

End-of-Course Assessment

Part I: Calculator NOT Permitted

Multiple Choice

Read each question. Then write the letter of the correct answer on your paper.

1. Which of the following is an irrational number?

- A -5
- B $\frac{2}{3}$
- C $\sqrt{4} = 2$
- D $\sqrt{5}$

2. You toss a 6-sided number cube and a coin at the same time. How many possible outcomes are there?

- A 2
- B 6
- C 8
- D 12

3. Rewrite $\frac{(5^{-3})(7^2)}{(5^6)(7^{-8})}$ using positive exponents.

- A $\frac{5^3}{7^6}$
- B $\frac{7^4}{5^2}$
- C $\frac{7^{10}}{5^9}$
- D $\frac{7^{10}}{5^9}$

Handwritten work for Question 10:
 $3\sqrt{2 \cdot 3 \cdot 3} - 2\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}$
 $3 \cdot 3\sqrt{2} - 2 \cdot 2 \cdot 2\sqrt{2}$
 $9\sqrt{2} - 8\sqrt{2} = 1\sqrt{2}$

10. Mandy works part-time to earn money for a trip. The amount she saves after working x hours is given by the equation $y = 7.5x + 40$. How much does Mandy earn per hour?

- A \$7.50
- B \$32.50
- C \$40
- D \$47.50

11. Express the following sentence in equation form.

- Five times the difference of a number and 2 is equal to the quotient of the same number and 6.
- A $5x - 2 = \frac{x}{6}$
 - B $5(x - 2) = \frac{x}{6}$
 - C $5(2 - x) = \frac{x}{6}$
 - D $5(x - 2) = \frac{x}{6}$

12. Simplify $\sqrt{x^4 y^2} \cdot \sqrt{8x^3 y}$.

- A $2x^5 y \sqrt{2y}$
- B $2x^2 \sqrt{2xy}$
- C $2x^3 y \sqrt{2x}$
- D $4x^3 y \sqrt{2x}$

Handwritten work for Question 7:
 $3\sqrt{18} - 2\sqrt{32} < 8\sqrt{2}$
 $3 \cdot 3\sqrt{2} - 2 \cdot 4\sqrt{2} < 8\sqrt{2}$
 $9\sqrt{2} - 8\sqrt{2} < 8\sqrt{2}$
 $1\sqrt{2} < 8\sqrt{2}$

7. Simplify $3\sqrt{18} - 2\sqrt{32}$.
- A -5
 - B $-\sqrt{2}$
 - C 1
 - D $\sqrt{2}$

8. A spinner is divided into 5 equal sections labeled A, B, C, D, E. You spin the spinner twice. What is the probability you land on a vowel both times?

- $P(\text{vowel}) = \frac{2}{5}$
 $\frac{2}{5} \cdot \frac{2}{5} = \frac{4}{25}$

9. Multiply $(4x + 2)(2x - 3)$.

- A $8x^2 - 6$
- B $8x^2 + 4x - 6$
- C $8x^2 - 8x - 6$
- D $8x^2 - 12x - 6$

Handwritten work for Question 9:
 $4x(2x-3) + 2(2x-3)$
 $8x^2 - 12x + 4x - 6$
 $8x^2 - 8x - 6$

Handwritten work for Question 12:
 $\sqrt{x^4 y^2} \cdot \sqrt{8x^3 y}$
 $x^2 y \cdot \sqrt{8x^3 y}$
 $x^2 y \cdot 2\sqrt{2x^3 y}$
 $2x^2 y \sqrt{2x^3 y}$

Handwritten work for Question 4:
 $|2x+1| = 9$
 $2x+1 = 9$
 $2x = 8$
 $x = 4$
 $2x+1 = -9$
 $2x = -10$
 $x = -5$

4. What is the solution to the equation $|2x + 1| - 3 = 6$?

- A -1, 2
- B -2, 2
- C -2, 4
- D -5, 4

5. Which equation represents a line perpendicular to a line that passes through $(-2, 4)$ and $(1, -5)$?

- A $y = -3x + 2$
- B $y = -\frac{1}{3}x + 2$
- C $y = \frac{1}{3}x + 2$
- D $y = 3x + 2$

6. Solve $y = 2xz^2 - xy$ for x .

- A $x = \frac{1}{2z^2}$
- B $x = \frac{y}{2z^2}$
- C $x = \frac{1}{2z^2 - 1}$
- D $x = \frac{y}{2z^2 - y}$

Handwritten work for Question 6:
 $y = x(2z^2 - y)$
 $\frac{y}{2z^2 - y} = x$

Handwritten work for Question 5:
 $m = \frac{-5-4}{1-(-2)} = \frac{-9}{3} = -3$
 $m_{\perp} = +\frac{1}{3}$

Handwritten work for Question 4:
 $y - 4 = \frac{1}{3}(x + 2)$
 $y - 4 = \frac{1}{3}x + \frac{2}{3}$
 $y = \frac{1}{3}x + 4\frac{2}{3}$
 $y = \frac{1}{3}x + \frac{14}{3}$

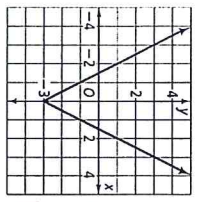
Handwritten work for Question 3:
 $\frac{(7^2)(7^8)}{(5^6)(7^{-8})}$
 $\frac{7^{10}}{5^9}$

3. Rewrite $\frac{(5^{-3})(7^2)}{(5^6)(7^{-8})}$ using positive exponents.

- A $\frac{5^3}{7^6}$
- B $\frac{7^4}{5^2}$
- C $\frac{7^{10}}{5^9}$
- D $\frac{7^{10}}{5^9}$

$(2x^4y^3)(2x^4y^3)$
 $2x^4 \cdot 2x^4 \cdot y^3 \cdot y^3$
 $4x^8y^6$

13. Simplify $(2x^4y^3)^2$.
- A $2x^8y^6$
 B $2x^4y^6$
 C $4x^8y^6$
 D $4x^4y^6$
- OR
 $2(2x^4)^2(y^3)^2$
 $4x^8y^6$



14. The graph of which equation is shown?
- A $y = -|2x| + 3$
 B $y = |2x| - 3$
 C $y = |2x - 3|$
 D $y = 2|x - 3|$
- Handwritten: $y = |2x| - 3$
 $v: (0, -3)$
 $m = 2$

16. What type of function is $f(x) = x^2 + 3x - 2$?
- A exponential
 B linear
 C quadratic
 D none of the above
- Handwritten: x^2 quadratic

17. Solve the equation $2x^2 + 3x - 2 = 2$.
- A $-2, -\frac{1}{2}$
 B $-2, \frac{1}{2}$
 C $2, -\frac{1}{2}$
 D $2, \frac{1}{2}$

18. What is the solution to the equation $\frac{x+4}{x+2} = 9 - 3x$?
- A -7
 B -2
 C 1
 D 2

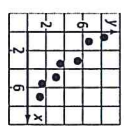
15. What is the solution of the system

$$\begin{cases} y = 2x + 3 \\ y = -x + 6 \end{cases}$$

Handwritten: $2x + 3 = -x + 6$
 $3x + 3 = 6$
 $3x = 3$
 $x = 1$

Handwritten: $2x(x+2) - 1(x+2) = 0$
 $(2x-1)(x+2) = 0$
 $2x-1 = 0 \Rightarrow x = \frac{1}{2}$
 $x+2 = 0 \Rightarrow x = -2$

Handwritten: $2x^2 + 3x - 2 = 2$
 $2x^2 + 3x - 4 = 0$
 $a=2, b=3, c=-4$
 $X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
 $X = \frac{-3 \pm \sqrt{9 - 4(2)(-4)}}{2(2)}$
 $X = \frac{-3 \pm \sqrt{41}}{4}$



19. Which of the following is the best estimate of an equation of a line of best fit for the scatter plot below?
- A $y = x + 4$
 B $y = -x + 4$
 C $y = x + 8$
 D $y = -x + 8$
- Handwritten: $m = -$
 $b \approx 7$ or 8

20. A baseball team is choosing new uniforms. They can choose from black, blue, white, and gray pants. They can choose from red, blue, green, and white shirts. How many different combinations of a pants and shirts are possible?
- A 4
 B 8
 C 16
 D 24
- Handwritten: $4 \cdot 4 = 16$

21. Which list is in order from least to greatest?
- A $-5, -\sqrt{2}, \frac{1}{2}, 1, 2, \sqrt{5}$
 B $-5, \frac{1}{2}, -\sqrt{2}, 1, 2, \sqrt{5}$
 C $5, -\sqrt{2}, \frac{1}{2}, 1, \sqrt{5}, 2$
 D $-\frac{1}{2}, -\sqrt{2}, -5, 1, 2, \sqrt{5}$
- Handwritten: $-\sqrt{2} \approx -1.4$

22. Multiply $\frac{4^{-3}}{5^3} \cdot \frac{5^4}{3^{-2}} \cdot \frac{25}{3}$.

A $\frac{5}{2}$
 B $\frac{15}{2}$
 C $\frac{80}{9}$
 D 60

Handwritten: $\frac{4^3 \cdot 5^3}{5^3} = 4^3 = 64$

23. A square-shaped area has sides measuring $5\sqrt{9}$ m. What is the area of the square?
- A 45 m^2
 B 180 m^2
 C 225 m^2
 D 2025 m^2
- Handwritten: $(5\sqrt{9})(5\sqrt{9}) = 5 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 405$

24. A student has scores of 73, 84, 91, and 78 on the fifth test in order to have an average score of 85?

A 85
 B 88
 C 97
 D 99

Handwritten: $\frac{73 + 84 + 91 + 78 + x}{5} = 85$
 $73 + 84 + 91 + 78 + x = 425$
 $326 + x = 425$
 $x = 99$

Short Response

25. Explain why the following question may be biased.

"Do you agree that more of the high school budget should be spent on the softball team than on the basketball team?"

The question is suggesting more should be spent on the softball.

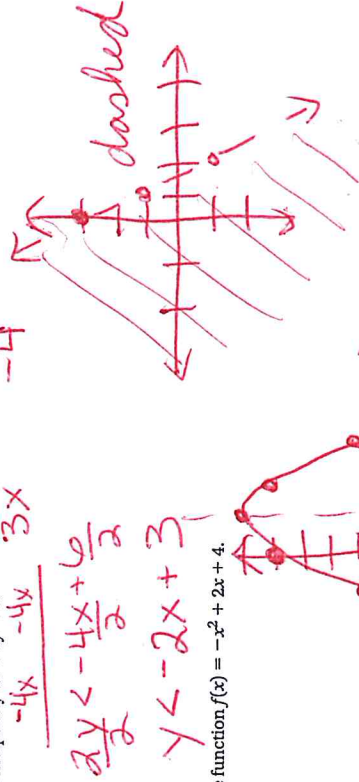
26. The area of a rectangle is $6x^2 - 5x - 4$. The width is $2x + 1$. What is the length? $3x - 4$

$$l \cdot w = a$$

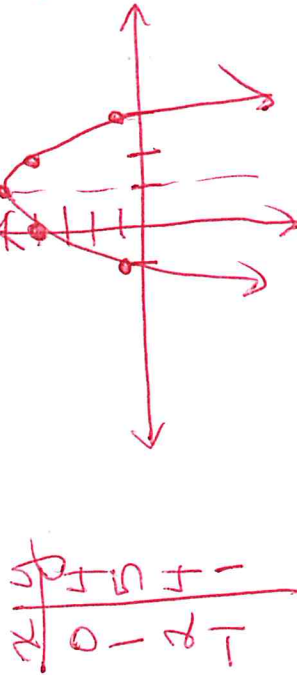
$$l(2x+1) = (6x^2 - 5x - 4)$$

$$(3x-4)(2x+1) = 6x^2 - 5x - 4$$

27. Graph the inequality $4x + 2y < 6$.



28. Graph the function $f(x) = -x^2 + 2x + 4$.



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$$1 \rightarrow -(-1)^2 + 2(-1) + 4 = -1 - 2 + 4 = 1$$

$$2 \rightarrow -(2)^2 + 2(2) + 4 = -4 + 4 + 4 = 4$$

Extended Response

29. A ball is thrown directly upward from a height of 30 feet with an initial velocity of 64 feet per second. The equation $h = -16t^2 + 64t + 30$ gives the height h after t seconds.

Part A. How long does it take for the ball to reach its maximum height? Show or explain your work.

$$h = -16(t^2 - 4t + 4) + 30 + 16$$

$$h = -16(t-2)^2 + 94$$

or

$$h = -16(1)^2 + 64(1) + 30 = -16 + 64 + 30 = 94$$

$t = 2$ seconds

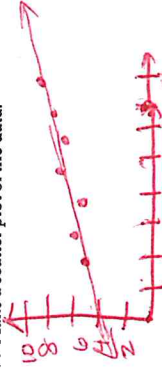
Part B. What is the maximum height of the ball? Show or explain your work.

94 feet

30. Refer to the table below.

x	1	1.5	2	2.5	3	3.5	4
y	5	6	5	7	6.5	7.5	8

Part A. Make a scatter plot of the data.



Part B. Estimate an equation of the line of best fit.

$$y = x + 4$$

(looks like $b=4, m=1$)

or

Choose $(1, 5)$ and $(4, 8)$ because my line goes through them

$$m = \frac{8-5}{4-1} = \frac{3}{3} = 1$$

$$y - 5 = 1(x - 1)$$

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$$y - 5 = x - 1$$

$$y = x + 4$$

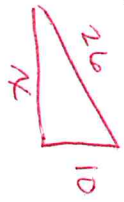
End-of-Course Assessment

Part II: Calculator Permitted

Multiple Choice

Read each question. Then write the letter of the correct answer on your paper.

31. The length of the hypotenuse of a right triangle is 26 inches. One of the legs measures 10 inches. What is the length of the other leg?



$x^2 + 10^2 = 26^2$
 $x^2 + 100 = 676$
 $x^2 = 576$
 $x = 24$

32. Simplify $2xy^2(3x^2 - 2y) - x^2y(2x - 3xy)$.

A $3x^3y^2 - 6xy^3$ Distribute
 B $9x^3y^2 - 6xy^3$ add exponents
 C $3x^3y^2 - 4xy^3 - 2xy^3$ terms
 D $9x^3y^2 - 4xy^3 - 2x^3y$ Add like terms

33. A bag contains 5 blue, 3 red, and 8 green marbles. You choose a marble, do not replace it, and then choose another. What is the probability that both marbles are red?

A $\frac{1}{128}$
 B $\frac{1}{40}$
 C $\frac{9}{256}$
 D $\frac{240}{17}$

$P(R) = \frac{3}{5+3+8} = \frac{3}{16}$
 $\frac{3}{16} \cdot \frac{3}{16} = \frac{9}{256}$

34. Write the expression using only positive exponents.

A $\frac{x^2}{2y^2}$
 B $\frac{y^2}{2x^2}$
 C $\frac{x^6}{2y^9}$
 D $\frac{y^9}{2x^6}$

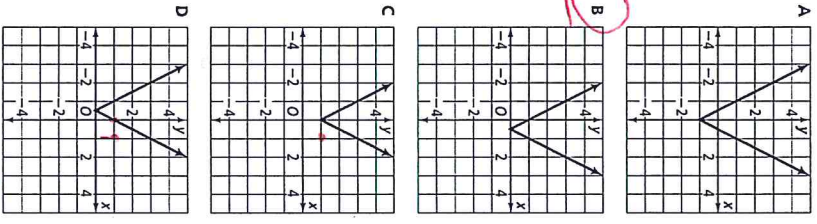
$\frac{4x^{-4}y^3}{8x^2y^{-6}} = \frac{1}{2} \frac{y^3}{x^4} \frac{y^6}{x^2} = \frac{y^9}{2x^6}$

35. Which function does the table represent?

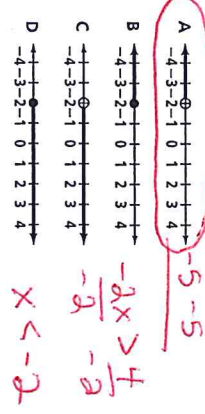
x	-2	-1	0	1	2
y	4	5	6	7	8

- A $y = -2x + 1$
 B $y = -5x$
 C $y = x + 6$
 D $y = -x + 2$

36. Which of the following is the graph of $y = |2x - 1|$?



37. Which of the following is the graph of the solution to the inequality $-2x + 5 > 9$?



38. In a sample of 50 randomly selected students, 32 students chose comedy as their favorite type of movie. Based on this data, what is the best estimate of how many of the 2890 students in the school would NOT choose comedy as their favorite type of movie?

A 925 students
 B 1040 students
 C 1850 students
 D 1965 students

$\frac{32}{50}$ chose, so $\frac{18}{50}$ did NOT

39. What is the solution to the equation $|x - 4| - 2 = -1$?

A 5, -7
 B 5, -5
 C 5, 3
 D 5, 7

$|x - 4| = 1$
 $x - 4 = 1$ or $x - 4 = -1$
 $x = 5$ or $x = 3$

$\frac{18}{50} = \frac{x}{2890}$
 $50x = 52020$
 $x = 1040$

40. How does the graph of $y = 3x - 1$ differ from that of $y = 3x$?

- A The graph is translated 1 unit left.
 B The graph is translated 1 unit down.
 C The graph is reflected across the x-axis.
 D The graph is reflected across the y-axis.

$$175 \left(1 + \frac{0.04}{4}\right)^{4 \cdot 2}$$

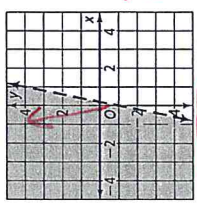
$$175(1.01)^8 = 189.50$$

Name _____ Date _____ Class _____

41. You deposit \$175 in an account that pays 4% interest compounded quarterly. How much will you have in the account after 2 years?
- A \$182.11
 B \$189.50
 C \$204.73
 D \$239.50

~~$y = 175(1.04)^8$~~
~~first~~
 $y = 189.28$

42. The graph of which inequality is shown?



- A $y > 5x - 1$
 B $y \geq 5x - 1$
 C $y < 5x - 1$
 D $y \leq 5x - 1$

$b = -1$
 $m = 5$

43. The length of a rectangle is 3 more than twice its width. The perimeter of the rectangle is 42 centimeters. What is the length of the rectangle?

A 6 cm
 B 13 cm
 C 15 cm
 D 29 cm

$l = 2w + 3$
 $w = w$
 $P = w + w + l + l$

$P = w + w + 2w + 3 + 2w + 3$
 $4w = 6w + 6$
 $3w = 6w$
 $w = 2$
 $l = 2(2) + 3 = 7$

44. The length of the base of a triangle is 1 more than twice its height. The area of the triangle is 18 in². What is the length of the base of the triangle?

$A = \frac{1}{2} b \cdot h$
 $18 = \frac{1}{2} h(2h+1)$
 $36 = 2h^2 + h$
 $2h^2 + h - 36 = 0$
 $x = \frac{-1 \pm \sqrt{1 - 4(2)(-36)}}{2 \cdot 2}$

$b = 2h + 1$

45. What is the solution of the system

$\begin{cases} y = 4x - 1 \\ y = 3x + 2 \end{cases}$

A (1, 3)
 B (1, 5)
 C (3, 1)
 D (3, 11)

$4x - 1 = 3x + 2$
 $x - 1 = 2$
 $x = 3$
 $y = 4(3) - 1 = 11$

46. What is the solution to the equation

$\frac{x}{3} + 1 = -2$
 $\frac{x}{3} = -3$
 $x = -9$

47. What is the solution to the inequality

$-9 \leq 2x + 1 < 5$

A $-5 \leq x < 2$
 B $-4 \leq x < 3$
 C $4 \geq x > -3$
 D $5 \geq x > -2$

$-9 \leq 2x + 1 < 5$
 $-10 \leq 2x < 4$
 $-5 \leq x < 2$

48. Solve the equation $x^2 - 4 = x + 8$.

A 3, 4
 B 3, -4
 C -3, 4
 D -3, -4

$x^2 - x - 12 = 0$
 $(x+3)(x-4) = 0$
 $x+3=0$ or $x-4=0$
 $x=-3$ or $x=4$

49. A cylinder has a volume of 135π ft³. Its height is 15 feet. What is its diameter?

A 3 feet
 B 4.5 feet
 C 6 feet
 D 9 feet

$V = \pi r^2 h$
 $135\pi = \pi r^2 \cdot 15$
 $9 = r^2$
 $r = 3$
 $d = 6$

50. What is the slope of the line through the points (3, -2) and (5, 8)?

A $-\frac{1}{5}$
 B $\frac{1}{5}$
 C $\frac{1}{2}$
 D $\frac{5}{2}$

$m = \frac{8 - (-2)}{5 - 3} = \frac{10}{2} = 5$

51. How many ways can you arrange the letters in the word MATH?

A 4
 B 12
 C 24
 D 256

$4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24$

52. What is 18 feet per minute in inches per hour?

A 3.6 inches per hour
 B 40 inches per hour
 C 90 inches per hour
 D 12,960 inches per hour

$18 \text{ ft} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} = 12960 \text{ in/hr}$

53. Which point is in the solution set for $4x - y > 1$?

- A (-1, 2)
 B (0, -1)
 C (0, 2)
 D (2, 0)
- $4(-1) - 2 > 1 \rightarrow -6 > 1$ no
 $4(0) - (-1) > 1 \rightarrow 1 > 1$ no
 $4(0) - 2 > 1 \rightarrow -2 > 1$ no
 $4(2) - 0 > 1 \rightarrow 8 > 1$ yes

54. What is the vertex of the graph of the function $f(x) = x^2 + 4x - 5$?

- A (-4, -5)
 B (-2, 7)
 C (-2, -9)
 D (7, -2)
- $f(x) = (x^2 + 4x + 4) - 5 - 4$
 $f(x) = (x + 2)^2 - 9$
 vertex: $(-2, -9)$

$52. 18 \text{ ft} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} = 12960 \text{ in/hr}$

Short Response

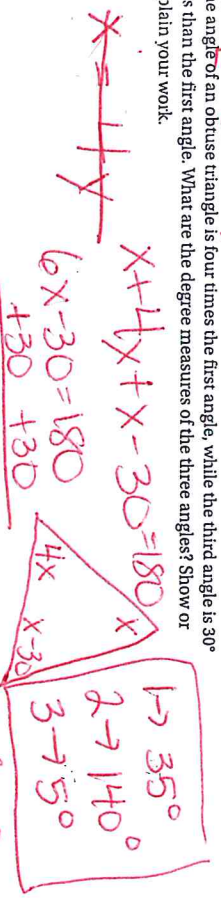
55. The ages of the members of a hiking club are 17, 18, 24, 28, 32, 36, 43, and 52. A new member who is 45 years old joins the club. In general, describe how this will affect the mean, median, mode, and range of the ages of the club.

mean will increase from $\frac{257}{8} = 32.125$
 median will increase from 30 to 32
 mode \rightarrow no change range stays the same $\rightarrow 35$

56. What is the factored form of $6x^4 - 21x^3 - 12x^2$? Show or explain your work.

$6x^4 - 21x^3 - 12x^2$
 $3x^2(2x^2 - 7x - 4)$
 $3x^2 \sqrt{(2x+1)(x-4)} = 3x^2(x-4)(2x+1)$

57. One angle of an obtuse triangle is four times the first angle, while the third angle is 30° less than the first angle. What are the degree measures of the three angles? Show or explain your work.



58. What are the zeros of the function $f(x) = 6x^2 - 4x - 2$? Show or explain your work.

$0 = \frac{6x^2 - 4x - 2}{2}$
 $0 = 3x^2 - 2x - 1$
 $0 = (3x+1)(x-1)$
 $x = -\frac{1}{3}, 1$

Extended Response

59. Marco has a combination of 20 nickels and dimes for a total of \$1.45. Part A Write a system of equations you could use to determine the number of each type of coin Marco has.

$x + y = 20$
 $0.05x + 0.10y = 1.45$

Part B How many of each type of coin does Marco have? Show or explain your work.

$-5(x+y=20) \rightarrow -5x-5y=-100$
 $100(0.05x+0.10y=1.45) \rightarrow 5x+10y=145$
 $5y=45$
 $y=9$
 $x+9=20$
 $x=11$

60. A map uses a scale of 0.25 in.: 5 miles.

Part A What is the actual distance between two towns if they are 5 inches apart on the map? Show or explain your work.

$\frac{0.25 \text{ in}}{5 \text{ mi}} = \frac{5 \text{ in}}{x \text{ mi}}$
 $x = 100 \text{ miles}$

Part B What is the distance between two towns on the map if the actual distance between them is 75 miles? Show or explain your work.

$\frac{0.25 \text{ in}}{5 \text{ mi}} = \frac{x \text{ in}}{75 \text{ mi}}$
 $\frac{18.75}{5} = \frac{5x}{5}$
 $3.75 = x$
 3.75 in