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Name:_____ Class:_____ Date:_____

New Problems

1. Identify a quantifier in the following categorical statement.

None of the cars have a hydrogen engine.

a. hydrogen
b. the cars
c. engine
d. None of

ANSWER: d

2. Use an Euler diagram to determine whether the argument is valid or invalid.

All divers have permits.
Lan is a diver.

Lan has a permit.

a. Valid
b. Invalid

ANSWER: a

3. Use an Euler diagram to determine whether the argument is valid or invalid.

No detectives are memoirs.
Some memoirs are non-fiction.

No detectives are non-fiction.

a. Valid
b. Invalid

ANSWER: b

4. You have a choice of paying an apartment rental cost of $1950/month, $400/week, or $90/day. Which paying choice would you take? Assume that there are 30 days in a month.

a. $1950/month
b. $400/week
c. $90/day

ANSWER: b

5. The ratios of comments, likes, and views for a Youtube video are 1:6:100, in that order. If a video has got 665,000 views, how many comments and likes does it have?

a. 6,650 comments, 39,900 likes
b. 6,215 comments, 37,290 likes
c. 6,652 comments, 53,200 likes
d. 6,650 comments, 53,200 likes

ANSWER: a

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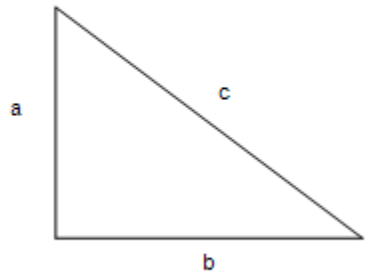
New Problems

6. A personal meal plan consists of fruits, milk, meat dishes, vegetable dishes, and grain dishes. Their ratios are 2:2:3:5:5, in that order. If a total of 25.5 servings are needed per day, how many servings of each are needed? Round your answers to the nearest tenth.

a. 51:51:76.5:127.5:127.5
b. 2:2:3:5:5
c. 3:3:4.5:7.5:7.5
d. 3:3:6.5:7.5:9.5

ANSWER: c

7. For the right triangle shown below, the sides a, b, and c are in the ratio of 3:4:5, in that order. If side b has a length of 20 centimeters, what are the lengths of sides a and c?



a. $a = 15\ cm,\ c = 20\ cm$
b. $a = 12\ cm,\ c = 20\ cm$
c. $a = 12\ cm,\ c = 25\ cm$
d. $a = 15\ cm,\ c = 25\ cm$

ANSWER: d

8. A racer completed a lap in 51.2 seconds on the first try. On the second try, the racer completed the lap in 43.9 seconds. What is the percent decrease in the lap time?

a. 16.6%
b. 14.3%
c. 0.14%
d. 0.17%

ANSWER: b

9. A startup founder had a credit card bill of $8914.76 at the end of September. If the minimum monthly payment is the greater of $300 or 4.5% of the credit card bill, what is the minimum monthly payment for September? Round your answer to the nearest cent.

a. $300

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b. $401.16
c. $387.66
d. $414.66

ANSWER: b

10. If you decide to make monthly payments of $180 (and make no additional charges on the account) on a credit card debt of $2592.44, assuming the annual interest rate of 20.5%, it will take approximately 17 months to repay the debt. What minimum monthly payment will reduce the repayment time to 12 months? Round your answer to the nearest dollar.

a. $224
b. $255
c. $196
d. $245

ANSWER: d

11. Ebenezer has $1212.18 in credit card debt and the annual interest rate is 20% compounded monthly. He decides to use the option that allows deferred credit card payments for 1 year, during which the interest on the card debt continues to accrue, but there are no late payment penalties. After this year, he wants to start repayment and pay off the credit card debt in 18 months without making any additional purchases. What will be his minimum monthly payment? Round your answer to the nearest dollar.

a. $96
b. $79
c. $103
d. $63

ANSWER: a

12. Kate invests $12,000 into an investment that earns an annual interest rate of 6.9% (the nominal rate). The current rate of inflation is 2.5%. How much will the investment increase in 1 year? Round your answer to the nearest cent.

a. $528.00
b. $521.48
c. $515.12
d. $493.92

ANSWER: c

13. One ball is thrown vertically upward from the ground and its height as a function of time is given by $h_1(t) = 20t - 4.9t^2$. The second ball is dropped from a 65-m-high cliff and its height as a function of time is given by $h_2(t) = 65 - 4.9t^2$. Time t is measured in seconds, and heights h_1 and h_2 are measured in meters. Determine the height difference between the two balls at time $t = 1.1$ s.

a. $\Delta h = 16.1$ m
b. $\Delta h = 59.1$ m
c. $\Delta h = 37.6$ m
d. $\Delta h = 43.0$ m

ANSWER: d

14. The velocity of a model rocket launched vertically upward changes with time as follows: $v(t) = 35 - 7.7t$, where t is in seconds and v is in meters per second. Find the average rate of change of the rocket's velocity between $t_1 = 0.8$ s and $t_2 =$

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1.4 s.

a. -4.62 m/s^2

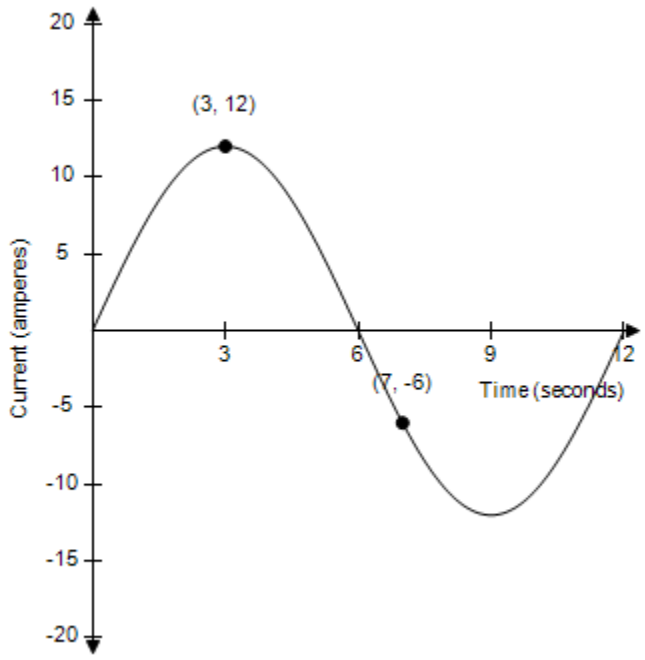
b. -3.30 m/s^2

c. -7.70 m/s^2

d. -2.10 m/s^2

ANSWER: c

15. The graph shows the current through an inductor as a function of time.



What is the average rate of change of the current in the interval between 3 seconds and 7 seconds?

a. –4.50 A/s

b. –1.5 A/s

c. –6.00 A/s

d. –2.00 A/s

ANSWER: a

16. A free neutron striking a uranium atom splits apart its nucleus, releasing energy. This process of nuclear fission also produces 2 or 3 free neutrons that strike other uranium atoms, causing a nuclear chain reaction. Suppose that uranium is bombarded with 60 free neutrons and on average 2.5 free neutrons are released in each fission event. Find the exponential growth model for the system and predict the number of free neutrons after 6 generations of fission events have occurred. Round your answer to the nearest whole number.

a. 14648

b. 110296

c. 150

d. 5859

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ANSWER: a

17. A purse contains 11 red, 19 blue, 22 yellow, and 48 green beads. Find the probability that one bead drawn at random will be red or green.

a. $\frac{12}{25}$

b. $\frac{59}{100}$

c. $\frac{37}{100}$

d. $\frac{11}{100}$

ANSWER: b

18. Tom received a bag of candies as a gift. It is known that one half of the candies is made of dark chocolate, and the other half is made of white chocolate. Among the dark chocolates, 5 pieces contain almonds, and the rest contain hazelnuts. Among the white chocolates, 5 pieces contain hazelnuts, and the rest contain almonds. There are 26 candies in total and they all have the same wrapper. What is the probability that a randomly selected candy will be made of white chocolate or contain hazelnuts?

a. $\frac{1}{2}$

b. $\frac{5}{26}$

c. $\frac{21}{26}$

d. 1

ANSWER: c

19. Jane and her friends are playing a board game. To win on her last step, Jane must roll at least 15 using one 20-sided dice (the dice with 20 sides numbered from 1 to 20 and having an equal probability of being rolled). What is the probability of losing?

a. $\frac{7}{10}$

b. $\frac{3}{10}$

c. $\frac{3}{4}$

d. $\frac{1}{4}$

ANSWER: a

20. A fortune teller uses a deck consisting of 78 cards, one of which is unique and named The Fool. If she has already drawn 2 cards and none of them are The Fool, what is the probability that the next card will also be not The Fool?

a. $\frac{77}{78}$

b. $\frac{25}{26}$

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c. $\frac{38}{39}$

d. $\frac{75}{76}$

ANSWER: d

21. In a batch of 70 fortune cookies, two cookies were mistakenly left without predictions. If 10 cookies are randomly selected from the batch, what is the probability that at least one is empty? Round your answer to three decimal places.

a. 0.733

b. 0.636

c. 0.364

d. 0.267

ANSWER: d

22. A deck consists of 52 usual cards and two Jokers. If you pull 5 cards from this deck (without replacing them), what is the probability that at least one of the cards is Joker?

a. 0.822

b. 0.217

c. 0.178

d. 0.172

ANSWER: c

23. The table shows the number of black and colored cars with manual and automatic transmission in a rental service's park.

	Black	Colored	Total
Manual	20	16	36
Automatic	24	28	52
Total	44	44	88

If you booked a car with manual transmission, what is the probability that it will be black?

a. $P(\text{black}|\text{manual}) = \frac{5}{22}$

b. $P(\text{black}|\text{manual}) = \frac{5}{9}$

c. $P(\text{black}|\text{manual}) = \frac{6}{13}$

d. $P(\text{black}|\text{manual}) = \frac{3}{11}$

ANSWER: b

24. In December, in Nowhere town, if it snows one day, there is a 58% chance that it will snow the next day. If it does not snow on a given day, there is a 20% chance that it will snow the following day. If there is no precipitation on December 1st, what is the probability that it will snow on the next three days and not snow on the fourth day. Round your answer to five decimal places.

a. 0.06728

b. 0.03902

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c. 0.02826

d. 0.01346

ANSWER: c

25. Mary, in addition to the regular five pence coins, has several defective five pence coins with two tails. There are five regular coins and one defective coin in her pocket, and 10 regular and two defective coins in her purse. Consider three successive events:
A) first, Mary randomly picks one regular coin from the pocket,
B) next, Mary randomly picks one regular coin from the purse,
C) next, Mary randomly picks one two-tailed coin from the purse.
Choose the correct statement.

a. Events A and B are dependent.

b. Events B and C are dependent.

c. Events A and C are dependent.

d. There are no two dependent events.

ANSWER: b

26. A player throws a dart at a target. Depending on what area of the target the dart hits, the player can get 1, 5, 10, 25, or 50 points. If the dart misses the target, the player loses 15 points. The probability of gaining/losing a certain number of points in one throw for this particular player is shown in the table.

Points	Probability
-15	0.01
1	0.26
5	0.25
10	0.2
25	0.25
50	0.03

What is the expectation for the player's throw? Round your answer to two decimal places.

a. 11.26 points per throw

b. 11.11 points per throw

c. 11.41 points per throw

d. 10.96 points per throw

ANSWER: b

27. The Countess wants to insure her $200,000 worth of jewelry against theft for a year. The insurance company estimates the chance of theft to be 0.1% and offers a 1-year policy for $398, which guarantees reimbursement of the full cost of the jewelry in the event of theft. What is the company's expectation? Round your answer to the nearest cent.

a. $197.20

b. $197.60

c. $198.00

d. $200.40

ANSWER: c

28. Eight athletes competed in a 100 meter sprint. Each athlete's time is given in the table below.

Athlete #	1	2	3	4	5	6	7	8
Time in seconds	9.86	9.80	9.85	9.73	9.65	9.77	9.87	9.83

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Find the range of this set of data.

a. 0.03
b. 9.80
c. 0.22
d. 0.07

ANSWER: c

29. A race car made six laps on a race track. The time it took to complete each lap is given in the table below.

Lap #	1	2	3	4	5	6
Time (min:sec)	2:25	2:24	2:39	2:15	2:27	2:30

Find the population standard deviation of the set of data. Calculate the standard deviation in seconds and round it to one decimal place.

a. 51.6
b. 7.2
c. 24.0
d. 5.0

ANSWER: b

30. The table below shows average monthly temperatures for a specific city over the course of a year.

Month	January	February	March	April	May	June	July	August	September	October	Nov
Temperature (^{o}C)	12	15	18	21	24	30	31	32	27	22	

Find the sample standard deviation of the set of data. Round your answer to one decimal place.

a. 7.0
b. 10.8
c. 20.0
d. 7.3

ANSWER: d

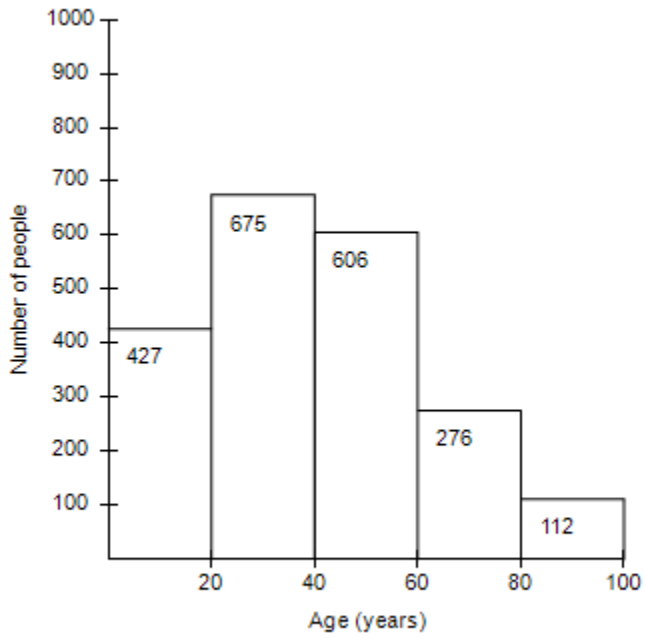
31. Demographers conducted a study on the population of a small village, categorizing it into the following age groups: 0-20 years, 20-40 years, 40-60 years, 60-80 years, and 80-100 years. The data they obtained is shown in the graph below.

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Find the population weighted variance of the set of data. Round your answer to one decimal place.
Hint: For each age category, assign a midpoint and calculate the weighted mean.

a. 896.4
b. 22.3
c. 496.5
d. 351.6

ANSWER: c

32. In a company, Tom's salary of $75,920 is greater than the salaries of 27 out of 46 employees. Find the percentile for Tom's salary, rounded to the nearest percent.

a. 41
b. 59
c. 61
d. 27

ANSWER: b

33. Thirteen students took a test, and their results are as follows: 85, 59, 78, 71, 95, 89, 91, 65, 62, 83, 80, 87, 74. Find the quartiles for the data.

a. $Q_1 = 65,\ Q_2 = 80,\ Q_3 = 89$
b. $Q_1 = 59,\ Q_2 = 80,\ Q_3 = 95$
c. $Q_1 = 71,\ Q_2 = 80,\ Q_3 = 87$
d. $Q_1 = 68,\ Q_2 = 80,\ Q_3 = 88$

ANSWER: d

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New Problems

34. The rate of a car's gasoline consumption is influenced by its driving speed. The table below illustrates gasoline consumption, measured in liters per hour, at various driving speeds specified in kilometers per hour.

Driving speed (km/h)	40	50	60	70	80	90	100	110
Gasoline consumption (liter/hour)	1.0	1.1	1.4	1.5	1.8	2.0	2.2	2.4

Find the equation of a linear regression line for the data where driving speed is the independent variable and gasoline consumption is the dependent variable. Round the slope and y-intercept to three decimal places.

a. $y = 0.021x + 0.121$

b. $y = 0.021x + 0.198$

c. $y = 0.121x + 0.021$

d. $y = 0.024x + 0.121$

ANSWER: a

35. The price of a home is linked to its total area. The agency released data on homes currently available for sale. The table below shows their respective prices and areas.

Home Price ($)	150000	180000	190000	220000	230000	250000	270000	300000
Home Area (m^2)	100	110	120	130	140	150	160	170

Treat the area as the independent variable and price as the dependent variable and find the linear regression equation. Round the slope and y-intercept to the nearest whole number.

a. $y = 2012x + 47307$

b. $y = 47857x + 2012$

c. $y = 2362x - 47307$

d. $y = 2012x - 47857$

ANSWER: d

36. A person's weight is influenced by various factors, with one of the primary determinants being height. The table below displays the heights and weights of eight individuals.

Height (cm)	153	161	166	172	174	181	185	189
Weight (kg)	50	56	62	64	73	75	82	89

To analyze this relationship, treat height as the independent variable and weight as the dependent variable, and determine the linear regression equation. Round the slope and y-intercept to three significant figures.

a. $y = 1.43x + 99.9$

b. $y = 1.06x - 114$

c. $y = 1.06x - 99.9$

d. $y = 1.43x + 114$

ANSWER: b

37. The table below provides daily air temperatures alongside sales of ice cream for each respective day, recorded at a specific ice cream shop.

Temperature (^oC)	20	23	25	28	32	34
Number of ice creams	107	115	176	238	318	343

Treat temperature as the independent variable and the number of ice creams as the dependent variable and find the linear regression equation for the given data. Round the slope to one decimal place and the y-intercept to the nearest whole number.

a. $y = 18.5x - 284$

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b. $y = 18.5x - 161$
c. $y = 23.2x - 284$
d. $y = 23.2x - 161$

ANSWER: a

38. The table below displays the ages and incomes of employees within one of the departments of a specific company.

Age (in years)	26	31	38	47	51	55	58	63
Income (in thousands of dollars)	42	51	60	62	65	70	73	79

Find the linear correlation coefficient for the given dataset. Round your answer to three decimal places.

a. 0.804
b. -0.980
c. 0.980
d. 0.882
e. -0.804
f. -0.882

ANSWER: c

39. There is a noticeable relationship between leading an active lifestyle, which includes regular exercise, and the occurrence of sickness. The table below displays daily exercise duration for six individuals alongside the number of sick days they experienced in a month.

Daily exercise in minutes	60	45	30	20	10	0
Number of sick days in a month	1	1	3	3	3	7

Calculate the linear correlation coefficient for this dataset. Round your answer to three decimal places.

a. –0.731
b. –0.859
c. –0.945
d. –0.645

ANSWER: b

40. The table below displays the population density of six cities alongside corresponding crime rates within these cities.

Population density (per square kilometer)	200	400	500	650	700	850
Crime rate (incidents per 1000 people)	7	5	11	14	14	18

Find the linear correlation coefficient for this dataset. Round your answer to three decimal places.

a. 0.914
b. 0.823
c. 0.997
d. 0.686

ANSWER: a

41. Braking distance is the distance a vehicle travels from the moment the driver applies the brakes to the moment the vehicle comes to a complete stop. Many factors, such as the type of a vehicle, road conditions, the efficiency of the braking system, tire quality, and several others influence braking distance. However, it is predominantly determined by the speed of the vehicle. The table below presents data on cars' speeds and their corresponding braking distances, collected from different but similar types of vehicles.

Car speed (km/h)	60	70	80	90	100	110

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Braking distance (m)	14	23	24	32	42	49

Find the linear correlation coefficient for the given data. Round your answer to three decimal places.

a. 0.779
b. 0.867
c. 0.916
d. 0.985

ANSWER: d

42. Three computer games have been selected as the finalists in an annual game award. Gamers who took part in the vote have ranked them in order of preference. The results are given in the following preference schedule.

	Rankings					
Game A	1	2	2	3	3	1
Game B	2	1	3	2	1	3
Game C	3	3	1	1	2	2
Number of voters:	397	357	274	235	212	166

If the plurality method of voting is used to distribute prizes, which game is the second-place winner and by how many votes does it lose to the first-place winner?

a. Game C is in second place, 54 votes behind first place.
b. Game C is in second place, 6 votes behind first place.
c. Game A is in second place, 54 votes behind first place.
d. Game A is in second place, 6 votes behind first place.

ANSWER: d

43. A home bakery asked its customers to rank five varieties of pies in order of preference. The results are shown in the following table.

	Rankings					
Apple pie	4	5	2	3	5	3
Blueberry pie	1	2	5	4	4	1
Cherry pie	3	1	4	2	2	5
Peach pie	5	2	3	1	1	4
Strawberry pie	2	3	1	5	3	2
Number of voters:	14	12	10	9	9	6

Using the Borda count method, which pies should come in first and second place?

a. 1st place: Blueberry pie
   2nd place: Peach pie
b. 1st place: Strawberry pie
   2nd place: Cherry pie
c. 1st place: Blueberry pie
   2nd place: Cherry pie
d. 1st place: Strawberry pie
   2nd place: Peach pie

ANSWER: b

44. A project team must select an activity for a corporate event. The project manager offered four different options, and the team members ranked them in order of preference, as shown in the following table.

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