

2007-08 Grade 11 CHAMP Math Contest

Part A: (5 credits each)

1.  $\left(\frac{1}{4}\right)^{-3} (-6)^0 (2)^{-2}$  is equal to:

- a) 0                      b) -16                      c) 16                      d) -96                      e)  $\frac{1}{256}$

2. If  $a^b = \frac{a^2 b^2}{2b - a}$ , then  $(2^3)^4$  is:

- a) -576                      b) -144                      c) 1296                      d) -1296                      e) 216

3. If  $x + y = 10$  and  $x - y = 6$ , then  $x^2 - y^2$  is:

- a) 60                      b) 64                      c) 36                      d) 26                      e) 46

4. If  $\frac{1}{9} + \frac{1}{10} + \frac{1}{n} = 1$ , the value of  $n$  is:

- a)  $\frac{90}{71}$                       b)  $\frac{71}{90}$                       c)  $\frac{3}{19}$                       d)  $\frac{1}{30}$                       e)  $\frac{1}{71}$

5. Moe has \$4.50, consisting of nickels, dimes, and quarters. He has twice as many dimes as nickels and four times as many dimes as quarters. The number of dimes he has is:

- a) 12                      b) 24                      c) 6                      d) 14                      e) none of these

6. Tom is one-fourth Denise's age. In three more years, he'll be half as old as Denise is now. How old is Denise now?

- a) 8                      b) 12                      c) 16                      d) 20                      e) 24

7. January 1, 2007 occurred on a Monday. In which year, will January 1 occur on a Monday again?

- a) 2012                      b) 2014                      c) 2016                      d) 2017                      e) 2018

8. If the lines defined by the equations  $5x - 4y + 7 = 0$  and  $4x + ky + 3 = 0$  are parallel, the value of  $k$  is:

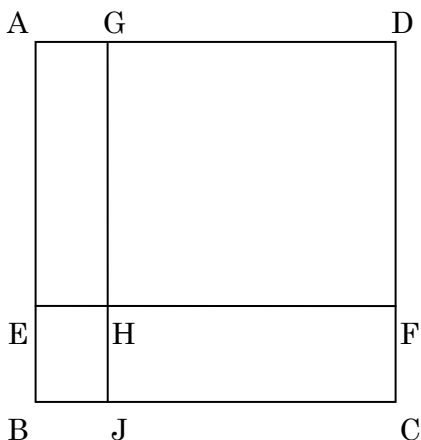
- a)  $\frac{16}{5}$                       b)  $-\frac{16}{5}$                       c) -5                      d) 5                      e) none of these

9. Geevitha was riding her new bike to prepare for an endurance race. She rode her bike at 6 km/h and arrived in the next town one hour earlier than if she had ridden at 5 km/h. How far did she ride?

- a) 6 km                      b) 12 km                      c) 24 km                      d) 30 km                      e) 60 km

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10. A rectangle is divided into three rectangles of different areas and a square GHFD. The area of rectangle AEHG is  $28 \text{ cm}^2$  and the area of rectangle HJCF is  $35 \text{ cm}^2$ . If all the rectangles have dimensions which are integers, the area of the square GHFD, in  $\text{cm}^2$ , could be:



- a) 35                      b) 36                      c) 49                      d) 16                      e) 9

**Part B: (6 credits each)**

11. The numbers along the bottom and right side represent the sum of each row and column. If each letter is a natural number, the value of ? is:

E	F	G	H	10
F	G	E	E	13
F	H	F	H	8
G	F	G	G	9
12	9	11	?	

- a) 8                      b) 9                      c) 10                      d) 11                      e) 12
12. The points  $(1, a)$  and  $(-1, b)$  are on the parabola  $y = px^2 + qx + 5$ . If  $a + b = 14$ , then the value of  $p$  is:  
 a) 7                      b) 2                      c) 5                      d)  $2 - q$                       e) none of these
13. Determine the length of the line segment connecting the points of intersection of  $y = x^2 - 5$  and  $y = 2x^2 - 9$ .  
 a) 16                      b)  $\sqrt{6}$                       c)  $\sqrt{18}$                       d) 4                      e) none of these
14. The lengths of the hour and minute hands of a clock are 4 cm and 6 cm respectively. The distance, to the nearest tenth of a cm, between the tips of the hands at 10:00 is:  
 a) 28 cm                      b) 7.2 cm                      c) 5.3 cm                      d) 1.4 cm                      e) 2.2 cm

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15. Two candles of the same height are lit at the same time. The first is consumed in 4 hours, the second in 3 hours. Assuming each candle burns at a constant rate, how many hours after being lit was the first candle twice the height of the second candle?

- a) 2                      b) 3                      c)  $\frac{4}{3}$                       d)  $\frac{12}{5}$                       e)  $\frac{3}{4}$

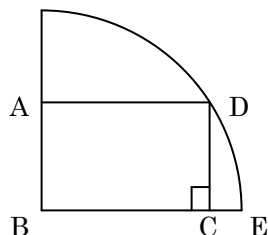
16. The number of integers between 100 and 1000 such that the sum of their digits is 10 is:

- a) 32                      b) 62                      c) 55                      d) 54                      e) 63

17. Two men and two boys wish to cross a river. Their small boat will carry the weight of only one man or two boys. The minimum number of times the boat must cross the river to get all four people on the opposite shore is:

- a) 5                      b) 6                      c) 7                      d) 8                      e) 9

18. Rectangle ABCD is drawn in a quarter circle as shown. If  $AD = 12$  and  $CE = 1$ , find the length of AB.



- a) 13                      b) 5                      c) 12                      d) 25                      e) 1

19. If each edge of a cube is increased by 300%, the percentage increase in the surface area is:

- a) 1600%                      b) 300%                      c) 900%                      d) 1500%                      e) none of these

20. A circle centred at the origin passes through the vertex of the parabola,  $y = x^2 - 5$ . Consider the four points:  $(-3, 4)$ ,  $(1, 2\sqrt{6})$ ,  $(-2\sqrt{5}, \sqrt{5})$ ,  $(\sqrt{21}, 2)$ . How many of these points are on the circle?

- a) 0                      b) 1                      c) 2                      d) 3                      e) 4

**Part C: (8 credits each)**

21. If  $x > 0$ ,  $y > 0$ , and  $z < 0$ , which expressions are always positive?

P:  $\frac{y-z}{x}$                       Q:  $\frac{z-x}{y}$                       R:  $\frac{z}{x+y}$                       S:  $\frac{z-x}{z}$                       T:  $\frac{y-z}{x+y}$

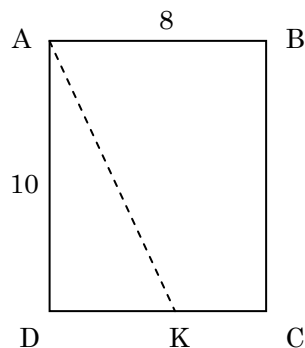
- a) P & T                      b) P, Q, & T                      c) P, S, & T                      d) R only                      e) none of them

22. The minimum value of the function  $y = 2^{x^2-2x}$  is:

- a) 0                      b) -1                      c) 2                      d)  $\frac{1}{2}$                       e) 1

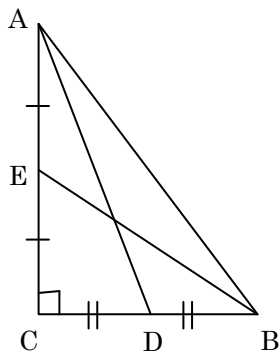
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23. In rectangle ABCD,  $AD = 10$ , and  $AB = 8$ . Point K is chosen on DC such that when triangle ADK is reflected in AK, the image of D is on BC. The length of DK is:



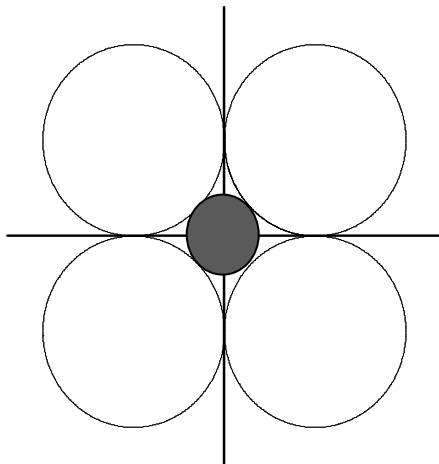
- a) 5                      b) 6                      c)  $2\sqrt{2}$                       d)  $3\sqrt{3}$                       e)  $4\sqrt{2}$

24. Given  $AD = 7$ ,  $EB = 4$ ,  $AE = EC$ ,  $CD = DB$ , the length of AB to one decimal place is:



- a) 4.2                      b) 7.2                      c) 7.1                      d) 13.0                      e) 3.6

25. Four circles, each with radius 5 cm, are tangent to the  $x$  – and  $y$  –axes and a smaller circle with centre  $(0,0)$ . The area of the smaller circle, to one decimal place, is:



- a)  $78.5 \text{ cm}^2$                       b)  $13.5 \text{ cm}^2$                       c)  $12.6 \text{ cm}^2$                       d)  $50.2 \text{ cm}^2$                       e)  $28.3 \text{ cm}^2$