

Name: _____

Test #: _____



Welcome to the 2018 Individual Math Competition

Please do not open your test booklet until instructed to do so

Test Taking Information and Instructions:

Thank you for participating in the TechTest Jr./STEAM Expo Math competition. Here are a few reminders about the exam:

- You are not allowed to bring in any paper or pencils with you. Pencils and scratch paper will be provided. If you need additional paper or pencils, you may raise your hand to call a proctor for assistance.
- If you have any questions, you may also raise your hand for assistance. However, the proctors can only provide clarification. They cannot assist you in figuring out a question.
- Circle your answers **clearly** on the test sheet.
- You have an hour and 45 minutes to complete the exam. After completing it, you will need to turn in your exam, answer sheet, all scratch paper and pencil(s). At that point, please quietly remain in your seat while the remaining participants complete their exams.
- All exams will be graded off-site. The winners will be announced on Saturday, April 7th at the STEAM Expo awards ceremony at the Nevada County Fairgrounds.

This year's 5th/6th grade version of the exam consists of 25 questions (146 points total). The questions include math (5th – 6th grade math and Pre-Algebra) topics typically covered in your 5th and 6th grade classes and are based on the Common Core standards (CCSS). The science questions are based on the standard Earth Science books.

Most questions are multiple-choice (the easier ones are worth fewer points than the more difficult ones), but a constructed response is required for the last 5 questions. Those 5 can be answered in the space provided. If more space is required, you may request a blank sheet of paper to use. The constructed response questions will be graded on the correctness of the answer as well as for the solution steps, so be sure to show your work. Calculators may be used, but phones or any other electronic devices are not allowed in the testing area.

** If you need a bathroom break during the test, please raise your hand and a proctor will assist you. **



2018 STEAM Expo/TechTest Jr. Math Problems (5th/6th Grade Version)

Questions 1-6 are worth 3 points each

- 1) There is a patch of lily pads on a lake. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long does it take for the patch to cover half of the lake?
 - a. 24
 - b. 47
 - c. 49
 - d. 72
 - e. 96

- 2) Evaluate $3 \times 10^5 + 5 \times 10^4 + 2 \times 10^2 + 4 \times 10^1 + 7 \times 10^0$
 - a. 35240
 - b. 35247
 - c. 350240
 - d. 350247
 - e. 43119

- 3) In your dresser drawer are 10 black socks, 11 white socks, and 12 blue socks, all mixed up. What is the minimum number of socks must you pull from the drawer, without looking at them, to ensure that you have at least one color-matched pair?
 - a. 2
 - b. 3
 - c. 4
 - d. 5
 - e. 10

- 4) Which of the following is a type of rock that forms from the cooling of molten rock at or below the surface of the Earth?
 - a. Sedimentary rock
 - b. Sandstone
 - c. Metamorphic Rock
 - d. Igneous Rock
 - e. Clastic Rock

- 5) Which process in the rock cycle causes sediment to form?
- Freezing
 - Cooking
 - Melting
 - Heat and pressure
 - Weathering and erosion
- 6) Which of the following connects points of equal elevation on a topographic map?
- Scale
 - Slope
 - Legend
 - Contour line
 - Level line

Questions 7-16 are worth 5 points each

- 7) If you have only three-cent and four-cent stamps, what is the smallest number of stamps you will need to put 37 cents' worth of postage on a postcard?
- 9
 - 10
 - 11
 - 12
 - 13
- 8) To find her heart rate while running, Carole stops briefly and counts 28 heartbeats in 12 seconds using her digital watch. She then continues running. What was her heart rate in beats per minute (BPM)?
- 2.3 BPM
 - 60 BPM
 - 120 BPM
 - 140 BPM
 - 336 BPM
- 9) Pete didn't pay much attention in class when his 6th grade class was studying probability, so 10 years later he wasn't very aware of how poor his chances would be when gambling in a casino. He started with \$25,000 and by the time he was done, he had only .05% of his money left. How much of his \$25,000 did he walk out of the casino with?
- \$12.50
 - \$500
 - \$1,250
 - \$5,000
 - \$12,500

10) You ordered a 12" by 8" rectangular pizza that included a one-inch border of plain (and relatively inexpensive) crust around the (relatively expensive) portion with toppings. What portion of the pizza's area had no topping?

- a. 33.3%
- b. 37.5%
- c. 50%
- d. 62.5%
- e. 66.7%



11) The earth is an average of 93 million miles from the sun. Given that, if you drove that distance in a car that got 45mpg and gas cost \$2.89 per gallon, how much would it cost you to drive to the sun and back?

- a. \$4,185.00
- b. \$2,066,000.00
- c. \$5,972,666.67
- d. \$11,945,333.33
- e. \$41,850.00

12) If a typical jet airplane's engine runs at an average of 10,000 Revolutions Per Minute (RPM), and the engine manufacturer tests the engine to ensure that it can last for at least 3 trillion revolutions, what's the minimum length of time that the engine should last?

- a. 3,333 hours
- b. 18,000 hours
- c. 50,000 hours
- d. 3,000,000 hours
- e. 5,000,000 hours

13) Aidan and his three buddies made a New Year's resolution to get in better shape by losing some weight. Aidan went into South Yuba Club to see what they thought. At the time, he weighed 194 pounds and was told that his ideal weight would be 152 pounds. What percentage of weight would Aidan have to lose in order to accomplish his New Year's resolution?

- a. 13.0%
- b. 21.6%
- c. 27.6%
- d. 32.3%
- e. 42.0%

- 14) In the northern hemisphere, a low pressure/storm system generally moves:
- Clockwise
 - Counterclockwise
 - South
 - North
 - Upwards
- 15) What occurs when soil containing liquid is shaken during an earthquake?
- Liquefaction
 - A Tsunami
 - Seismic sea waves
 - A strike-slip fault
 - A reverse fault
- 16) What is an "Earthquake Magnitude" a measure of
- The location of an earthquake
 - The damage incurred
 - The amount of energy released
 - The length of time the earthquake lasted
 - How far away the epicenter was

Questions 17-20 are worth 7 points each

- 17) "Nutrition Facts" labels on processed foods refer to adults consuming 2000 calories per day. According to standard nutritional guidelines, about 55% of those calories should come from carbohydrates. About 30% should come from fats. The remainder of those 2000 calories should come from protein. If there are 4 calories in each gram of protein, how many grams of protein should the standard adult consume per day?
- 15 grams
 - 30 grams
 - 60 grams
 - 75 grams
 - 110 grams
- 18) Niagara Falls has 700,000 gallons of water flowing over it every second. If you could channel all that water into a narrow stream, how long would you theoretically (ignoring splashing and the fact that you would probably be pulled to your death, etc...) need to hold a $\frac{1}{2}$ gallon water bucket under that stream to fill it up?
- 1.3×10^{-3} seconds
 - 8.0×10^{-5} seconds
 - 2.8×10^{-6} seconds
 - 7.1×10^{-7} seconds
 - 9.3×10^{20} seconds

19) What is the angle formed by the hour and minute hands of an analog clock 3:15pm?

Refer to the diagram at the right.

- a. 6.0 degrees
- b. 7.5 degrees
- c. 10.5 degrees
- d. 82.5 degrees
- e. 92.5 degrees



20) Your average grade after 8 tests is 88%. After taking your 9th test, you found out that your average is now 89%, but your test paper got lost and your teacher was feeling bad about it. You told your teacher not to worry because you could figure out what the score on the 9th test was. It was:

- a. 88%
- b. 89%
- c. 91.5%
- d. 95.5%
- e. 97%

Constructed Response #1 (10 points):

The recommended maximum adult dosage for Ibuprofen is not to exceed 3.0g per day. If typical pills (e.g., Advil, Motrin) contain 200mg of Ibuprofen and they are to be taken no more frequently than every 4 hours, what is the maximum number of pills an adult can take every 4 hours without exceeding the above constraints?

Note: the answer can be either a whole number or a decimal.

Constructed Response #2 (10 points):

Cassini was launched 20 years ago to explore the planet Saturn. On 9/15/17, it ran out of fuel and was sent to the surface of Saturn, transmitting its final images as it descended to its fiery demise at 75,000mph.

Saturn is 746 million miles from earth. Light (and radio waves) travels at 186,000 miles per second. How long did it take for the final transmission to travel from Saturn to Earth?

Constructed Response #3 (10 points):

Per the latest US census, there is a birth every 8 seconds and a death every 10 seconds. Given that (ignoring immigration and emigration), what would the change in the US population be after 1 year?

Constructed Response #4 (8 points):

It takes 1.9 kg of quarter-inch plywood to cover a cubical box with edges 30 cm long. What is the mass of the same type of plywood needed to cover a cubical box with edges 90 cm long?

Constructed Response #5 (12 points):

Amazon is raising funds to purchase a square, ten-acre parcel of land on which to build a new distribution center. What is the side length of that parcel, in feet, given that there are 640 acres in a square mile?