Mathematics
Practice Test Booklet
for the PSSA

High School Level
Grade 11

Name:

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For Multiple-Choice Questions:

- First solve the problem on scratch paper.
- Choose one of the answers given and record your choice in the answer booklet.
- If none of the choices matches your answer, go back and check your work for possible errors.
- One of the answers provided is the correct response.
- You may not use a calculator for items 1-5. You may use a calculator for all other items on this test.

SECTION 1

You may <u>not</u> use a calculator for items 1-5.

1. Juan installs car alarms. It takes him about 1 hour and 10 minutes to complete an installation. Estimate how many alarms he can put in during a 7-hour work day.

A) 2
B) 4
C) 6
D) 8

2. Mars is about 142,000,000 miles from the sun. Pluto is about 26 times farther from the sun than Mars. About how many miles is Pluto from the sun?

E) 3,692,000
F) 369,200,000
G) 3,692,000,000
H) 36,920,000,000

3. Your restaurant bill was $56.30. Which amount below is closest to a 15% gratuity?

A) $ 8.00
B) $ 8.50
C) $ 9.00
D) $ 15.00

4. A carpenter makes $14.00 per hour. She is paid $1\frac{1}{2}$ times this amount for any hours worked over 40 hours for the week. Last week she worked 47 hours. Which amount is the closest to her actual pay for that week?

E) $ 600
F) $ 650
G) $ 700
H) $ 750

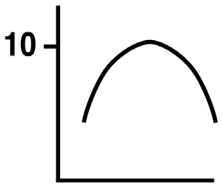
5. $\frac{0.0684}{0.2} =$

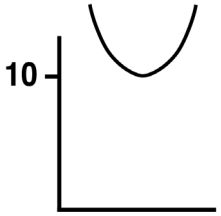
A) 0.0342
B) 0.342
C) 3.42
D) 34.2

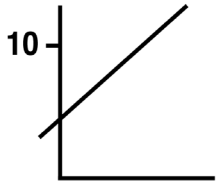
GO ON

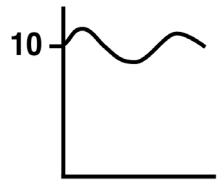
You may use a calculator for the rest of the questions on this test.

6. Which of the following functions has a **maximum** value of 10?

E) 

F) 

G) 

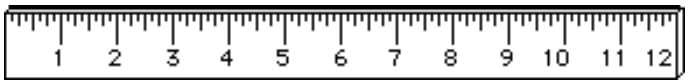
H) 

7. Which of the following is the **domain** of this relation?

$$\{(-2, 0), (1, 3), (3, 0), (-2, -3)\}$$

A) $\{-2, 1, 3\}$
B) $\{-3, 0, 3\}$
C) $\{-2, -3\}$
D) $\{-2, 0\}$

8. For the 12-inch ruler shown below, what value does the smallest division represent?



Note: figure **not** drawn to scale

E) $\frac{1}{10}$ in.

F) $\frac{1}{8}$ in.

G) $\frac{1}{7}$ in.

H) $\frac{1}{4}$ in.

9. If n = –3, what is the value of the expression $n^4 - n^3$?

A) –21
B) –3
C) 54
D) 108

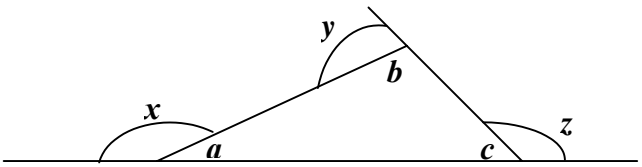
10. A square has **diagonal** of 8 units. What is its **area**?

E) 16 units^2
F) 32 units^2
G) $16\sqrt{2}$ units^2
H) $32\sqrt{2}$ units^2

11. Given the following salaries:
$ 54,000; $75,000; $55,000; $62,000; $226,000; $65,000; $59,000; $61,000; $162,000; $59,000
The mean, median and mode, respectively are:

A) $ 87,800; $62,000; $59,000
B) $ 61,000; $61,000; $61,000
C) $824,900; $61,500; $59,000
D) $ 87,800; $61,500; $59,000

12. Using the following figure, what is the value of $(x + y + z) - (a + b + c)$?



E) –180
F) 0
G) 180
H) 360

GO ON

13. $A=\begin{bmatrix} 4 & -1 \\ 3 & 2 \end{bmatrix}$ and $B=\begin{bmatrix} -1 & -3 \\ 0 & 6 \end{bmatrix}$

What is AB?

A) $\begin{bmatrix} 4 & -3 \\ 0 & -12 \end{bmatrix}$

B) $\begin{bmatrix} -4 & -9 \\ 0 & 12 \end{bmatrix}$

C) $\begin{bmatrix} -4 & -18 \\ -3 & 3 \end{bmatrix}$

D) $\begin{bmatrix} -4 & 3 \\ 0 & 12 \end{bmatrix}$

14. A box contains 8 red marbles and 10 green marbles. A **green** marble is drawn out of the box and **set aside**. What is the probability that the next marble that is drawn out is a **green** marble?

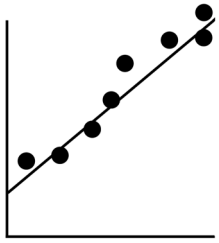
E) $\frac{5}{9}$

F) $\frac{10}{17}$

G) $\frac{9}{17}$

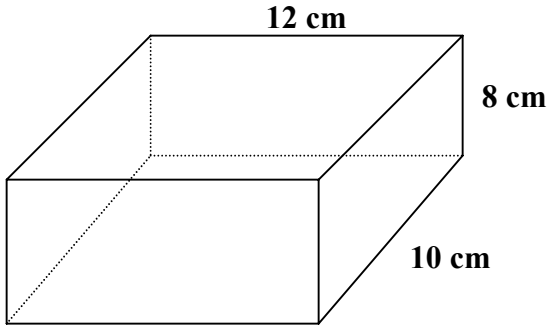
H) $\frac{4}{9}$

15. Which regression equation **best** fits the data shown?



A) $y = 10x - 30$
B) $y = 10x + 30$
C) $y = -10x + 30$
D) $y = -10x - 30$

16. How many cubes, 2 cm on a side, can be packed into this box?



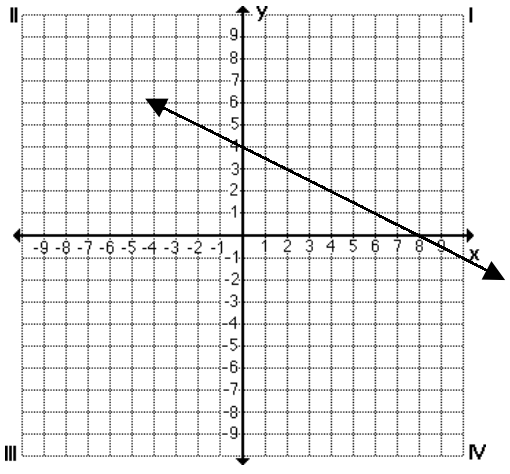
Note: figure **not** drawn to scale

E) 100
F) 120
G) 240
H) 960

17. Which of the following functions represents an exponential growth function?

A) $y = 3^x$
B) $y = 3^{-x}$
C) $y = \sqrt{3}\,x$
D) $y = x^3$

18. Which equation is graphed below?



E) $x + y = 4$
F) $2x + y = 8$
G) $x + 2y = 8$
H) $x - 2y = 8$

GO ON

19. What conclusion drawn from the following situation is **always** correct?

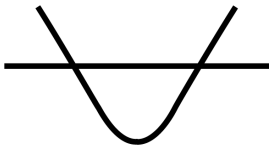
Chris goes to a bicycle shop and spends $60.00 on two items with different prices.

A) Each item costs $30.00
B) At least one item costs more than $30.00.
C) One item costs $45.00.
D) No conclusion can be drawn.

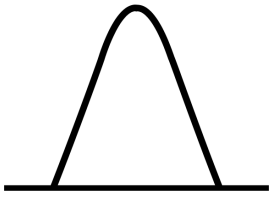
20. Which of the following **best** represents the normal curve?

E)

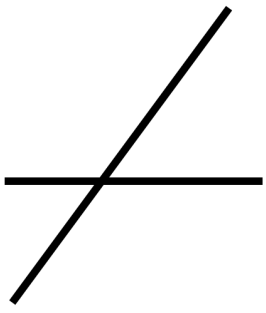
F)



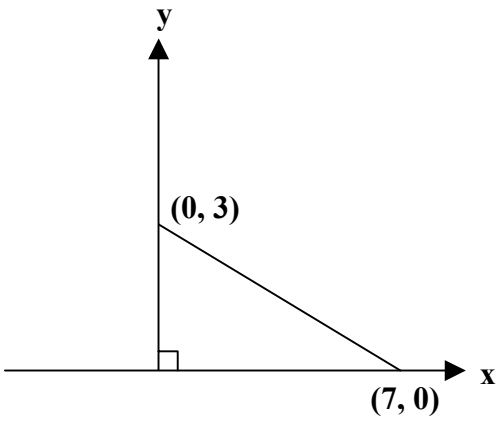
G)



H)



21. If this triangle is rotated 360° **about the x-axis**, which of the following will result?



A) cone with diameter equal to 6
B) cone with diameter equal to 14
C) circle with diameter equal to 6
D) circle with diameter equal to 14

22. A rectangular birthday cake is 9 inches by 13 inches and has 6 circular balloons on it that don't overlap. Each balloon has a $\frac{1}{2}$ inch radius. If a fly lands on the cake, what is the probability that it lands on a balloon?

E) $\frac{2}{3}\%$

F) 4 %

G) 16 %

H) 42.8%

GO ON

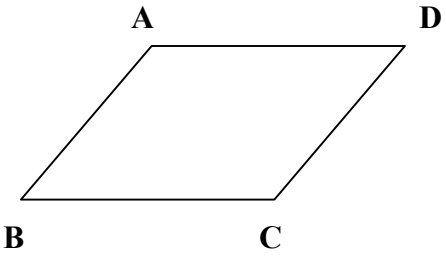
23. What is the **amplitude** of the graph of $y = 8\sin 2x$?

A) 2
B) 8
C) 16
D) 180

24. In the parallelogram

$\overline{AB} = 3x - 4$
$\overline{BC} = x + 5$
$\overline{CD} = 2x + 10$

What is BC?



E) 14
F) 19
G) 38
H) 76

STOP

25. A kitchen floor measures 12 feet 8 inches wide by 18 feet 9 inches long. The floor is being covered with tiles that are 8 inch squares. How many tiles must be bought to cover the floor?

Show your work and explain the steps you used to justify your answer. Do all work for this problem in the box below. Remember you must show all the steps you used to solve the problem even if you used a calculator. To receive the highest score, all calculations and steps must be shown and explained in writing. Numeric answers must always be labeled.

For full credit, you **must** do the following:

1. show OR describe each step of your work, even if you did it in your head ("mental math") or used a calculator,

AND

2. write an explanation stating the mathematical reason(s) **why** you chose each of your steps.

IF YOU NEED MORE SPACE, PLEASE USE PAGE 9.

25. ***Continued***. If you need more space, use this page. Please refer to previous page for task explanation.

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SECTION 2

26. If $a = -2$ and $b = -7$, what is the value of $|-4a + 3b|$?

A) −3
B) 5
C) 13
D) 19

27. A meat market reduced the price of pork to \$2.07 per pound, which is 90% of the original price. What is the **savings** per pound?

E) \$0.20
F) \$0.21
G) \$0.23
H) \$0.30

28. Megan works at a local animal shelter. She needs to find out whether there are more dogs than cats in her county. Which of these methods would give Megan the **best** information?

A) compare the number of dogs and cats at the animal shelter on a randomly selected day
B) compare the number of dogs and cats in one randomly selected acre of her town
C) compare the number of dogs and cats treated at the veterinary clinic on a randomly selected day
D) compare the number of dogs and cats in one randomly selected acre of every town and township in her county

29. What is the value of K in the equation $(5^3)(2^5) = 4(10^K)$?

E) 2
F) 3
G) 4
H) 6

30. The perimeter of a rectangle is 24 units. Which expression represents the area of the rectangle in terms of the width, x?

A) $A(x) = x(24 - 2x)$
B) $A(x) = (2x)(12 - x)$
C) $A(x) = x(12 - x)$
D) $A(x) = 12x^2$

31. A farmer needs to know the average weight of the calves he sold in 1997. Which of these **must** the farmer know for 1997 in order to calculate this average?

1. number of cows and calves he had
2. number of calves he sold
3. total weight of calves he sold
4. price per pound for the calves
5. total amount of money he earned

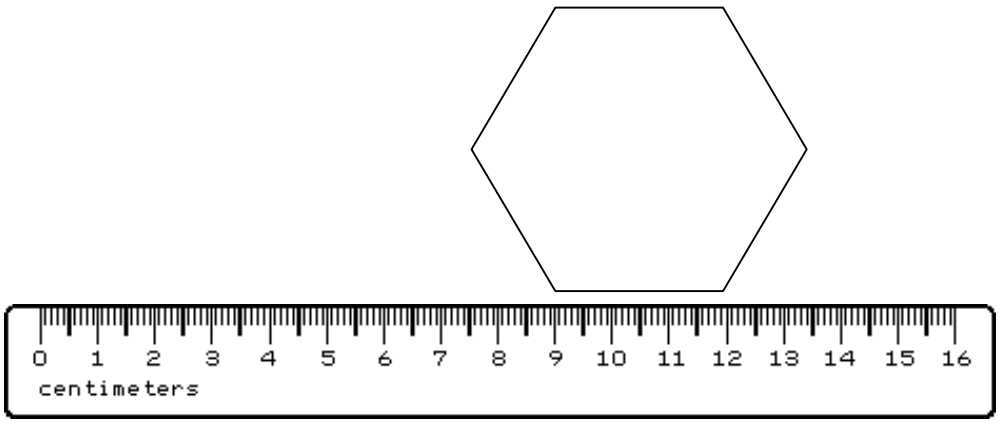
E) 1 and 3 only
F) 2 and 3 only
G) 2 and 4 only
H) 4 and 5 only

32. What is the value of x in the equation $\frac{1}{x} = \sqrt{0.04}$?

A) 5
B) 16
C) 25
D) 50

GO ON

33. The hexagon shown has all sides equal. Use the ruler shown to measure the side of the hexagon. What is the **perimeter** of the hexagon?



Note: ruler **not** actual size

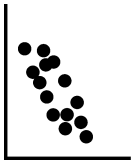
E) 2.9 cm
F) 11.8 cm
G) 17.4 cm
H) 67.8 cm

34. A random sample of 10,000 people was taken to determine the number of hours of TV watched per week. The results of the survey showed a normal distribution with a mean of 4.5 hours and a standard deviation of 0.5 hours. What is the **median** number of hours of TV watched?

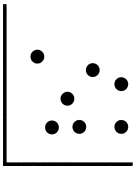
A) 0.5 hours
B) 4.0 hours
C) 4.5 hours
D) 5.0 hours

35. Which of the following scatter plots could represent two sets of data with a **strong negative** relationship?

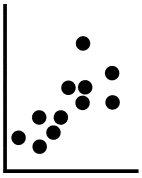
E)



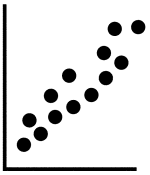
F)



G)



H)



GO ON

36. What is the solution of $\frac{1}{27} = 3^{1-2n}$?

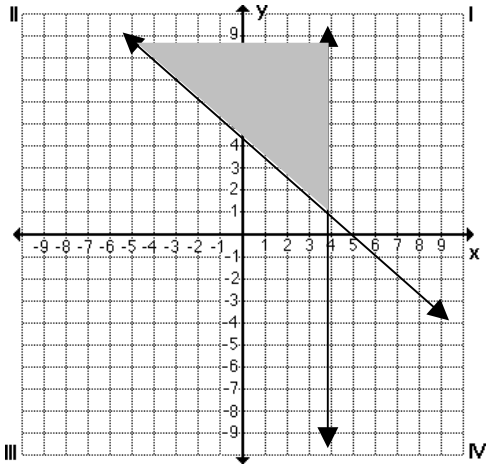
A) n = – 3
B) n = 0
C) n = 1
D) n = 2

37. R and T are on a number line. X is the midpoint of $\overline{RT}$.

Which of the following is **false**?

E) $\overline{RX} < \overline{RT}$
F) $\overline{RX} = \overline{XT}$
G) $\overline{RX} > \overline{XT}$
H) $\overline{RX} + \overline{XT} = \overline{RT}$

38. Which system of inequalities is represented in the graph?



A) $x \geq 4$
$4y \leq -3x + 2$

B) $x \leq 4$
$4y \geq -4x + 16$

C) $x \geq 4$
$3y \geq -4x + 12$

D) $x \leq 4$
$4y > 3x + 12$

39. A rectangular box has a length of 10 feet, a width of 6 feet, and a height of 4 feet. The longest straight rod that could fit in the box would have to go **along the diagonal** between opposite corners. To the nearest tenth of a foot, how long is the longest rod that fits?

E) 10 feet
F) 11.7 feet
G) 12 feet
H) 12.3 feet

40. The number of hours it takes to paint a house **varies inversely** as the number of workers. Using the information in the table, how many hours would it take 6 workers to complete the job?

Workers	2	4	5	6
Number of hours	36	18	14.4	?

A) 9
B) 10
C) 10.8
D) 12

GO ON

41. Mr. And Mrs. Smith and their 4 children went to an aquarium. The sign below shows the ticket prices. If the Smiths paid a total of $26, which of these could be the ages of their children?

AQUARIUM TICKETS	
Adults	$7.50
Seniors	$3.50
Students (13-18)	$5.00
Children (4-12)	$3.00
Children under 4	FREE

E) 10, 7, 5, and 4 years old
F) 13, 10, 8, and 3 years old
G) 14, 10, 9, and 4 years old
H) 15, 13, 6, and 2 years old

42. If the circumference of a circle is 22 π units, what is its area?

A) 121 units^2
B) 121 π units^2
C) 484 units^2
D) 484 π units^2

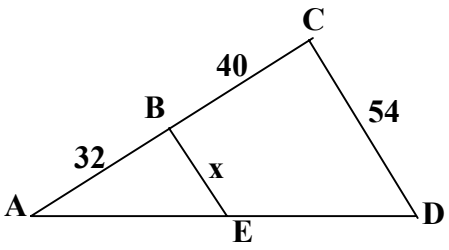
43. The regression equation that models the number of chirps (N) a bird is expected to make per minute, based on the temperature, T, in degrees Celsius, has been found to be: $N = 9T - 59$. If the temperature were 25° Celsius, how many chirps per minute are expected?

E) 9
F) 166
G) 284
H) 866

44. Patty decided to add 5 points to each of the scores in a list. She had already calculated the mean, mode, median and range of the original scores. Which of these was **not** changed by the addition of 5 points?

A) mean
B) median
C) mode
D) range

45. $\overline{BE} \parallel \overline{CD}$ What is the value of ***x***?



E) 18
F) 24
G) 30
H) 43.2

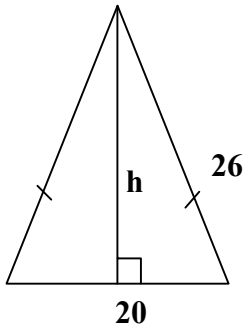
46. To estimate the population of the deer herd in Potter County, an environmental researcher uses the capture-tag-recapture method. He captures and tags 135 deer. He then releases them and waits two months before trying to recapture any deer. This time he captures 146 deer of which 2 were previously tagged. From this information, what is the **best estimate** of the number of deer in Potter County?

A) 279
B) 281
C) 1,849
D) 9,855

47. When a cannonball is shot into the air, its height, in feet, during the flight is given by the function $h(t) = 160 + 480t - 16t^2$ where h(t) is the height in seconds. What is the **maximum height** of the cannonball?

E) 15 feet
F) 160 feet
G) 3,744 feet
H) 3,760 feet

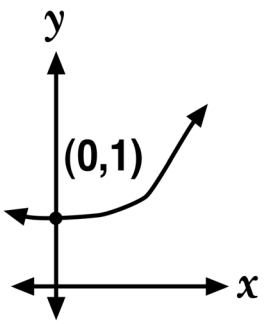
48. What is the length of the altitude h?

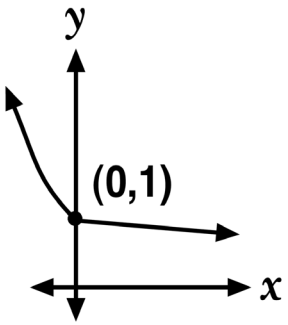


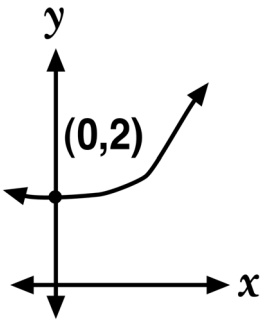
A) 21 units
B) 22 units
C) 23 units
D) 24 units

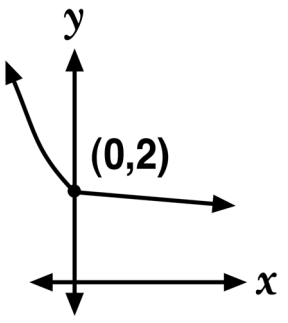
49. Which of the following is the graph of

$$y = 2^{.25x}$$

E)


F)


G)


H)


STOP

50. The height, in feet, of a missile is given by $H = 1600t - 16t^2$ and t is the time in seconds.

A) What is the **maximum** height reached by the missile?
B) What is the **time** it reaches the **maximum** height?
C) What is the **time** when the missile hits the ground?

For full credit, you **must** do the following:

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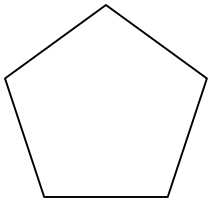
SECTION 3

51. Helena works five hours a day for six days a week at **$8.60** per hour. She wants to buy a word processor for **$1100**. Which of the following is **not** needed to find how many weeks Helena must work to have enough money to buy the word processor?

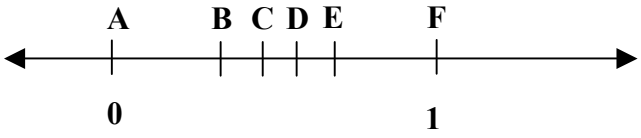
A) how much tax is charged on the word processor
B) how much time Helena will spend learning to use the word processor
C) how much in deductions is taken out of each of Helena's checks
D) how much of her weekly salary Helena must spend on other things

52. How many lines of symmetry does this regular polygon have?



E) 0
F) 1
G) 5
H) 10

53. On the number line below, points B and E divide segment AF into three equal parts. Points C and D divide segment BE into three equal parts. What is the coordinate of point C?



A) $\frac{2}{9}$
B) $\frac{2}{5}$
C) $\frac{4}{9}$
D) $\frac{2}{3}$

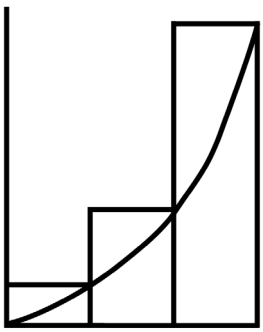
54. Which of the following measures the "spread" in a set of data?

E) Mean
F) Median
G) Point
H) Standard deviation

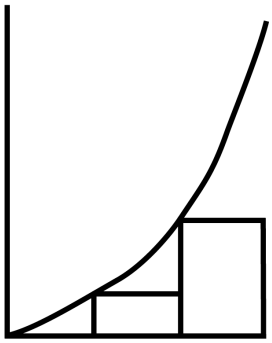
GO ON

55. Which of the following methods **most accurately estimates** the area under the curve of $y = x^2$?

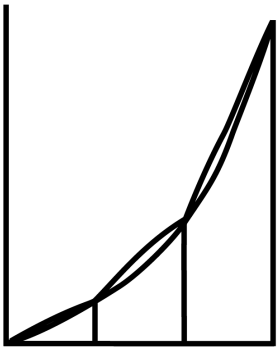
A)



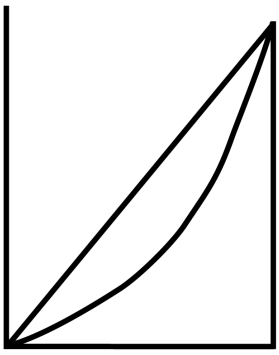
B)



C)



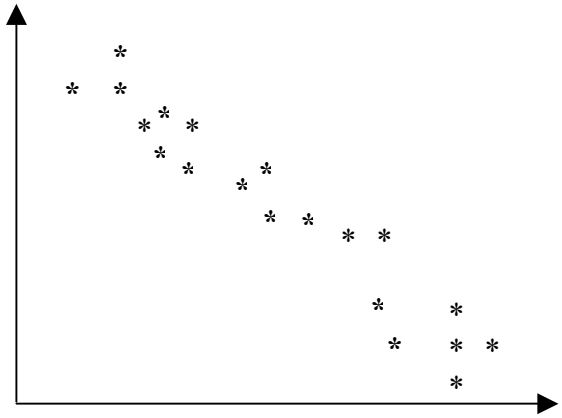
D)



56. What are the coordinates of the center and the radius of the circle with the equation $x^2 + (y - 1)^2 = 16$?

E) center (0, 1); r = 4
F) center (0, -1); r = 16
G) center (0, 1); r = 16
H) center (0, -1); r = 4

57. In the scatter plot below, which of the following is true?



A) As one quantity increases the other decreases.
B) As one quantity decreases the other decreases.
C) As one quantity increases the other increases.
D) As one quantity increases, the other stays the same.

GO ON

58. Weekly chores at Sam's house are determined by drawing cards from a deck of 6 cards. The cards are marked: wash the dishes, dry the dishes, take out the garbage, clean your room, run the vacuum cleaner, and do the wash. Each day a card is drawn and not replaced. What is the probability that Sam will have to wash or dry the dishes on Monday, the first day a card is drawn?

E) $\frac{1}{6}$

F) $\frac{1}{3}$

G) $\frac{1}{2}$

H) $\frac{2}{3}$

59. If $f(x) = x^4 - 5$, what is the number missing from the table?

x	*f(x)*
0	– 5
–1	– 4
?	11
3	76

A) –4
B) –2
C) 4
D) 6

60. The lifetime of a wheel bearing produced by a certain company is normally distributed. The mean lifetime is 200,000 miles and the standard deviation is 10,000 miles. How many bearings in a 3000 lot sample will be within one standard deviation of the mean? (p = 0.683 for one standard deviation.)

E) 683
F) 2,049
G) 6,830
H) 136,600

61. What is the sum of the following infinite series?

$$\frac{2}{3} + \frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \ldots$$

A) $1\frac{1}{4}$

B) $1\frac{7}{24}$

C) $1\frac{1}{3}$

D) 2

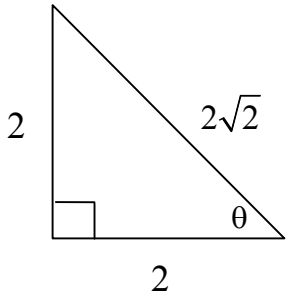
GO ON

62. How many solutions are there to this system of equations?

$$3x + 5y = -2$$
$$6x = 4 - 10y$$

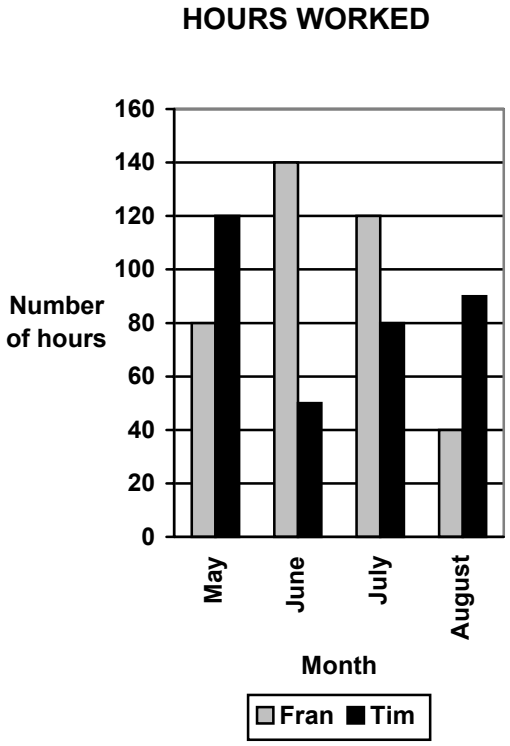
E) none
F) one
G) two
H) infinitely many

63. Consider the following right triangle. Which of the following statements is correct?



A) $\sin\theta < \cos\theta$
B) $\sin\theta > \cos\theta$
C) $\sin\theta = \cos\theta$
D) $\sin\theta = 2$

64. What was the **average** number of hours Fran worked during the four months?



E) 85 hours
F) 90 hours
G) 95 hours
H) 190 hours

65. Simplify: $\dfrac{18x^3y^4}{24x^{-3}y^{-6}}$

A) $\dfrac{3x^6}{4y^2}$

B) $\dfrac{3y^{10}}{4}$

C) $\dfrac{3x^6}{4y^{10}}$

D) $\dfrac{3x^6y^{10}}{4}$

GO ON

66. A sphere has a radius of 10 cm. What happens to its surface area when the radius is tripled?

E) it is tripled
F) it is multiplied by 6
G) it is multiplied by 9
H) it is multiplied by 30

67. Which of the following is the equation of the line that passes through (–2, 3) and has slope $\frac{1}{2}$?

A) $2x - y = -7$
B) $x + 2y = 4$
C) $2x + y = -1$
D) $x - 2y = -8$

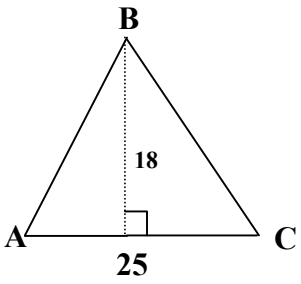
68. The state wants to issue new license plates using the following pattern.

digit	digit	digit	letter	letter

Every digit or letter can be used. How many different license plates can be produce in the state?

E) 67,000
F) 105,000
G) 325,000
H) 676,000

69.



The area of ΔABC is equal to the area of a square. What is the length of the **side of the square**?

A) 15 units
B) $15\sqrt{2}$ units
C) 30 units
D) $30\sqrt{2}$ units

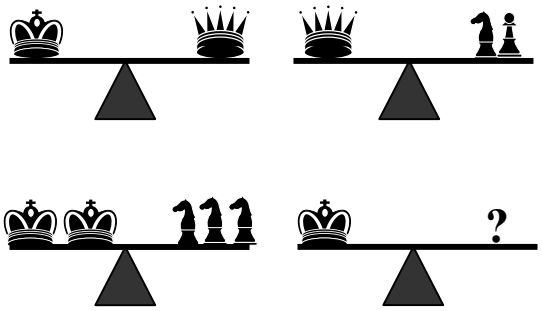
70. What are the coordinates of the **vertex** of the parabola with the equation

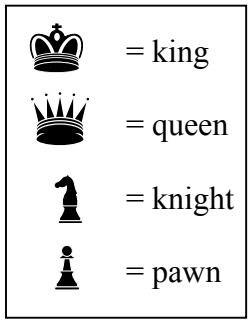
$$y = x^2 - 8x + 5$$

E) (–4, 11)
F) (4, –11)
G) (0, 5)
H) (6, –7)

GO ON

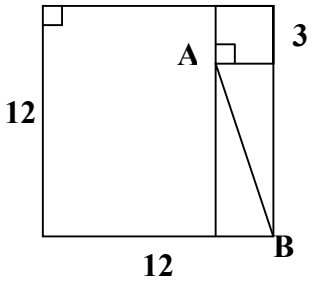
71. The students in the chess club wondered about the relative weights of the chess pieces. According to the pictures below, how many pawns will balance one king?





A) 2
B) 3
C) 4
D) 6

72. Using the drawing, including the 2 squares, which inequality gives the **best approximation** to AB?



E) $9 < AB < 10$
F) $11 < AB < 12$
G) $10 < AB < 11$
H) $9 < AB < 12$

STOP

73. A container must hold 400 cubic inches of sand. Accurately sketch and label the dimensions of a rectangular prism, sphere, and cylinder which will each hold the 400 cubic inches of sand with the least amount of wasted space. Show the calculations that verify that each container will hold 400 cubic inches.

Show your work and explain the steps you used to justify your answer. Do all work for this problem in the box below. Remember you must show all the steps you used to solve the problem even if you used a calculator. To receive the highest score, all calculations and steps must be shown and explained in writing. Numeric answers must always be labeled.

For full credit, you **must** do the following:

1. show OR describe each step of your work, even if you did it in your head ("mental math") or used a calculator,

AND

2. write an explanation stating the mathematical reason(s) **why** you chose each of your steps.

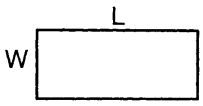
IF YOU NEED MORE SPACE, PLEASE USE PAGE 26.

73. ***Continued***. If you need more space, use this page. Please refer to previous page for task explanation.

AFTER YOU HAVE CHECKED YOUR WORK, CLOSE YOUR TEST BOOKLET SO YOUR TEACHER WILL KNOW YOU ARE FINISHED.

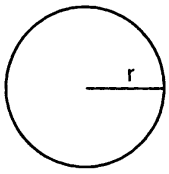
GRADE 11 FORMULA SHEET

Formulas that you may need to work questions on this test are found below. You may refer to this page at any time during the test. A calculator may be used on this test. You may use calculator π or the number 3.14.

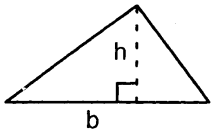


$A = LW$

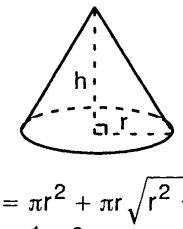
$P = 2L + 2W$



$C = 2\pi r \quad A = \pi r^2$

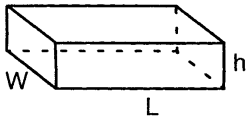


$A = \frac{1}{2}bh$



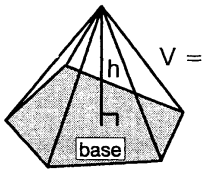
$A = \pi r^2 + \pi r\sqrt{r^2 + h^2}$

$V = \frac{1}{3}\pi r^2 h$

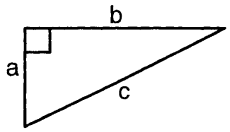


$A = 2LW + 2Lh + 2Wh$

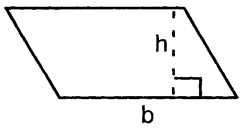
$V = LWh$



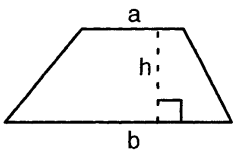
$V = \frac{1}{3}$ (Area of the base) × (Height)



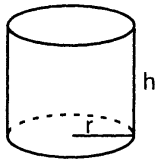
$a^2 + b^2 = c^2$



$A = bh$

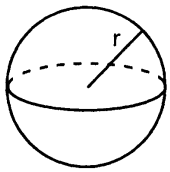


$A = \frac{h}{2}(a + b)$



$A = 2\pi r^2 + 2\pi rh$

$V = \pi r^2 h$



$A = 4\pi r^2 \quad V = \frac{4}{3}\pi r^3$

Constant Motion $d = rt$

Simple Interest $I = prt$

Quadratic Formula

If $ax^2 + bx + c = 0$, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Compounding Interest (n times per year) $\text{Amount} = p(1 + \frac{r}{n})^{nt}$

Permutations $P(n, r) = \frac{n!}{(n - r)!}$

Combinations $C(n, r) = \frac{n!}{r!(n - r)!}$

Standard Deviation $\sqrt{\frac{\sum_{i=1}^{N}(x_i - \bar{x})^2}{N}}$

$\sin\theta = \frac{opp}{hyp} \quad \cos\theta = \frac{adj}{hyp} \quad \tan\theta = \frac{opp}{adj}$

Law of Cosines $a^2 = b^2 + c^2 - 2bc\cos A$

Law of Sines $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Nth Term of an Arithmetic Sequence $a_n = a + (n - 1)d$

Nth Term of a Geometric Sequence $a_n = ar^{n-1}$

Sum of an Arithmetic Series $S_n = \frac{n}{2}[2a + (n-1)d]$

Sum of a Geometric Series

$S_n = \frac{a - ar^n}{1 - r}$ *or* $S_n = \frac{a(1 - r^n)}{1 - r}$

Sum of an Infinite Geometric Series $S = \frac{a}{1 - r}$

$\text{Log}_b x = \frac{\text{Log}_c x}{\text{Log}_c b}$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$z = \frac{x - \mu}{\sigma}$