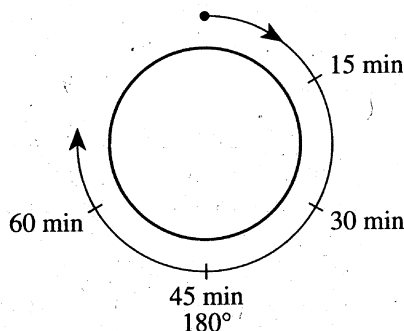


## MATHEMATICS PRACTICE TEST 2 EXPLANATORY ANSWERS

**Question 1.** The correct answer is C. The restaurant is rotating  $180^\circ$  in 45 minutes. That is  $60^\circ$  each 15 minutes. That is  $240^\circ$  every 60 minutes. You might want to sketch something like the drawing below.



If you like an algebraic solution, you can set up a proportion  $\frac{180^\circ}{45 \text{ min}} = \frac{x^\circ}{60 \text{ min}}$  and solve it:  $x = \left(\frac{180}{45}\right) = 4 \cdot 60 = 240$ .

Most people who do not get this question right choose D, which gives the number of degrees the restaurant would rotate in 45 minutes if it made 1 complete rotation each hour.

**Question 2.** The correct answer is J. The 12 vases cost \$18, so each vase costs  $\frac{\$18}{12} = \$1.50$ .

If you chose F, you probably divided 12 by 18 rather than 18 by 12. If vases cost \$0.67 each, then 12 vases would cost less than \$12.

**Question 3.** The correct answer is B. The longer side of the apartment is 30 feet long, and it is 6 inches long on the scale drawing. So, the length of the room, in feet, is 5 times the length on the drawing, in inches. Using this relationship, the length of the shorter side of the apartment is 5 times the 4 inches from the scale drawing. This is 20 feet.

Alternately, you could notice that the length of the shorter side is  $\frac{2}{3}$  the length of the longer side on the drawing, and so the length of the shorter side of the room is  $\frac{2}{3}$  of 30 feet, which is 20 feet.

These solutions are equivalent to using a proportion such as  $\frac{6 \text{ in}}{30 \text{ ft}} = \frac{4 \text{ in}}{x \text{ ft}}$  and solving:  $x = \frac{4 \cdot 30}{6} = 4 \cdot 5 = 20$  feet.

**Question 4.** The correct answer is H. The total profit for the 5 years was, in millions,  $\$8 + \$8 + \$8 + \$9 + \$9 = \$42$ . Then the average profit, in millions, was  $\frac{\$42}{5} = \$8.4$ .

The most common wrong answer was J, which is the average of 8 and 9. Because there were more years with a profit of \$8 million than with \$9 million, the average for the 5 years must be closer to \$8 million than to \$9 million.



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**Question 5.** The correct answer is A. If the van were driven for 20 miles, the cost for those miles would be  $\$0.30 \cdot 20 = \$6$ . Then the daily charge of \$25 would have to be added in, for a total of \$31. Similarly, if the van were driven for  $m$  miles, the cost for those miles would be  $0.30m$  dollars, and the daily charge would make the total  $0.30m + 25$  dollars.

C comes from treating the 30 cents like it was 30 dollars.

**Question 6.** The correct answer is F. The sum of the measures of all four interior angles in any quadrilateral is always  $360^\circ$ . The given three angle measures add up to  $65^\circ + 100^\circ + 75^\circ = 240^\circ$ , so the missing angle measure is  $360^\circ - 240^\circ = 120^\circ$ .

If  $\overline{AB}$  were parallel to  $\overline{CD}$ , then the measure of  $\angle B$  and the measure of  $\angle C$  would add up to  $180^\circ$  and the answer would be G. But the problem does not say that those sides are parallel, and it turns out that they are not parallel.

If you chose K, you may have calculated the average of the three given angle measures or taken the supplement of  $\angle A$ .

**Question 7.** The correct answer is C. The shorter two sides are the same length in  $\triangle ABC$ , so the same thing has to happen in any triangle similar to it. That means that  $\overline{DE}$  is the same length as  $\overline{EF}$ , which is 3 meters. Then, the perimeter of  $\triangle DEF$  is  $3 + 3 + 5 = 11$  meters.

The most common incorrect answer is A, correctly finding the length of  $\overline{DE}$  and stopping there.

**Question 8.** The correct answer is K. This problem can be solved by substituting the Celsius temperature ( $C = 38$ ) into the formula and solving for  $F$ . The substitution step gives  $F = \frac{9}{5}(38) + 32$ , which can be solved as follows:  $F = 68.4 + 32 \Rightarrow F = 100.4$ . It is appropriate to round this to the nearest degree Fahrenheit because the precision of the Celsius temperature was only to the nearest degree Celsius.

If you chose J, you may have added  $38 + 32$  and missed the  $\frac{9}{5}$ . An answer of H might come from calculating  $\frac{9}{5}(38)$  correctly and forgetting to add in 32.

**Question 9.** The correct answer is B. Nick can only order whole cases, which contain 24 boxes of pens with 10 pens per box, for a total of  $24 \cdot 10 = 240$  pens per case. An order of 2 cases would be 480 pens, which falls short of the desired 500 pens. To get 500 pens from his supplier, Nick needs to order 3 cases, and he will get 720 pens.

If you got answer A, you may have correctly divided 500 by 240 to get approximately 2.08 cases, but you may have rounded that to the nearest integer, which does not give the correct answer in this context. Answer E represents the number of boxes (not cases) of pens needed if Nick could order any whole number of boxes.

**MATHEMATICS PRACTICE TEST 2 EXPLANATORY ANSWERS**

**Question 10.** The correct answer is **K**. When  $a + b = 6$ , then  $2(a + b) + \frac{a+b}{6} + (a + b)^2 - 2$  becomes  $2(6) + \frac{6}{6} + (6)^2 - 2$ , which simplifies to  $12 + 1 + 36 - 2 = 47$ .

**Question 11.** The correct answer is **C**. If you bought 1 hamburger and 1 soft drink, it would cost \$2.10. If you bought 1 hamburger more, your order would cost \$3.50. So, the cost of the additional hamburger was  $\$3.50 - \$2.10 = \$1.40$ . Because 1 hamburger and 1 soft drink cost \$2.10, a soft drink must cost  $\$2.10 - \$1.40 = \$0.70$ .

Alternatively, you could set up two equations with two unknowns. Let  $h$  dollars be the cost of each hamburger and  $s$  dollars be the cost of each soft drink. Then  $h + s = 2.10$  and  $2h + s = 3.50$ . Subtraction gives:

$$\begin{array}{r} 2h + s = 3.50 \\ -(h + s = 2.10) \\ \hline h = 1.40 \end{array}$$

And then, substituting 1.40 for  $h$  in  $h + s = 2.10$  gives  $s = 2.10 - 1.40 = 0.70$ .

The most common wrong answer is **E**, which is the correct cost of a hamburger. However, the question asks for the cost of a soft drink. Answer choice **D** is half of \$2.10, which would only be correct if a soft drink cost the same as a hamburger.

**Question 12.** The correct answer is **K**. There are many ways to solve this equation. One solution is the following.

$$\begin{array}{l} \text{start with} \quad 12x = -8(10 - x) \\ \\ \text{divide both sides by } -8 \Rightarrow -\frac{3}{2}x = 10 - x \\ \\ \text{add } x \text{ to both sides} \Rightarrow -\frac{1}{2}x = 10 \\ \\ \text{multiply both sides by } -2 \Rightarrow x = -20 \end{array}$$

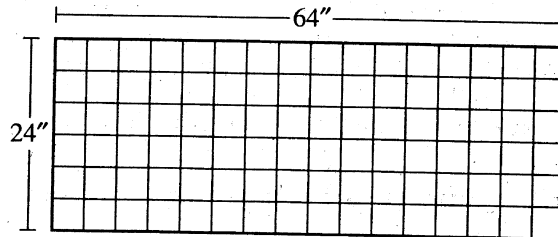
Another solution method would be to graph  $y = 12x$  and  $y = -8(10 - x)$  and see where the two graphs intersect. A calculator would produce these graphs, and you could find an approximate solution. That is good enough for this problem, because the answer choices are spread apart.

This is a problem where checking your answer is easy and can pay off. When  $x = -20$ , the left side of the original equation is  $12(-20)$ , which is  $-240$ . The right side is  $-8(10 - (-20))$ , which simplifies to  $-8(10 + 20)$ , then to  $-8(30)$ , then to  $-240$ . This solution checks. No other answer choice would satisfy the equation.

If you chose **H** or **J**, you may have multiplied out  $-8(10 - x)$  to get  $-80 + x$  or  $-80 - x$  and done the rest of the steps correctly. You could have caught this by checking your answer. If you made an error with minus signs, you may have gotten one of the other answer choices.

**MATHEMATICS PRACTICE TEST 2 EXPLANATORY ANSWERS**

**Question 13.** The correct answer is C. There would be 6 tiles along the 24" side ( $6 \cdot 4" = 24"$ ). There would be 16 tiles along the 64" side ( $16 \cdot 4" = 64"$ ). Then,  $6 \cdot 16 = 96$  tiles are needed to completely cover the rectangular countertop:



An alternate solution is to figure the area of the countertop in square inches,  $24 \cdot 64$ , which is 1,536 square inches. Then, divide that by the area of a tile, which is 16 square inches. The result is 96, which is the number of tiles needed. The tiles cover the area without being cut because the side lengths of the countertop are divisible by the side length of a tile.

The most common wrong answer is E, which comes from correctly calculating the area of the countertop (1,536 square inches), but dividing by the length of the side of the square (4 inches) rather than by  $4 \cdot 4$  square inches. If you chose A or B, you may have confused perimeter and area.

**Question 14.** The correct answer is H. If the answer choices give 2 of the 3 interior angle measures in a triangle, then the third angle measure is  $180^\circ$  minus the sum of the given angle measures. The chart below shows this calculation.

	1st angle	2nd angle	Sum of 1st + 2nd angles	3rd angle ( $180^\circ - \text{sum of 1st + 2nd angles}$ )
F.	$20^\circ$	$40^\circ$	$60^\circ$	$120^\circ$
G.	$30^\circ$	$60^\circ$	$90^\circ$	$90^\circ$
H.	$40^\circ$	$100^\circ$	$140^\circ$	$40^\circ$
J.	$45^\circ$	$120^\circ$	$165^\circ$	$15^\circ$
K.	$50^\circ$	$60^\circ$	$110^\circ$	$70^\circ$

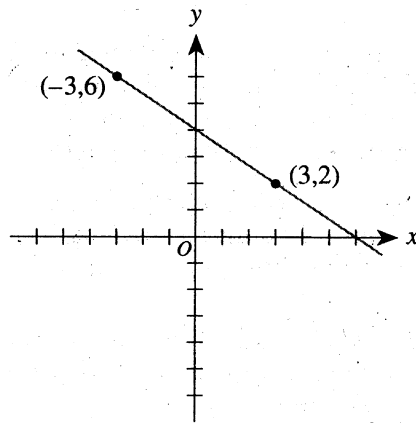
The only place where the third angle has measure equal to one of the first two angles is in H, where there are two  $40^\circ$  angles.

## MATHEMATICS PRACTICE TEST 2 EXPLANATORY ANSWERS

**Question 15.** The correct answer is C. The perimeter of the triangle, 66 inches, is the length of the three sides added together. Because one side is 16 inches long, the lengths of the other two sides added together must be  $66 - 16 = 50$  inches. The ratio of the lengths of these two sides is 2:3. This ratio denotes 2 parts for the first side, 3 parts for the second side, and therefore 5 parts altogether. Because there are 50 inches altogether, and this must make up the 5 parts, each part is 10 inches long. That makes one side 2 parts, or 20 inches long, and the other side 3 parts, or 30 inches long. So the longest side of the triangle is 30 inches long.

B is the length of another side of the triangle, but not the longest side.

**Question 16.** The correct answer is H. Sketching a picture can be helpful.



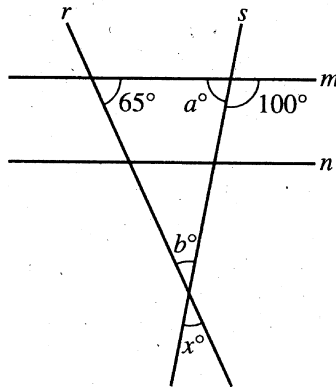
The points  $(-3, 6)$  and  $(3, 2)$  are on opposite sides of the  $y$ -axis, and an equal distance away from the  $y$ -axis, because the  $x$ -coordinates are 3 and  $-3$ . So, the midpoint will be the  $y$ -intercept of the line. The  $y$ -coordinate of the midpoint is  $\frac{6+2}{2}$ , which is 4.

If the points were not so nicely spaced with the  $y$ -axis, you could find the equation of the line through the two points and use it to identify the  $y$ -intercept. The slope of the line would be the change in  $y$  divided by the change in  $x$ ,  $\frac{6-2}{-3-3} = -\frac{2}{3}$ . The point-slope form of the equation is then  $y - 2 = -\frac{2}{3}(x - 3)$ . To find the  $y$ -intercept, set  $x = 0$  and solve for  $y$ , so  $y - 2 = 2 \Rightarrow y = 4$ . This shows that 4 is the  $y$ -intercept.

From the picture alone, you could deduce that the line had to cross the  $y$ -axis between 2 and 6. This observation eliminates all the answer choices except the correct one.

## MATHEMATICS PRACTICE TEST 2 EXPLANATORY ANSWERS

**Question 17.** The correct answer is C. In the figure below, the angles with measure  $a^\circ$  and  $100^\circ$  form a straight angle along line  $m$ . This means  $a^\circ + 100^\circ = 180^\circ$ , or  $a^\circ = 80^\circ$ . Now, you know two of the three angles in the larger triangle. The sum of all three must be  $180^\circ$ . So,  $80^\circ + b^\circ + 65^\circ = 180^\circ$ , which means that  $b^\circ = 35^\circ$ . The angle measure  $b^\circ$  is equal to angle measure  $x^\circ$  because vertical angles have the same measure. So,  $x^\circ = 35^\circ$ .



If you chose A, you may have calculated  $180^\circ - (65^\circ + 100^\circ)$ . These three given angle measures,  $x^\circ$ ,  $65^\circ$ , and  $100^\circ$ , do not need to add to  $180^\circ$ . They are not the measures of the three interior angles in the *same* triangle.

**Question 18.** The correct answer is H. Each week, both ponds get shallower. The table below shows what happens for the first few weeks.

	Now	1 week	2 weeks	3 weeks	4 weeks
First pond	180 cm	179 cm	178 cm	177 cm	176 cm
Second pond	160 cm	159.5 cm	159 cm	158.5 cm	158 cm
Difference	20 cm	19.5 cm	19 cm	18.5 cm	18 cm

The ponds are getting closer and closer to the same depth, at the rate of 0.5 cm per week. Because the ponds started out 20 cm different, it will take  $20 \div 0.5 = 40$  weeks to bring them to the same depth.

You could also check the answer choices. Answer F is not correct because, after 10 weeks, the first pond would be  $180 - 10 = 170$  cm deep and the second pond would be  $160 - 5 = 155$  cm deep. The other incorrect answers can be eliminated in the same way.

The most common incorrect answer is G. If you chose that answer, you may have reasoned that it would take 20 weeks for the first pond to get down to the level of the second pond. And that is correct, except that the second pond has gotten shallower during that 20 weeks, so the ponds are not the same depth.

**MATHEMATICS PRACTICE TEST 2 EXPLANATORY ANSWERS**

**Question 19.** The correct answer is E. A line will always have an equation of the form  $x = a$  or  $y = mx + b$ , for suitable constants  $a$ ,  $m$ , and  $b$ . And, if a graph has an equation that can be put into one of these forms, the graph is a line.

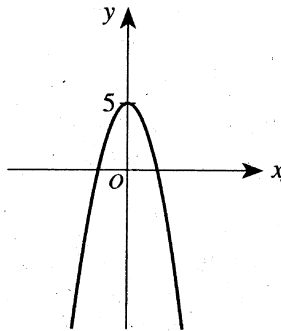
Equation A is already in the first form, where  $a = 4$ .

Starting with Equation B, divide both sides by 3 and you will get  $y = 2$ . This is the second form, with  $m = 0$  and  $b = 2$ .

Equation C can be manipulated into the second form as follows:  $x - y = 1 \Rightarrow -y = 1 - x \Rightarrow +y = -1 + x \Rightarrow y = x - 1$ , which has  $m = 1$  and  $b = -1$ .

Equation D is already in the second form, with  $m = \frac{3}{4}$  and  $b = -2$ .

Equation E can be written as  $y = -x^2 + 5$ . This is the equation of a parabola, shown below. It is the only one of the equations that is not a line.



**Question 20.** The correct answer is G. All the answer choices are in terms of  $\angle A$ . Many people remember the trigonometric functions in the context of a right triangle, in terms of the lengths of the side opposite the angle, the side adjacent to the angle, and the hypotenuse. For the triangle given in the problem, the side opposite  $\angle A$  has length 12 cm, the side adjacent to  $\angle A$  has length 5 cm, and the hypotenuse has length 13 cm. The values of the trig functions are  $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{5}{13}$ ,  $\sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{12}{13}$ , and  $\tan A = \frac{\text{opposite}}{\text{adjacent}} = \frac{12}{5}$ .

The only answer choice that gives one of these is G.

If you chose F, you may have been expecting the angle to be at one end of the horizontal base of the triangle. The value of  $\cos B$  is  $\frac{12}{13}$ . Triangles can be rotated to any position. The terms “opposite,” “adjacent,” and “hypotenuse” are chosen to apply when the triangle is in an arbitrary position.

