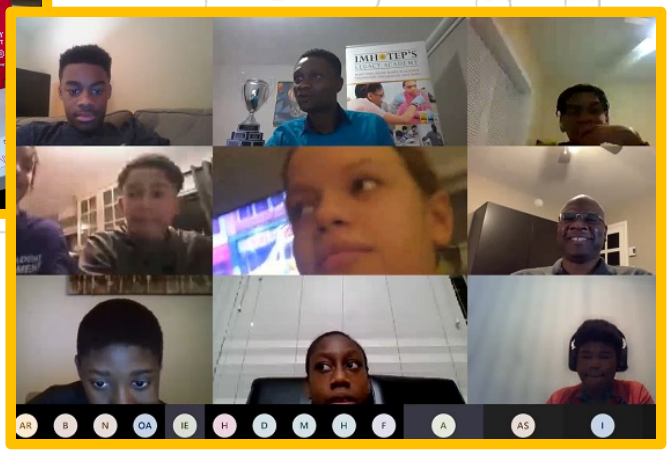
IMHOTEP'S LEGACY ACADEMY

2022 STEM QUIZ TOURNAMENT STUDY HANDBOOK



Reviews and Updates

REVIEWER	ACTIONS/COMMENTS	DATE
Tobi Adeoye	Developer	2022-07-11
Dr. Claver Diallo (*sec. 3*)	Assisting Professor	2021-09-14
Dr. Pemberton Cyrus	Review section 1	2022-09-05
Dr. Tim Bardouille	Review Section 3	2022-09-12

SECTION 1 - CALCULATIONS

Questions: Grade 6

1. Evaluate the expressions for the given value of the variable: 3b-8 for b=5.

   Answer:
   3b-8 for b=5
   =3(5)-8
   =15-8
   =7

2. List all factors of 12.

   Answer:
   Factors of 12: 1,2,3,4,6 and 12

3. In what quadrant is (5,4) situated?

   Answer:
   (5,4) is in Quadrant 1

4. Is 7 a composite number?

   Answer:
   No, 7 is a prime number. A composite number is defined as a number that has more than two factors. 7 only has two factors, 1 and 7, therefore it is not a composite number.

5. What is 50% of 1,000?

   Answer:
   50% of 1,000
   =0.5*1,000
   =500

6. Which of the following expressions are equivalent?
   a. 2(x+3)-2
   b. 2x+4
   c. 3x+9-x-5

Answer:

a) 2(x+3)-2
= 2x+6-2
= 2x+4

b) 2x+4

c) 3x+9-x-5
= 3x-x+9-5
= 2x+4

They are all equivalent

7. Write the number "1 543" in words.

Answer:

One thousand five hundred forty-three

8. What is the name of a triangle with only two equal sides?

Answer:

An isosceles triangle has only two sides of equal length.

9. A bag contains ten balls, two are yellow and the rest are purple. What is the ratio of purple balls to the total number of balls in the bag?

Answer:

10 balls: 2 yellow balls
10-2=8, 8 purple balls
8 purple balls: 10 balls in bag
=8:10
=4:5

10. Find the Greatest Common Factor (GCF) of 18 and 24.

Answer:

Factors of 18: 1, 2, 3, **6**, 9 and 18
Factors of 24: 1, 2, 3, 4, **6**, 8, 12 and 24
GCF= 6

Questions: Grade 7

1. Solve the absolute value |-7|

Answer:

|-7|
=|7|
=7

2. What numbers are divisible by 2?
   a. 653
   b. 268
   c. 726
   d. 941

   Answer:
   a) 653: last digit is an odd number; therefore, it is not divisible by 2
   b) 258: last digit is an even number; therefore, it is divisible by 2
   c) 726: last digit is an even number; therefore, it is divisible by 2
   d) 941: last digit is an odd number; therefore, it is not divisible by 2

3. What is 10% of 50

   Answer:
   10% of 50
   =0.1*50
   =5

4. Order from smallest to largest: 5.96, 9.56, 9.65, 6.95, 5.69

   Answer:
   5.69, 5.96, 6.95, 9.56, 9.65

5. Find the Lowest Common Multiple (LCM) of 25 and 15.

   Answer:
   Common multiples of 25: 25, 50, **75**, 100…
   Common multiples of 15: 15, 30, 45, 60, **75**, 90…
   LCM= 75

6. Calculate the mode of the following data set: 5,3,6,8,2,4,9,5,5,7

   Answer:
   2,3,4,**5**,**5**,**5**,6,7,8,9
   The mode is 5

7. When a six-sided dice is rolled, what is the probability of getting a prime number?

Answer:

On a six-sided die, 1,2,3 and 5 are prime numbers.

Therefore, there are 4 out of 6 ways of rolling a prime number, or 66.6%.

8. The perimeter of an equilateral triangle is equal to 180 cm. What is the length of one side of this triangle?

Answer:

180/3 cm = 60 cm

9. Which of the following statements is true?
   a. 3>5
   b. 5<7
   c. 2<5
   d. 8<9

Answer:

a) 3>5 False

b) 5<7 True

c) 2<5 True

d) 8<9 True

10. In a normal, shuffled deck of cards (52 cards) what is the probability that a card selected from the deck is a face card?

Answer:

There are 4 suits in the deck: hearts, clubs, spades and diamonds, each suit has 3 faces; jack, queen, and king. 4*3=12. Answer is 12/52 or 23%

Questions: Grade 8

1. What is the missing number from the following Pythagorean triple? 5, ___, 13.

Answer:

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

$b^2=c^2-a^2$

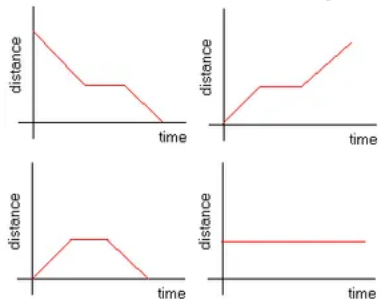
$b^2=13^2-5^2$

$b^2= 169-25$

$b^2=144$

$b=12$

2. Peter drove at a constant speed for 2 hours. He then stopped for an hour to do some shopping and have a rest then drove back home driving at a constant speed. Which graph best represents the changes in the distance from home as Peter was driving?



Answer:

As peter drives away from home, the distance from home should increase. Only the graphs bottom-left and top-right shows an increase at the start (t=0). While shopping the distance stays constant but as he starts driving back the distance must decrease as he approaches home. Therefore, only the graph at the bottom-left shows a decrease of distance and best represents the changes in the distance.

3. Covert 0.05 to a percentage.

Answer:

0.05*100 = 5%

4. Evaluate x^2+y^2 for the given values of x and y: x=4 and y=5.

Answer:

x^2+y^2
$=4^2+5^2$
$=16+25$
$=41$

5. What would be the coordinates of the triangle with points (-4, -8), (-6,8) and (0,0) if they were moved two points to the right.

Answer:

"To the right" moves on the x axis, so only the x coordinates would change by adding 2. (-4,-8) would change to (-2,-8). (-6,8) would change to (-4,8). (0,0) would change too (2,0).
So the answer is: (-2,-8), (-4,8) and (2,0)

6. Which of these expressions is an example of the distributive property?

A) a(b+c) = (a+b)c
B) a(b+c) = ab+ac
C) a(b+c) = abc+ab-ac
D) a(b-c) = ab-c

Answer:

B

7. Each summer, Kendra plants a vegetable garden in her yard. Last year, she planted 6 rows of tomatoes and 8 rows of peppers. Kendra wants to keep the same ratio this year, but she only plans to plant 3 rows of tomatoes. How many rows of peppers will Kendra plant this year?

Answer:

6 rows of tomatoes last year: 8 rows of peppers last year
= 6:8
= 3:4
So, if 3 rows of tomatoes this year there should be 4 rows of peppers.

8. There are three marbles in a bag, one red, one blue and one yellow. You pick a marble at random, put it back, then pick another marble at random. What is the probability of you picking a red marble and then picking a blue one?

Answer:

Odd of picking red * odds of picking blue
=1/3*1/3
=1/9

9. Ava is about to ride a straight water slide. The launching platform is at the top of a tower that is 9 meters tall. The splash pool at the end of the slide is 12 meters from the base of the tower. How long is the water slide itself?

Answer:

$a^2+b^2 = c^2$
$9^2+12^2 = c^2$
$81+144 = c^2$
$225 = c^2$
$15 = c$

10. Is 0 an integer?

Answer:

Yes, because it is a whole number.

Questions: Grade 9

1. Simplify. $D^8 * D^3$. Express your answer as a single term.

Answer:

$D^8 * D^3 = D^{8+3}$

$= D^{11}$

2. Which of the following is divisible by 8:
   a. 6836
   b. 8365
   c. 8471
   d. 9440

Answer:

a. 6836 - last 3 digits add up to 17, therefore it is not divisible by 8
b. 8365 - last 3 digits add up to 14, therefore it is not divisible by 8
c. 8471 - last 3 digits add up to 12, therefore it is not divisible by 8
d. 9440 - last 3 digits add up to 8, therefore it is divisible by 8

3. Determine the coefficient of -2y.

Answer:

A coefficient is defined as a number being multiplied by a variable. In this example -2 is the coefficient because it is being multiplied by y.

4. Find the value of 3^5.

Answer:

3^5

$= 3*3*3*3*3$

$=243$

5. The numbers 8, 5, 7, and x have an average equal to 6, what is the value of x?

Answer:
(8+5+7+x)/4 = 6
(20+x)/4 = 6
4*(20+x)/4 = 6*4
20+x-20 = 24-20
x = 4

6. Is the polynomial: -x, constant, linear, quadratic, or cubic?

Answer:
Linear

7. Divide the following monomial: $x^3/-x^2$.

Answer:
$x^3/-x^2$
$-(x^{3-2})$
$(-1)x$
$-x$

8. Write as a single monomial if possible: x^2y*3x/x^2.

Answer:
x^2y*3x/x^2
$= 3x^3y/x^2$
$= 3(x^3/x^2)y$
$= 3xy$

9. Which expression is classified as a polynomial?
   a. 5x
   b. 8xy
   c. $7x^2$
   d. 4x-8

Answer:
D

10. If twice the difference of a number and 3 is added to 4, the result is 22 more than four times the number. Find the number.

Answer:

$2(x-3)+4 = 4x+22$

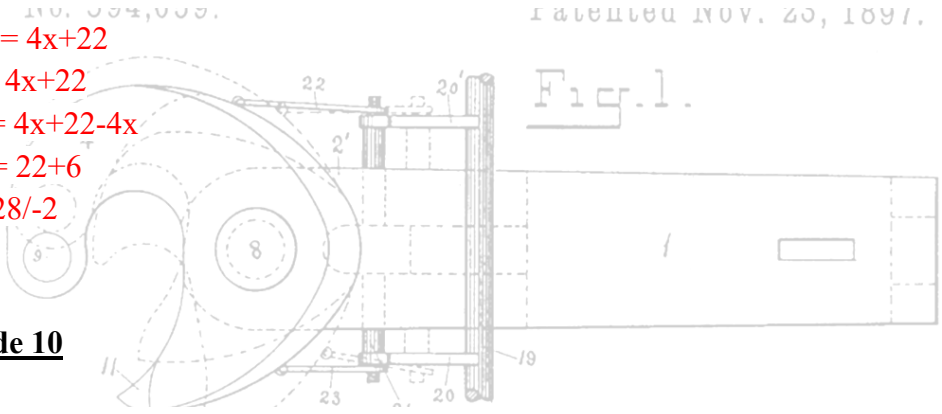
$2x-6+4 = 4x+22$

$2x-4x-6 = 4x+22-4x$

$-2x-6+6 = 22+6$

$-2x/-2 = 28/-2$

$x = -14$



Questions: Grade 10

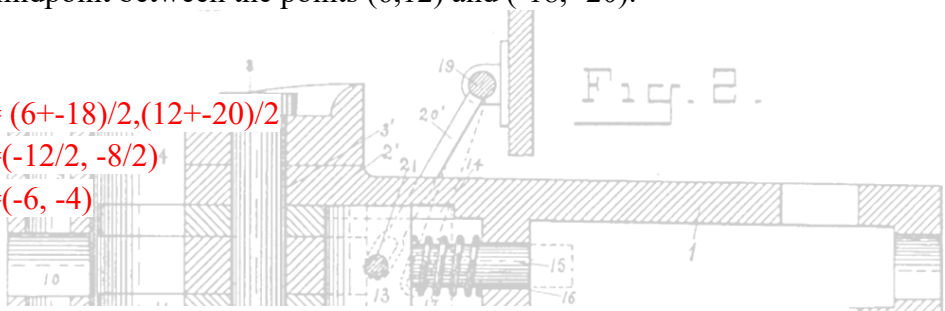
1. Find the midpoint between the points (6,12) and (-18, -20).

Answer:

$(x_m, y_m)= (6+-18)/2,(12+-20)/2$

$(x_m, y_m)=(-12/2, -8/2)$

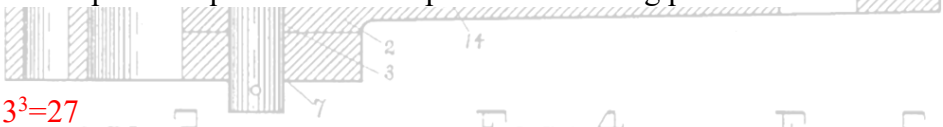
$(x_m, y_m)=(-6, -4)$

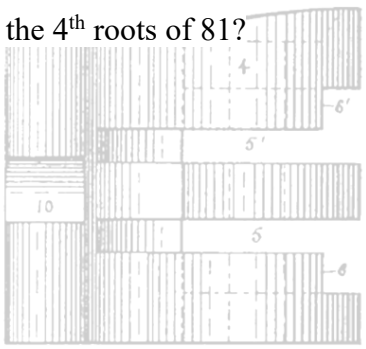


2. Show that 9 is a perfect square and 27 is a perfect cube using prime factors.

Answer:

$3^2=9$ and $3^3=27$

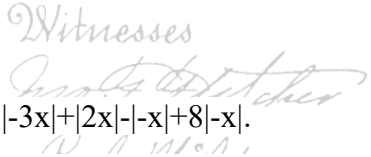




3. What are the 4^{th} roots of 81?

Answer:

3 or -3



4. Simplify |-3x|+|2x|-|-x|+8|-x|.

Answer:

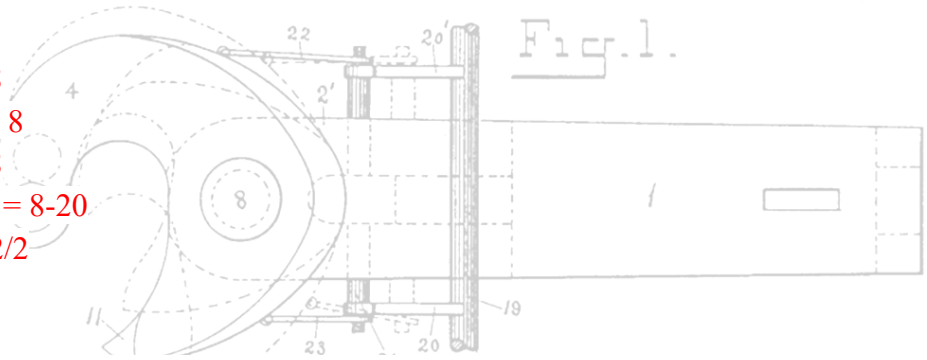
|-3x|+|2x|-|-x|+8|-x|

= |3x|+|2x|-|x|+8|x|

= 3x+2x-x+8x
= 12x

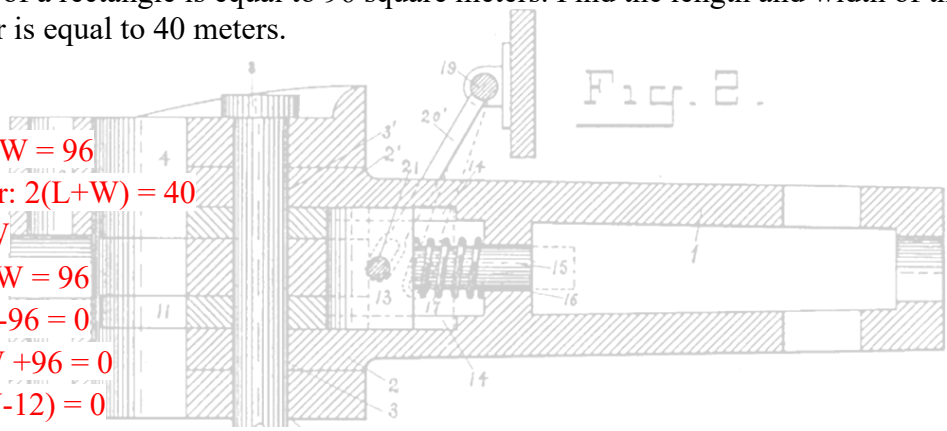
5. For what value of K is the point (4, K) on the line 2K+ 5x=8.

Answer:
2K+5x = 8
2K+5(4) = 8
2K+20 = 8
2K+20-20 = 8-20
2K/2 = -12/2
K = -6

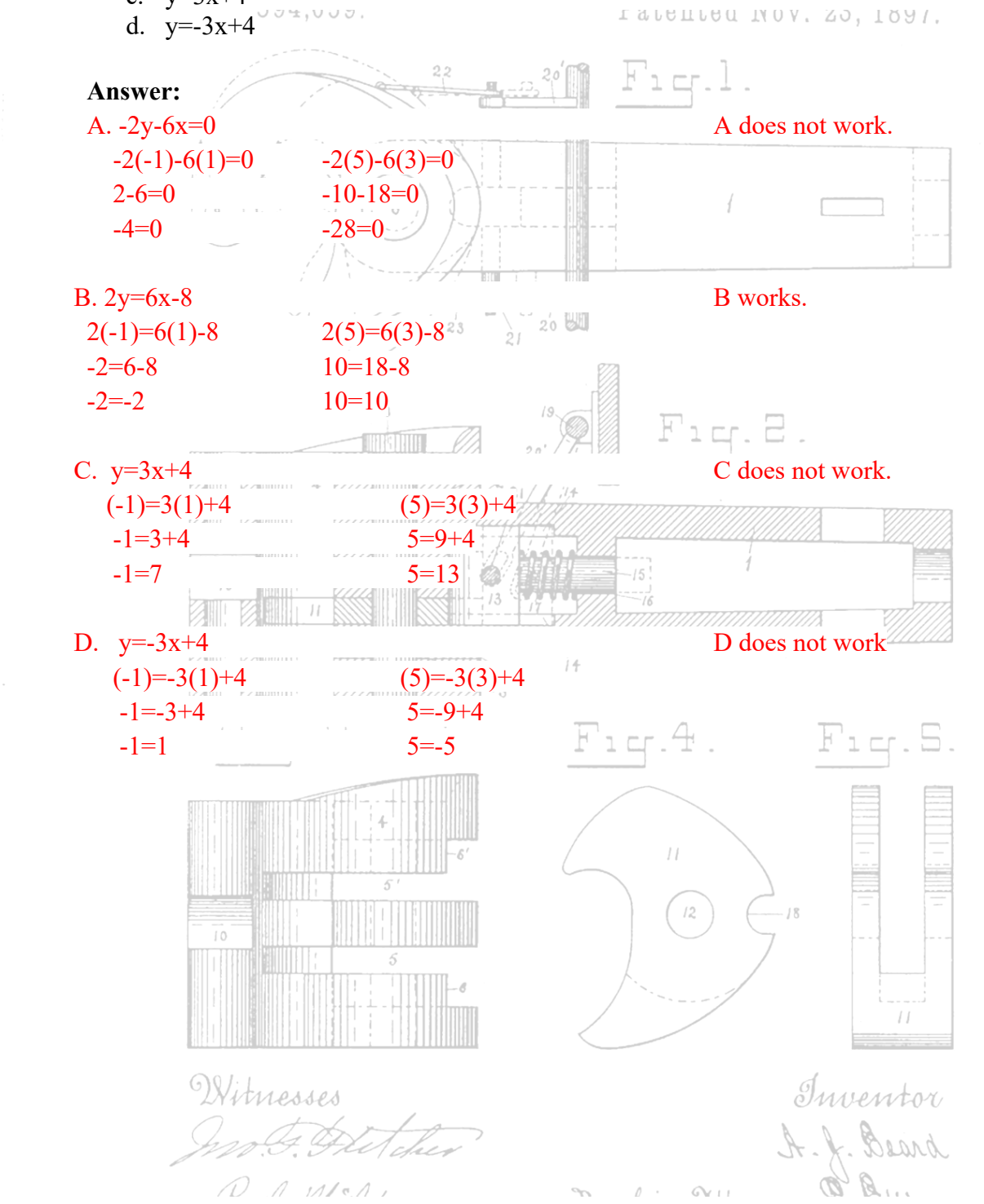


6. The area of a rectangle is equal to 96 square meters. Find the length and width of the rectangle if the perimeter is equal to 40 meters.

Answer:
Area: L*W = 96
Perimeter: 2(L+W) = 40
L = 20-W
(20-W)*W = 96
$20W-W^2-96 = 0$
$W^2 -20W +96 = 0$
(W-8)(W-12) = 0
Therefore the width of this rectangle can be 8 or 12 m.
If the width is 12, then the length is 8.
If the width is 8, then the length is 12.



7. Which line given by its equation below contains the points (1, -1) and (3, 5)
   a. -2y-6x=0
   b. 2y=6x-8
   c. y=3x+4
   d. y=-3x+4



Answer:

A. -2y-6x=0 — A does not work.

-2(-1)-6(1)=0 | -2(5)-6(3)=0

2-6=0 | -10-18=0

-4=0 | -28=0

B. 2y=6x-8 — B works.

2(-1)=6(1)-8 | 2(5)=6(3)-8

-2=6-8 | 10=18-8

-2=-2 | 10=10

C. y=3x+4 — C does not work.

(-1)=3(1)+4 | (5)=3(3)+4

-1=3+4 | 5=9+4

-1=7 | 5=13

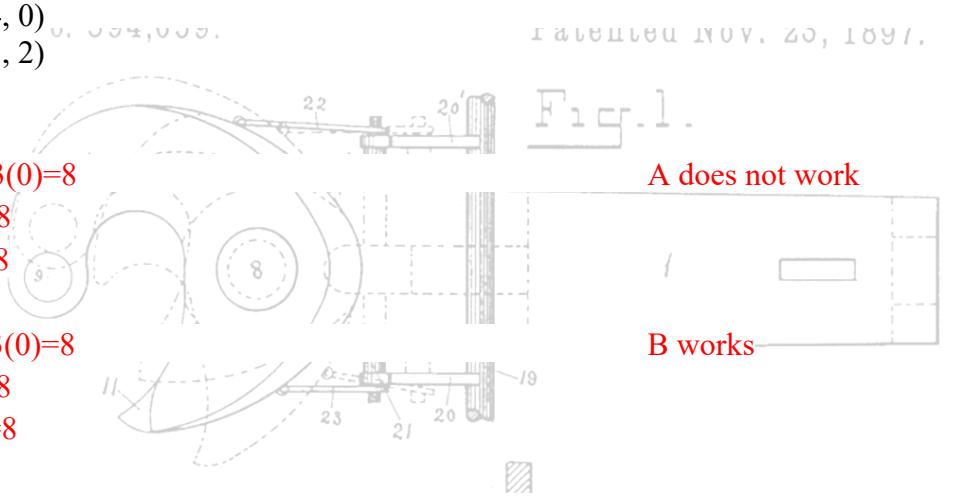
D. y=-3x+4 — D does not work

(-1)=-3(1)+4 | (5)=-3(3)+4

-1=-3+4 | 5=-9+4

-1=1 | 5=-5

8. Which of the following ordered pairs is a solution to the equation 2x+3y=8
   a. (0, 0)
   b. (4, 0)
   c. (1, 2)

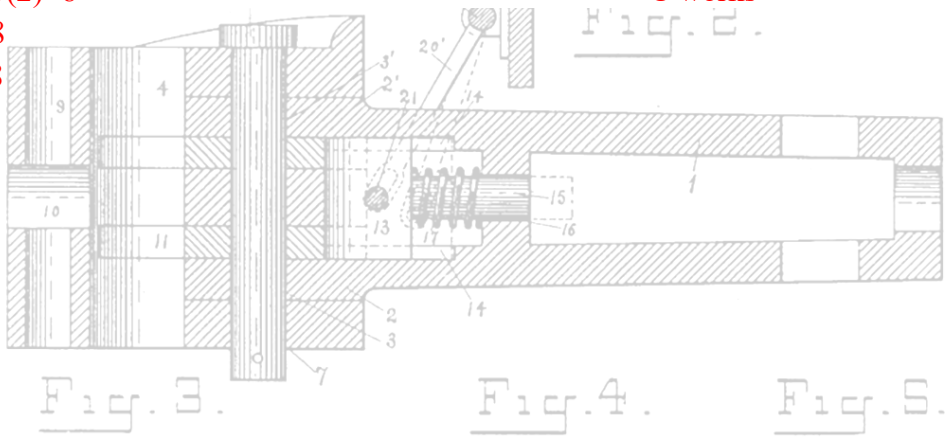


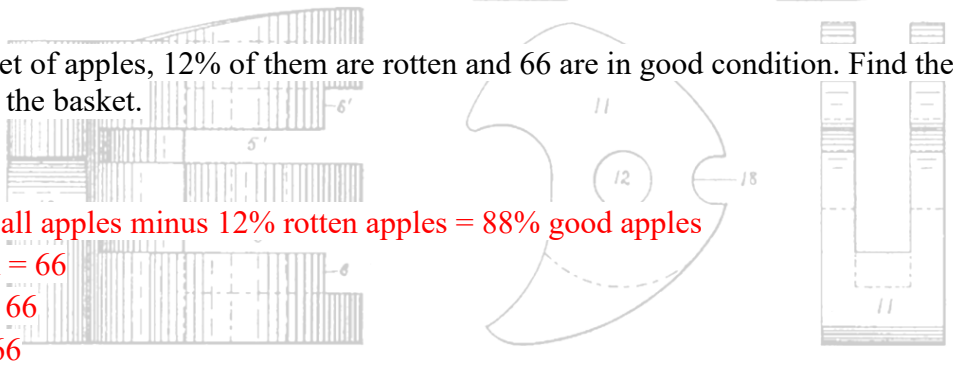
Answer:

A. 2(0)+3(0)=8 — A does not work
0+0=8
0=8

B. 2(4)+3(0)=8 — B works
8+0=8
8=8

C. 2(1)+3(2)=8 — C works
2+6=8
8=8





9. In a basket of apples, 12% of them are rotten and 66 are in good condition. Find the total number of apples in the basket.

Answer:

100% of all apples minus 12% rotten apples = 88% good apples
88% of x = 66
0.88*x = 66
0.88x = 66
0.88x/0.88 = 66/0.88
x = 75
There are 75 apples in the basket.

SECTION 2 - CULTURAL RELEVANCE

Sources:
https://en.wikipedia.org/wiki/Gladys_West

Gladys West (October 27, 1930- Present)

"We have made a lot of progress since when I came in, because now at least you can talk about things and be open a little more. Before you sort of whispered and looked at each other, or something, but now the world is opening up a little bit and making it easier for women. But they still gotta fight."

Introduction

Gladys West is an American mathematician known for her contributions to the mathematical modelling of the shape of the Earth, and her work on the development of the satellite Geodesy models that were eventually incorporated into the Global Positioning System (GPS). West was inducted into the United States Air Force Hall of Fame in 2018. West was also awarded the Webby Lifetime Achievement Award at 25th Annual Webby Awards for the development of the satellite geodesy models.

Early Life

West was born as Gladys Mae Brown in Sutherland, Virginia, in Dinwiddie County, a rural county south of Richmond. Her family was an African American farming family in a community of sharecroppers. She spent much of her childhood working on her family's small farm. Her mother worked at a tobacco factory. Her father was a farmer who also worked for the railroad. West realized early on that she did not want to work in the tobacco fields or factories like the rest of her family and decided that education would be her way out.

When West was on her way to graduate high school, the only obstacle keeping her from higher education was financial. Her parents tried to save but supporting an entire family on a sharecropper's wage did not leave much left for West's education. West began babysitting to help save but, ultimately, her superior academic performance resulted in her securing two scholarships. **At West's high school, the top two students of each graduating class received full scholarships to Virginia State College (now formally University), a historically black public university. West graduated as valedictorian in 1948 and received the much needed scholarship.** She was initially unsure what college major to pursue at VSU, as she had excelled in all her subjects in high school. She was encouraged to major in science or mathematics because of their difficulty, and West ultimately chose to study mathematics, a subject mostly studied at her college by men. She also became a member of the Alpha Kappa Alpha sorority. West graduated in 1952 with a Bachelor of Science in mathematics. After graduating, she taught math and science for two years in Waverly, Virginia. West then returned to VSU to complete her Master of Mathematics degree, graduating in 1955. Afterward, she briefly took another teaching position in Martinsville, Virginia.

Career

In 1956, West was hired to work at the Naval Proving Ground in Dahlgren, Virginia, (now called

sense oceans. West consistently put in extra hours, cutting her team's processing time in half. She was recommended for a commendation in 1979.

From the mid-1970s through the 1980s, West programmed an IBM 7030 Stretch computer to deliver increasingly precise calculations to model the shape of the Earth; an ellipsoid with additional undulations, known as the *Geoid*. Generating an extremely accurate Geopotential model required her to employ complex algorithms to account for variations in gravitational, tidal, and other forces that distort Earth's shape. In her autobiography, West spoke of some of the complex problems she solved, which had proven too difficult for other members of the team. **West's model ultimately became the basis for the Global Positioning System (GPS).**

In 1986, West published *Data Processing System Specifications for the Geosat Satellite Radar Altimeter*, a 51-page technical report from The Naval Surface Weapons Center (NSWC). The guide was published to explain how to increase the accuracy of the estimation of geoid heightsand vertical deflection, important components of satellite geodesy. **This was achieved by processing the data created from the radio altimeter on the Geosat Satellite, which went into orbit on March 12, 1984.**

Honours and Awards

West's vital contributions to GPS technology were rediscovered when a member of West's sorority Alpha Kappa Alpha read a short biography Gladys had submitted for an alumni function.

West was inducted into the United States Air Force Hall of Fame in 2018, one of the highest honours bestowed by Air Force Space Command (AFSPC). The AFSPC press release at the time called her one of "the so-called 'Hidden Figures' part of the team who did computing for the US military in the era before electronic systems", a reference to the 2016 book by Margot Lee Shetterly, which was adapted into the film *Hidden Figures*. Capt. Godfrey Weekes, commanding officer at the Naval Surface Warfare Center Dahlgren Division in 2018, described the role played by West in the development of Global Positioning System: “She rose through the ranks, worked on the satellite geodesy, and contributed to the accuracy of GPS and the measurement of satellite data. As Gladys West started her career as a mathematician at Dahlgren in 1956, she likely had no idea that her work would impact the world for decades to come.” West agreed, saying that she had no idea at the time that her work would affect so many: “When you’re working every day, you’re not thinking, ‘What impact is this going to have on the world?’ You're thinking, ‘I've got to get this right.’”

As an alumna of Virginia State University Dr. Gladys West was nominated and won the award for “Female Alumna of the Year” at the Historically Black Colleges and Universities Awards sponsored by *HBCU Digest* in 2018.

West was selected by the BBC as part of their 100 Women of 2018. In 2021, she was awarded the Prince Philip Medal by the UK's Royal Academy of Engineering, their highest individual honour.

Gladys West and Sam Smith look over data from the Global Positioning System at Dahlgren in 1985

Gladys West being inducted into the Air Force Space and Missile Pioneers Hall of Fame in 2018
(US Air Force)

Sources:
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https://www.whitehousehistory.org/benjamin-banneker

Benjamin Banneker (November 9, 1731- October 9, 1806)

"The colour of the skin is in no way connected with strength of the mind or intellectual powers"

Introduction

What do you see when you look at the stars? Benjamin Banneker saw astronomical patterns from which he could make calculations and predictions. Banneker was not only a mathematician and astronomer, but a free African American man living in a slave state in the eighteenth century, never knew the weight of iron shackles or the crack of an overseer's whip. A native of Baltimore County, Maryland, his experience diverged from those of most African Americans living in the early United States. He received a formal education during his youth, maintained his property and farm as an adult, and parlayed his intellectual gifts into national prestige. Dispute his many accomplishments, however, Banneker was forced to navigate the same racial prejudices that African Americans often faced in both slave and free states.

Early life

Born on November 9, 1731, in Ellicott's Mills, Maryland, Banneker was the son of an ex-slave named Robert and his wife, Mary Banneky. Mary was the daughter of an Englishwoman named Molly Welsh, a former indentured servant, and her husband, Bannka, an ex-slave whom she freed and who asserted that he came from tribal royalty in West Africa. Unlike most black children of his day in America, Benjamin was born a freeman and not enslaved. **He grew up on his family's farm where he worked hard even as a child. He helped with the tobacco crops, chopped wood, and did all sorts of chores around the farm.**

He was taught to read by his maternal grandmother and for a very short time attended a small Quaker school. Banneker was primarily self-educated. **His early, and most well-known accomplishment was and a wooden clock that was reputed to keep accurate time and ran for more than 50 years until his death.** In addition, Banneker taught himself astronomy and accurately forecasted the solar eclipse of 1789. After his father's passing, he ran his own farm for years, cultivating a business selling tobacco via crops.

base lines and boundaries had been established and Banneker had returned home, he prepared an ephemeris for the following year, which was published in Baltimore in *Benjamin Banneker's Pennsylvania, Delaware, Maryland and Virginia Almanack and Ephemeris, for the Year of Our Lord, 1792; Being Bissextile, or Leap-Year, and the Sixteenth Year of American Independence.* Banneker's calculations would give the positions of the planets and stars for each day of the year, and his almanacs were published every year from 1792 until 1797.

Honours and awards

Starting in 1792, Benjamin began to publish his famous Almanac. **The full title was *Benjamin Banneker's Pennsylvania, Delaware, Maryland, and Virginia Almanack and Ephemeris*, for the Year of Our Lord.** It contained all sorts of information including astronomical data, weather predictions, tables, essays, commentaries, and tide tables. He published a new almanac each year for six years until 1797.

Banneker's accomplishments extended into other realms, including civil rights. In 1791, Jefferson was secretary of state and Banneker considered the respected Virginian, though a slaveholder, to also be open to view African Americans as more than slaves. **Thus, he wrote Jefferson a letter hoping that he would "readily embrace every opportunity to eradicate that train of absurd and false ideas and opinions which so generally prevail with respect to us."** To further support his point, Banneker included a handwritten manuscript of an almanac for 1792, containing his astronomical calculations.

In his letter, Banneker acknowledged he was "of the African race" and a free man. He recognized that he was taking "a liberty" writing to Jefferson, which would be unacceptable considering "the almost general prejudice and prepossession which is so prevalent in the world against those of my complexion." Banneker then respectfully chided Jefferson and other patriots for their hypocrisy, enslaving people like him while fighting the British for their own independence.

Jefferson quickly acknowledged Banneker's letter, writing a response. He told Banneker that he took "the liberty of sending your almanac to Monsieur de Condorcet [secretary of the French Academy of Sciences] ...because I considered it as a document to which your whole colour had a right for their justification against the doubts which have been entertained of them." Banneker published Jefferson's letter alongside his original piece of correspondence in his 1793 almanac. Banneker's outspokenness with regard to the issue of slavery earned him the widespread support of the abolitionist societies in Maryland and Pennsylvania, both of which helped him publish his almanac.

Illustrated portrait of American author, astronomer, and farmer Benjamin Banneker (1731 - 1806), mid to late 18th century.
(Getty Images)

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intelligence to solve complicated equations. Katherine Johnson, along with other smart women, worked in this capacity. But Katherine was more than a mathematician who was great at geometry. She was born with a thirst for knowledge, and she had a mild-mannered assertiveness which helped her pioneer a pathway that future female scientists would follow.

Early life

Katherine Coleman was born on August 26, 1918, in White Sulphur Springs, West Virginia. Her intelligence and skill with numbers became obvious when she was a child. She was in high school by the time she was 10 years old. **After she graduated college with honours at 18, Johnson taught Black students math.** She later enrolled in graduate school at West Virginia University to study math but left early to raise a family and return to teaching.

In 1939 Katherine was selected to be one of the first three African American students to enrol in a graduate program at West Virginia University. She studied math but soon left to take care of her family. She had married James Goble that year. He died in 1956. (She later married James Johnson.)

Career

In 1952, when she was 34 years old, she learned about jobs for Black women with mathematics and computing skills at the Langley laboratory at the National Advisory Committee for Aeronautics, which would later become NASA. She and the other women worked as "human computers," figuring out the difficult calculations needed for spaceflight. During her time there, she broke racial barriers, like using the bathroom that was supposed to be for white women only.

In 1953 Johnson began work at the West Area Computing unit of the National Advisory Committee for Aeronautics (NACA). **The West Computers, as they were known, were a group of African American women. They studied data from tests and provided mathematical computations that were essential to the success of the U.S. space program.**

The West Computers were segregated from white workers. They were forced to use separate bathrooms and dining facilities. That changed when NACA became NASA in 1958.

At NASA Johnson was a member of the Space Task Group. She calculated the flight path for the spacecraft that put the first U.S astronaut in space in 1961. The year before she had coauthored a paper with an engineer. It was the first time a woman in her division received credit as an author of a research report. She authored or coauthored 26 research reports during her career.

Johnson also played an important role in NASA's Mercury program (1961–63) of crewed spaceflights. In 1961 she calculated the path for *Freedom 7*, the spacecraft that put the first U.S astronaut in space, Alan B. Shepard, Jr. The following year, at the request of John Glenn, Johnson verified that the electronic computer had planned his flight correctly. Glenn subsequently made history aboard *Friendship 7*, becoming the first U.S. astronaut to orbit Earth. **Johnson was also part of the team that calculated where and when to launch the rocket for the Apollo 11 mission from July 16 to 24, 1969, which sent the first three men to the Moon.** Johnson later worked on the space shuttle program. She retired from NASA in 1986.

Legacy, Honours and Awards

Johnson's social influence as a pioneer in space science and computing is demonstrated by the honours she received and her status as a role model for a life in science. Johnson was named West Virginia State College Outstanding Alumnus of the Year in 1999. President Barack Obama presented her with the Presidential Medal of Freedom, one of 17 Americans so honoured on November 24, 2015. She was cited

Shepard's flight, but what they didn't know at the time was that the calculations that got him into space and safely home were done by today's guest of honour, Katherine Johnson". **During the event, Johnson also received a Silver Snoopy award; often called the astronaut's award, NASA stated it is given to those "who have made outstanding contributions to flight safety and mission success". Presented to her by NASA astronaut Leland D. Melvin.**

In 2016, the book *Hidden Figures: The American Dream and the Untold Story of the Black Women Mathematicians Who Helped Win the Space Race* was published. It tells the story of the West Computers, including Johnson, Dorothy Vaughan, and Mary Jackson. **A motion picture based on the book was also released in 2016 with the same title as the book; *Hidden Figures*.**

A photograph from the 1960s shows Katherine Johnson at work at her desk at the National Aeronautics and Space Administration
(NASA)

Katherine Johnson received the Presidential Medal of Freedom in 2015. The award is the highest honour a civilian can receive from the United States government.
(NASA)

1. There is a clothing store in Dartmouth. The owner has devised his own method of pricing items. A vest costs $20, socks cost $25, a tie costs $15 and a blouse costs $30. Using this method, how much would a pair of underwear cost?

   Q# 1 Answer:
   The pricing method consists of charging $5 for each letter required to spell the item. $5*9=$45.

2. When Miguel was 6 years old, his little sister, Leila, was half his age. If Miguel is 40 years old today, how old is Leila?

   Q# 2 Answer:
   Let x be Leila's age when Miguel is 6
   x=6/2
   x=3
   Let y be Leila's age when Miguel is 40
   y=40-3
   y=37

Fig. 3.

Witnesses

Fig. 4.

Fig. 5.

Inventor
A. J. Beard

Unit of measurement

1 Astronomical Unit = 1.0 AU = 1.49 x 10^8 kilometers

1 Parsec = 3.26 Light years = 3 x 10^{18} centimeters = 206,265 AU

1 Watt = 107 ergs/sec

1 Star = 2 x 10^{33} grams

1 Yard = 36 inches

1 meter = 39.37 inches

1 mile = 5,280 feet

1 Liter = 1000 cm3

1 inch = 2.54 centimeters

1 kilogram = 2.2 pounds

1 Gallon = 3.78 Liters

1 kilometer = 0.62 miles

Temperature equation

Celsius to Fahrenheit	° F = 9/5 (° C) + 32
Kelvin to Fahrenheit	° F = 9/5 (K - 273) + 32
Fahrenheit to Celsius	° C = 5/9 (° F - 32)
Celsius to Kelvin	K = ° C + 273
Kelvin to Celsius	° C = K - 273
Fahrenheit to Kelvin	K = 5/9 (° F - 32) + 273

3. I am a three-digit number. My second digit is 4 times bigger than the third digit. My first digit is 3 less than my second digit. What number am I?

   COMMENT: This could be 141 or 582. To give an unambiguous answer, change the question to "My second digit is 5 times bigger than the third digit."

   Q# 3 Answer:
   Number is xyz
   For y and z, single digit that is 5 times bigger than another single digit is (y,z)=(5,1)
   Given that x is 3 less than y, then x=2
   251

4. If I have two thermometers, one in Celsius and the other in Fahrenheit, is it true or false that the temperature in degrees C is always lower than the same temp in degrees F? If false, when are they the same?

   Q# 4 Answer:
   False. The conversion equation is F=(9/5)*C+32, if you plot it on the same graph as F=C the point where they will intersect is (-40,-40)

   Alternatively, let's check to see if it possible that F can equal C by setting F=C in the equation:
   C=(9/5)C+32
   Solve for C
   -32 = (4/5)C
   C = -32*5/4
   C= -40
   Check that F is 40 as well
   F = (9/5)*(-40)+32
   F = -40
   So, yes C can equal F. It does so when C = F = -40

   Since C and F intersect at one temperature only, there is a crossing point. Thus, C is not always lower than F.

5. You have 8 coins that each weigh one ounce, but one of the coins is a counterfeit that is slightly lighter, about 0.9 ounces. You have a weighting scale, but it cost one dollar to use each time. How can you identify the fake coin with as few weighing as as possible?

   Q# 5 Answer:
   3. Split the coins in 2 groups of 4, then weigh one of the groups. This group will either weigh 4 ounces exactly or 3.9 ounces. Repeat the same step with the lighter group by splitting them into 2 groups of 2 and weighing one (one will weigh 1.9 ounces). Again, keep the lighter group, then split into 2 groups of 1. Weigh one coin to determine which is the light coin.

6. You roll a pair of dice with your eyes closed. A friend tells you that at least one of them is a one

7. Using topology, how many holes are in a straw?

Q# 7 Answer:
1. Topology deals with shapes that can be continuously deformed into one another. In topology a triangle is the same as a square or a circle because we can smoothly mold these into one another. To a topologist, a coffee mug just has one hole, making it the same as a donut. By that logic, a straw is also the same as a donut because you can smoothly mold a straw into a donut without adding or removing holes.

10. If you can purchase 8 eggs for 26 cents, how many can you buy for a cent and a quarter?

Q# 8 Answer:
8, a cent and a quarter is the same as 26 cents.

8. 1, 11, 21, 1211, 111221, 312211, ? What is the next number in this sequence?

Q# 9 Answer:
13112221. This sequence is called a look and say sequence. Start with 1, that is one 1-> 11. 11->two 1's -> 21. 21-> one 2, one 1-> 1211. 1211-> one 1, one 2, two 1's-> 111221. 111221-> three 1's, two 2's, one 1-> 312211. 312211-> one 3, one 1, two 2's, two 1's-> 13112221.

9. Among 100 exam scores, the mean score is 60 but the mode score is 85. If you randomly select a student, would 60 or 85 be the better guess at their score?

Q# 10 Answer:
85. Because mode is the most common score.

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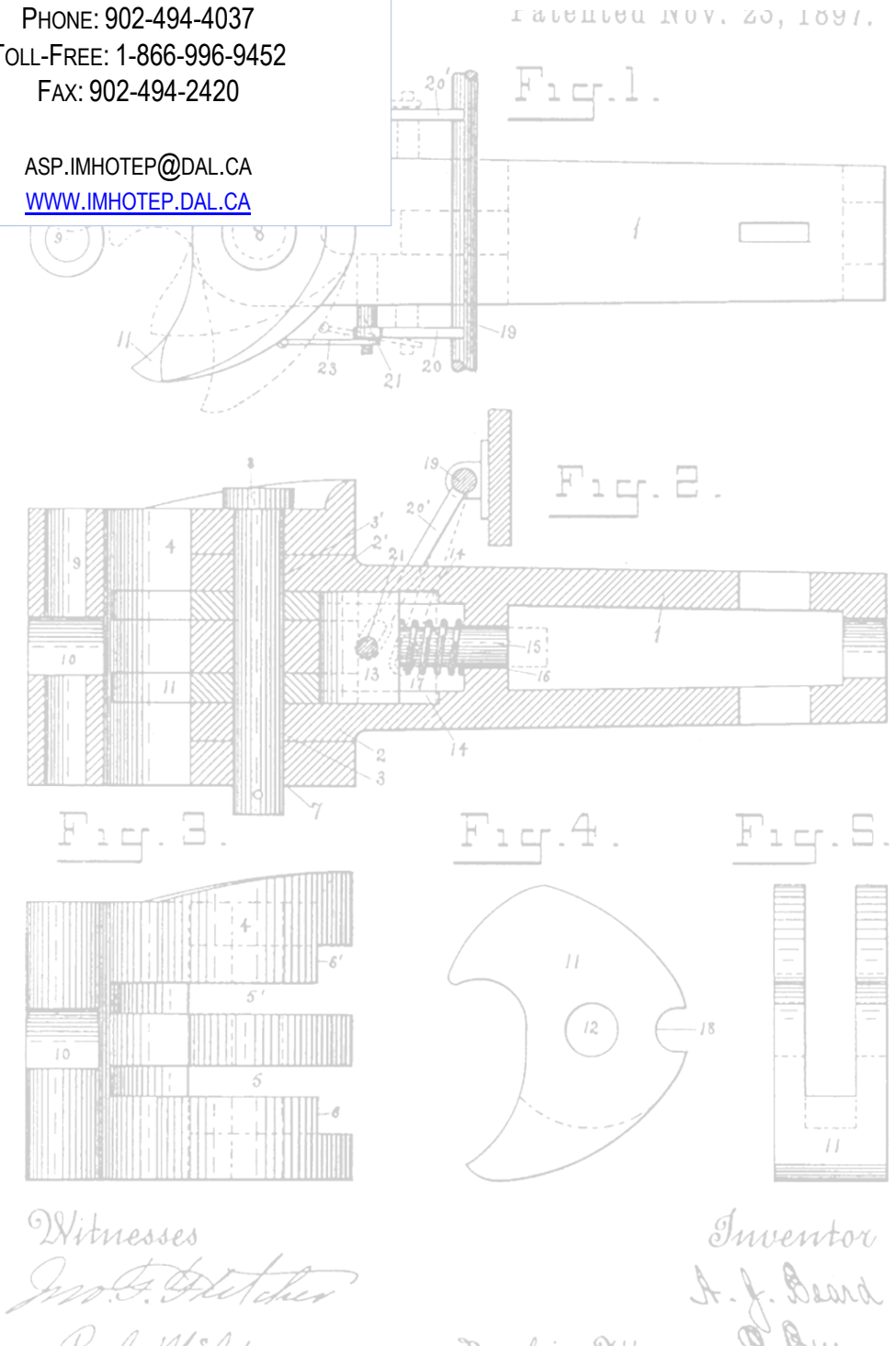

No. 594,659. Patented Nov. 23, 1897.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Witnesses
Jno. G. Fletcher

Inventor
A. J. Beard