Name: _Key_

IB Math Studies
Prior Learning Summer Packet

The following packet represents skills identified as things students should know prior to taking IB Math Studies. You should complete as much as you can WITHOUT a calculator showing work whenever possible. This material is also fair game on any future assessment. It will be due the third day of school.

Answers as well as a pdf copy of this assignment are posted on my website at fchsmrshaley.weebly.com (Go to the Math Studies Tab). Solutions will be posted later this summer. If you need additional help, check out the Prior Learning Chapter on my website or go to **www.khanacademy.org/** . You can type most any topic in the search bar and find help. You can also access the IB Math Studies Formula Booklet on my website as well. Keep in mind you can always access the Internet over the summer at many public places and can get computer access at the New Albany Floyd County Public Library.

Evaluate each expression.

1. $2 \times 3^2 - 3$

$2 \cdot 9 - 3$
$18 - 3$ ⟶ $\boxed{15}$

2. $2(3 + 4 \times 7)$

$2(3 + 28)$
$2(31)$ ⟶ $\boxed{62}$

3. $7 - \frac{x}{y} \times 2$ when $x = 2$ & $y = -3$

$7 - \frac{2}{-3} \cdot 2$
$7 + \frac{2}{3} \cdot 2$
$7 + \frac{4}{3}$ ⟶ $\frac{21}{3} + \frac{4}{3} = \boxed{\frac{25}{3} \text{ or } 8\frac{1}{3}}$

4. $12x^{-2}y^3 + 3(x + y)$ when $x = 2$ & $y = -3$

$\frac{12y^3}{x^2} + 3(x+y)$
$\frac{12(-3)^3}{(2)^2} + 3(2 + -3)$
$\frac{12 \cdot (-27)}{4} + 3(-1)$ ⟶ $-81 + -3$ ⟶ $\boxed{-84}$

Determine the specified value.

5. What is 42% of 7,500?

$7500 \cdot 0.42 =$
$\boxed{3150}$

6. If a $62 shirt is on sale for 20% off, what price do you pay? (Ignore sales tax)

Option 1:
$62 \cdot 0.20 =$
12.40
$62 - 12.40 =$
$\$49.60$

Option 2:
20% off means you pay 80%.
$62 \cdot 0.80 =$
$\boxed{\$49.60}$

7. The rent for an apartment has increased from €2,700 to €3,645 per month. What is the percentage increase?

€ = Euros
$3645 - 2700 = 945$
$\frac{945}{2700} = 0.35 \cdot 100 = \boxed{35\%}$

8. In a store, an item's price is given as ¥44, including tax. The tax rate is 10%. What was the price without tax?

¥ = Yen

Price with tax = price · 110%
$price \cdot 1.10 = 44$
$price = 40$ ⟶ $\boxed{¥ 40}$

Put the values in increasing order.

9. 0.0332, -0.14, 0.1569, 6.3, -0.073	10. $\frac{3}{5}, \frac{7}{13}, \frac{1}{3}, \frac{5}{4}, \frac{1}{6}$ ← common denominators or

9.
$$-0.14, -0.073, 0.0332, 0.1569,$$
$$6.3$$

10. ← Change to decimals

$0.6, 0.538, 0.33, 1.25, 0.167$

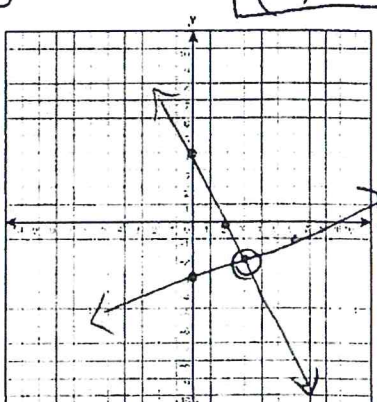$$\frac{1}{6}, \frac{1}{3}, \frac{7}{13}, \frac{3}{5}, \frac{5}{4}$$

Evaluate each scenario.

11. You are making a model of the Queen Elizabeth II (QE2). The ratio of the size of the model to the actual ship is 1:500. The model is approximately 23.1 inches long. What is the length of the actual QE2?	12. If there are 16 girls of 28 students, what is the ratio of boys to girls, in simplest form?

11.
$$\frac{1}{500} = \frac{23.1}{x}$$

$$x = 23.1(500) = \boxed{11,550 \text{ inches}}$$
$$\boxed{962.5 \text{ feet}}$$

12.
$$28 - 16 = 12 \text{ boys}$$

$$12 : 16$$

$$\boxed{3 : 4}$$

Determine if each statement is true or false. If it is false, give a counterexample.

13. The absolute value of a positive number is always negative.	14. The absolute value of a negative number is always positive.	15. $|x| = x$ for every value of x.

13. false

$$|5| = 5$$

14. true

15. false ... if $x = -4$

$$|-4| \neq -4$$

Solve each system of equations by the specified method.

16. Substitution: $\begin{cases} 3x - y = 5 \\ 2x - 3y = -6 \end{cases}$	17. Elimination: $\begin{cases} 6x - 5y = 3 \\ 4x + 2y = -14 \end{cases}$	18. Graphing: $\begin{cases} y = \frac{1}{3}x - 3 \\ 2x + y = 4 \end{cases}$

16.
$$3x - 5 = y$$
$$2x - 3(3x - 5) = -6$$
$$2x - 9x + 15 = -6$$
$$-7x + 15 = -6$$
$$-7x = -21$$
$$x = 3$$
$$3(3) - y = 5$$
$$9 - y = 5 \qquad \boxed{(3, 4)}$$
$$y = 4$$

17.
$$2(6x - 5y = 3) \rightarrow 12x - 10y = 6$$
$$5(4x + 2y = -14) \quad 20x + 10y = -70$$
$$32x = -64$$
$$x = -2$$
$$4(-2) + 2y = -14$$
$$-8 + 2y = -14$$
$$2y = -6$$
$$y = -3$$
$$\boxed{(-2, -3)}$$

18.
$$\boxed{(3, -2)}$$

Solve each equation by factoring.

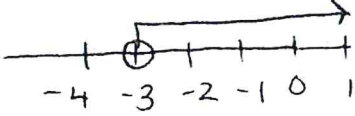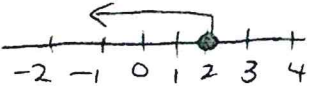| 19. $x^2 + 3x - 18 = 0$	20. $3x^2 - 2x - 8 = 0$
$(x+6)(x-3)=0$ $x=-6 \quad x=3$	$(3x+4)(x-2)=0$ $x=\frac{-4}{3} \quad x=2$
21. $16x^2 - 9 = 0$ $(4x+3)(4x-3)=0$ $x=-3/4 \quad x=3/4$	22. Solve using the Quadratic Formula: $6x^2 - 7x - 3 = 0 \quad a=6 \quad b=-7 \quad c=-3$ $\dfrac{-(-7) \pm \sqrt{(-7)^2 - 4(6)(-3)}}{2(6)} = \dfrac{7 \pm \sqrt{121}}{12}$ $\dfrac{7 \pm 11}{12} = \dfrac{18}{12}$ and $\dfrac{-4}{12} = \dfrac{3}{2}$ and $\dfrac{-1}{3}$

Expand each expression.

23. $6x(2x-7)$	24. $(x-6)^2$	25. $(3x-5)(2x+7)$
$12x^2 - 42x$	$(x-6)(x-6)$ $x^2 - 6x - 6x + 36$ $x^2 - 12x + 36$	$6x^2 + 21x - 10x - 35$ $6x^2 + 11x - 35$

Solve each equation. Give exact answers.

26. $2(3-x) = 22 + 2x$	27. $-3x - 5 = -12x$	28. $\dfrac{2}{x-3} = \dfrac{5}{x+1}$
$6 - 2x = 22 + 2x$ $6 = 22 + 4x$ $-16 = 4x$ $x = -4$	$-5 = -9x$ $x = 5/9$	$2(x+1) = 5(x-3)$ $2x + 2 = 5x - 15$ $2 = 3x - 15$ $17 = 3x \quad x = \dfrac{17}{3}$ or $x = 5\frac{2}{3}$

Solve each inequality. Then graph the solution set on a number line.

29. $-15m < 45$	30. $3x - 2 \geq 7x - 10$
$m > -3$ (number line: open circle at -3, arrow right; marks $-4\ -3\ -2\ -1\ 0\ 1$)	$-4x - 2 \geq -10$ $-4x \geq -8$ $x \leq 2$ (number line: closed circle at 2, arrow left; marks $-2\ -1\ 0\ 1\ 2\ 3\ 4$)

Solve for the specified variable.

31. Solve for C: $F = \dfrac{9}{5}C + 32$	32. Solve for r: $A = \pi r^2$
$F - 32 = \dfrac{9}{5}C$ $\dfrac{5}{9}(F - 32) = C$	$\dfrac{A}{\pi} = r^2$ $\sqrt{\dfrac{A}{\pi}} = r$

Least Common Multiple   Greatest Common Factor

Find the Lowest Common Multiple (LCM) and Highest Common Factor (HCF) of each pair of numbers.

33. 10 & 55	34. 35 & 42
LCM: 110 HCF: 5 (55·2)	LCM: 210 HCF: 7 (42·5)

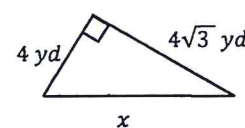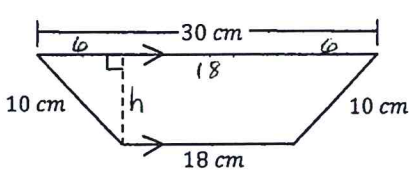*Fill in the appropriate inequality symbol to make each statement true.*

35. $(a > b, c > 0) \Rightarrow ac$ ___ bc positive $>$	36. $(a > b, c < 0) \Rightarrow ac$ ___ bc negative $<$
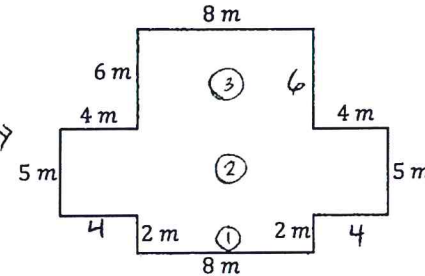
Identify the quadrant in which each point lies.

$$\begin{array}{c|c} II & I \\ \hline III & IV \end{array}$$
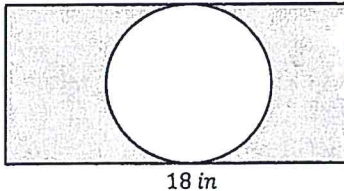
37. (-3, 2) II	38. (-8, -1) III

Determine the specified value.

39. Find the value of x.	40. Find the area.

39. Find the value of x.

4 yd , $4\sqrt{3} \text{ yd}$, x

$a^2 + b^2 = c^2$

$4^2 + (4\sqrt{3})^2 = x^2$

$16 + 16 \cdot 3 = x^2$

$16 + 48 = x^2$

$x^2 = 64$

$\boxed{x = 8 \text{ yd}}$

40. Find the area.

30 cm, 6, 6, 18, 10 cm, h, 10 cm, 18 cm

$h^2 + 6^2 = 10^2$

$h = 8$

trapezoid $= \frac{1}{2} h (b_1 + b_2)$

$= \frac{1}{2} (8)(18 + 30)$

$= 4(48) = \boxed{192 \text{ cm}^2}$

41. Find the perimeter of the below object.

start here

$5 + 4 + 6 + 8 + 6 + \ldots + 4$

8 m, 6 m, (3), 6, 4 m, 4 m, 5 m, (2), 5 m, 4, 2 m, (1), 2 m, 4, 8 m

$\boxed{58 m}$

42. Find the area of the below object.

$A_1 = 2 \cdot 8 = 16$

$A_2 = 5 \cdot (4 + 8 + 4)$

$= 5 \cdot 16 = 80$

$A_3 = 6 \cdot 8 = 48$

$16 + 80 + 48 = \boxed{144 m^2}$

43. Find the circumference of the below circle.

$C = \pi d$

$d = 8 \text{ in}$

$C = \pi \cdot 8$

$\boxed{C = 8\pi \text{ or } 25.1 \text{ in}}$

8 in, 18 in

44. Find the area of the shaded region below.

$A_{Rect} = 8 \cdot 18 = 144$

$A_{Cir} = \pi r^2 = \pi (4)^2$

$= 16\pi$

Shaded... $\boxed{144 - 16\pi \text{ or } 93.7 \text{ in}^2}$

Use the midpoint formula to determine the requested information.

$$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

45. Calculate the midpoint between (8, -13) & (1, -7).

$$\left(\frac{8+1}{2}, \frac{-13+-7}{2}\right) = \left(\frac{9}{2}, \frac{-20}{2}\right)$$

$$\boxed{(4.5, -10)}$$

46. M(2, 4) is the midpoint of $\overline{RS}$. If S has the coordinates (9, 11), find the coordinates of R.

$$\frac{x+9}{2} = 2 \qquad \frac{y+11}{2} = 4 \qquad x = -5 \quad y = -3$$

$$x+9 = 4 \qquad y+11 = 8 \qquad \boxed{(-5, -3)}$$

Calculate the distance between the two given points. $\left(\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}\right)$

47. (-4, 2) & (2, -6)

$$\sqrt{(-4-2)^2 + (2-(-6))^2}$$

$$\sqrt{(-6)^2 + (8)^2} = \sqrt{36+64} = \sqrt{100} = \boxed{10}$$

48. (9, 15) & (5, 12)

$$\sqrt{(9-5)^2 + (15-12)^2}$$

$$\sqrt{4^2 + 3^2} = \sqrt{16+9} = \sqrt{25} = \boxed{5}$$

Write an equation in slope-intercept form for the line which... $y=mx+b$ $\quad m=\frac{y_2-y_1}{x_2-x_1}$ $\quad y-y_1 = m(x-x_1)$

49. ...goes through (3, 12) & (6, 27).

$$\frac{27-12}{6-3} = \frac{15}{3} = 5 \qquad pt\ (3,12)$$

$$y-12 = 5(x-3)$$

$$y-12 = 5x-15 \qquad \boxed{y = 5x-3}$$

50. ...goes through (4, -6) & has a slope of ¾.

$$m = \frac{3}{4} \qquad pt\ (4, -6)$$

$$y+6 = \frac{3}{4}(x-4)$$

$$y+6 = \frac{3}{4}x - 3 \qquad \boxed{y = \frac{3}{4}x - 9}$$

51. ...is parallel to $y = \frac{3}{2}x - 6$ & goes through (-6, 2).

$$m = \frac{3}{2} \qquad pt\ (-6, 2)$$

$$y-2 = \frac{3}{2}(x+6) \qquad y-2 = \frac{3}{2}x+9$$

$$y-2 = \frac{3}{2}x + \frac{18}{2} \rightarrow \qquad \boxed{y = \frac{3}{2}x + 11}$$

52. ...is perpendicular to $5x + 2y = 8$ & goes through (5, 3).

$$2y = -5x + 8$$

$$y = -\frac{5}{2}x + 4$$

$$\perp m = \frac{2}{5}$$

$$pt\ (5, 3)$$

$$y-3 = \frac{2}{5}(x-5)$$

$$y-3 = \frac{2}{5}x - 2$$

$$\boxed{y = \frac{2}{5}x + 1}$$

Simplify each expression so that answers are in lowest terms with no negative exponents.

53. $(x^{11}y^{-2})^4$

$$x^{44}y^{-8} = \frac{x^{44}}{y^8}$$

54. $\frac{-3s^3t^2}{s^{-2}t^8} \Rightarrow \frac{-3s^3s^2t^2}{t^8} = \frac{-3s^5}{t^6}$

55. $4(a^2b^6)^{-3}$

$$4a^{-6}b^{-18} = \frac{4}{a^6b^{18}}$$

56. $\left(\frac{m^4}{-5m^{-2}n^3}\right)^2 = \frac{m^8}{25m^{-4}n^6} = \frac{m^8 \cdot m^4}{25n^6}$

$$\frac{m^{12}}{25n^6}$$

Simplify each expression. Answers should be exact (expressed with square roots) as opposed to in decimal form.

57. $-\sqrt{72}$

$$-\sqrt{36}\sqrt{2}$$

$$\boxed{-6\sqrt{2}}$$

58. $5\sqrt{12} + 9\sqrt{3}$

$$5\sqrt{4}\sqrt{3} + 9\sqrt{3}$$

$$5 \cdot 2\sqrt{3} + 9\sqrt{3} = 10\sqrt{3} + 9\sqrt{3} = \boxed{19\sqrt{3}}$$

59. $\frac{-4\sqrt{10}}{\sqrt{2}}$

$$-4\frac{\sqrt{10}}{\sqrt{2}} = \boxed{-4\sqrt{5}}$$

60. $\sqrt{32} \cdot \sqrt{6}$

$$\sqrt{32 \cdot 6} = \sqrt{192}$$

$$\sqrt{16}\sqrt{2}\sqrt{6} = 4\sqrt{12} = 4\sqrt{4}\sqrt{3} = 4 \cdot 2\sqrt{3}$$

$$\boxed{8\sqrt{3}}$$

Write each number in scientific notation.

61. 8580000	62. 0.00000084
Move 6 places to left 8.58×10^{6}	move 7 places to right 8.4×10^{-7}

Write each number in standard notation.

63. 7.9×10^{4}	64. 4.52×10^{-5}
move 4 places to right $79000 = \boxed{79{,}000}$	move 5 places to left $0.0000452 = \boxed{0.0000452}$