21. The graph below shows the hair colors of all the students in a class.

Class Hair Color

What is the probability that a student chosen at random from this class has black hair? [2]

RUBRIC

2 Points

Answer of 6/20

1 Point

Writing a fraction with the correct numerator of 6 but an incorrect denominator

OR

Writing a fraction with a correct denominator of 20 but an incorrect numerator

OR

Showing a fraction based on an error in reading the graph (of no more than 1 in numerator or the denominator) such as 5/21 or 7/19

Answer:

6/20

STUDENT A: Score 2

2 Red, 3 Blonde, 6 Black, 9 Brown   6/20 or 3/10

My reason for concluding to 6/20 is because, the number of students tallyed-up is 20 and there are 6 children with black hair. That makes 6 out of 20 students with black hair, but if you reduce the answer you will get 3 our of 10 students w/ Black hair
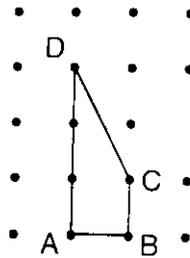
---

22. In the figure shown below, each dot is one unit from an adjacent horizontal or vertical dot.

Find the number of square units in the area of quadrilateral *ABCD*. Show how you arrived at your answer.

RUBRIC

2 Points

Appropriate method such as using the trapezoid formula and substituting in the correct values of h=1 b=3 b=1 arriving at answer of 2

   OR

Breaking the figure into two figures such as a square with an area of 1, a triangle with an area of 1 and showing the sum of 2 as the answer

   OR

Showing the top triangular piece folded over to form a 2 X 1 rectangle

1 Point

Giving correct answer of 2 with no explanation

   OR

Showing the trapezoid formula but substituting or calculating incorrectly or using an incorrect trapezoid formula and substituting correctly

   OR

Breaking the figure into the two parts but calculating the area incorrectly such as arriving at an answer of 3 because of calculating the triangular area s 2 not 1
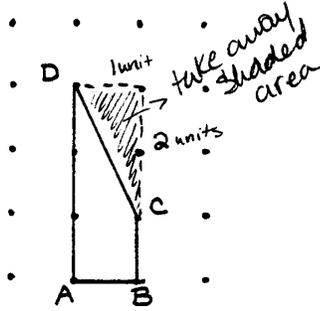
Answer:

2

A of ∆ I = b·h/2
    "   = 1·2/2
    "   = 2/2
A of ∆I = 1

A of ☐ II = b·h
    "   = 1·1
A of ☐ II = 1

Area of Quadrilateral ABCD = A of ∆I + A of ☐II
                          "   =
                                              1 + 1

Area of Quadrilateral ABCD = 2

STUDENT C: Score 1

$A = L \times W.$

$A = $ of $ABCD$

$A = 1 \times 3$

$A = 3$

$A/7$

$2 \times 1 = 2$

$A = 3 - 2$

$\boxed{A = 1}$

STUDENT D: Score 0

$a \rightarrow b = 1$ unit

$b \rightarrow c = 1$ unit

$c \rightarrow d = 2$ units

$d \rightarrow a = 3$ units

7 square units

23. A design was constructed by using two rectangles *ABDC* and *A'B'D'C'*. Rectangle *A'B'D'C'* is the result of a translation of rectangle *ABDC*. The table of translations is shown below. Find the coordinates of points *B* and *D'*.

Rectangle *ABDC*	Rectangle *A'B'D'C'*
A (2,4)	A' (3,1)
B	B' (-5,1)
C (2,-1)	C' (3,-4)
D (-6,-1)	D'

RUBRIC

2 Points

Answers of B (-6,4) and D' (-5,-4)

1 Point

One of the correct answers listed above

Answer:

B (-6,4)
D' (-5,-4)

Rectangle ABCD	Rectangle A'B'C'D'
A (2,4)	A´ (3,1)
B (−6,4)	B´ (−5,1)
C (2,−1)	C´ (3,−4)
D (−6,−1)	D´ (−5,−4)

$A (2,4) \rightarrow A'(3,1) \quad T = (1,-3)$

$C (2,-1) \rightarrow C'(3,-4) \quad T = (1,-3)$

$B \quad ? \quad \rightarrow \quad B' -5, 1$

$\qquad \qquad \qquad \dfrac{-1 \quad +3}{}$

$\boxed{B = (-6, 4)}$

$D (-6,-1) \rightarrow D' \; ?$

$\qquad \dfrac{1 \quad -3}{-5, -4}$

$\boxed{D' = (-5, -4)}$

24. Mr. Cash bought *d* dollars worth of stock. During the first year, the value of the stock tripled. The next year, the value of the stock decreased by $1200.

    (a) Write an expression in terms of *d* to represent the value of the stock after two years.

    (b) If an initial investment is $1,000, determine its value at the end of 2 years.

RUBRIC

2 Points

a) 3d - 1200 or an equivalent expression

    AND

b) $1800

1 Point

One of the correct answers listed above

    OR

Calculating an answer for part (b) which is correct for an incorrect expression shown in part (a)

STUDENT A: Score 2
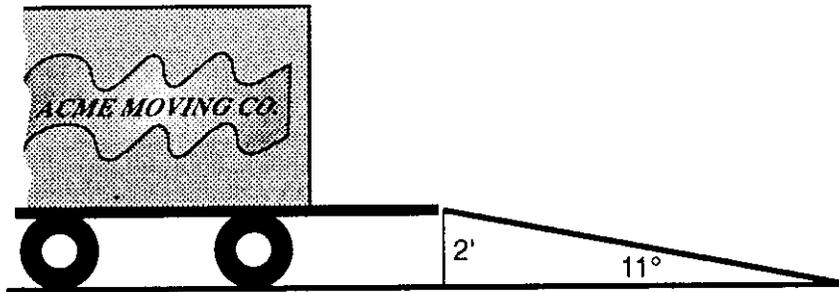
 (a) Write an expression in terms of *d* to represent the value of the stock after two years.

$$3d - \$1200 = value$$

(b) If an initial investment is $1,000, determine its value at the end of 2 years.

$$3(\$1000) - \$1200 = value$$
$$\$3000.00 - \$1200.00 = \$1800.00 \ ans.$$

---

25. The tailgate of a truck is 2 feet above the ground. The incline of a ramp used for loading the truck is 11°, as shown below.

Find, to the *nearest tenth of a foot*, the length of the ramp.

RUBRIC

2 Points

Correct answer of 10.5

1 Point

| Appropriate equation sin 11 = 2/x or cos 79 = 2/x but answered not rounded correctly

   OR

Incorrect trigonometric function set equal to x/2 or 2/x and answer carried out to correct nearest tenth for values used |
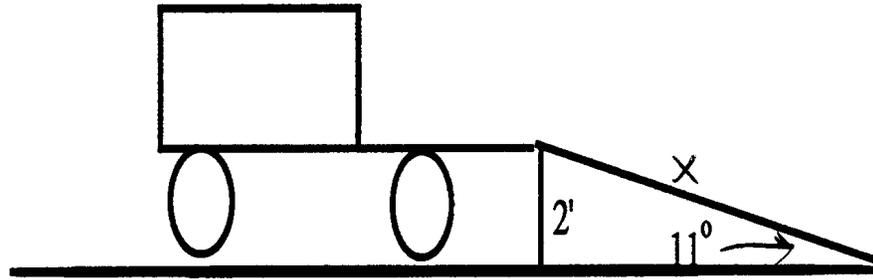| --- |

0 Points

Use of the Pythagorean Theorem

| **Answer:**

10.5 |
| --- |

STUDENT B: Score 2

$\sin 11 = \frac{2}{x}$

$.1908 = \frac{2}{x}$

$.1908x = 2$

$\qquad x = 10.4822$

$\qquad x \approx 10.5'$ (ANS)

26. On his first 5 biology tests, Bob received the following scores: 72, 86, 92, 63, and 77. What test score must Bob earn on his sixth test so that his average (mean score) for all six tests will be 80? Show how you arrived at your answer.

RUBRIC

3 Points

Clearly identified answer of 90 arrived at by showing 480 points needed (6 x 80) minus 390 points already received using equations, table, or trial and error

    OR

Shows a score of 87 - 92 will result in an average which rounds to 80 such as 390 + 87 = 477 and 477/6 =79.5 which rounds to 80

2 Points

Has all correct work shown but does not identify answer or has an incorrect statement

    OR

Shows appropriate method but calculates average incorrectly

1 Point

Gives an answer of any number 87-92 with no explanation

    OR

Begins a proper method using 390 points already received but does not arrive at a proper score

Answer:

90

STUDENT B: Score 3

$80 \cdot 6 = 480$

Bob must ~~rearn~~ earn a 90 on his next ~~test~~ test to get a 80 average.
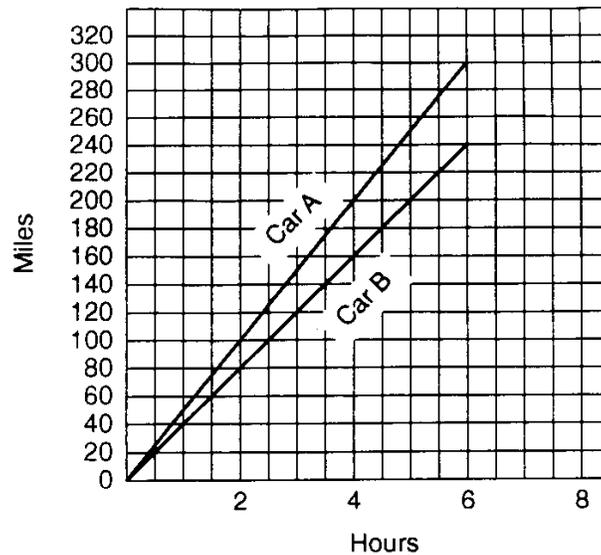
ans. ↗

$$\begin{array}{r} 72 \\ 86 \\ 92 \\ 63 \\ +\,77 \\ \hline 390 \end{array}$$

$$\begin{array}{r} {}_{3}480 \\ -390 \\ \hline 90 \end{array}\ \text{ans.)}$$ ←

$$\begin{array}{r} 72 \\ 86 \\ 92 \\ 63 \\ 77 \\ +\,90 \\ \hline 480 \end{array}$$

$\dfrac{480}{6} = 80$

27. The figure below represents the distances traveled by car *A* and car *B* in 6 hours.

Which car is going faster and by how much? Explain how you arrived at your answer.

RUBRIC

3 Points

Answer of car A, by 10 mph, and an explanation such as showing A at 50 mph and B at 40 mph or that the difference at the one hour mark on the graph is 10 miles or saying that the car A graph has a steeper slope

2 Points

Answer as above without the unit of mph

OR

Answer of 10 mph by showing 50 - 40 but without identifying car A as the faster one

OR

Answers of car A and 10 mph without an appropriate explanation

OR

Answer of car A because its graph as a steeper slope

OR

Car A is faster because it travels further than car B in the same amount of time

1 Point

Answer of A with no or incorrect difference in speed (i.e., 60 miles) and no appropriate explanation

OR

Answer of 10 with no appropriate explanation or car identified

Answer:

Car A by 10 mph

STUDENT A: Score 3

A) $\dfrac{100 \text{ miles}}{2}$ per $\dfrac{2\text{ hrs.}}{2}$ B) $\dfrac{80 \text{ miles}}{2}$ per $\dfrac{2\text{ hrs}}{2}$

50 miles per hr.   40 miles per hr.

Car A is going 10 miles/hr. faster than car B.

I looked at the amount of miles at 2 hrs. and divided it by 2 to get the amount at 1 hr. Then I subtracted the 2 values (A-B) to find the difference.

STUDENT C: Score 2

A is faster   in 2 hours ~~the~~ car A
traveled 100 miles and
In 2 hours car B only travld
80 miles.

STUDENT D: Score 1

Car A is going faster by 60 miles.

According to the graph, Car A traveled

300 miles in 6 hours and Car B

traveled 240 miles in 6 hours, so

Car A is going faster than Car B by

300 − 240 = 60 miles.

STUDENT E: Score 0

distance = rate × time

Car A

D = 30· ~~4 hours 15 min~~   D = 30·6

~~(scribbled out)~~

D = ~~880~~

D = 300·6
= 1800.

Car B

D = 240·6
D = 1440

Car B is faster because
it too less ~~time~~
_ miles at the same
time as car A.

28. A total of 800 votes were cast in an election. The table below represents the votes that were received by the candidates. Candidate *D* got at least 30 votes more than Candidate *E*. What is the *least* number of votes that Candidate *D* could have received? Show how you arrived at your answer.

Candidate	Number of Votes
A	213
B	328
C	39
D	*x*
E	*y*

RUBRIC

3 Points

Correct answer of 125 with appropriate equations or method showing that 220 votes were split between D and E so that D had a least 30 votes more than E

2 Points

An appropriate method to arrive at 220 votes for D and E and shows a difference of 30 votes but then answer is incorrect such as 140.

1 Point

Answer 125 with no appropriate method shown

   OR

Computes the 220 votes for D and E and merely divides them by 2 to arrive at 110

   OR

Subtracts 30 from 220 to arrive at answer of 190

Answer:

125

STUDENT A: Score 3

$$213$$
$$+ 328$$
$$39$$
$$580$$

$$800$$
$$- 580$$
$$220$$

Let x = candidate E
Let $x + 30$ = candidate D

$$x + x + 30 = 220$$
$$2x + 30 = 220$$
$$ - 30 \quad -30$$
$$2x = 190$$
$$x = 95$$

$$x + 30 = \text{candidate D}$$
$$95 + 30$$
$$\boxed{125}$$

29. In a school of 320 students, 85 students are in the band, 200 students are on sports teams, and 60 students participate in both activities. How many students are *not* involved in either band or sports? Show how you arrived at your answer.

RUBRIC

3 Points

Correct answer of 95 arrived at by the use of an appropriate method such as a Venn diagram, table, or trial and error showing 25 only in band, 140 only in sports, and 60 in both for a total of 225 of the 320 students, leaving 95 not involved.

2 Points

Shows an appropriate method to arrive at the 225 but does not subtract from 320

   OR

Uses an appropriate method to arrive at the 25 and 140 noted above but does not include the students in both giving answer of 320-165 = 155

1 Point

Answer of 95 with no appropriate method shown

   OR

Gives an answer of 35 by subtracting 285 from 320

   OR

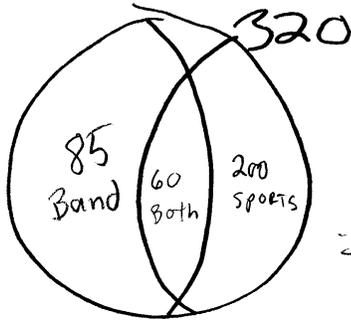Shows both 25 and 140 but does not subtract from 320

0 Points

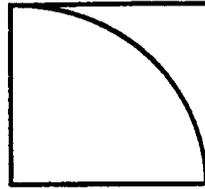Gives an answer of 25 or -25 by subtracting 345 from 320 or vice versa

Answer:

95

320

85
Band

60
Both

200
SPORTS

200

85 (w/ 60 already on Sport)
- 60
25 only in band

200 = only sports and some in band
+ 25 only in band
225 involved in either
band or SPORTS.

320
- 225
95 STUDENTS
NOT involved
in Band or
Sports.

30. Ms. Brown plans to carpet part of her living room floor. The living room floor is a square 20 feet by 20 feet. She wants to carpet a quarter-circle as shown below.

20'

Find, to the nearest square foot, what part of the floor will remain uncarpeted. Show how you arrived at your answer.

RUBRIC

3 Points

Correct answer of 86 by showing the area of the quarter-circle 100 π or 314 subtracted from the area of the square (400) and rounding off result.

2 Points

Appropriate as above without rounded answer

   OR

Appropriate method with calculation error for one of the areas and answered rounded as required

1 Point

Answer of 86 with inappropriate or no method shown

   OR

Properly calculates quarter-circle area and leaves answer as 100 π or 314

   OR

Uses wrong formula for the area of the circle but takes 1/4 of it

0 Points

Shows only the area of the square 400 sq. ft.

Answer:

86

STUDENT B: Score 3

$$A \text{ of } \blacksquare = A \text{ of } \square - \tfrac{1}{4} A \text{ of } O$$

$$A \text{ of } O = \tfrac{1}{4} \pi r^2$$
$$A = \tfrac{1}{4} \pi 20^2$$
$$A = \tfrac{1}{4} 400 \pi$$
$$A = \tfrac{1}{4} 1256$$
$$A = 314$$

$$A \text{ of } \square = lw$$
$$A = 20 \cdot 20$$
$$A = 400$$

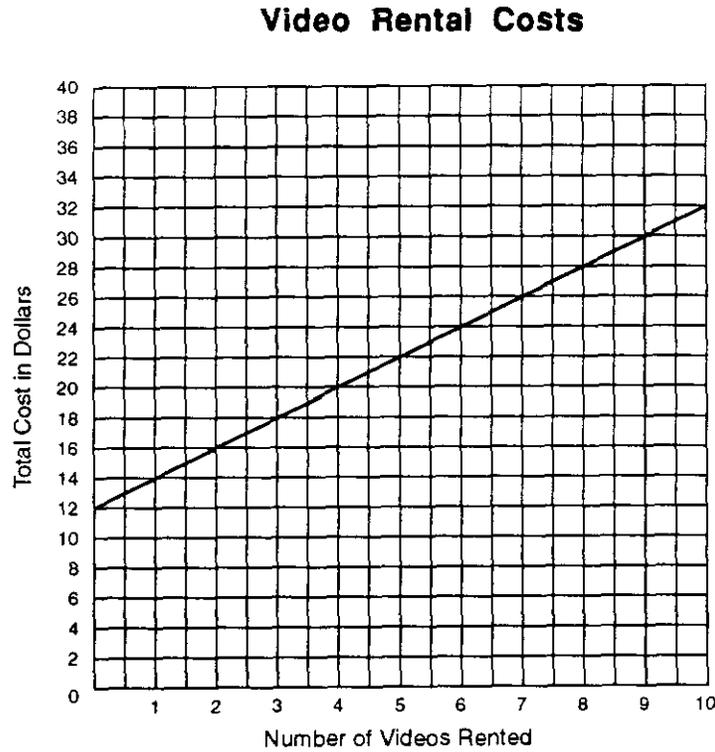$$A \text{ of } \blacksquare = \begin{array}{r} 400 \\ -314 \\ \hline 86 \end{array}$$

$$A \text{ of } \blacksquare = 86 \text{ sq. ft.}$$

31. Two video rental clubs offer two different rental fee plans:

Club *A* charges $12 for membership and $2 for each rented video.
Club *B* has a $4 membership fee and charges $4 for each rented video.

The graph below represents the total cost of renting videos from Club *A*.

Video Rental Costs

(a) On the same set of *xy*-axes, draw a line to represent the total cost of renting videos from Club *B*.

(b) For what number of video rentals is it less expensive to belong to Club *A*? Explain how you arrived at your answer.

RUBRIC

2 Points—13 (a)

Properly graphs Club B with the correct slope of 4 and y-intercept of 4

1 Point—13 (a)

Graph has only a correct slope or only a correct intercept

2 Points—13 (b)

Gives a number of videos which are correct for their graph or
calculation (such as any number greater than 4 for a correct
solution) and gives an appropriate explanation either using the
graph (i.e., lower line) or using a specific example (i.e., for 5 videos
Club A costs $22 and Club B $24)

1 Point—13 (b)

Gives an appropriate number of videos but does not give proper
explanation

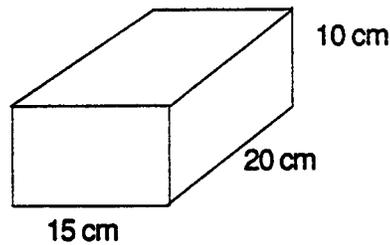*** NOTE**: Student drew correct graph for Part A, which is not shown here.

STUDENT A: Score 4

(a) On the same set of *xy*-axes, draw a line to represent the total cost of renting videos from Club B.

(b) For what number of video rentals is it less expensive to belong to Club A? Explain how you arrived at your answer.

If you rent 5 videos or more it is less expensive to belong to club A

I arrived at the answer by looking at the graph I found where line Club A is under the line for Club B. Then, I looked to where the roles switched. From that point on was the answer.

32. Jed bought a generator that will run for 2 hours on a liter of gas. The gas tank on the generator is a rectangular prism with dimensions 20 cm by 15 cm by 10 cm as shown below.

If Jed fills the tank with gas, how long will the generator run? Show how you arrived at your answer.

RUBRIC

4 Points

Correct answer of 6 hours with work shown which might include correct volume of 3000 cm^3 and converting to 3 liters

3 Points

Correct answer with no work shown

   OR

Correct work shown but hours not indicated

   OR

Correct method used but one mistake in calculations or conversions

2 Points

Finding the tank's capacity of 3 liters

1 Point

Finds only the volume of the tank

Answer:

6 hours

STUDENT B: Score 4

Volume of tank = lwh

$$= 15 \cdot 20 \cdot 10 = 3000 \text{ cm}^3$$

$3000^3 \text{ cm} = x \text{ liters}$

$3000^3 \text{ cm} = 3000 \text{ mL} = 3 \text{ L}$

$1 \text{ cm}^3 = 1 \text{ mL}$

$1 \text{ L} = 1000 \text{ mL}$

ans. $3 \text{ L} \times 2 \text{ hrs} = 6$ hours the generator will run

33. A clothing store offers a 50% discount at the end of each week that an item remains unsold. Patrick wants to buy a shirt at the store and he says, "I've got a great idea! I'll wait two weeks, have 100% off, and get it for free!" Explain to your friend Patrick why he is incorrect and find the correct percent of discount on the original price of a shirt.

RUBRIC

4 Points

Gives an appropriate explanation to show Patrick he is wrong such as showing that for a particular item costing say $10, the first 50% discount would result in a $5 price and the second 50% discount would result in a $2.50 price, not $0. The student then finds the correct 75% discount. (The student need not show a specific example if they show the 75% discount as their explanation.)

3 Points

Gives an appropriate explanation to Patrick but only computes that the cost is 25% of the original cost or leaves the discount as a fraction (3/4) not as a percent.

2 Points

Gives a specific correct example to show Patrick incorrect but does not correctly show the percent discount.

1 Point

Explanation to Patrick is partially correct or just says 25%

If you wait a week the price of the shirt will be 50% off —

if you wait another week the price of the shirt will be 50% off of the 50% taken — so at 2 weeks you will be saving 75% of the original cost —

If you take $\frac{1}{2}$ of a $\frac{1}{2}$

$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ it is $\frac{1}{4}$

of the original cost adding to the $\frac{1}{2}$ off $\frac{2}{4} + \frac{1}{4} = \frac{3}{4} = 75\%$

34. A 10-foot ladder is placed against the side of a building as shown in figure 1 below. The bottom of the ladder is 8 feet from the base of the building. In order to increase the reach of the ladder against the building, it is moved 4 feet closer to the base of the building as shown in figure 2.
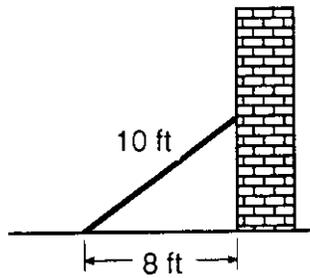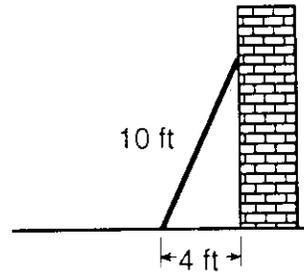

Figure 1   Figure 2

To the *nearest foot*, how much further up the building does the ladder now reach? Show how you arrived at your answer.

RUBRIC

4 Points

Finds the height of 6 feet in figure 1, the height of 9.16 or 9 feet in figure 2 and subtracts to arrive at a correct answer of 3 feet

3 Points

Calculates correctly but does not round to nearest foot

   OR

Makes one mistake in calculating heights and does calculate a difference

2 Points

Finds the 6 foot height and attempts to use the Pythagorean Theorem to find the height of figure 2 but either calculates wrong or substitutes incorrectly

1 Point

Finds only the 6 foot height of figure 1

OR

Attempts to use the Pythagorean Theorem but substitutes incorrectly
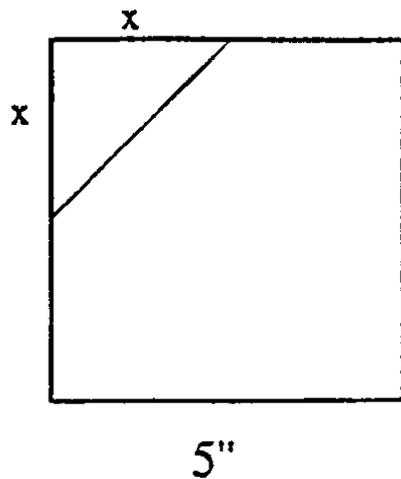
Answer:

3 Feet

STUDENT B: Score 4

Figure I

$a^2 + b^2 = c^2$
$a^2 + 8^2 = 10^2$
$a^2 + 64 = 100$
$ -64 \quad -64$
$a^2 = 36$
$\sqrt{a^2} = \sqrt{36}$
$a = 6$

Figure 2

$a^2 + b^2 = c^2$
$a^2 + 4^2 = 10^2$
$a^2 + 16 = 100$
$ -16 \quad -16$
$a^2 = 84$
$\sqrt{a^2} = \sqrt{84}$
$a = 9.1651539$

9.1651539
-6
$\overline{3.1651539}$

$\boxed{\approx 3 \text{ feet}}$

---

35. A corner is cut off a 5" by 5" square piece of paper. The cut is x inches from a corner as shown below.

(a) Write an equation, in terms of x, that represents the area, A, of the paper after the corner is removed.

(b) What value of x will result in an area that is $\frac{7}{8}$ of the area of the original square piece of paper? Show how you arrived at your answer.

1 Points—13 (a)

Showing $25 - x^2 / 2$ or $1/2(5 + (5-x))5$ or an equivalent expression or as an equation A=

3 Points—13 (b)

Uses an appropriate equation, such as $175 = 200 - 4 x^2$ and arrives at an answer of 2.5

   OR

Uses an appropriate method such as dividing the square into 8 equal triangles to arrive at a correct answer of 2.5

   OR

Uses an incorrect equation from part (a) and follows it through to an answer. (Equation must be of equal difficulty, i.e., not linear.)

2 Points—13 (b)

Uses a correct method or equation and makes one mistake in the solution

1 Point—13 (b)

Uses correct or equally difficult incorrect equation and makes several mistakes.

Answer:

2.5

STUDENT A: Score 4

(a) Write an equation, in terms of x, that represents the area, A, of the paper after the corner is removed.

Area of paper after corner is removed = Area of the square − Area of the triangle

$A = s^2$

$A = s^2$
$A = 25$

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

$A = \frac{1}{2}(x)(x)$
$A = \frac{x^2}{2}$

$A = 25 - \frac{x^2}{2}$

(b) What value of x will result in an area that is $\frac{7}{8}$ of the area of the original square piece of paper? Show how you arrived at your answer.

Area of paper after corner is removed = $\frac{7}{8}$ of the Area of the square

$25 - \frac{x^2}{2} = \frac{7}{8}(25)$

$8(25 - \frac{x^2}{2}) = (\frac{175}{8})8$

$2\frac{4}{}(200) - \frac{4}{}(\frac{8x^2}{x}) = (175)2$

$400 - 8x^2 = 350$

$400 = 8x^2 + 350$

$\div 2 \quad 0 = 8x^2 - 50$

$0 = 4x^2 - 25$

$0 = (2x-5)(2x+5)$

$2x - 5 = 0 \quad \text{or} \quad 2x + 5 = 0$

$2x = 5 \quad \text{or} \quad 2x = -5$

$\boxed{x = 2.5} \quad \text{or} \quad x = -2.5$

STUDENT C: Score 3

(a) Write an equation, in terms of x, that represents the area, A, of the paper after the corner is removed.

$$A = (5 \cdot 5) - (x \cdot x)$$
$$A = 25 - x^2$$

(b) What value of x will result in an area that is $\underline{7}$ of the area of the original square
                                                                                              8
piece of paper? Show how you arrived at your answer.

$\dfrac{7}{8} \cdot \dfrac{25}{1} = \dfrac{175}{8}$

$$\frac{7}{8}(25) = 25 - x^2$$
$$21.875 = 25 - x^2$$
$$\underline{-21.875 \quad \cdot 21.875}$$
$$0 = 3.125 - x^2$$
$$\underline{+x^2 \qquad\qquad +x^2}$$
$$x^2 = 3.125$$
$$x = \sqrt{3.125}$$

STUDENT D: Score 2

(a) Write an equation, in terms of x, that represents the area, A, of the paper after the corner is removed.

$$A = \frac{1}{2}(5 + 5 - x)h$$

(b) What value of x will result in an area that is $\frac{7}{8}$ of the area of the original square piece of paper? Show how you arrived at your answer.

$A = bl$

$A = (5)(5)$

$\boxed{A = 25}$

$25 \cdot \frac{7}{8} = \frac{1}{2}(b_1 + b_2)h$

$21\frac{7}{8} = \frac{1}{2}(5 + 5 - x)5$

$21\frac{7}{8} = \frac{4}{8}(5 + 5 - x)5$

$21\frac{7}{8} = 2\frac{4}{8}(5 + 5 - x)$

$\div 2\frac{4}{8} \quad \div 2\frac{4}{8}$

$19\frac{3}{8} = (5 + 5 - x)$

$19\frac{3}{8} = 25 - 5x$

$-15 \quad -15$

$\dfrac{-5\frac{5}{8}}{-5} = \dfrac{-5x}{-5}$

$\boxed{1\frac{1}{4} = x}$

STUDENT E: Score 1

(a) Write an equation, in terms of x, that represents the area, A, of the paper after the corner is removed.

$$A = 25 - \frac{1}{2}x^2$$

(b) What value of x will result in an area that is $\frac{7}{8}$ of the area of the original square piece of paper? Show how you arrived at your answer.

STUDENT F: Score 0

(a) Write an equation, in terms of x, that represents the area, A, of the paper after the corner is removed.

$$x + x = 5$$
$$\frac{2x}{2} = \frac{5}{2}$$
$$x = 2.5"$$

(b) What value of x will result in an area that is $\frac{7}{8}$ of the area of the original square piece of paper? Show how you arrived at your answer.

$$(\tfrac{7}{8})\ 2.5 \times \tfrac{7}{8}\ (3)$$

$$\frac{2.5}{8} \times \frac{7}{8} = \frac{17.5}{8}$$