

Answer: a. $\frac{m-n}{m+n}$

Multiply the dividend by the reciprocal of the divisor.

$$\frac{m^3 - n^3}{m^3 + n^3} \div \frac{m^2 + mn + n^2}{m^2 - mn + n^2} = \frac{m^3 - n^3}{m^3 + n^3} \cdot \frac{m^2 - mn + n^2}{m^2 + mn + n^2}$$

Factor

$$= \frac{(m-n)(m^2 + mn + n^2)}{(m+n)(m^2 - mn + n^2)} \cdot \frac{m^2 - mn + n^2}{m^2 + mn + n^2}$$

Cancel common factors

$$= \frac{(m-n)\cancel{(m^2 + mn + n^2)}}{(m+n)\cancel{(m^2 - mn + n^2)}} \cdot \frac{\cancel{m^2 - mn + n^2}}{\cancel{m^2 + mn + n^2}}$$

$$= \frac{m-n}{m+n}$$

17. The scores of 8 students were 75, 79, 73, 83, 87, 90, 93, 96. What was the average score of the students? (a) (b) (c) (d)

- a. 83.7 c. 88
b. 84.5 d. 90.2

Answer: b. 84.5

Quantitative Reasoning - Solutions

Directions: Shade the oval that corresponds to the best answer.

1. Find the value of N if

(a) (b) **(c)** (d)

$$N = 18 - 15 \div (8 - 5) \times 3 + 7$$

- a. 0 b. 6 c. 10 d. 15

Answer: c. 10

By PEMDAS,

$$\begin{aligned} N &= 18 - 15 \div (8 - 5) \times 3 + 7 \\ &= 18 - 15 \div 3 \times 3 + 7 \\ &= 18 - 5 \times 3 + 7 \\ &= 18 - 15 + 7 \\ &= 3 + 7 \\ &= 10 \end{aligned}$$



2. Given $30^2 - ? + 15^2 = 1222$, what value should be substituted to “?” to make the equation *true*? (a) (b) (c) **(d)**

- a. 73 b. 81 c. -89 d. -97

Answer: d. -97

Isolate the “?” on the left side of the equation,

$$30^2 - ? + 15^2 = 1222$$

$$? = 30^2 + 15^2 - 1222$$

$$? = 900 + 225 - 1222$$

$$? = 1125 - 1222$$

$$? = -97$$

3. What number should replace x to make the equation (a) (b) (c) (d)

$$\frac{x}{112} = \frac{7}{x} \text{ true?}$$

- a. 3 b. 14 c. 20 d. 28

Answer: d. 28

$$\begin{aligned} \frac{x}{112} &= \frac{7}{x} \\ (x)(x) &= (7)(112) \\ x^2 &= 784 \\ \sqrt{x^2} &= \sqrt{784} \\ x &= \pm 28 \end{aligned}$$

4. A five-digit number is to be formed using the numerals 0, 1, 2, 3, 4 and 5, without repetition. The total number of ways in which this can be done is _____ (a) (b) (c) (d)

- a. 12 b. 240 c. 600 d. 720

Answer: c. 600

Form 5-digit spaces:

There are only 5 possible numbers for the first digit since 0 is not included.

5 _____

The second digit will have 5 possible numbers since you can now place 0 and the other 4 numerals not used in the first digit.

5 5 _____

Continuing the process,

5 5 4 3 2

By Fundamental Principle of Counting,

$$5 \times 5 \times 4 \times 3 \times 2 = 600$$



5. $37\frac{1}{2}\%$ of 192 + $33\frac{1}{3}\%$ of 306 = ?

a **b** **c** **d**

a. 174

c. 274

b. 198

d. 498

Answer: a. 174

Change the percents to fractions before multiplying,

$$\begin{aligned} 37\frac{1}{2}\% \times 192 + 33\frac{1}{3}\% \times 306 &= \frac{3}{8} \times 192 + \frac{1}{3} \times 306 \\ &= 72 + 102 \\ &= 174 \end{aligned}$$

6. Simplify the rational expression $\frac{ab+3a-b^2-3b}{a^2-b^2}$. (a) (b) (c) (d)

a. 1

c. $\frac{a+b}{a-b}$

b. 3

d. $\frac{b+3}{a+b}$

Answer: d. $\frac{b+3}{a+b}$

Rearrange the terms

$$\frac{ab+3a-b^2-3b}{a^2-b^2} = \frac{ab-b^2+3a-3b}{a^2-b^2}$$

Factor

$$\frac{b(a-b)+3(a-b)}{(a+b)(a-b)} = \frac{(a-b)(b+3)}{(a+b)(a-b)}$$

Cancel common factors

$$\frac{\cancel{(a-b)}(b+3)}{(a+b)\cancel{(a-b)}} = \frac{b+3}{a+b}$$

7. Determine the domain of the function $y = \frac{x}{2x-7}$. (a) (b) (c) (d)

a. $\{x \mid x = y\}$

c. $\left\{x \mid x \neq \frac{7}{2}\right\}$

b. $\{x \mid x = 2\}$

d. $\{x \mid x \neq 7\}$

Answer: c. $\left\{ x \mid x \neq \frac{7}{2} \right\}$

For a rational function, its denominator must not be equal to zero.

$$2x - 7 \neq 0$$

$$2x \neq 7$$

$$x \neq \frac{7}{2}$$

8. A sum of money is divided among Jeriza, Guye, Maan and Marlon in the ratio 3 : 7 : 11 : 15 respectively. If the share of Marlon is Php 300 more than the share of Jeriza, then what is the total amount of money of Guye and Maan together? (a) (b) (c) (d)

- a. Php 360 c. Php 1500
b. Php 450 d. Php 1800

Answer: b. Php 450

Let 3x - Jeriza's money
7x - Guye's money
11x - Maan's money
15x - Marlon's money



Since Marlon's money is 300 more than Jeriza's money,

$$15x = 3x + 300$$

$$15x - 3x = 300$$

$$12x = 300$$

$$x = 25$$

Solve for Guye and Maan's money.

$$\begin{aligned} 7x+11x &= 7(25)+11(25) \\ &= 175+275 \\ &= 450 \end{aligned}$$

9. Which among the following is a solution of the inequality $5y+6(y-1) \leq 3y-1$? (a) (b) **(c)** (d)

a. 1 b. $\frac{5}{7}$ c. $\frac{5}{9}$ d. $\frac{7}{8}$

Answer: c. $\frac{5}{9}$

$$5y+6(y-1) \leq 3y-1$$

$$5y+6y-6 \leq 3y-1$$

$$5y+6y-3y \leq -1+6$$

$$8y \leq 5$$

$$y \leq \frac{5}{8}$$

Thus, from the choices: $\frac{5}{9} \leq \frac{5}{8}$

10. Simplifying the complex fraction $\frac{\frac{a+b}{a-b}-1}{\frac{3}{a-b}}$ will give (a) **(b)** (c) (d)

_____.

a. 1

c. $\frac{1}{3}$ b. $\frac{2b}{3}$ d. $\frac{a+b}{a-b}$ Answer: b. $\frac{2b}{3}$ 

$$\begin{aligned} \frac{\frac{a+b}{3} - 1}{a-b} &= \frac{\frac{a+b}{3} - \frac{1(a-b)}{a-b}}{a-b} = \frac{\frac{a+b-a+b}{3}}{a-b} = \frac{\frac{2b}{3}}{a-b} \\ &= \frac{2b}{a-b} \cdot \frac{a-b}{3} = \frac{2b}{3} \end{aligned}$$

11. $(9\sqrt{x}+2)(5\sqrt{x}-3) = \underline{\hspace{2cm}}$.

(a) (b) (c) (d)

a. $18x-10\sqrt{x}-15$ c. $5x-17\sqrt{x}-6$

b. $45x-17\sqrt{x}-6$ d. $45x-10\sqrt{x}-6$

Answer: b. $45x-17\sqrt{x}-6$

Applying FOIL Method,

$$\begin{aligned} &(9\sqrt{x}+2)(5\sqrt{x}-3) \\ &= (9\sqrt{x})(5\sqrt{x}) - (9\sqrt{x})(3) + 2(5\sqrt{x}) - 2(3) \\ &= 45x - 27\sqrt{x} + 10\sqrt{x} - 6 \\ &= 45x - 17\sqrt{x} - 6 \end{aligned}$$

12. $(5^{x+5} + 5^{x+2}) \div (5^{x+4} - 5^{x+1}) =$ (a) (b) (c) (d)

a. 5

c. $\frac{5^{2x+7}}{5^{2x+5}}$

b. 25

d. $\frac{315}{62}$

Answer: d. $\frac{315}{62}$

Apply the Law of Exponent: $a^m \cdot a^n = a^{m+n}$

$$\begin{aligned} (5^{x+5} + 5^{x+2}) \div (5^{x+4} - 5^{x+1}) &= \frac{5^{x+5} + 5^{x+2}}{5^{x+4} - 5^{x+1}} \\ &= \frac{5^x \cdot 5^5 + 5^x \cdot 5^2}{5^x \cdot 5^4 - 5^x \cdot 5^1} \end{aligned}$$

Factor and cancel common terms

$$\begin{aligned} &= \frac{5^x \cdot 5^2 \cdot (5^3 + 1)}{5^x \cdot 5 \cdot (5^3 - 1)} = \frac{\cancel{5^x} \cdot 5^2 (5^3 + 1)}{\cancel{5^x} \cdot \cancel{5} (5^3 - 1)} \\ &= \frac{5(5^3 + 1)}{5^3 - 1} = \frac{5(126)}{124} = \frac{315}{62} \end{aligned}$$

13. What is the product of (a) (b) (c) (d)

$$\frac{x^2 + 10x + 25}{3x^2 + 8x - 35} \cdot \frac{9x^2 - 42x + 49}{2x^2 + 9x - 5} ?$$

a. $\frac{7x-3}{x-2}$

c. $\frac{3x-7}{2x-1}$

b. $\frac{x-7}{x-1}$

d. $\frac{3x-1}{2x-7}$



Answer: c. $\frac{3x-7}{2x-1}$

Factor and cancel common terms of the rational expression.

$$\frac{x^2+10x+25}{3x^2+8x-35} \cdot \frac{9x^2-42x+49}{2x^2+9x-5} = \frac{\cancel{(x+5)}(x+5)}{(3x-7)\cancel{(x+5)}} \cdot \frac{\cancel{(3x-7)}(3x-7)}{(2x-1)\cancel{(x+5)}} = \frac{3x-7}{2x-1}$$

14. The sum of $\frac{3r+2}{2r^2+5r+2}$ and $\frac{2r-5}{r^2-3r-10}$ is _____.

(a) (b) (c) (d)

a. $\frac{5r-3}{3r^2+2r-8}$

b. $\frac{7r^2-21r-15}{(2r+1)(r+2)(r-5)}$

c. $\frac{6r^2-11r-10}{(2r+1)(r+2)(r-5)}$

d. $\frac{3r+2}{r^2-3r-10}$

Answer: b. $\frac{7r^2 - 21r - 15}{(2r+1)(r+2)(r-5)}$

$$\begin{aligned} \frac{3r+2}{2r^2+5r+2} + \frac{2r-5}{r^2-3r-10} &= \frac{3r+2}{(2r+1)(r+2)} + \frac{2r-5}{(r+2)(r-5)} \\ &= \frac{(3r+2)(r-5)}{(2r+1)(r+2)(r-5)} + \frac{(2r-5)(2r+1)}{(r+2)(r-5)(2r+1)} \\ &= \frac{3r^2 - 15r + 2r - 10}{(2r+1)(r+2)(r-5)} + \frac{4r^2 + 2r - 10r - 5}{(r+2)(r-5)(2r+1)} \\ &= \frac{3r^2 - 13r - 10}{(2r+1)(r+2)(r-5)} + \frac{4r^2 - 8r - 5}{(r+2)(r-5)(2r+1)} \\ &= \frac{7r^2 - 21r - 15}{(2r+1)(r+2)(r-5)} \end{aligned}$$

15. The weight of a container is 25% of the weight of the container when filled with water. After filling up the container, some of the water got spilled during transportation. Now, the container, along with the remaining water, weighs only seven-tenths of the original weight. What fractional part of the liquid has been spilled? (a) (b) (c) (d)

a. $\frac{1}{4}$ b. $\frac{2}{5}$ c. $\frac{3}{4}$ d. $\frac{4}{5}$

Answer: b. $\frac{2}{5}$

Let x - total weight of container and water

$0.25x$ - weight of container

$0.75x$ - weight of water

y - weight of spilled water

From the problem,

$$x - y = \frac{7}{10}x$$

$$x - \frac{7}{10}x = y$$

$$\frac{3}{10}x = y$$

$$0.30x = y$$

Therefore,

$$\frac{\text{Weight of spilled water}}{\text{Weight of water only}} = \frac{y}{0.75x} = \frac{0.30x}{0.75x} = \frac{30}{75} = \frac{2}{5}$$

16. What is the quotient when $\frac{m^3 - n^3}{m^3 + n^3}$ is divided by **a** **b** **c** **d**

$$\frac{m^2 + mn + n^2}{m^2 - mn + n^2} ?$$

a. $\frac{m - n}{m + n}$

c. $\frac{m^2 - n^2}{m^2 + n^2}$

b. -1

d. $\frac{m^2 + mn - n^2}{m^2 - mn + n^2}$



Answer: a. $\frac{m-n}{m+n}$

Multiply the dividend by the reciprocal of the divisor.

$$\frac{m^3 - n^3}{m^3 + n^3} \div \frac{m^2 + mn + n^2}{m^2 - mn + n^2} = \frac{m^3 - n^3}{m^3 + n^3} \cdot \frac{m^2 - mn + n^2}{m^2 + mn + n^2}$$

Factor

$$= \frac{(m-n)(m^2 + mn + n^2)}{(m+n)(m^2 - mn + n^2)} \cdot \frac{m^2 - mn + n^2}{m^2 + mn + n^2}$$

Cancel common factors

$$\begin{aligned} &= \frac{(m-n)\cancel{(m^2 + mn + n^2)}}{(m+n)\cancel{(m^2 - mn + n^2)}} \cdot \frac{\cancel{m^2 - mn + n^2}}{\cancel{m^2 + mn + n^2}} \\ &= \frac{m-n}{m+n} \end{aligned}$$

17. The scores of 8 students were 75, 79, 73, 83, 87, 90, 93, 96. What was the average score of the students? (a) (b) (c) (d)

- a. 83.7 c. 88
b. 84.5 d. 90.2

Answer: b. 84.5

$$\begin{aligned}
 \text{Average} &= \frac{\text{sum of scores}}{\text{number of scores}} \\
 &= \frac{75 + 79 + 73 + 83 + 87 + 90 + 93 + 96}{8} \\
 &= \frac{676}{8} = 84.5
 \end{aligned}$$

18. Amadeo can do a job in 4 hours that Gary can do in 3 hours and Rembrant can do in 6 hours. If the three work together, how many hours will they finish the job? (a) (b) (c) (d)

a. $\frac{1}{12}$ hour

c. $1\frac{2}{3}$ hours

b. $1\frac{1}{3}$ hours

d. $1\frac{3}{4}$ hours



Answer: b. $1\frac{1}{3}$ hours

Let x - the time they will be working together

worker	rate of work per hour	number of hours working together	work done
Amadeo	$\frac{1}{4}$	x	$\frac{1}{4}x$
Gary	$\frac{1}{3}$	x	$\frac{1}{3}x$
Rembrant	$\frac{1}{6}$	x	$\frac{1}{6}x$

The sum of the parts of the task completed is equal to 1. Hence,

$$\begin{aligned}\frac{1}{4}x + \frac{1}{3}x + \frac{1}{6}x &= 1 \\ \left(\frac{3}{12} + \frac{4}{12} + \frac{2}{12}\right)x &= 1 \\ \frac{9}{12}x &= 1 \\ x &= \frac{1}{\frac{9}{12}} = 1\left(\frac{12}{9}\right) \\ x &= \frac{4}{3} = 1\frac{1}{3} \text{ hrs}\end{aligned}$$

19. Averaging a speed of 50 km/hr, a train can reach its destination on time. If it goes with an average speed of 40 km/hr, it will be late by 36 minutes. How long is the normal travel time? (a) (b) (c) (d)

- a. $\frac{3}{5}$ hour c. $1\frac{2}{3}$ hours
b. $1\frac{3}{5}$ hours d. $2\frac{2}{5}$ hours

Answer: d. $2\frac{2}{5}$ hours

	Rate	Time	Distance
On time	50	x	$50x$
Late	40	$x + \frac{36}{60}$	$40\left(x + \frac{36}{60}\right)$

Since the train will travel the same distance at any speed,

$$50x = 40\left(x + \frac{36}{60}\right)$$

$$50x = 40\left(x + \frac{3}{5}\right)$$

$$50x = 40x + 24$$

$$50x - 40x = 24$$

$$10x = 24$$

$$x = \frac{24}{10} = \frac{12}{5} = 2\frac{2}{5} \text{ hours}$$



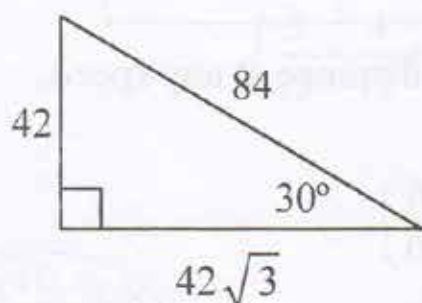
20. What is the area of a 30° - 60° - 90° triangle if its hypotenuse is 84 cm? (a) (b) (c) (d)

a. $882\sqrt{3} \text{ cm}^2$ c. $3528\sqrt{3} \text{ cm}^2$

b. $963\sqrt{3} \text{ cm}^2$ d. $7056\sqrt{3} \text{ cm}^2$

Answer: a. $882\sqrt{3} \text{ cm}^2$

In a 30-60-90 triangle, the length of the side opposite the 30° is half of the hypotenuse while the side opposite the 60° is $\sqrt{3}$ times the shortest leg.



$$\begin{aligned}
 \text{Area of triangle} &= \frac{\text{base} \times \text{height}}{2} \\
 &= \frac{42 \times 42\sqrt{3}}{2} \\
 &= (21)(42\sqrt{3}) \\
 &= 882\sqrt{3} \text{ cm}^2
 \end{aligned}$$

21. A chemist has 30 ml of a 19% alcohol solution. (a) (b) (c) (d)
 How many ml of a 13% alcohol solution does he
 need to make a 16% alcohol solution?

- a. 30 ml c. 48 ml
 b. 35 ml d. 60 ml

Answer: a. 30 ml

	concentration (%)	amount (mL)	amount of alcohol
alcohol solution 1	0.19	30	$(0.19)(30)$
alcohol solution 2	0.13	x	$(0.13)(x)$
alcohol mixture	0.16	$x + 30$	$0.16(x+30)$

sum of alcohol amount of each solution = alcohol amount of mixture

$$(0.19)(30) + (0.13)(x) = 0.16(x+30)$$

Multiply both sides by 100,

$$(19)(30) + (13)(x) = (16)(x + 30)$$

$$570 + 13x = 16x + 480$$

$$16x - 13x = 570 - 480$$

$$3x = 90$$

$$x = 30 \text{ mL}$$

22. Given a right triangle with $\tan \theta = \frac{8}{15}$, what is (a) (b) (c) (d)

$\csc \theta \sec \theta$?

a. $\frac{8}{17}$ b. $\frac{289}{150}$ c. $\frac{120}{289}$ d. $\frac{289}{120}$

Answer: d. $\frac{289}{120}$



Since $\tan \theta = \frac{\text{opposite side of } \theta}{\text{adjacent side of } \theta} = \frac{8}{15}$, then

$$\begin{aligned} \text{hypotenuse} &= \sqrt{8^2 + 15^2} \\ &= \sqrt{289} = 17 \end{aligned}$$

$$\csc \theta = \frac{\text{hypotenuse}}{\text{opposite}} = \frac{17}{8}$$

$$\sec \theta = \frac{\text{hypotenuse}}{\text{adjacent}} = \frac{17}{15}$$

Therefore,

$$\csc \theta \sec \theta = \left(\frac{17}{8} \right) \left(\frac{17}{15} \right) = \frac{289}{120}$$

23. The average age of a husband and wife and their pet dog is 21 years. If the average age of the husband and wife is 26 years, how old is the dog? **a** **b** **c** **d**

a. 11 b. 15 c. 21 d. 26

Answer: a. 11

Let x - the husband's age

y - the wife's age

z - the dog's age

Average age of all three:

$$\frac{x+y+z}{3} = 21$$

$$x+y+z = 3(21)$$

$$x+y+z = 63 \quad \text{Eq (1)}$$

Average of husband and wife:

$$\frac{x+y}{2} = 26$$

$$x+y = 2(26)$$

$$x+y = 52 \quad \text{Eq (2)}$$

Substitute eq (2) into eq (1),

$$x + y + z = 63$$

$$52 + z = 63$$

$$z = 63 - 52$$

$$z = 11$$



24. Marlon mixed coffee A that is worth Php 150 per kilo with coffee B that is worth Php 100 per kilo. How many kilograms of coffee A must be used if he wants to produce a 90-kilogram mixture that is worth Php 115 per kilo? (a) (b) (c) (d)

a. 27 kg b. 35 kg c. 90 kg d. 100 kg

Answer: a. 27

	amount	price/kilogram	cost
Coffee A	x	150	$150x$
Coffee B	$90 - x$	100	$100(90 - x)$
Coffee Mixture	90	115	$90(115)$

sum of the cost of each coffee = cost of coffee mixture

$$150x + 100(90 - x) = 115(90)$$

$$150x + 9000 - 100x = 115(90)$$

$$150x - 100x = 10350 - 9000$$

$$50x = 1350$$

$$x = 27$$

25. The simplest form of $\frac{4x^2 + 20x + 25}{6x^2 + x - 35}$ is _____.

(a) (b) (c) (d)

a. $\frac{x+5}{x-7}$

c. $\frac{x+5}{x+7}$

b. $\frac{2x-5}{3x+7}$

d. $\frac{2x+5}{3x-7}$

Answer: d. $\frac{2x+5}{3x-7}$

Factor the numerator and the denominator then simplify.

$$\begin{aligned}\frac{4x^2 + 20x + 25}{6x^2 + x - 35} &= \frac{(2x+5)(\cancel{2x+5})}{(\cancel{2x+5})(3x-7)} \\ &= \frac{2x+5}{3x-7}\end{aligned}$$

26. What is the value of y in the equation

(a) (b) (c) (d)

$$\frac{5y+3}{4} + \frac{25}{12} = \frac{5+2y}{3} ?$$

a. -3

b. -2

c. 12

d. 25

Answer: b. -2

$$\begin{aligned}\frac{5y+3}{4} + \frac{25}{12} &= \frac{5+2y}{3} \\ (12)\left(\frac{5y+3}{4} + \frac{25}{12}\right) &= \left(\frac{5+2y}{3}\right)(12)\end{aligned}$$

$$(12)\left(\frac{5y+3}{4}\right) + (12)\left(\frac{25}{12}\right) = \left(\frac{5+2y}{3}\right)(12)$$

$$3(5y+3)+25 = 4(5+2y)$$

$$15y+9+25 = 20+8y$$

$$15y-8y = 20-9-25$$

$$7y = -14$$

$$y = -2$$

27. Which radical expression is in simplest form?

(a) (b) (c) (d)

a. $\sqrt[5]{9x^3y^7}$

c. $\sqrt[12]{y^6}$

b. $\sqrt[12]{32x^7y^5}$

d. $\sqrt[8]{1024x^{11}y^6}$

Answer: b. $\sqrt[12]{32x^7y^5}$

Since all exponents of the radicand are less than the index and have no common factor. All the other choices can still be simplified.

a. $\sqrt[5]{9x^3y^7} = y\sqrt[5]{9x^3y^2}$

c. $\sqrt[12]{y^6} = (y^6)^{\frac{1}{12}} = y^{\frac{6}{12}} = y^{\frac{1}{2}} = \sqrt{y}$

d. $\sqrt[8]{1024x^{11}y^6} = 2x\sqrt[8]{4x^3y^6}$



28. The bus fare for the first 4 kilometers of a trip is ☒ a ☐ b ☐ c ☐ d
Php 10 and an additional Php1.50 for every
succeeding kilometer. How much will one pay for
a distance of 19 kilometers?

- a. Php 32.50 c. Php 37.00
b. Php 35.50 d. Php 38.50

Answer: a. Php 32.50

$$\begin{aligned}\text{Fare} &= 10 + 1.50(19 - 4) \\ &= 10 + 1.50(15) \\ &= 10 + 22.50 \\ &= 32.50\end{aligned}$$

29. If the probability that an event will occur is $\frac{2}{5}$, ☒ a ☐ b ☐ c ☐ d
what is the probability that it will **not** occur?

- a. $\frac{3}{5}$ b. $\frac{6}{25}$ c. $\frac{4}{5}$ d. 1

Answer: a. $\frac{3}{5}$

$$P(A') = 1 - P(A) = 1 - \frac{2}{5} = \frac{3}{5}$$

30. Find the probability of drawing 4 Queens and a King from a standard deck of cards. (a) (b) (c) **(d)**

a. $\frac{{}^{52}C_4 \cdot {}^{52}C_1}{{}^{52}C_5}$

c. $\frac{{}^{52}C_5}{{}^{52}C_4 \cdot {}^{48}C_1}$

b. $\frac{1}{{}^{52}C_5}$

d. $\frac{4}{{}^{52}C_5}$

Answer: d. $\frac{4}{{}^{52}C_5}$

Let A be the event of drawing 4 Queens
B be the event of drawing a King

$$\begin{aligned} P(A \text{ and } B) &= \frac{n(A) \cdot n(B)}{n(S)} \\ &= \frac{{}^4C_4 \cdot {}^4C_1}{{}^{52}C_5} = \frac{1 \cdot 4}{{}^{52}C_5} = \frac{4}{{}^{52}C_5} \end{aligned}$$

31. Find the 7th term of an arithmetic progression if the 10th term is 32, and the 15th term is 47. **(a)** (b) (c) (d)

- a. 23 b. 25 c. 27 d. 29

Answer: a. 23

For arithmetic progression, the n th term is

$$a_n = a_1 + (n-1)d$$



Form the equations for the 10th and 15th term.

$$32 = a_1 + (10-1)d$$

$$32 = a_1 + 9d \quad (1)$$

$$47 = a_1 + (15-1)d$$

$$47 = a_1 + 14d \quad (2)$$

Solve for the unknowns using elimination method.

$$\begin{array}{rcl} 32 = a_1 + 9d & \rightarrow & 32 = a_1 + 9d \\ -(47) = -(a_1 + 14d) & \rightarrow & \underline{-47 = -a_1 - 14d} \\ & & -15 = -5d \\ & & 3 = d \end{array}$$

Substitute d to equation (1).

$$32 = a_1 + 9(3)$$

$$a_1 = 32 - 27$$

$$a_1 = 5$$

Solve for the 7th term.

$$a_n = a_1 + (n-1)d$$

$$a_7 = 5 + (7-1)(3)$$

$$= 5 + 18$$

$$a_7 = 23$$

32. Preparing for a marathon run, Guye slowly trains by following a daily jogging program. During the first day, he jogs around for 20 minutes then adds another three minutes for each succeeding day. How many days will it be before he is up to jogging more than 110 minutes per day? (a) (b) (c) (d)

a. 31 b. 32 c. 33 d. 34

Answer: b. 32

Since he is supposed to be jogging by more than 110 minutes,

$$a_n > 110 \quad \text{or} \quad a_1 + (n-1)d > 110$$

Isolate n to get the number of days.

$$n > \frac{110 - a_1}{d} + 1$$

$$n > \frac{110 - 20}{3} + 1$$

$$n > \frac{90}{3} + 1$$

$$n > 30 + 1$$

$$n > 31$$



33. The ages of Allen and Jasper are in the ratio 3 : 2 respectively. After 8 years, the ratio of their ages will be 4 : 3. What is the age of Jasper now? (a) (b) (c) (d)

a. 16 b. 19 c. 21 d. 24

Answer: a. 16

Let $3x$ - age of Allen

$2x$ - age of Jasper

After 8 years,

$$\frac{3x+8}{2x+8} = \frac{4}{3}$$

$$3(3x+8) = 4(2x+8)$$

$$9x+24 = 8x+32$$

$$9x-8x = 32-24$$

$$x = 8$$

Therefore, the age of Jasper is $2x = 2(8) = 16$.

34. What are the possible values of x in the equation

$$x^2 - 4x = 45?$$

(a) (b) (c) (d)

a. $\{4, 45\}$

c. $\{-9, 5\}$

b. $\{3, 15\}$

d. $\{9, -5\}$

Answer: d. $\{9, -5\}$

$$x^2 - 4x = 45$$

$$x^2 - 4x - 45 = 0$$

$$(x-9)(x+5) = 0$$

$$x-9 = 0$$

$$x+5 = 0$$

$$x = 9$$

$$x = -5$$

35. The distance between the points $(-9, 4)$ and $(7, -2)$ is _____ units. (a) (b) (c) (d)

a. 17

c. $2\sqrt{77}$

b. $2\sqrt{73}$

d. 22

Answer: b. $2\sqrt{73}$

$$(x_1, y_1) = (-9, 4) \text{ and } (x_2, y_2) = (7, -2)$$

Using the distance formula,

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

$$d = \sqrt{(7 - (-9))^2 + (-2 - 4)^2}$$

$$= \sqrt{(16)^2 + (-6)^2}$$

$$= \sqrt{256 + 36}$$

$$= \sqrt{292}$$

$$= 2\sqrt{73}$$

36. Mr. Velasco bought a shirt with a 14% discount. (a) (b) (c) (d)
If he only paid Php 537.50, what was the original price of the shirt?

a. Php 500

c. Php 625

b. Php 575

d. Php 750



Answer: c. Php 625

rate of discount = 14%

discounted price = Php 537.50

rate of discounted price = $100\% - 14\% = 86\%$

$$\begin{aligned}\text{Original Price} &= \frac{\text{Discounted Price}}{\text{Rate of Discounted Price}} \\ &= \frac{537.50}{0.86} \\ &= \text{Php } 625\end{aligned}$$

37. If the numerator of a fraction is increased by 250% (a) (b) (c) (d)

and the denominator is decreased by 7, the

resultant fraction is $\frac{7}{9}$. What is the original fraction

if the denominator is 625% of the numerator?

a. $\frac{1}{10}$ b. $\frac{4}{25}$ c. $\frac{4}{9}$ d. $\frac{7}{9}$

Answer: b. $\frac{4}{25}$

Let x - the numerator

Let x - the numerator

$$6\frac{1}{4}x = \frac{25}{4}x \text{ - the denominator}$$

$$\frac{x + \frac{5}{2}x}{\frac{25}{4}x - 7} = \frac{7}{9}$$

$$\frac{\frac{7}{2}x}{\frac{25}{4}x - 7} = \frac{7}{9}$$

$$\left(\frac{7}{2}x\right)(9) = 7\left(\frac{25}{4}x - 7\right)$$

$$\frac{63}{2}x = \frac{175}{4}x - 49$$

$$49 = \frac{175}{4}x - \frac{63}{2}x$$

$$49 = \frac{49}{4}x$$

$$x = 4$$

$$\frac{25}{4}x = \frac{25}{4}(4) = 25$$

Thus, the original fraction is $\frac{4}{25}$.



38. A conference hall can accommodate about 975 persons. About 72% of the available seminar tickets were sold. How many tickets are left unsold for the seminar? (a) (b) (c) (d)

a. 273 c. 702
b. 573 d. 975

Answer: a. 273

$$\begin{aligned}\text{Sold tickets} &= 72\% \text{ of } 975 \\ &= 0.72(975) \\ &= 702\end{aligned}$$

$$\begin{aligned}\text{Unsold tickets} &= 975 - 702 \\ &= 273\end{aligned}$$

39. In a race, the first runner up receives $\frac{3}{4}$ of the champion's prize money while the second receives $\frac{2}{5}$ of what the champion received. What is the difference between the prize of the first runner-up and the second runner-up given that the champion's prize money is P20 000? (a) (b) (c) (d)

a. Php 4 000 c. Php 6 000
b. Php 5 000 d. Php 7 000

Answer: d. Php 7 000

Champion's prize money = Php 20 000

$$\begin{aligned}\text{1st runner up's prize money} &= \frac{3}{4}(20\,000) \\ &= \text{Php } 15\,000\end{aligned}$$

$$\begin{aligned}\text{2nd runner up's prize money} &= \frac{2}{5}(20\,000) \\ &= \text{Php } 8\,000\end{aligned}$$

Hence,

$$\begin{aligned}\text{Difference} &= 15\,000 - 8\,000 \\ &= \text{Php } 7\,000\end{aligned}$$



40. A wheel makes 1 000 revolutions in covering a distance of 88 km. The diameter of the wheel is

(a) (b) (c) (d)

a. $\frac{11}{125}$ km

c. $\frac{11}{125\pi}$ km

b. $\frac{11\pi}{125}$ km

d. $\frac{11}{250\pi}$ km

Answer: c. $\frac{11}{125\pi}$ km

Distance = circumference \times number of revolutions

$$88 = \pi d \times 1\,000$$

$$\frac{88}{1000\pi} = d$$

$$d = \frac{11}{125\pi} \text{ km}$$