Name:_____   School Team: _____

Event 1: Computations Without Calculator- 20 points total

Circle your final answer!

Part I (2 points each)
   Give all answers in simplest form.

1. Solve for x. $-5x - 12 + 3x = 4x$

2. $\dfrac{5^3 - 24 \div 3 + 3}{4}$

3. $7.24 \div x = 0.04$

4. Find $5ab - (ab)^2$ If $a = 3$ and $b = 2$

5. $5\frac{1}{2} - 6\frac{7}{8} + 9\frac{2}{3} - 12\frac{5}{6}$

Name:_____   School Team:_____

Circle your final answer!

Event 1: Computations Without Calculator
  Part II (2 points each)
    Give all answers in simplest form.

1. Find 240% of 24

2. Find the number which is 13 less than the GCF of 16 and 96

3. 410 is what percent of 40?

4. $(3^3 - 19)(25 - 4^2)$

5. $(1.3)^2 - \sqrt{100}$

Name:_____   School Team: _____

Circle your final answer!

Event 2: Computations With Calculator- 25 points total
Consumer Math (5 points each)

1. The monthly salaries of 3 people are as follows:
    Person A receives $500
    Person B receives $750
    Person C receives $1250
    The company wants to distribute a bonus of $4000 to be shared fairly among the three employees. If the person in charge of distributing the bonus decided that it should be awarded based on the ratio of their salaries, how much money would each person receive?

2. A woman earned $4,627.39 one month. She is exempted from tax for the first $1000 of her income. The next $1550 is taxed at 6%. After that, the next $2000 is taxed at 7%. The remainder of the money is taxed at 8%. Find the amount of tax the woman owes to the nearest cent.

3. Ian sold two computers at $3200 each. He made a profit of 25% on one computer but a loss of 20% on the other computer. Find the net profit or loss.

4. A traveler can use Taxi A or Taxi B to travel to the airport, a distance of 30 miles. Taxi A charges $4.50 per ride, plus $0.40 per mile. Taxi B charges only per mile at a rate of $0.45 per mile. Which company would be less expensive?

5. A woman buys a piano for $1862.57. She wants to make a $45\frac{1}{2}$% profit. How much should she sell the piano for? Round your answer to the nearest cent.
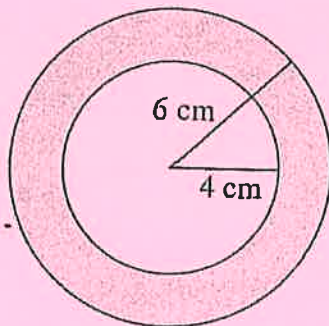
Name:_____   School Team: _____

Event 3: Mathematical Reasoning With Calculator- 35 points total
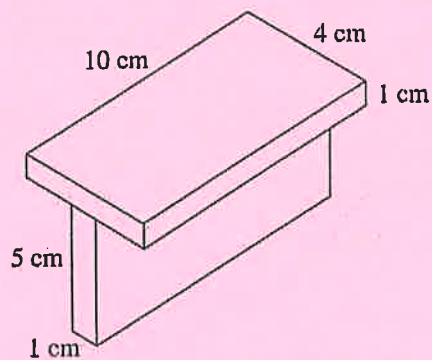
Circle your final answer!

Geometry (7 points each)
**Remember to use labels when appropriate**

1. Find the area and perimeter of the shaded region. Use 3.14 for pi.

6 cm

4 cm

2. Find the surface area of the entire figure.

10 cm   4 cm

1 cm

5 cm
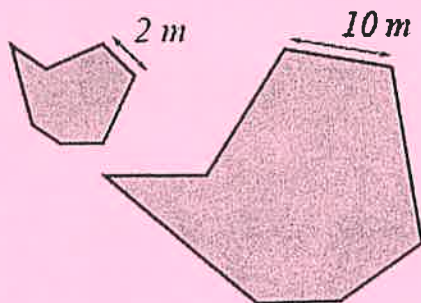
1 cm

Name:_____   School Team: _____

Event 3: Mathematical Reasoning With Calculator- 35 points total
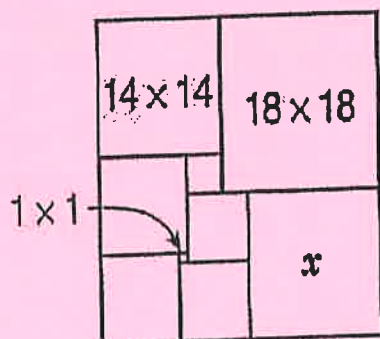
Circle your final
answer!

Geometry Part II (7 points each)
  Remember to use labels when appropriate

3. The two figures below are similar. If the area of the smaller figure is $10m^2$, find the area of the larger figure. *Hint: The figures are not drawn to scale.*

2 m   *10 m*

4. Below is a rectangle which has been portioned into unequal squares. Find the area of the square marked x. Your answer should be in square units.

14 × 14   18 × 18

1 × 1

x

5. Find the angle made by the hands of an analog clock if the current time is 2:30.

Name:_____   School Team: _____

Event 4: Mental Math (no calculator)- 20 points total
(2 points each)

Example: _____

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

Name:_____   School Team: _____

Circle your final answer!

Event 5: Team Problems (with calculator)- 100 points total
   Part 1: Percent Problem Solving (6 points each)

1.

   a) 60% of the marbles in a bag are red and the rest are black. After another 9 black marbles are added, the ratio of the number of red marbles to the number of black marbles is 4:3. How many black marbles are there now?

   b) The length of the base of a triangle is increased by 10% and its height is increased by 20%. Find the new area of the triangle as a percentage of the original one.

   c) A television cost $4800.00. A man tried to sell it at a price marked 20% above its cost. However, in need of money quickly he ended up selling the television at 75% of the price he was asking. What is the amount of money the man lost in the transaction?

   d) A square has sides of length 12cm. What is the increase in area in percentage if the side lengths are increased by 3cm?

   e) A baker made 350 cookies. 100 of them were chocolate chip and the rest were sugar cookies. How many percent fewer chocolate chip cookies were there than sugar cookies?

Name:_____   School Team: _____

Circle your final
answer!

Event 5: Team Problems (with calculator)- 100 points total
    Part 2: Geometry and Measurement (5 points each)

Remember to use clear labels as needed! Remember to simplify all fractions.
   2. An alien decides to teach a math class. She informs you that you will begin measuring
       using only glogs, rickets, and jalas. 5 glogs make 1 ricket, and 6 rickets make one jala.

   a) How many glogs are in 3 jalas?

   b) How many jalas are in 2 glogs?

   c) A rectangle has sides with a ratio 3:4. The longer side measures 6 rickets. Find the
       area of the rectangle in terms of square glogs.

   d) If one glog is equivalent to 3 inches, determine which is larger:
           Square A has an area of 12 square yards
           Square B has side lengths of 1.5 jalas

Name:_____   School Team:_____

Circle your final answer!

Event 5: Team Problems (with calculator)- 100 points total
    Part 3: Patterns and Logic (6 points each)

3. Solve each of the following problems. Simplify any fractions whenever possible.
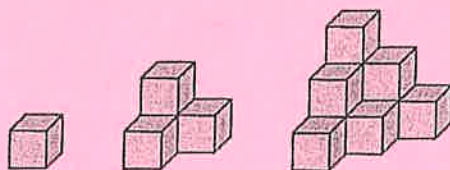
a) Find the missing term in the pattern.

$$1, \frac{1}{3}, \frac{1}{9}, \underline{\hspace{2cm}}, \frac{1}{81}$$

b) Find the missing term in the pattern.

$$10, 17, \underline{\hspace{2cm}}, 37, 50, 65$$

c) How many cubes will be in the 7th collection of cubes in this sequence?

Both (d) and (e) use the figure below.

d) How many black triangles are in the 5th figure?

e) How many white triangles are in the 5th figure?

Name:_____   School Team:_____

Circle your final answer!

Event 5: Team Problems (with calculator)- 100 points total
    Part 4: Number Theory (5 points each)

4. Find the solution for each of the given situations. Use labels when appropriate.

    a) A certain type of gutter comes in 6 foot, 8 foot, and 10 foot lengths. Jolie is going to purchase 3 sections of gutter. List all possible lengths of gutter she could have by laying the three pieces end to end.

    b) Three boys are trying to make a secret code from 2 letters. They want to count the codes AB and BA as two separate codes (order matters) but do not want to use secret codes with the same letter twice (such as AA). How many possible different codes can they create?

    c) Your laundry basket contains 4 plain socks: a red one, a blue one, a yellow one, and a green one. The basket also contains 4 patterned socks: a striped sock, a sock with hearts, a polka-dotted sock, and a sock with penguins. If you reach into the laundry basket, pick out a sock, and put it on your left foot and then reach in again, pick out another sock, and put it on your right foot, how many possible different outcomes are there?

    d) There are 6 people at a party. Each person gives each other person a high-five exactly one time. How many high-fives are given at the party?

Name:_____   School Team: _____

Event 1: Computations Without Calculator- 20 points total

Circle your final
answer!

Part I (2 points each)
  Give all answers in simplest form.

1. Solve for x. $-5x - 12 + 3x = 4x$

$+5x$ $+5x$

$-12 + 3x = 9x$ $\boxed{x = -2}$

$-3x \quad -3x$

$-12 = 6x$

2. $\dfrac{5^3 - 24 \div 3 + 3}{4}$ $= \dfrac{125 - 8 + 3}{4} = \dfrac{117 + 3}{4} = \dfrac{120}{4} = \boxed{30}$

3. $7.24 \div x = 0.04$ means $0.04 \cdot x = 7.24$

$x = 7.24 \div 0.04$

$\boxed{x = 181}$

$$
\begin{array}{r}
1\ 81. \\
.04\overline{)7.24} \\
\underline{-4} \\
32 \\
\underline{-32} \\
0\ 4
\end{array}
$$

4. Find $5ab - (ab)^2$ If a = 3 and b = 2

$5(3)(2) - (3 \cdot 2)^2 = 30 - 6^2 = 30 - 36$

$= \boxed{-6}$

5. $5\frac{1}{2} - 6\frac{7}{8} + 9\frac{2}{3} - 12\frac{5}{6}$ $= 5\frac{12}{24} - 6\frac{21}{24} + 9\frac{16}{24} - 12\frac{20}{24}$

$= 5 - 6 + 9 - 12 + \frac{12}{24} - \frac{21}{24} + \frac{16}{24} - \frac{20}{24}$

$= -4 - \frac{9}{24} - \frac{4}{24}$

$= -4 - \frac{13}{24}$

$= \boxed{-4\frac{13}{24} \text{ or } -\frac{109}{24}}$

Name:_____   School Team: _____

Circle your final answer!

Event 1: Computations Without Calculator
    Part II (2 points each)
        Give all answers in simplest form.

1. Find 240% of 24

    $100\% \to 24$
    $10\% \to 2.4$
    $20\% \to 4.8$
    $40\% \to 9.6$

    $24 + 24 + 9.6 = \boxed{57.6}$
    $100\% \quad 100\% \quad 40\%$

2. Find the number which is 13 less than the GCF of 16 and 96

    $16 - 13 = \boxed{3}$

3. 410 is what percent of 40?

    $25\% \to 10$
    $100\% \to 40$
    $1000\% \to 400$

    $\boxed{1025\%}$

4. $(3^3 - 19)(25 - 4^2) =$

    $(27 - 19)(25 - 16) = (8)(9) = \boxed{72}$

5. $(1.3)^2 - \sqrt{100}$ $= 1.3 \times 1.3 - 10 = 1.69 - 10 = 0.69 - 9 = \boxed{-8.31}$

Name:_____   School Team: _____

Circle your final answer!

Event 2: Computations With Calculator- 25 points total
Consumer Math (5 points each)

1. The monthly salaries of 3 people are as follows:
   Person A receives $500
   Person B receives $750
   Person C receives $1250
   The company wants to distribute a bonus of $4000 to be shared fairly among the three employees. If the person in charge of distributing the bonus decided that it should be awarded based on the ratio of their salaries, how much money would each person receive?

   $A:B:C$
   $500:750:1250$
   $50:75:125$
   $2:3:5$

   $4000 \div 10 = 400$
   $2 \times 400 = 800$
   $3 \times 400 = 1200$
   $5 \times 400 = 2000$

   Person A $800
   Person B $1200
   Person C $2000

2. A woman earned $4,627.39 one month. She is exempted from tax for the first $1000 of her income. The next $1550 is taxed at 6%. After that, the next $2000 is taxed at 7%. The remainder of the money is taxed at 8%. Find the amount of tax the woman owes to the nearest cent.

   $4627.39
   -1000
   -1550
   -2000
   $\overline{77.39}$

   $0.06 \times 1550 = 93$
   $0.07 \times 2000 = 140$
   $0.08 \times 77.39 = 6.19$

   $93 + 140 + 6.19 = \boxed{$239.19}$

3. Ian sold two computers at $3200 each. He made a profit of 25% on one computer but a loss of 20% on the other computer. Find the net profit or loss.

   Computer 1
   $125\% \to 3200$
   $100\% \to 2560$
   Profit: $640

   Computer 2
   $80\% \to 3200$
   $100\% \to 4000$
   Loss: $800

   Loss of $800 and profit of $640 is

   $\boxed{\text{Net Loss: } $160}$

4. A traveler can use Taxi A or Taxi B to travel to the airport, a distance of 30 miles. Taxi A charges $4.50 per ride, plus $0.40 per mile. Taxi B charges only per mile at a rate of $0.45 per mile. Which company would be less expensive?

   Taxi A: $4.50 + 0.40(30) = $16.50
   Taxi B: $0.45(30) = $13.50

   $\boxed{\text{Taxi B}}$

5. A woman buys a piano for $1862.57. She wants to make a $45\frac{1}{2}\%$ profit. How much should she sell the piano for? Round your answer to the nearest cent.

   $145\frac{1}{2}\%$ of $1862.57 means $1.455 \times $1862.57

   $\boxed{$2710.04}$

Name:_____   School Team: _____

Event 3: Mathematical Reasoning With Calculator- 35 points total

Circle your final answer!

Geometry (7 points each)
Remember to use labels when appropriate

1. Find the area and perimeter of the shaded region. Use 3.14 for pi.

3/3/1

6 cm

4 cm

Area: $3.14 \times (6cm)^2 - 3.14 \times (4cm)^2 = 113.04 cm^2 - 50.24 cm^2$
$= \boxed{62.8 cm^2}$ Area

Perimeter: $3.14 \times 12cm + 3.14 \times 8cm = 37.68cm + 25.12 cm$
$= \boxed{62.8cm}$ Perimeter

2. Find the surface area of the entire figure.

10 cm
4 cm
1 cm
5 cm
1 cm

6/1

Upper piece
$40cm^2 + 4cm^2 + 10cm^2 + 10cm^2 + 4cm^2 + (40cm^2 - 10cm^2) = 98 cm^2$

Lower piece
$5cm^2 + 5cm^2 + 50cm^2 + 50cm^2 + 10cm^2 = 120cm^2$

$120cm^2 + 98cm^2 = \boxed{218 cm^2}$

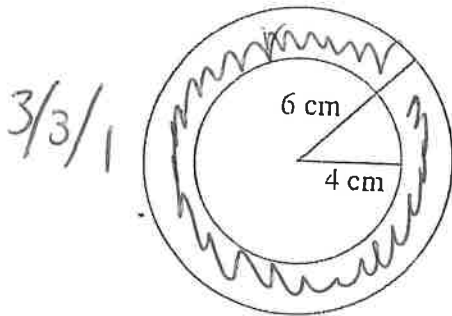Name:_____   School Team: _____

Event 3: Mathematical Reasoning With Calculator- 35 points total

Circle your final answer!

Geometry Part II (7 points each)
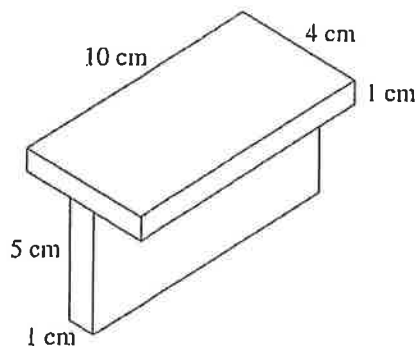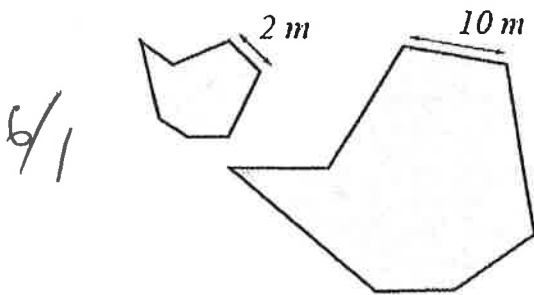   *Remember to use labels when appropriate*

3. The two figures below are similar. If the area of the smaller figure is $10m^2$, find the area of the larger figure. *Hint: The figures are not drawn to scale.*

2 m   10 m

Scale factor small to large is 5

$10 m^2 \times 5 \times 5 = \boxed{250 m^2}$

4. Below is a rectangle which has been portioned into unequal squares. Find the area of the square marked x. Your answer should be in square units.

14 × 14   18 × 18

1 × 1

B   A

C   D   E

x
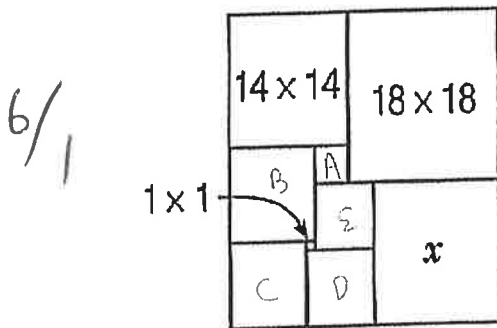
A must be 4x4
So B must be 10×10
C must be 9×9
D must be 8×8
E must be 7×7

7 - 4 = 3
18 - 3 = 15

x has an area of 15×15
or
$\boxed{225 \text{ square units}}$

5. Find the angle made by the hands of an analog clock if the current time is 2:30.
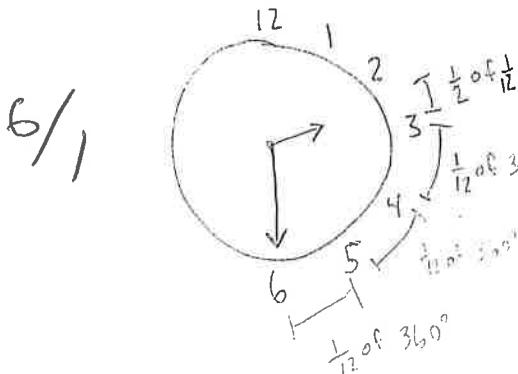
12
1
2   $I \frac{1}{2}$ of $\frac{1}{12}$ of $360°$
3    $360 \div 12 = 30$
$\frac{1}{12}$ of $360°$ In 30 minutes the hour hand moves
4   half way between the 2 and 3
5                $\frac{1}{2} \cdot 30 = 15$
6
$\frac{1}{12}$ of $360°$

$30 + 30 + 30 + 15 = 90 + 15 = 105$

$\boxed{105°}$

Name:_____   School Team: _____

Event 4: Mental Math (no calculator)- 20 points total
(2 points each)

Example: _____23_____

+2 1) _____84_____

to 2) _____$\frac{7}{18}$_____

+2 3) _____$96 in^2$_____ (Accept an answer of 96)

+2 4) _____3_____

+2 5) _____2.45_____

+2 6) _____16_____

+2 7) _____-3_____

+2 8) _____111_____

to 9) _____-4_____

+2 10) _____250%_____ (Accept an answer of 250)

16)

Name:_____   School Team: _____

Circle your final answer!

Event 5: Team Problems (with calculator)- 100 points total
   Part 1: Percent Problem Solving (6 points each)

1.
   a) 60% of the marbles in a bag are red and the rest are black. After another 9 black marbles are added, the ratio of the number of red marbles to the number of black marbles is 4:3. How many black marbles are there now?

6

$60 : 40$
$3 : 2$
red   black

$\dfrac{3x}{2x+9} = \dfrac{4}{3}$

$9x = 8x + 36$
$x = 36$

$2(36) + 9 = \boxed{81}$

   b) The length of the base of a triangle is increased by 10% and its height is increased by 20%. Find the new area of the triangle as a percentage of the original one.

5/1

$Area = \dfrac{1}{2} bh = .5 bh$

$New \triangle area = \dfrac{1}{2} (1.1b)(1.2)h = .66bh$

If .5 bh is 100%,
then .66 bh is
$\boxed{132\%}$

   c) A television cost $4800.00. A man tried to sell it at a price marked 20% above its cost. However, in need of money quickly he ended up selling the television at 75% of the price he was asking. What is the amount of money the man lost in the transaction?

5/1

Want to sell for $1.2($4800) = 5760

Sold for $.75($5760) = 4320

$$4800 - $4320 = \boxed{$480}$$

   d) A square has sides of length 12cm. What is the increase in area in percentage if the side lengths are increased by 3cm?

5/1

Original area: $144cm^2$

new area: $225cm^2$

$144 cm^2 \rightarrow 100\%$
$225 cm^2 \rightarrow \boxed{156.25\%}$

   e) A baker made 350 cookies. 100 of them were chocolate chip and the rest were sugar cookies. How many percent fewer chocolate chip cookies were there than sugar cookies?

5/1

250 sugar

150 fewer choc. chip

$\dfrac{150}{250}$

$\boxed{60\%}$

Name:_____   School Team: _____

Circle your final answer!

Event 5: Team Problems (with calculator)- 100 points total
   Part 2: Geometry and Measurement (5 points each)

Remember to use clear labels as needed! Remember to simplify all fractions.
2. An alien decides to teach a math class. She informs you that you will begin measuring using only glogs, rickets, and jalas. 5 glogs make 1 ricket, and 6 rickets make one jala.

a) How many glogs are in 3 jalas?

5

1 jala = 6 rickets   1 ricket = 5 glogs
3 jalas = 18 rickets   18 rickets = (90 glogs)

b) How many jalas are in 2 glogs?

5

1 glog = $\frac{1}{5}$ ricket   2 glogs = $\frac{2}{30}$ jala
1 ricket = $\frac{1}{6}$ jala
1 glog = $\frac{1}{5}$ ricket = $\frac{1}{30}$ jala

($\frac{1}{15}$ jala) .0$\overline{6}$

c) A rectangle has sides with a ratio 3:4. The longer side measures 6 rickets. Find the area of the rectangle in terms of square glogs.

$^4/_1$

1 ricket = 5 glogs
6 rickets = 30 glogs
4.5 rickets = 22.5 glogs

$6 ÷ 4 = 1.5$ $3 × 1.5 = 45$
6 rickets
[rectangle] 4.5 rickets
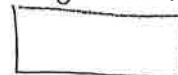
30 glogs × 22.5 glogs = (675 square glogs)

d) If one glog is equivalent to 3 inches, determine which is larger:
   Square A has an area of 12 square yards
   Square B has side lengths of 1.5 jalas

5

Square A
_____
[square] $\sqrt{12}$ yards = $3\sqrt{12}$ feet
              = $36\sqrt{12}$ inches

$36\sqrt{12}$ in × $36\sqrt{12}$ in = 15552 in²

(Square B is larger)
_____

[square] 1.5 jalas = 9 rickets = 45 glogs
                     = 135 in

135 in × 135 in = 18225 in²

Name:_____   School Team: _____

Circle your final answer!

Event 5: Team Problems (with calculator)- 100 points total
Part 3: Patterns and Logic (6 points each)

3. Solve each of the following problems. Simplify any fractions whenever possible.

a) Find the missing term in the pattern.

6

$$1, \frac{1}{3}, \frac{1}{9}, \boxed{\frac{1}{27}}, \frac{1}{81}$$

$\frac{1}{1}$

$\frac{1}{3^0}, \frac{1}{3^1}, \frac{1}{3^2}, \frac{1}{3^3}, \frac{1}{3^4}$

b) Find the missing term in the pattern.

6

$$10, 17, \boxed{26}, 37, 50, 65$$

7   9   11   13   15

c) How many cubes will be in the 7th collection of cubes in this sequence?

6 (84)

Collection	Cubes
1	1
2	4 = 1 + 3
3	10 = 1 + 3 + 6
4	20 = 1 + 3 + 6 + 10
5	35 = 1 + 3 + 6 + 10 + 15
6	56 = 1 + 3 + 6 + 10 + 15 + 21
7	84 = 1 + 3 + 6 + 10 + 15 + 21 + 28

Both (d) and (e) use the figure below.

Blk 1 White 0   Blk 3 White 1   Black 9 White 4   Black 27 white 13   Black 81 white 40

1   2   3   4   5

6 d) How many black triangles are in the 5th figure? (81)

6 e) How many white triangles are in the 5th figure? (40)

Name:_____   School Team: _____

Circle your final answer!

Event 5: Team Problems (with calculator)- 100 points total
  Part 4: Number Theory (5 points each)

4. Find the solution for each of the given situations. Use labels when appropriate.

a) A certain type of gutter comes in 6 foot, 8 foot, and 10 foot lengths. Jolie is going to purchase 3 sections of gutter. List all possible lengths of gutter she could have by laying the three pieces end to end.

666   10 10 6
6 6 6
8 8 8   10 10 8
10 10 10   6 8 10
6 6 8   4/1
6 6 10
8 8 6
8 8 10

$$18 ft \qquad 20 ft \qquad 28 ft$$
$$24 ft \qquad 22 ft$$
$$30 ft \qquad 26 ft$$

b) Three boys are trying to make a secret code from 2 letters. They want to count the codes AB and BA as two separate codes (order matters) but do not want to use secret codes with the same letter twice (such as AA). How many possible different codes can they create?

5

26 possibilities   25 possibilities

$26 \times 25 = \boxed{650}$

c) Your laundry basket contains 4 plain socks: a red one, a blue one, a yellow one, and a green one. The basket also contains 4 patterned socks: a striped sock, a sock with hearts, a polka-dotted sock, and a sock with penguins. If you reach into the laundry basket, pick out a sock, and put it on your left foot and then reach in again, pick out another sock, and put it on your right foot, how many possible different outcomes are there?

5

8 possible   7 possible

$8 \times 7 = \boxed{56}$

d) There are 6 people at a party. Each person gives each other person a high-five exactly one time. How many high-fives are given at the party?

5

A B C D
AB BC
AC BD
AD CD

# of people	# of high fives
2	1
3	3
4	6
5	10
6	15

2 +2
2 +3
2 +4
2 +5

$\boxed{15}$

15
18
12
43

12
20
24
15
71

2
18
14
24
5
61

Name:_____ School Team: _____

Circle your final answer!

TIE BREAKER (with calculator)

1) The counting numbers are arranged in a triangular array as seen below. In what row does 2017 appear?

$$1 \quad \leftarrow 1$$
$$2 \quad 3 \quad 4 \quad \leftarrow 2$$
$$5 \quad 6 \quad 7 \quad 8 \quad 9 \quad \leftarrow 3$$
$$10 \quad 11 \quad 12 \quad 13 \quad 14 \quad 15 \quad 16 \quad \leftarrow 4$$
$$17 \quad 18 \quad 19 \quad 20 \quad 21 \quad 22 \quad 23 \quad 24 \quad 25 \quad \leftarrow 5$$

Each row contains through it's value squared.

(45)

$44 \times 44 = 1936$
$45 \times 45 = 2025$
So the 45th row has 2017

2) Given the points A(-1, 0), B(0, 2), C(2, 0), list all possible points D so that these four points form the vertices of a parallelogram.

$(3, 2)$

$(1, -2)$

$(-3, 2)$