

Mathletics Contest 2015 Integrated Mathematics II Released Items

1. Which of the following are zeros of the function  $f(x) = x^2 + 3x + 5$

- (a)  $\frac{-3 \pm \sqrt{11}}{2}$       (b)  $\frac{-3 \pm i\sqrt{11}}{2}$       (c)  $\frac{3 \pm i\sqrt{11}}{2}$       (d)  $\frac{3 \pm \sqrt{11}}{2}$
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2. Which of the following is a possible simplification of  $\frac{2}{1+i}$ ?

- (a)  $1 - i$       (b)  $\frac{1+i}{2}$       (c)  $1 + i$       (d)  $\frac{1-i}{2}$
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3. If  $f(x) = x^{5/3}$ , then  $f(4) = \underline{\hspace{2cm}}$ .

- (a)  $8\sqrt[3]{2}$       (b)  $\sqrt[5]{4^3}$       (c)  $\sqrt[5]{64}$       (d)  $64\sqrt[3]{16}$
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4. Which of the following equations is true for all rational number values of  $x$ ,  $y$ , and  $z$ ?

- (a)  $x(y+z) = (y+z)x$       (b)  $x(y+z) = (x+y)z$   
(c)  $x(y+z) = xy+z$       (d)  $x(y+z) = (xy)(xz)$
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5. A geometric sequence with a missing term is shown below.

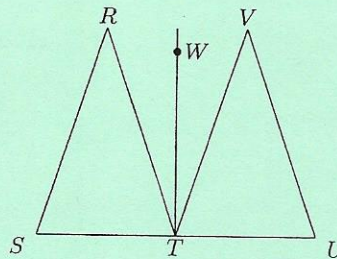
$$\frac{2}{25}, \frac{2}{5}, \underline{\hspace{1cm}}, 10, 50, \dots$$

What is the missing term in the sequence?

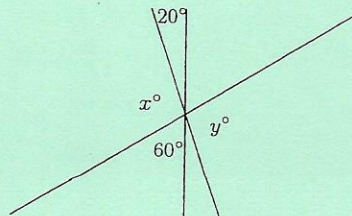
- (a)  $\frac{1}{5}$       (b)  $\frac{1}{2}$       (c) 2      (d) 5
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MATHLETICS CONTEST 2014  
 GEOMETRY  
 RELEASED QUESTIONS

- (21) A cylindrical can is 10 inches in height and has a surface area of about 245 square inches, including the top and bottom. Which of the following is the approximate volume of the can in cubic inches?  
 (a) 283                      (b) 385                      (c) 785                      (d) 1131
- (22) The point  $(3, -2)$  is rotated  $90^\circ$  clockwise about the origin. The image is:  
 (a)  $(-3, -2)$               (b)  $(-2, -3)$               (c)  $(2, -3)$               (d)  $(-3, -2)$               (e) None of These
- (23)  $\overline{SR} \parallel \overline{TV}$ ,  $\overline{TR} \cong \overline{UV}$ , and  $\overline{TW}$  bisects both  $\overline{SU}$  and  $\angle RTV$ . What can you conclude?

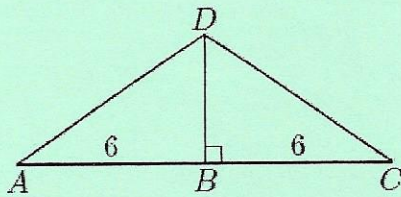


- (a) SAS can be used to prove that  $\triangle RST \cong \triangle VTU$   
 (b) ASA can be used to prove that  $\triangle RST \cong \triangle VTU$   
 (c) SSS can be used to prove that  $\triangle RST \cong \triangle VTU$   
 (d) There is not sufficient information to prove that  $\triangle RST \cong \triangle VTU$
- (25) In the figure, three lines intersect in a point. Given the measures of the acute angles as shown, what is the value of  $x + y$ ?



- (a)  $80^\circ$                       (b)  $100^\circ$                       (c)  $130^\circ$                       (d)  $150^\circ$                       (e)  $200^\circ$

- (4) In the figure below, points  $A$ ,  $B$ , and  $C$  are collinear, and  $\overline{AB}$  and  $\overline{BC}$  are each 6 units long. If the area of  $\triangle ACD$  is 24 square units, how many units long is the altitude  $\overline{BD}$ ?



- (a) 2                      (b) 4                      (c) 6                      (d) 8
- (8) In a hexagon, three angles have the same measure. The measure of each of the congruent angles is twice the measure of the fourth angle and is half the measure of the fifth angle. The sixth angle measures  $115^\circ$ . What is the measure of the smallest angle?
- (a)  $55^\circ$                       (b)  $110^\circ$                       (c)  $121^\circ$                       (d)  $41^\circ$
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- (9) The exterior angle of a base angle in an isosceles triangle is  $100^\circ$ . What is the measure of the vertex angle?
- (a)  $80^\circ$                       (b)  $60^\circ$                       (c)  $40^\circ$                       (d)  $20^\circ$
- (12) A mountain climber stands on level ground 300 m from the base of a cliff. The angle of elevation to the top of the cliff is  $58^\circ$ . What is the **approximate** height of the cliff?
- (a) 566 m                      (b) 480 m                      (c) 354 m                      (d) 187 m
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- (13) A 20-foot ladder is leaning against a wall. The foot of the ladder is 7 feet from the base of the wall. What is the **approximate** measure of the angle the ladder forms with the ground?
- (a)  $70.7^\circ$                       (b)  $69.5^\circ$                       (c)  $20.5^\circ$                       (d)  $19.3^\circ$
- (16) What is the ratio of the surface areas of two spheres with volumes of  $64 \text{ cm}^3$  and  $125 \text{ cm}^3$ ?
- (a) 4 : 5                      (b) 8 : 10                      (c) 16 : 25                      (d) 64 : 125
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- (17) A point is randomly selected on  $\overline{XY}$ . What is the probability that it will be closer to the midpoint of  $\overline{XY}$  than to either  $X$  or  $Y$ ?
- (a)  $1/4$                       (b)  $1/3$                       (c)  $1/2$                       (d)  $3/4$

