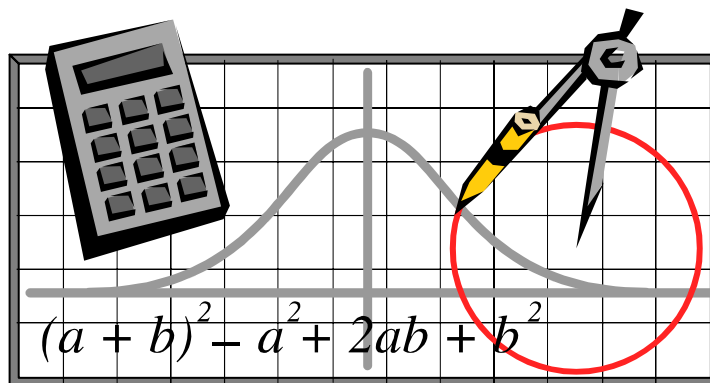


Part C

Advanced Level

(Up to the end of Math 053)



Advanced Level Algebra

Algebraic Expressions*Answers on page C 14***Simplify the following algebraic expressions by combining like terms.**

1. $2xy^2 - 5xy - 3xy^2 + 2xy$

2. $5x - 7(2x - 3) - 4$

3. $\frac{1}{2}(6x + 4) - \frac{2}{3}(3x - 9)$

A summary of the laws of exponents is given below.

$x^1 = x$

$x^0 = 1$ (where $x \neq 0$)

$x^{-n} = \frac{1}{x^n}$

$x^m \cdot x^n = x^{m+n}$

$\frac{x^m}{x^n} = x^{m-n}$

$(x^m)^n = x^{mn}$

Using the above laws, complete the following simplifications.

4. $(3x^2)(5x)(x^2)^3$

5. $\frac{42x^6y^7}{-21x^{10}y^{-3}}$

6. $\left(\frac{4a^{-3}b^2}{-8ab^3}\right)^3$

Linear Equations and Inequalities*Answers on page C 14***Solve each of the following linear equations.**

7. $5x + 7 = 2x - 8$

8. $25 - (x + 1) = 3x$

9. $\frac{3x}{2} + 5 = \frac{x}{3}$

10. $0.2x + 4.9 = 0.7x - 1.3$

Solve each of the following inequalities.

11. $2x \leq x - 8$

12. $3 - 5x \geq x + 12$

13. $-4 < 2x + 2 \leq 8$

Write an algebraic equation or inequality to represent each problem. Then solve the problem using your equation or inequality. Be sure to identify the variable.

14. The sum of two consecutive odd integers is 56. Find the integers.

Let the 1st number = x

Let the 2nd number = $x + 2$

15. Ms. Jones earns a base salary of \$880 per month, plus \$32 for each product that she sells. During November she earned a total of \$5680. How many products did she sell?

16. Tickets for a local concert sold for \$5 and \$8. Jim collected \$499 on the sale of 80 tickets. How many of each type did he sell?

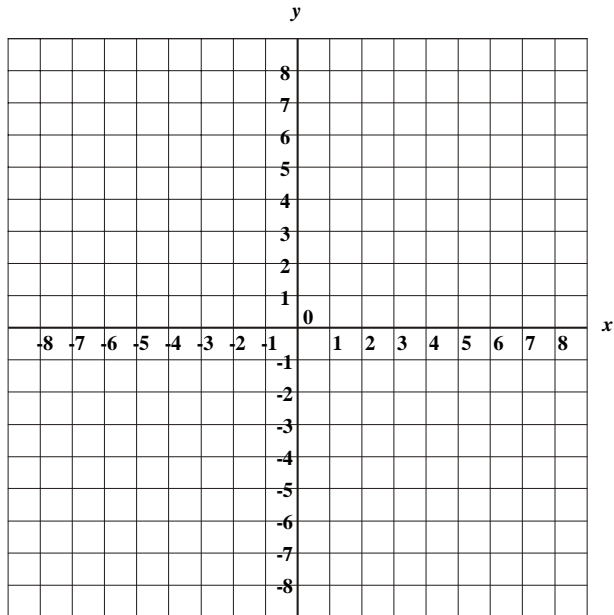
17. You have \$20,000 to invest. You invest part of this at 6% interest and the rest at 8%. What is the most you can invest at 6% to earn at least \$1440 interest?

Graphing of Linear Equations and Inequalities *Answers on page C 14, 15*

Graph each of the following.

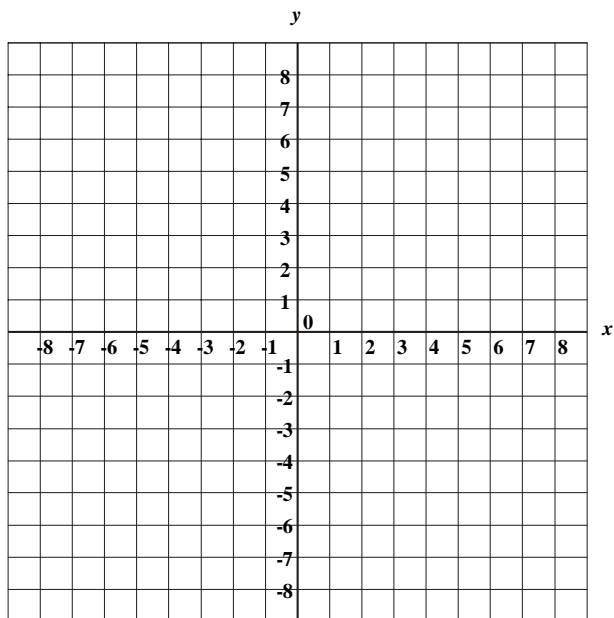
18. $y = \frac{1}{2}x - 4$

x	y



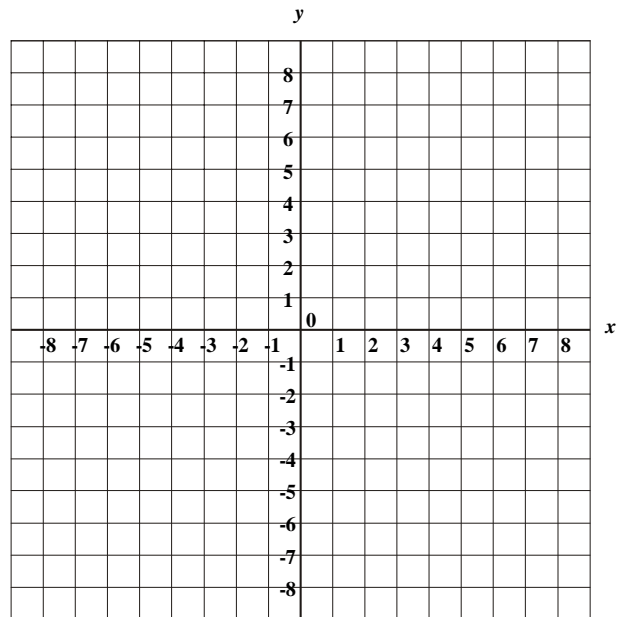
19. $3x + 2y = 6$

x	y



20. $2y > 6x + 4$

x	y



Systems of Equations

Answers on page C 16

A solution of a system of equations in two variables is an ordered pair of numbers that makes both equations true.

Solve the following systems of equations

21. $x + y = 4$
 $x - y = 2$

22. $y = 7 - x$
 $2x - y = 8$

23. $5x + 3y = 17$
 $-5x + 2y = 3$

Factoring Polynomials*Answers on page C 16***Factor each of the following**

24. $x^2 + 10x + 25$

25. $3x^4 - 12$

26. $15x^2 + 7x - 2$

27. $8x^3 + 125$

Rational Expressions and Equations*Answers on page C 16***Simplify**

28. $\frac{x^4}{3x+6} \cdot \frac{5x+10}{5x^2}$

29. $\frac{y^2-9}{y+2} \div \frac{y+3}{y+2}$

30. $\frac{3x}{7} + \frac{2y}{3x}$

31. $\frac{a}{a+3} - \frac{a-4}{a}$

Solve each equation

32.
$$\frac{4}{5} + \frac{x}{3} = \frac{x}{5}$$

33.
$$\frac{3}{y+1} = \frac{2}{y-3}$$

34.
$$\frac{50}{x} - \frac{50}{x-2} = \frac{4}{x}$$

Solve each problem using an algebraic equation

35. A tank can be filled in 18 hours by pipe A alone and in 22 hours by pipe B alone. How long will it take to fill the tank if both pipes are in operation?

36. The speed of a river is 5 km per hour. A boat travels 7 km upstream in the same time as it takes to travel 16 km downstream. What would be the speed of the boat in still water?

Radical Expressions and Equations*Answers on page C 16***Simplify by combining like radical terms**

37. $2\sqrt{3} - 5\sqrt{5} + 4\sqrt{3} - 2\sqrt{5}$

38. $3\sqrt{45} + 3\sqrt{5}$

39. $\sqrt{25x-25} - \sqrt{9x-9}$

Multiply and simplify the following

40. $\sqrt{5} (2 + 3\sqrt{5})$

41. $(2 - \sqrt{3}) (2 + \sqrt{3})$

42. $(\sqrt{5} + \sqrt{2}) (2\sqrt{5} - 3\sqrt{2})$

Simplify

43. $\sqrt{16x^4}$

44. $\sqrt[3]{-8}$

45. $\sqrt[8]{(-2)^8}$

Solve each equation

46. $\sqrt{x} - 7 = 3$

47. $x + 1 = 3\sqrt{x - 1}$

48. $\sqrt{5x - 3} = \sqrt{2x + 3}$

Quadratic Equations

Answers on page C 16, 17

The quadratic formula below is important; be sure to remember it.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solve each of the following quadratic equations

49. $x^2 - 6x + 9 = 0$

50. $x^2 - 2x - 5 = 0$

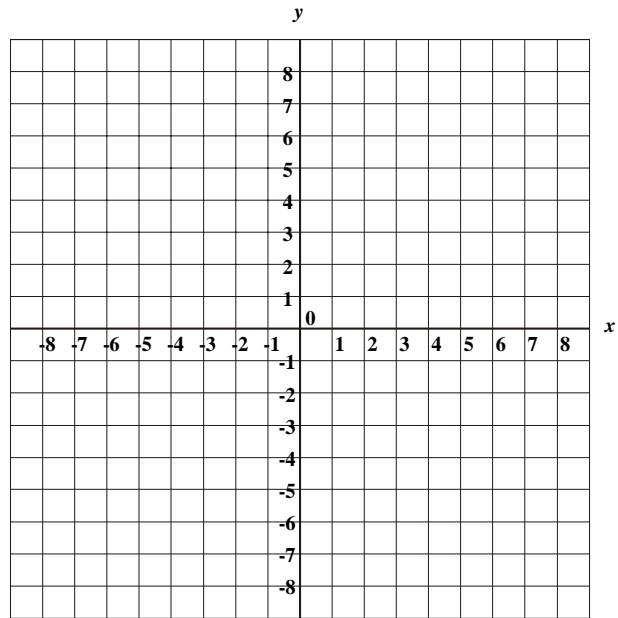
51. $4x^2 + 5x - 6 = 0$

52. $\frac{x + 3}{x} = \frac{x - 4}{3}$

Graph each of the following equations

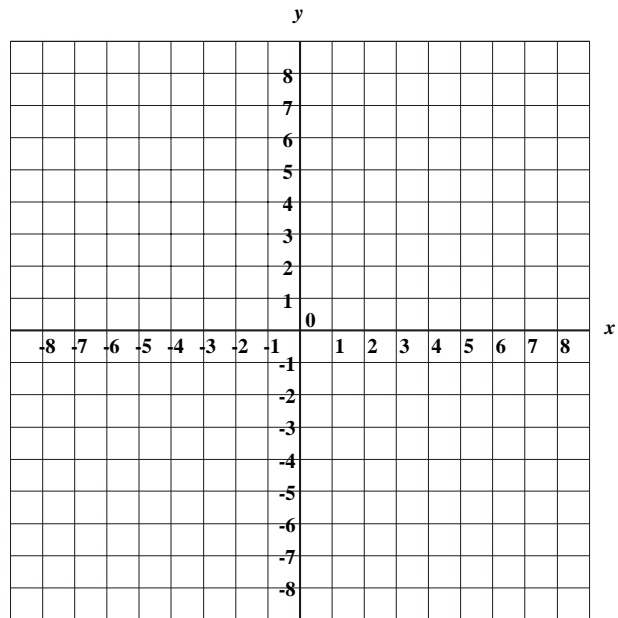
53. $y = (x + 2)^2 - 3$

x	y



54. $y = -2(x - 1)^2 + 1$

x	y



Functions*Answers on page C 17*

Given $f(x) = x^2 - 2x$ and $g(x) = 3x + 2$, find the following

55. $f(-2)$

56. $g\left(\frac{1}{3}\right)$

57. $(f + g)(x)$

Advanced Level Trigonometry

Trigonometric Ratios

The trigonometric ratios are

$$\sin = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan = \frac{\text{opposite}}{\text{adjacent}}$$

The Law of Sines is

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

The Law of Cosines is

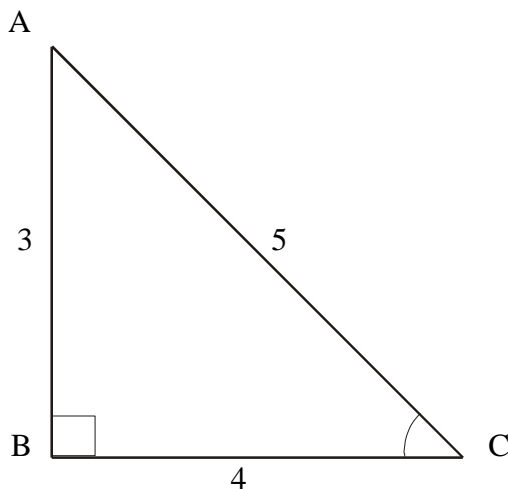
$$c^2 = a^2 + b^2 - 2ab \cos C$$

Exercises

Answers on page C 18

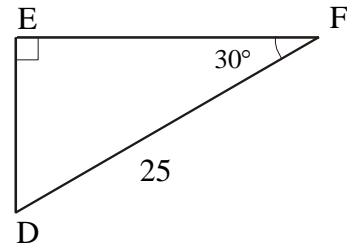
Use the above information to answer the following questions

58. Find the measure of $\angle ACB$

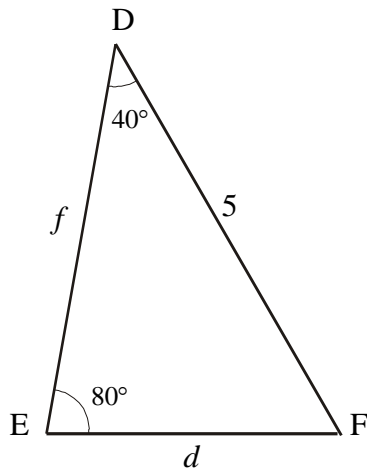


59. Find the length of \overline{EF} .

$$\overline{EF} =$$



60. Solve the $\triangle DEF$ by finding the measure of each of those sides and angles whose quantity is not given and is represented only by letter.



$$\angle F =$$

$$f =$$

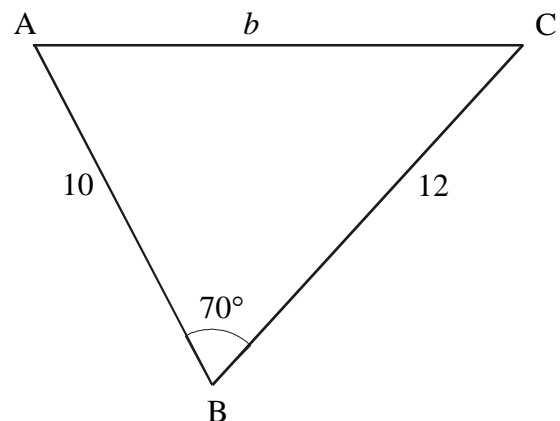
$$d =$$

61. Solve the $\triangle ABC$ by finding the measure of each of those sides and angles represented only by letter.

$$b =$$

$$\angle A =$$

$$\angle C =$$



Answers

Algebraic Expressions

1. $-xy^2 - 3xy$ 2. $17 - 9x$ 3. $x + 8$ 4. $15x^9$
5. $-2x^{-4}y^{10}$ or $\frac{-2y^{10}}{x^4}$ 6. $-\frac{1}{8a^{12}b^3}$

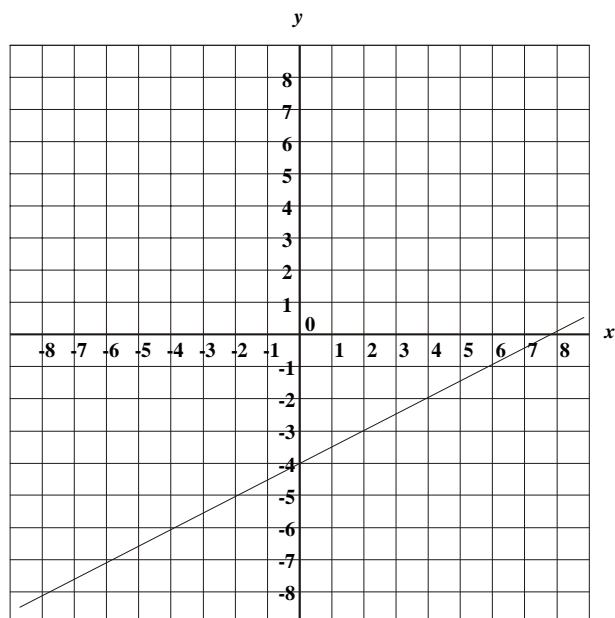
Linear Equations and Inequalities

7. $x = -5$ 8. $x = 6$ 9. $x = -\frac{30}{7}$ 10. $x = 12.4$
11. $x \leq -8$ 12. $x \leq -\frac{3}{2}$ 13. $-3 < x \leq 3$
14. $n + n + 2 = 56$ the numbers are 27 and 29
15. $880 + 32n = 5680$ number of products sold is 150
16. $5n + 8(80 - n) = 499$ 47 tickets @ \$5 and 33 tickets @ \$8
17. $6\%n + 8\%(20,000 - n) \geq 1440$ \$8,000 max.

Graphing of Linear Equations and Inequalities

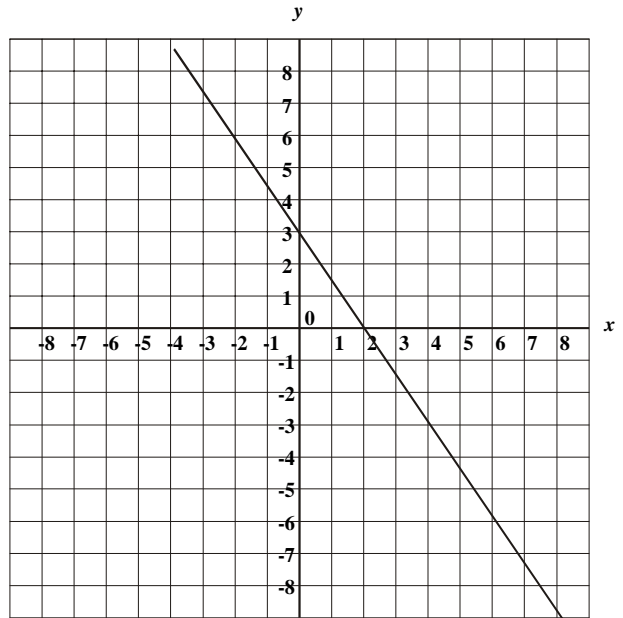
18. $y = \frac{1}{2}x - 4$

x	y
0	-4
2	-3
4	-2



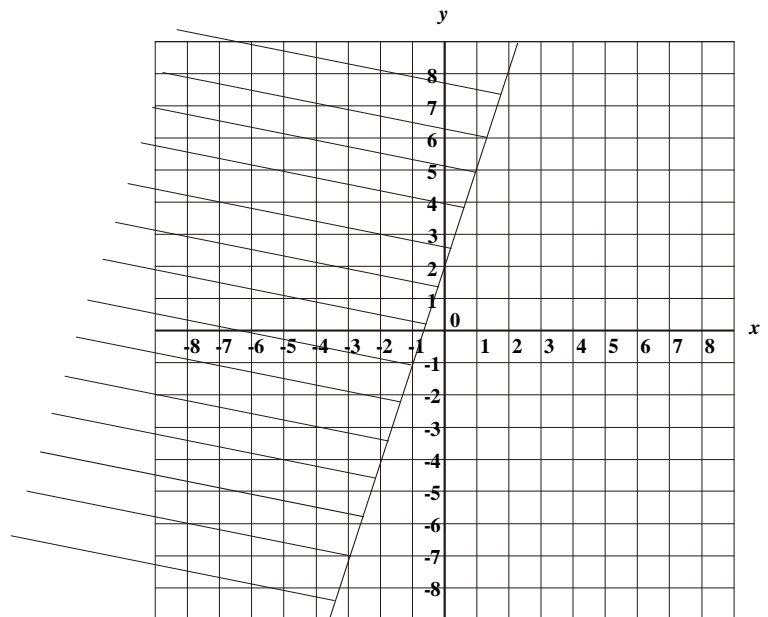
19. $3x + 2y = 6$

x	y
2	0
1	1.5
0	3



20. $2y > 6x + 4$

x	y
1	5
0	2
-1	-1
-2	-4



Systems of Equations

21. (3, 1)

22. (5, 2)

23. (1, 4)

Factoring Polynomials

24. $(x + 5)(x + 5)$ or $(x + 5)^2$

25. $3(x^4 - 4) = 3(x^2 + 2)(x^2 - 2)$

26. $(3x + 2)(5x - 1)$

27. $(2x + 5)(4x^2 - 10x + 25)$

Rational Expressions and Equations

28. $\frac{x^2}{3}$

29. $y - 3$

30. $\frac{9x^2 + 14y}{21x}$

31. $\frac{a + 12}{a(a + 3)}$

32. $x = -6$

33. $y = 11$

34. $x = -23$

35. $\frac{1}{18} + \frac{1}{22} = \frac{1}{t}$

time is $9\frac{9}{10}$ hours or 9 hours and 54 minutes

36. $\frac{7}{s-5} = \frac{16}{s+5}$

speed is 12.8 km per hour

Radical Expressions and Equations

37. $6\sqrt{3} - 7\sqrt{5}$

38. $12\sqrt{5}$

39. $2\sqrt{x-1}$

40. $2\sqrt{5} + 15$

41. $4 - 3 = 1$

42. $4 - \sqrt{10}$

43. $4x^2$

44. -2

45. 2

46. $x = 100$

47. $x = 2$ or 5

48. $x = 2$

Quadratic Equations

49. $x = 3$

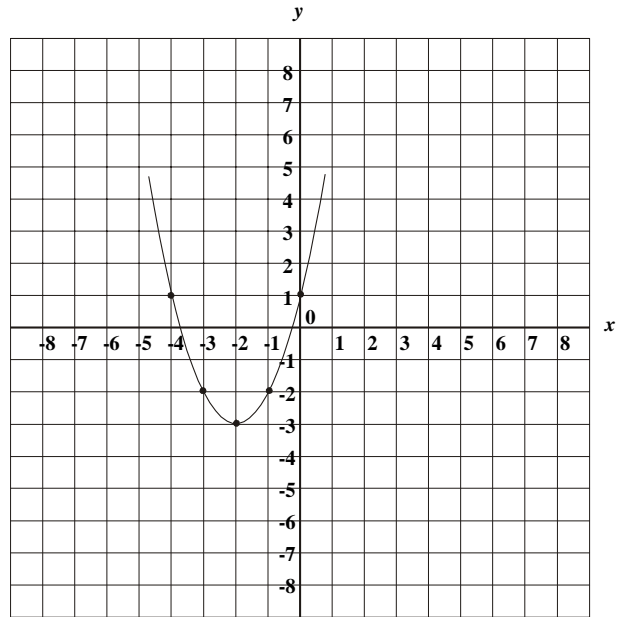
50. $x = 1 \pm \sqrt{6}$ or 3.45 and -1.45

51. $x = \frac{3}{4}$ or -2

52. $x = \frac{7 \pm \sqrt{85}}{2}$ or 8.1 and -1.1

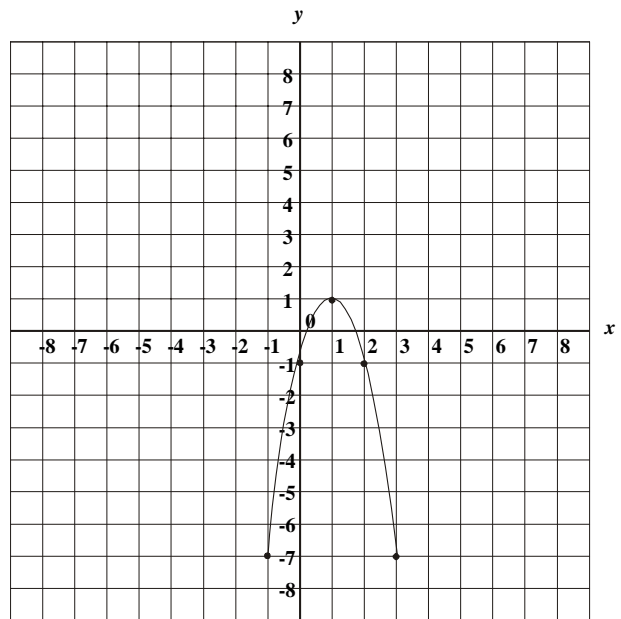
53. $y = (x + 2)^2 - 3$

x	y
0	1
-1	-2
-2	-3
-3	-2
-4	1



54. $y = -2(x - 1)^2 + 1$

x	y
2	-1
1	1
0	-1
-1	-7
3	-7



Functions

55. 8

56. 3

57. $x^2 + x + 2$

Trigonometric Ratios

58. the measure of $\angle ACB = 36.9^\circ$

59. the measure of $\overline{EF} = 21.7$ (units)

60. $\angle F = 180^\circ - (80^\circ + 40^\circ) = 60^\circ$

$$\frac{d}{\sin 40^\circ} = \frac{5}{\sin 80^\circ} \quad d = 3.3$$

$$\frac{f}{\sin 60^\circ} = \frac{5}{\sin 80^\circ} \quad f = 4.4$$

61. $b^2 = 12^2 + 10^2 - 2 \times 12 \times 10 \times \cos 70^\circ$

$$b = 12.725$$

$$\frac{12}{\sin A} = \frac{12.725}{\sin 70^\circ}$$

$$\angle A = 62.4^\circ$$

$$\angle C = 180^\circ - (70^\circ + 62.4^\circ) = 47.6^\circ$$

Tables of Trigonometric Ratios

Angle	tan	sin	cos	Angle	tan	sin	cos
1°	0.017	0.017	1.000	46°	1.036	0.719	0.695
2°	0.035	0.035	0.999	47°	1.072	0.731	0.682
3°	0.052	0.052	0.999	48°	1.111	0.743	0.669
4°	0.070	0.070	0.998	49°	1.150	0.755	0.656
5°	0.087	0.087	0.996	50°	1.192	0.766	0.643
6°	0.105	0.105	0.995	51°	1.235	0.777	0.629
7°	0.123	0.122	0.993	52°	1.280	0.788	0.616
8°	0.141	0.139	0.990	53°	1.327	0.799	0.602
9°	0.158	0.156	0.988	54°	1.376	0.809	0.588
10°	0.176	0.174	0.985	55°	1.428	0.819	0.574
11°	0.194	0.191	0.982	56°	1.483	0.829	0.559
12°	0.213	0.208	0.978	57°	1.540	0.839	0.545
13°	0.231	0.225	0.974	58°	1.600	0.848	0.530
14°	0.249	0.242	0.970	59°	1.664	0.857	0.515
15°	0.268	0.259	0.966	60°	1.732	0.866	0.500
16°	0.287	0.276	0.961	61°	1.804	0.875	0.485
17°	0.306	0.292	0.956	62°	1.881	0.883	0.469
18°	0.325	0.309	0.951	63°	1.963	0.891	0.454
19°	0.344	0.326	0.946	64°	2.050	0.899	0.438
20°	0.364	0.342	0.940	65°	2.145	0.906	0.423
21°	0.384	0.358	0.934	66°	2.246	0.914	0.407
22°	0.404	0.375	0.927	67°	2.356	0.921	0.391
23°	0.424	0.391	0.921	68°	2.475	0.927	0.375
24°	0.445	0.407	0.914	69°	2.605	0.934	0.358
25°	0.466	0.423	0.906	70°	2.748	0.940	0.342
26°	0.488	0.438	0.899	71°	2.904	0.946	0.326
27°	0.510	0.454	0.891	72°	3.078	0.951	0.309
28°	0.532	0.469	0.883	73°	3.271	0.956	0.292
29°	0.554	0.485	0.875	74°	3.487	0.961	0.276
30°	0.577	0.500	0.866	75°	3.732	0.966	0.259
31°	0.601	0.515	0.857	76°	4.011	0.970	0.242
32°	0.625	0.530	0.848	77°	4.332	0.974	0.225
33°	0.649	0.545	0.839	78°	4.705	0.978	0.208
34°	0.675	0.559	0.829	79°	5.145	0.982	0.191
35°	0.700	0.574	0.819	80°	5.671	0.985	0.174
36°	0.727	0.588	0.809	81°	6.314	0.988	0.156
37°	0.754	0.602	0.799	82°	7.115	0.990	0.139
38°	0.781	0.616	0.788	83°	8.144	0.993	0.122
39°	0.810	0.629	0.777	84°	9.514	0.995	0.105
40°	0.839	0.643	0.766	85°	11.430	0.996	0.087
41°	0.869	0.656	0.755	86°	14.301	0.998	0.070
42°	0.900	0.669	0.743	87°	19.081	0.999	0.052
43°	0.933	0.682	0.731	88°	28.636	0.999	0.035
44°	0.966	0.695	0.719	89°	57.290	1.000	0.017
45°	1.000	0.707	0.707				

Tables of Squares & Square Roots

n	n^2	\sqrt{n}
1	1	1.000
2	4	1.414
3	9	1.732
4	16	2.000
5	25	2.236
6	36	2.449
7	49	2.646
8	64	2.828
9	81	3.000
10	100	3.162
11	121	3.317
12	144	3.464
13	169	3.606
14	196	3.742
15	225	3.873
16	256	4.000
17	289	4.123
18	324	4.243
19	361	4.359
20	400	4.472
21	441	4.583
22	484	4.690
23	529	4.796
24	576	4.899
25	625	5.000
26	676	5.099
27	729	5.196
28	784	5.292
29	841	5.385
30	900	5.477
31	961	5.568
32	1024	5.657
33	1089	5.745
34	1156	5.831
35	1225	5.916
36	1296	6.000
37	1369	6.083
38	1444	6.164
39	1521	6.245
40	1600	6.325
41	1681	6.403
42	1764	6.481
43	1849	6.557
44	1936	6.633
45	2025	6.708
46	2116	6.782
47	2209	6.856
48	2304	6.928
49	2401	7.000
50	2500	7.071

n	n^2	\sqrt{n}
51	2601	7.141
52	2704	7.211
53	2809	7.280
54	2916	7.348
55	3025	7.416
56	3136	7.483
57	3249	7.550
58	3364	7.616
59	3481	7.681
60	3600	7.746
61	3721	7.810
62	3844	7.874
63	3969	7.937
64	4096	8.000
65	4225	8.062
66	4356	8.124
67	4489	8.185
68	4624	8.246
69	4761	8.307
70	4900	8.367
71	5041	8.426
72	5184	8.485
73	5329	8.544
74	5476	8.602
75	5625	8.660
76	5776	8.718
77	5929	8.775
78	6084	8.832
79	6241	8.888
80	6400	8.944
81	6561	9.000
82	6724	9.055
83	6889	9.110
84	7056	9.165
85	7225	9.220
86	7396	9.274
87	7569	9.327
88	7744	9.381
89	7921	9.434
90	8100	9.487
91	8281	9.539
92	8464	9.592
93	8649	9.644
94	8836	9.695
95	9025	9.747
96	9216	9.798
97	9409	9.849
98	9604	9.899
99	9801	9.950
100	10000	10.000