高校入試　数学　サンプル

INSTRUCTION TO CANDIDATES

・Full marks are not always given for a correct answer without work shown. Answers must be supported by work and/or explanations. Even if an answer is incorrect, some marks may be given for a correct method, if it is shown by written working. Therefore, you are advised to show all work.
・All work must be written in English.
・Answer all questions in the boxes provided.

受験者への指示

・答えのみを記された解答では満点にならないことがあります。答えだけで
なく、答えを得るまでの途中過程を必ず記して解答してください。答えが間違っていたとしても、記した途中過程が正しければ部分点を与えることがあります。
・途中過程は全て英語で記しなさい。
・答えが全て解答欄に記しなさい。

1) Simplify $\frac{2x-8}{2} - \frac{12x+9}{3}$.

2) Expand and simplify $2(x+1)(2x-3)$.

3) Fully factorize $-2x^2-8x+10$.

4) Simplify $4\sqrt{80}-2\sqrt{45}$.

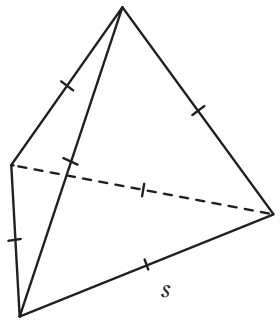
5) Three students each flip a coin. What is the probability that all coins are on the same side?

6) Solve the equation $-\frac{x}{3}+\frac{8}{3}=\frac{1}{3}\left(x+\frac{3}{2}\right)^2-\frac{3}{4}$ for x.

7) Find the equation of the line that passes through point $(-2, 1)$ and is parallel to the line $y = 3x + 6$.

8) A rectangular garden is surrounded by a 16 m fence, and has an area of 15 m^2. Find the length of the longer side of the garden.

9) The following triangular pyramid has edge lengths that are all s units long.



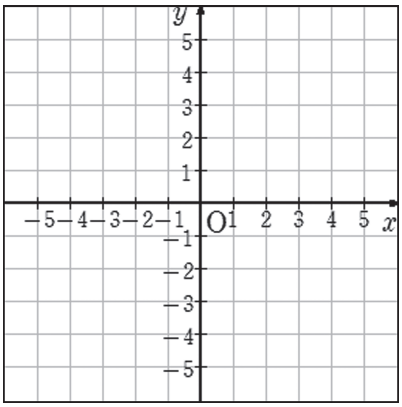
a. Show that the surface area of the pyramid, A, is given by $A=s^2\sqrt{3}$.

b. Rearrange the formula to show that $s^2=\frac{A\sqrt{3}}{3}$.

c. Hence, find the side length when the pyramid has a surface area of $\sqrt{12}$ cm^2.

10) Consider the equation $y=(x-2)^2-(3-x)^2+4$.

a. Graph the equation on the coordinate plane below.



b. The curve will intersect with the equation $y=-2x-3$. Find the coordinates of the intersection.

.....

.....

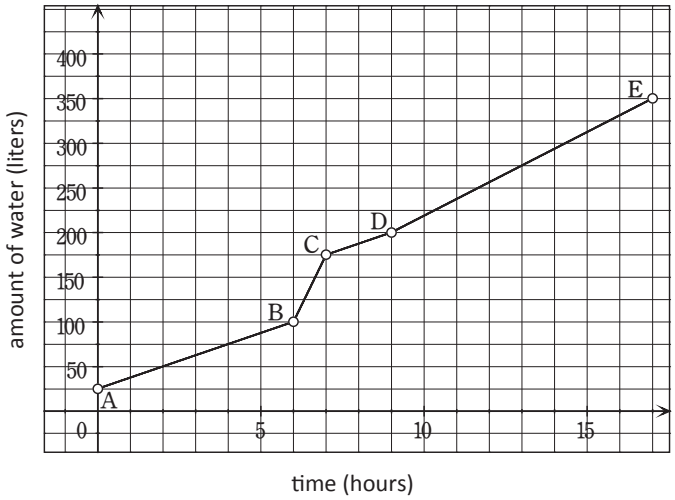
.....

.....

.....

.....

11) When a rainstorm came, Bob began measuring the amount of water in a water tank. He measured 5 times, plotted the points, and connected them using line segments, as shown below.



a. How much water was in the tank before the storm?

.....

.....

b. What time period was it raining the hardest?

.....

.....

c. How much water was in the tank after 13 hours?

.....

.....

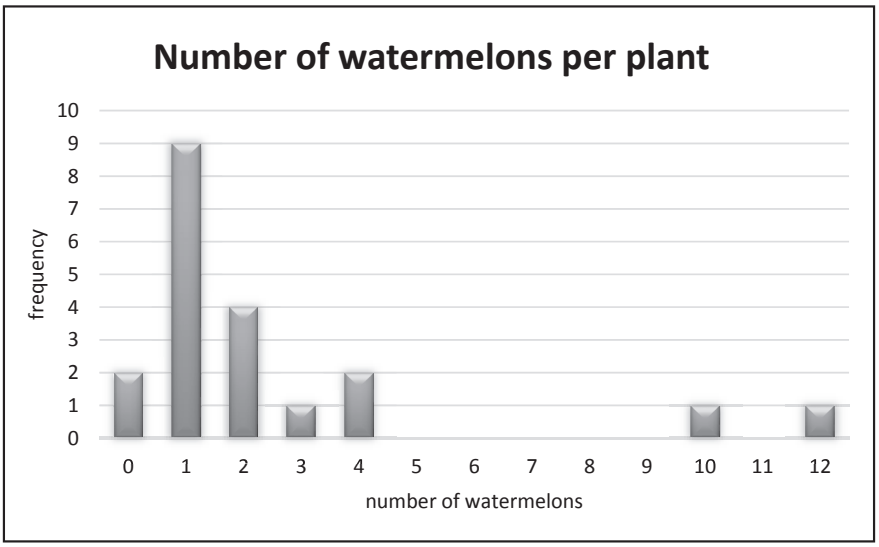
d. At what rate is the tank filling between points C and D?

.....

.....

.....

12) A farmer wants to find information about the number of watermelons per plant. To do this, she chose 20 random plants, and counted the number of watermelons per plant. The results are as follows:



a. Find the mean, median, and mode.

.....

.....

.....

.....

b. Would the mean or median be more suitable for the investigation? Explain your answer.

.....

.....

.....

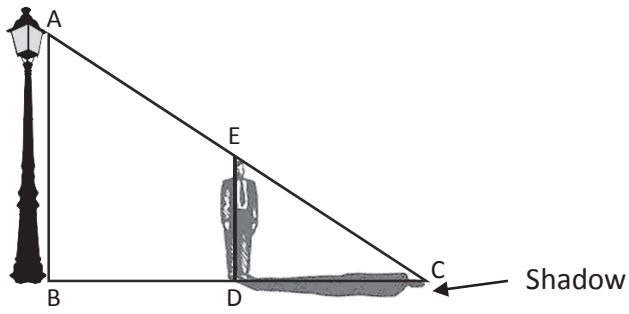
c. The farmer also checked another patch of watermelons. Out of the 30 plants, she found the mean to be 2.2 watermelons per plant. Find the new mean for all 50 plants.

.....

.....

.....

13) A man is standing 14 m from a street light that is 12 m tall.



a. Write in the given distances on the diagram above.

b. Show that the two right triangles in the diagram are similar.

.....

.....

.....

.....

c. How tall is the man if his shadow is 2 m long?

.....

.....

.....

.....

14) Two normal dice, labeled A and B, are rolled. Let a be the number shown on die A, and b be the number shown on die B. Consider the line $y=\frac{a}{b}x+a-b+1$. Find the probability that the line has a slope of at least 0.7, and goes through $(0, 0)$.

15) A square with side lengths of 10 cm is connected to a semicircle, as shown below, where $\overset{\frown}{AB}=\overset{\frown}{AC}$. Find the area of the shaded region.