

ST. KATHARINE DREXEL PREP MATH DEPARTMENT
SUMMER MATH PACKET 2021-2122

THIS PACKET IS FOR STUDENTS ENTERING:
ADVANCED MATHEMATICS
12TH GRADE STUDENTS



DIRECTIONS: IN ORDER TO RECEIVE MAXIMUM CREDIT:

- **ALL PROBLEMS MUST BE COMPLETED.**
- **ALL WORK MUST BE SHOWN ON LOOSE LEAF PAPER AND MUST BE COMPLETED WITH A PENCIL ONLY. PAPERS WILL NOT BE GRADED IF THE WORK IS DONE WITH AN INK PEN.**
- **YOU MAY USE MATH WEBSITES SUCH AS KHAN ACADEMY FOR ASSISTANCE**

DUE DATE: THE SUMMER MATH PACKET MUST BE SUBMITTED THE FIRST WEEK OF SCHOOL FOR A HOMEWORK GRADE. YOUR MATH TEACHER WILL SELECT PROBLEMS FROM THE MATH PACKET TO CREATE YOUR FIRST QUIZ IN YOUR MATH COURSE.

MATH SUMMER PACKET – ADV. MATH/ACT PRACTICE PROBLEMS 2021
12TH GRADE STUDENTS

Name _____

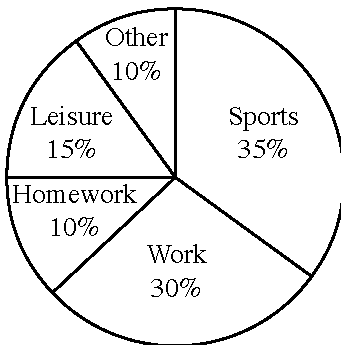
Multiple Choice

Identify the choice that best completes the statement or answers the question.

- _____ 1. 180 is 45% of what number?
a. 81 b. 145 c. 204 d. 400 e. 340
- _____ 2. Solve $3(8 - x) = -6x + 15$.
a. -3 b. -1 c. 2 d. -2 e. 3
- _____ 3. During the last 10 years, the population of a town increased from 6000 to 10,320. What percent increase does this represent?
a. 80% b. 72% c. 75% d. 78% e. 70%
- _____ 4. The first five batters on a softball team's lineup have the following numbers of hits for the season: 83, 71, 68, 62, 61. What is the mean number of hits for these five players?
a. 71 b. 69 c. 68 d. 70 e. 67
- _____ 5. A dance company is planning a program that will consist of one ballet, one tap, and one jazz routine. In its repertoire are five ballet, three jazz, and six tap routines. How many different programs are possible?
a. 56 b. 90 c. 14 d. 28 e. 72
- _____ 6. Which of these numbers is between 6 and 7?
a. $2\sqrt{5}$ b. $3\sqrt{6}$ c. $6\sqrt{2}$ d. $4\sqrt{3}$ e. $5\sqrt{2}$
- _____ 7. Erika read 90 pages in $2\frac{1}{2}$ hours. At the same time, how many hours would it take her to read 225 pages?
a. $5\frac{3}{4}$ b. $5\frac{1}{2}$ c. 6 d. $6\frac{1}{2}$ e. $6\frac{1}{4}$
- _____ 8. After $\frac{4\frac{4}{9}}{1\frac{1}{5}}$ has been simplified to a mixed number in lowest terms, what is the numerator of the fraction?
a. 19 b. 16 c. 18 d. 20 e. 22
- _____ 9. For a birthday party, Marissa bought three cartons of ice cream at \$4.59 each and two packages of plastic bowls at \$3.00 each. If food is not taxed and non-emergency grocery items are taxed at the rate of 5%, what was her total bill?
a. \$20.76 b. \$20.37 c. \$19.77 d. \$20.27 e. \$20.07
- _____ 10. $\sqrt{\frac{1}{9}} - \sqrt{\frac{1}{36}} = ?$
a. $-\sqrt{\frac{1}{27}}$ b. $\frac{1}{6}$ c. -3 d. $\sqrt{\frac{1}{12}}$ e. $\frac{1}{2}$

11. The circle graph below shows the results of a survey of the 660 students in a school. How many students participate in sports?

**After-School Activities
for 660 Students**



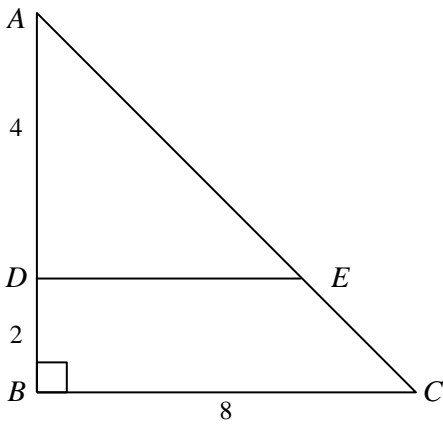
- a. 237 b. 35 c. 231 d. 243 e. 249
12. $\frac{3}{5} + \frac{1}{3} = ?$
 a. $\frac{4}{5}$ b. $\frac{8}{15}$ c. $\frac{1}{2}$ d. $\frac{4}{15}$ e. $\frac{14}{15}$
13. Which of these expressions represents the greatest number?
 a. $|-11 + (-4)| - |-4|$ d. $|-6 - (-12)| - 4$
 b. $-|7 - 3| + |-9 - 11|$ e. $-|-8| + |-9| + |4 - 8|$
 c. $|-8 + (-2)| + |-7|$
14. Solve for x if $\frac{12}{21} = \frac{x+4}{2x+4}$.
 a. 8 b. 10 c. 9 d. 12 e. $8\frac{1}{2}$
15. A toy maker has $6\frac{1}{4}$ yards of fabric. He wants to make five stuffed animals that each require $\frac{7}{8}$ yard of fabric. How many yards of fabric will he have left?
 a. $1\frac{1}{2}$ yd b. $1\frac{3}{8}$ yd c. $1\frac{3}{4}$ yd d. $1\frac{5}{8}$ yd e. $1\frac{7}{8}$ yd
16. $4^0 + 3^{-1} + 2^{-2} + 1^{-3} = ?$
 a. $2\frac{7}{12}$ b. $3\frac{7}{12}$ c. $3\frac{1}{12}$ d. $2\frac{1}{12}$ e. $\frac{7}{12}$
17. Three quarters of Andre's collection of coins is pennies. Of the remaining coins, $\frac{2}{5}$ are quarters. If there are 280 coins in his collection, what is the value of the quarters?
 a. \$12.50 b. \$9.25 c. \$7.00 d. \$21.00 e. \$17.50
18. $\frac{20}{10} + 30 \times 10 + \frac{40}{10^2} + 50 \times 10^2 = ?$
 a. 5302.4 b. 5320.4 c. 5432 d. 5032.4 e. 5032.04
19. Students must choose one of five books for their next book report. The books have 218, 180, 240, 164, and 128 pages, respectively. What is the range in the number of pages per book?
 a. 144 b. 180 c. 162 d. 186 e. 112

- ___ 27. Solve $\frac{2x-3}{13} = \frac{1}{x+4}$.
- a. $-\frac{9}{2}, -5$ b. $-\frac{7}{2}, 3$ c. $\frac{3}{2}, 4$ d. $\frac{1}{2}, -9$ e. $\frac{5}{2}, -5$
- ___ 28. Evaluate $a(a - \sqrt{b})^{-1}$ when $a = 4$ and $b = \frac{1}{4}$.
- a. $\frac{8}{7}$ b. $\frac{7}{4}$ c. $-\frac{7}{2}$ d. $\frac{4}{7}$ e. 14
- ___ 29. Three times 7 less than x equals 11 more than x . Which of these equations could you use to find x ?
- a. $x - 3 \cdot 7 = 11 + x$ d. $3(7 - x) = x + 11$
b. $3 \cdot 7 - 3 \cdot x = x - 11$ e. $3(x - 7) = x + 11$
c. $3 \cdot 7 - x = x + 11$
- ___ 30. $\frac{\sqrt{121} - \sqrt{49}}{\sqrt{4}} = ?$
- a. $3\sqrt{2}$ b. $6\sqrt{2}$ c. 3 d. 2 e. $2\sqrt{3}$
- ___ 31. Factor $9x^2 - 30x + 25$.
- a. $(3x - 5)(3x + 5)$ d. $(3x - 2)\left(3x - \frac{25}{2}\right)$
b. $(3x - 5)^2$ e. $(3x - 10)(3x + 15)$
c. $(3x + 5)^2$
- ___ 32. Evaluate $yx^y - xy^x$ for $x = \frac{1}{2}$ and $y = 4$.
- a. $\frac{3}{4}$ b. $-1\frac{3}{4}$ c. $\frac{1}{4}$ d. $-\frac{1}{2}$ e. $-\frac{3}{4}$
- ___ 33. Simplify $\frac{a^2 - b^2}{a - b} - 2b$.
- a. $a - b$ b. $a^2 - b$ c. $a + b$ d. $a - b^2$ e. $a^2 + b^2$
- ___ 34. For an interval training program, a runner alternately runs and walks. She walks at w minutes per mile and runs at r minutes per mile. She walks for twice as long as she runs. If she trains for m minutes, how many miles has she covered?
- a. $\frac{1}{3}mr + \frac{2}{3}mw$ d. $(m + 2m)(r + w)$
b. $\frac{m}{3r} + \frac{2m}{3w}$ e. $\left(\frac{m}{2}\right)r + mw$
c. $\frac{m}{2r} + \frac{2m}{w}$
- ___ 35. $\frac{\sqrt{0.0025}}{\sqrt{0.04}} = ?$
- a. 2.5 b. 0.25 c. 0.0025 d. 25 e. 0.025
- ___ 36. Factor $16x^2 - 121$.
- a. $(16x - 11)(x - 11)$ d. $(4x - 11)(4x + 11)$
b. $(2x + 11)(8x - 11)$ e. $(4x - 11)^2$
c. $(2x - 11)(8x + 11)$

- _____ 37. The surface area of a rectangular prism with height h and base of length ℓ and width w is given by the formula $h(2\ell + 2w) + 2\ell w$. If a rectangular prism with a base of length 6 feet and width 3 feet has a surface area of 225 square feet, find its height.
- a. 8.5 ft b. 10.5 ft c. 9.5 ft d. 9 ft e. 10 ft
- _____ 38. Six more than 3 times x equals 4 times 2 less than x . Find x .
- a. 9.5 b. -2.5 c. 6 d. 26 e. 14
- _____ 39. $\frac{(x^2y)^6 x^3y^{-2}}{x^{-1}y^2} = ?$
- a. x^6 b. $\frac{x^5}{y}$ c. $\frac{x^4}{y^4}$ d. x^3y e. x^4
- _____ 40. A rectangle with length $2x - 1$ and width $x + 5$ has an area of 156 square units. Find x .
- a. 9 b. 13 c. 7 or $\frac{23}{2}$ d. 7 e. 12
- _____ 41. An equilateral triangle with sides of length s has an area equal to $\frac{5\sqrt{3}}{4}$. Find the length of one side of an equilateral triangle if its area is $25\sqrt{3}$ square units.
- a. $5\sqrt{3}$ b. 5 c. $\frac{25\sqrt{3}}{4}$ d. $10\sqrt{3}$ e. 10
- _____ 42. $a^{\frac{1}{2}} a^{\frac{2}{3}} = ?$
- a. $a\sqrt{a}$ b. $\sqrt[3]{a}$ c. $a^6\sqrt{a}$ d. $a^3\sqrt{a}$ e. $\sqrt[3]{a}$
- _____ 43. Factor $6x^2 - 5x - 4$.
- a. $(6x - 1)(x + 4)$ d. $(2x + 1)(2x + 4)$
 b. $(3x - 2)(2x + 2)$ e. $(3x + 2)(2x - 2)$
 c. $(3x - 4)(2x + 1)$
- _____ 44. Evaluate $\frac{m^2 + m^{-2} + m}{m}$ for $m = 0.5$.
- a. $5\frac{1}{4}$ b. $25\frac{1}{2}$ c. $20\frac{1}{4}$ d. $15\frac{3}{4}$ e. $10\frac{1}{2}$
- _____ 45. For one week all of the cassette tapes at a music store are discounted by 20%. The sales tax rate is 6%. If Mario buys t tapes originally priced at \$12 each and c CDs priced at \$15 each, write an expression for his total bill.
- a. $1.06(9.6t + 15c)$ d. $1.06(10t + 5c)$
 b. $6(20t + 15c)$ e. $0.06(9.6 + 12c)$
 c. $1.06 \cdot 9.6t + 15c$
- _____ 46. Simplify $(4d)^{\frac{1}{2}}(8d)^{\frac{1}{3}}(16d)^{\frac{1}{4}}$.
- a. $\frac{1}{6d^{24}}$ b. $8d^{12}\sqrt{d}$ c. $8d^6\sqrt{d}$ d. $\frac{11}{2d^{12}}$ e. $\frac{13}{6d^{12}}$
- _____ 47. The product of a number and 3 more than twice the number is 275. Find the number.
- a. 13 or $-\frac{23}{2}$ d. 11 or $-\frac{25}{2}$
 b. 11 or $-\frac{23}{2}$ e. 13 or $-\frac{25}{2}$
 c. 11 or $-\frac{21}{2}$

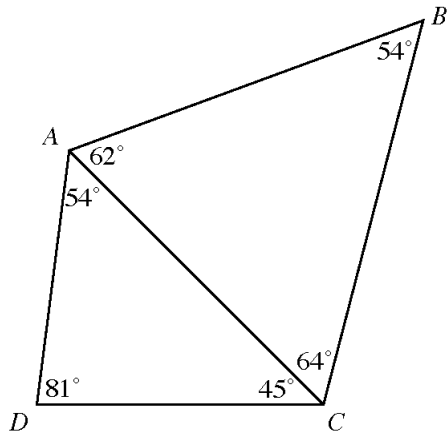
- ___ 48. For any triangle with sides of lengths a , b , and c , the area is given by the formula $A = \sqrt{s(s-a)(s-b)(s-c)}$, where s is equal to one-half the length of the perimeter. What is the area of a triangle in square units with sides of lengths 2, 3, and 3?
- a. $4\sqrt{2}$ b. $2\sqrt{2}$ c. $6\sqrt{2}$ d. $20\sqrt{3}$ e. $4\sqrt{3}$
- ___ 49. Simplify $\frac{m}{2} + \frac{2m}{3} + \frac{3m}{4}$.
- a. $\frac{11m}{9}$ b. $\frac{23m}{12}$ c. $\frac{2m}{3}$ d. $\frac{11m}{12}$ e. $\frac{21m}{12}$
- ___ 50. Use the quadratic formula to solve $3x^2 - 2x - 4 = 0$ for x .
- a. $\frac{1}{3} \pm \frac{2\sqrt{13}}{3}$ d. $\frac{1}{3} \pm \frac{\sqrt{13}}{3}$
b. $\frac{1}{6} \pm \frac{2\sqrt{13}}{3}$ e. $\frac{5}{6} \pm \frac{2\sqrt{13}}{3}$
c. $\frac{1}{6} \pm \frac{\sqrt{13}}{6}$
- ___ 51. Which of the following quadratic equations has two real solutions?
- a. $x^2 + 5x + 8 = 0$ d. $2x^2 - 4x + 3 = 0$
b. $2x^2 - 5x + 3 = 0$ e. $3x^2 - 2x + 1 = 0$
c. $3x^2 - 3x + 2 = 0$
- ___ 52. Solve $\frac{2}{x} - \frac{9}{x+4} = 2$.
- a. $\frac{1}{4}, 8$ b. $\frac{1}{2}, 8$ c. $-\frac{1}{4}, -4$ d. $\frac{3}{4}, -8$ e. $-\frac{1}{2}, 4$
- ___ 53. Find the product $(x^2 + 4x - 3)(3x + 2)$.
- a. $3x^3 + 14x^2 + x - 6$ d. $3x^3 + 12x^2 - x - 6$
b. $3x^3 + 14x^2 - x - 6$ e. $3x^3 + 10x^2 - x - 6$
c. $3x^3 - 10x^2 + x - 6$
- ___ 54. What is the sixth term of the geometric sequence whose first term is 2 and whose fourth term is -54 ?
- a. -324 b. 1458 c. -648 d. 540 e. -486
- ___ 55. Find y if $2x + 4y = 2$ and $4x + y = 18$.
- a. 2 b. -2 c. -4 d. 4 e. 6
- ___ 56. A company ships two different products, one in smaller packages that weighs 12 pounds and the other in a 20-pound package. A shipment of nine packages weighs a total of 124 pounds. What is the total weight of the smaller packages?
- a. 72 lb b. 48 lb c. 37 lb d. 60 lb e. 84 lb
- ___ 57. $(1 - 2i)^3 = ?$
- a. $3 - 8i$ b. $-11 + 2i$ c. $-6 + 4i$ d. $13 - 14i$ e. $1 - 8i$
- ___ 58. Solve $2x^2 - 5x + 1 = 0$.
- a. $\frac{5}{4} \pm \frac{\sqrt{11}}{4}$ d. $-\frac{5}{4} \pm \frac{\sqrt{13}}{4}$
b. $-\frac{5}{4} \pm \frac{\sqrt{33}}{4}$ e. $\frac{7}{4} \pm \frac{\sqrt{17}}{4}$
c. $\frac{5}{4} \pm \frac{\sqrt{17}}{4}$

59. $\frac{\sqrt[4]{x^2} \sqrt[4]{x^4}}{\sqrt[4]{x^8}} = ?$
- a. $\frac{5}{x^4}$ b. $\frac{3}{x^4}$ c. $\frac{3}{x^4}$ d. $\frac{1}{x^2}$ e. $\frac{1}{x^4}$
60. What is the remainder in the division $(x^3 - 2x^2 + 3x - 4) \div (x - 2)$?
- a. -2 b. 2 c. 0 d. 1 e. -10
61. Solve $|3x + 2| \leq 5$.
- a. $x \geq 1$ or $x \leq -\frac{7}{3}$ d. $-\frac{7}{3} \leq x \leq 1$
b. $x \leq -1$ or $x \geq \frac{7}{3}$ e. $1 \leq x \leq \frac{7}{3}$
c. $-1 \leq x \leq \frac{7}{3}$
62. Find x if $y = x^2 - 4$ and $y = 2x + 3$.
- a. $4 \pm 2\sqrt{2}$ d. $2 \pm \sqrt{2}$
b. $1 \pm 2\sqrt{2}$ e. $-1 \pm \sqrt{2}$
c. $-2 \pm 2\sqrt{2}$
63. If $A = \begin{bmatrix} 1 & 0 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 \\ -3 & 2 \end{bmatrix}$, find $2A - 3B$.
- a. $\begin{bmatrix} 2 & 12 \\ -5 & 0 \end{bmatrix}$ b. $\begin{bmatrix} 2 & -12 \\ 5 & 0 \end{bmatrix}$ c. $\begin{bmatrix} 2 & -12 \\ -5 & 12 \end{bmatrix}$ d. $\begin{bmatrix} 2 & 12 \\ -5 & 0 \end{bmatrix}$ e. $\begin{bmatrix} 2 & -12 \\ -13 & 0 \end{bmatrix}$
64. $\frac{6+2i}{2-i} = ?$
- a. $2 - 3i$ b. $2 + 2i$ c. $3 + 2i$ d. $2 + 3i$ e. $3 - 2i$
65. Suppose \overrightarrow{BC} bisects $\angle ABE$, and D is the interior of $\angle ABC$. If $m\angle CBD = 28^\circ$ and $m\angle ABE = 136^\circ$, find $m\angle ABD$.
- a. $n \parallel p$ b. $\ell \parallel p$ c. $\ell \perp n$ d. $m \perp p$ e. $\ell \parallel n$
66. A base of an isosceles triangle has measure 75° . What is the measure of the vertex angle?
- a. 75° b. 105° c. 15° d. 30° e. 52.5°
67. In right triangle ABC below, $\overline{DE} \parallel \overline{BC}$. If $AD = 4$, $BD = 2$, and $BC = 8$, find AE .



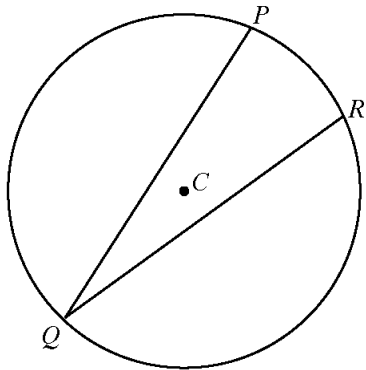
- a. 7 b. $6\frac{2}{3}$ c. $7\frac{1}{2}$ d. 6 e. 8

68. Which segment is the longest?



- a. \overline{CD} b. \overline{AD} c. \overline{AC} d. \overline{BC} e. \overline{AB}

69. Find the radius of circle C if $m\angle PQR = 24^\circ$ and the length of arc PR is 8π .



- a. 15 b. 20 c. 30 d. 60 e. 45

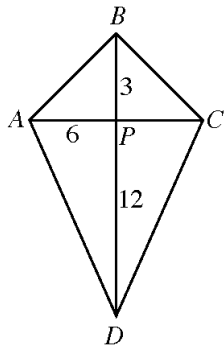
70. In circle R, chords \overline{AB} and \overline{CD} intersect at point M. If $CD = 21$, $AM = 4$, $BM = 27$, and \overline{CM} is shorter than \overline{DM} , find CM.

- a. 9 b. 13 c. 7 d. 8 e. 12

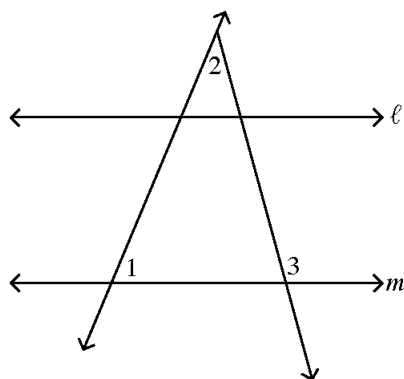
71. What is the surface area of a right cylinder of radius 3 meters and height 8 meters?

- a. $60\pi \text{ m}^2$ b. $72\pi \text{ m}^2$ c. $24\pi \text{ m}^2$ d. $63\pi \text{ m}^2$ e. $66\pi \text{ m}^2$

- ___ 72. Find the perimeter of the kite shown below if $AP = 6$, $BP = 3$, and $DP = 12$.



- a. $18\sqrt{5}$ b. $15\sqrt{5}$ c. $12\sqrt{5}$ d. $6\sqrt{5}$ e. $9\sqrt{5}$
- ___ 73. A rhombus has diagonals of lengths 8 feet and 14 feet. Find its area.
a. $30\sqrt{3} \text{ ft}^2$ b. 28 ft^2 c. 65 ft^2 d. 112 ft^2 e. 56 ft^2
- ___ 74. Suppose $\angle 1$ is supplementary to $\angle 2$, and $\angle 2$ is complimentary to $\angle 3$. Which of the following statements is true?
a. $m\angle 1 + m\angle 3 = 180^\circ$ d. $m\angle 1 - m\angle 3 = 90^\circ$
b. $m\angle 1 + m\angle 3 = 90^\circ$ e. none of the above
c. $m\angle 1 - m\angle 1 = 90^\circ$
- ___ 75. Two angles of a triangle measure 78° and 24° . Classify the triangle by its sides and angles.
a. equilateral equiangular d. isosceles acute
b. isosceles right e. scalene obtuse
c. scalene acute
- ___ 76. A hemisphere of radius 3 inches sits on top of a cylinder of radius 3 inches. The entire solid is 12 inches tall. What is the volume of the entire solid?
a. $99\pi \text{ in}^2$ b. $126\pi \text{ in}^2$ c. $144\pi \text{ in}^2$ d. $117\pi \text{ in}^2$ e. $108\pi \text{ in}^2$
- ___ 77. An equilateral triangle has sides of length 6. What is the length of a median of the triangle?
a. $2\sqrt{2}$ b. $3\sqrt{3}$ c. $4\sqrt{3}$ d. $4\sqrt{2}$ e. 6
- ___ 78. A triangular prism has a base that is a right triangle with legs 5 and 12 feet long. The prism is 10 feet tall. What is its volume?
a. 600 ft^3 b. 300 ft^3 c. 6 ft^3 d. 450 ft^3 e. 150 ft^3
- ___ 79. Lines ℓ and m are parallel. If $m\angle 1 = 67^\circ$ and $m\angle 2 = 36^\circ$, find $m\angle 3$.



- a. 77° b. 103° c. 73° d. 89° e. 113°

80. Which point lies in the fourth quadrant?
 a. $(6, -2)$ b. $(5, 3)$ c. $(-3, -4)$ d. $(-8, 5)$ e. $(0, -7)$
81. Which of the following equations represents a line has slope 3 and passes the point at $(-4, -1)$?
 a. $x + 3y = -7$ d. $3x + y = 11$
 b. $3x - y = -11$ e. $x - 3y = -1$
 c. $3x + y = -13$
82. What is the distance between the points at $(-2, 5)$ and $(2, -1)$?
 a. $4\sqrt{3}$ b. $2\sqrt{13}$ c. $6\sqrt{2}$ d. $2\sqrt{15}$ e. 8
83. Which of the following equations represents a line that passes through point $(2, -1)$ and $(-4, 3)$?
 a. $3x + 2y = 4$ d. $2x + 3y = 1$
 b. $2x - 3y = 7$ e. $3x - 2y = -18$
 c. $3y - 2x = 1$
84. What is the slope of the line whose equation is $3x - 5y = 10$?
 a. $\frac{3}{5}$ b. $-\frac{3}{5}$ c. $\frac{5}{3}$ d. 2 e. $-\frac{5}{3}$
85. What is an equation of the line perpendicular to the graph of $y = -2x + 5$ that passes through the point at $(4, 7)$?
 a. $x + 2y = 18$ d. $2x - y = 1$
 b. $x - 2y = -5$ e. $x - 2y = -10$
 c. $2x + y = 15$
86. What is the slope of the line passing through the points at $(-5, -2)$ and $(3, 2)$?
 a. 2 b. -2 c. 4 d. $-\frac{1}{2}$ e. $\frac{1}{2}$
87. What is an equation of the line with y -intercept 5 and x -intercept -3 ?
 a. $y = \frac{5}{3}x - 3$ d. $y = \frac{3}{5}x + 5$
 b. $y = \frac{3}{5}x + 3$ e. $y = -\frac{5}{3}x + 5$
 c. $y = \frac{5}{3}x + 5$

- _____ 88. What is the midpoint of \overline{AB} if A has coordinates $(3, -8)$ and B has coordinates $(-5, 2)$?
- a. $(-2, -3)$ b. $(-2, -2)$ c. $(-1, -3)$ d. $(-2, -4)$ e. $(-1, -4)$
- _____ 89. $\triangle ABC$ has vertices $A(4, 7)$, $B(9, 7)$, and $C(7, 3)$. What kind of triangle is $\triangle ABC$?
- a. isosceles b. right c. scalene d. equilateral e. obtuse