise comparison method and with how many points?

Number of voters	3	1	2
1st (15 pts)	C	A	B
2nd (10 pts)	A	B	C
3rd (5 pts)	B	C	A

Solution: C (1.5 points)

$500 Which of the fairness criteria are violated using the plurality with elimination method?

Solution: Condorcet (a pairwise winner can receive third party votes), monotonocity (an eliminated third party can take votes away from the winner, splitting the vote), Independence of Irrelevant Alternatives (more irrelevant alternatives means more second choices).

Types of Numbers

$100 Which sets of numbers does π belong to?

Solution: Irrational, Real, Complex

$200 What is $\sqrt{-49}$ in terms of i?

Solution: $7i$

$300 What complex number is represented by the following line?

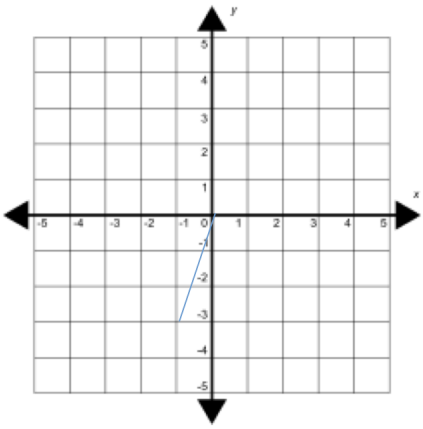


Image: printablepaper.net

Solution: -1-3i

$400 Evaluate (4 - 4$i$) - (-4 + 4$i$).

Solution: 8 - 8i

$500 Evaluate (-4 + 2$i$) $\times$ (7 - 3i).

Solution: -28 + 12i + 14i - 6i^2
=-28 + 26i + 6
=-22 + 26i

Word Problems

$100 Ahmed is going to the store. One quarter of the way to the store, he stops to talk with Kee. He then continues for 12 km and reaches the store. How many kilometres does he travel altogether?

Solution: Ahmed travels $12 \div \frac{3}{4} = 16$ km.

$200 The Summer Olympics are held once every 4 years. During an 18 year period, what is the largest number of Summer Olympics that could be held?

Solution: 5

$300 Three consecutive numbers add to 90. What is the largest number?

Solution: 31

$400 At Mathie High School, a total of 36 students are on either the baseball team, the hockey team, or both. If there are 25 students on the baseball team and 19 students on the hockey team, how many students play both sports?

Solution: There are 8 students who play both sports.
25 + 19 = 44
44 - 36 = 8

$500 Greg, Charlize and Azarah run at different but constant speeds. Each pair ran a race on a track that measured 100 m from start to finish. In the first race, when Azarah crossed the finish line, Charlize was 20 m behind. In the second race, when Charlize crossed the finish line, Greg was 10 m behind. In the third race, when Azarah crossed the finish line, how many metres was Greg behind?

Solution: 28 m behind.
The ratio A:C = 100:80 and C:G=100:90, so getting Charlize's 100 to 80, we find Greg's distance by taking $90 \times \frac{80}{100} = 72$.
So Greg has ran 72 metres (he is 28 metres behind).

Final Jeopardy

Successfully preform a mathematical card trick learned in class.