T M S C A H I G H S C O O L

M A T H E M A T I C S

T E S T # 8 ©

J A N U A R Y 1 9 , 2 0 1 3

GENERAL DIRECTIONS

1. About this test:
   A. You will be given 40 minutes to take this test.
   B. There are 60 problems on this test.
2. All answers must be written on the answer sheet/Scantron form/Chatsworth card provided. If you are using an answer sheet, be sure to use **BLOCK CAPITAL LETTERS**. Clean erasures are necessary for accurate grading.
3. If using a scantron answer form, be sure to correctly denote the number of problems not attempted.
4. You may write anywhere on the test itself. You must write only answers on the answer sheet.
5. You may use additional scratch paper provided by the contest director.
6. All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
7. Calculators used on this test must be conform to the UIL standards. Graphing calculators are allowed. Calculators need not be cleared.
8. All problems answered correctly are worth **SIX** points. **TWO** points will be deducted for all problems answered incorrectly. No points will be added or subtracted for problems not answered.
9. In case of ties, percent accuracy will be used as a tie breaker.

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA TMSCA

2012-2013 TMSCA High School Mathematics

1. What is 36% of the sum of $\frac{1}{3}$ and $\frac{2}{9}$?

   (A) $\frac{9}{25}$ (B) $\frac{125}{81}$ (C) 81 (D) $\frac{81}{125}$ (E) $\frac{1}{5}$

2. Events A and B are independent such that $P(B)=4P(A)$ and $P(A\cup B)=0.84$. Find $P(A)$.

   (A) 0.46 (B) 0.80 (C) 0.24 (D) 0.20 (E) 0.96

3. Let *y* vary directly with x^2+11. If $y=72.9$ when $x=4$, find *y* when $x=1$.

   (A) 34.99 (B) 151.88 (C) 18.23 (D) 32.40 (E) 151.46

4. Find the *y*-intercept of the line containing $(7,3)$ and perpendicular to $5x-4y+11=0$.

   (A) $(8.6,0)$ (B) $(10.75,0)$ (C) $(0,10.75)$ (D) $(0,8.6)$ (E) $(0,-10.5)$

5. Given the sequence 2, 6, 15, 32, 65,…, 440, *k*, 1440 find the value of *k*.

   (A) 1040 (B) 940 (C) 1353 (D) 801 (E) 678

6. If $\int_2^k \frac{1}{x+2}dx=\ln 2$, find the value of *k*.

   (A) 6 (B) 8 (C) 0 (D) 2 (E) 4

7. The first term of an infinite geometric sequence is 75, while the third term is 27. The sequence has two possible sums. The larger possible sum is

   (A) 153 (B) 117.188 (C) 187.500 (D) 46.875 (E) 55.147

8. A box is designed in the shape of a pentagonal prism to ship a decorative fountain. If the perimeter of the base is $2\frac{2}{9}$ yards, what is the length of the longest support that will fit in the box parallel to the base?

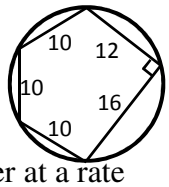
   (A) 25.89 in (B) 129.44 in (C) 144.66 in (D) 89.40 in (E) 30.61 in

9. Three brothers can dig a hole 6ft x 3ft x 2ft in one hour. How long would it take six brothers to dig a new hole that is three times as long, wide and deep if they each work at the same rate as the first three?

   (A) 13 hr 5 min (B) 2 hr (C) 2 hr 30 min (D) 13 hr 30 min (E) 20 hr 30 min

10. Find the area of the pentagon inscribed in the circle on the right.

    (A) $96+75\sqrt{3}$ (B) $171\sqrt{3}$ (C) $171\sqrt{2}$ (D) $96+100\sqrt{2}$ (E) $96+100\sqrt{3}$



11. A right conical tank with a base diameter of 2 yards and a height of 41 inches is filling with water at a rate of 3.1 gal/min. How long will it take to fill?

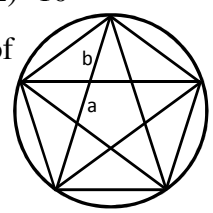
    (A) 932.44 min (B) 233.11 min (C) 310.82 min (D) 77.70 min (E) 60.58 min

12. Given that $(a+4i)(b+i)=17-31i$, where $a,b\in\mathbb{Z}$, find the value of $a+b$.

    (A) 3 (B) 4 (C) -7 (D) 7 (E) -10

13. A regular pentagon is inscribed in a circle and the diagonals are drawn. What is the ratio of the lengths *b* to *a*?

    (A) $\frac{\pi}{2}$ (B) e (C) φ (D) π (E) ε



14. Given $y = -2\cos x$, find the value of x for which $\frac{dy}{dx} = \frac{dx}{dy}$, where $0 \le x \le \frac{\pi}{2}$

(A) 0 (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{6}$ (E) π

15. Given the pyramid at right, the fourth number in the 14th row is the sum of the first ____ triangular numbers.

(A) 11 (B) 12 (C) 13 (D) 14 (E) 10

1
1 1
1 2 1
1 3 3 1

16. The measure of one interior angle of a regular dodecagon is

(A) 108° (B) 144° (C) 136° (D) 150° (E) 156°

17. Given $f(x) = 6x^3 - 11x^2 + kx + 105$, find k if $(x+3)$ is a factor of $f(x)$.

(A) -14 (B) -52 (C) -26 (D) -156 (E) -6

18. A fair six-sided die with sides labeled 1, 1, 2, 3, 3, 6 is thrown. What is the expected value of a single roll?

(A) 2 (B) $\frac{8}{3}$ (C) 3 (D) $\frac{11}{6}$ (E) $\frac{5}{2}$

19. Find the total area of the two regions enclosed by the curves $y = x^3 - 4x^2 + x - 12$ and $y = 6x - 14$.

(A) 28.58 (B) 78.08 (C) 111.42 (D) 53.33 (E) 66.86

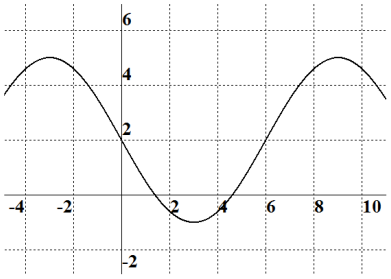
20. $\cos x + \sin x \tan x =$

(A) $\sec x$ (B) $\cos x$ (C) $\cot x$ (D) $\csc x$ (E) $\sin x$

21. A circle is inscribed in a triangle. The center of the circle is the ____ of the triangle.

(A) centroid (B) circumcenter (C) incenter (D) orthocenter (E) foci

22. If the equation of the function graphed below is $y = a\sin bx + c$, find the value of $a \cdot b \cdot c$.



(A) $\frac{\pi}{6}$ (B) $-\pi$ (C) $-\frac{\pi}{6}$ (D) $\frac{\pi}{3}$ (E) π

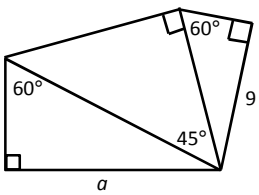
23. Carrie's drives to work every weekday on the highway. Her average daily speeds for the week are 68 mph, 68 mph, 57 mph, 65 mph, and 66 mph. What is her average speed for the week?

(A) 63.36 mph (B) 64.52 mph (C) 63.48 mph (D) 64.8 mph (E) 63.75 mph

24. Carries Ice Cream Shop has nine flavors of ice cream and three types of cones. How many distinct 2-scoop cones can be ordered?

(A) 108 (B) 165 (C) 45 (D) 55 (E) 135

25. Find the value of a on the picture to the right.



(A) $6\sqrt{6}$ (B) $\frac{27\sqrt{2}}{2}$ (C) $6\sqrt{3}$ (D) $3\sqrt{6}$ (E) $9\sqrt{2}$

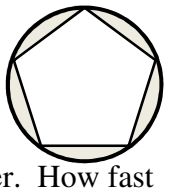
26. $\sum_{n=1}^{10}\left[n(n+1)\right] =$

(A) 245 (B) 110 (C) 55 (D) 440 (E) 385

27. Let $a_1 = 3$, $a_2 = -2$, and $a_n = 2(a_{n-1})(-a_{n-2})$. Find a_5.

(A) 284 (B) -576 (C) -288 (D) 1728 (E) -1152

28. A regular pentagon is inscribed in a circle with a radius of 8 cm. Find the area of the shaded region.



(A) 160.45 cm^2 (B) 101.90 cm^2 (C) 9.65 cm^2 (D) 48.89 cm^2 (E) 75.40 cm^2

29. A fish is reeled in at a rate of 2 feet per second from a point 7 feet above the surface of the water. How fast is the angle between the line and the water changing when there are 25 feet of line out?

(A) $\frac{7}{150}$ rad/sec (B) $\frac{7}{300}$ rad/sec (C) $-\frac{7}{600}$ rad/sec (D) $\frac{7}{600}$ rad/sec (E) $-\frac{7}{300}$ rad/sec

30. If a hiker travels 6 miles on a bearing of 12°, then another 5 miles on a bearing of 334°, what is the shortest distance back to his starting point?

(A) 10.00 miles (B) 2.26 miles (C) 10.06 miles (D) 13.06 miles (E) 10.41 miles

31. If $f(x) = 2\cos^2 x$, $g(x) = x^2 + 9$, and $h(x) = g(f'(x))$, find $h\left(\frac{\pi}{6}\right)$.

(A) 21.00 (B) 9.25 (C) 18.00 (D) 13.91 (E) 12.00

32. The total surface area of an octahedron is $64\sqrt{3}$ cm^2. Find the length of one edge?

(A) $8\sqrt{2}$ in (B) $4\sqrt{3}$ in (C) $4\sqrt{2}$ in (D) $2\sqrt{3}$ in (E) $8\sqrt{3}$ in

33. The point $(2,-7)$ is reflected over the *x*-axis, reflected over the line $y = x$, rotated 270° clockwise around the origin, then shifted down three units to the point (a,b). Find $a+b$.

(A) 2 (B) -12 (C) -7 (D) -5 (E) -9

34. Which of the following is not a solution to $f(x) \geq \left|25 - \sqrt{x^2}\right|$?

(A) $(-3,22)$ (B) $(-8,18)$ (C) $(9,14)$ (D) $(0,30)$ (E) $(4,21)$

35. If $f(x) = x + 7$, $g(x) = 9 - 4x$ and $h(x) = \frac{f(x)}{g(x)}$, find $h^{-1}(1)$.

(A) -0.25 (B) 1.48 (C) -0.67 (D) -0.58 (E) 0.4

36. The probability of rolling each number one through six on a weighted die is shown in the table below. Find the expected value of a single roll.

x	1	2	3	4	5	6
$p(x)$	$\frac{1}{3}$	$\frac{1}{12}$	k	$\frac{5}{24}$	$\frac{1}{12}$	$\frac{1}{6}$

(A) 1 (B) $\frac{7}{2}$ (C) $\frac{9}{2}$ (D) $\frac{11}{4}$ (E) $\frac{25}{8}$

37. If $f(x) = 2x^3 + ax^2 + bx + c$ and $f(x)$ has zeroes at -5, -7, and 3, find $a+b+c$.

(A) -95 (B) -190 (C) -23 (D) -194 (E) -97

38. Which of the following is closed under subtraction?
I. natural numbers II. irrational numbers III. real numbers IV. odd integers
(A) I & III (B) I, III & IV (C) III (D) IV (E) none of these

39. What is the equation of a line through $(5,14)$ that is normal to $x^2 - y = 11$?
(A) $10x - y - 36 = 0$ (B) $x + 10y - 145 = 0$ (C) $x + 10y - 19 = 0$ (D) $10x - y + 9 = 0$ (E) $x - 10y + 19 = 0$

40. The school day at Austin Elementary School begins at 8:25 am and ends at 4:15 pm. How many degrees does the minute hand on the clock in the cafeteria move during one school day?
(A) 2650° (B) 235° (C) 1290° (D) 2580° (E) 2820°

41. $\int (\cos^2 x - \sin^2 x)\,dx =$ _____ $+ C$, where C is some arbitrary constant.
(A) $\frac{\cos^3 x}{3} - \frac{\sin^3 x}{3}$ (B) $-2(\sin x + \cos x)$ (C) $\sin x \cos x$ (D) x (E) $-\frac{\sin 2x}{2}$

42. The average life of a color TV is 9 years with a standard deviation of 1.75 years before it breaks. Suppose that a company guarantees color TVs and will replace a TV that breaks while under guarantee with a new one. How long should the company set the guarantee if they do not want to replace more than 5% of TVs?
(A) 6.1 years (B) 5.9 years (C) 5.5 years (D) 6.5 years (E) 6.3 years

43. There are seven boys and five girls on the student council. Their sponsor is asked to select three boys and three girls to attend a community luncheon. How many different groups could the sponsor choose?
(A) 350 (B) 45 (C) 12600 (D) 315 (E) 6300

44. A seasoned basketball player makes 45% of her free throws. She shoots free throws 4 times during a Friday game. What is the probability that she makes at least 2 of them?
(A) 0.241 (B) 0.368 (C) 0.543 (D) 0.609 (E) 3.223

45. $f(x) = (x-2) - \frac{(x-2)^3}{3!} + \frac{(x-2)^5}{5!} - \frac{(x-2)^7}{7} \ldots$. Find the 10^{-8} place of $f(4)$.
(A) 0 (B) 6 (C) 9 (D) 5 (E) 2

46. A furniture store is running a sale on dining chairs. The original price of each chair is \$128. During the sale, customers receive a 10% discount on the first chair they buy, 20% on the second, 30% on the third and so on with a limit of six per customer. How much would a customer pay for a set of six chairs if the tax is 8.25%?
(A) \$563.42 (B) \$580.75 (C) \$503.32 (D) \$623.52 (E) \$540.38

47. How many numbers in the form a^4, where $a \in \mathbb{Z}^+$ divide $3! \times 4! \times 7!$?
(A) 2 (B) 3 (C) 5 (D) 6 (E) none

48. What is the area of a triangle with side lengths 8 inches, 11 inches, and 17 inches?
(A) 8.37 in^2 (B) 44.00 in^2 (C) 35.50 in^2 (D) 26.00 in^2 (E) 39.75 in^2

49. The faces of an icosahedron are regular
(A) hexagons (B) squares (C) pentagons (D) triangles (E) octagons

50. Express $\log(100\sqrt{ab})$ in terms of P and Q if $P = \log a$ and $Q = \log b$.
(A) $20PQ$ (B) $100P + \frac{1}{2}Q$ (C) $50P + \frac{1}{2}Q$ (D) PQ (E) $\frac{1}{2}(P+Q) + 2$

51. The sum of the first ten terms of an arithmetic sequence is 665 and the sum of the first twenty terms is 2430. Find the common difference of the sequence.
(A) 13 (B) 17 (C) 15 (D) 11 (E) 12

52. At which of the following x-values is the graph of $f(x) = x^4 - 12x^3 + 48x^2 - 64x$ concave down?
(A) 3 (B) 4 (C) 2 (D) 1 (E) 5

53. If $\cos\theta = -\frac{7}{25}$ and $\pi \le \theta \le 2\pi$, then $\tan\theta =$
(A) $-\frac{24}{25}$ (B) $\frac{24}{7}$ (C) $-\frac{24}{7}$ (D) $\frac{7}{24}$ (E) $-\frac{7}{24}$

54. The line $3x + 2y = 39$ forms a chord with the circle $x^2 + y^2 + 4x - 6y - 156 = 0$. Find the length of the chord.
(A) 13 (B) $2\sqrt{39}$ (C) $\sqrt{195}$ (D) $4\sqrt{13}$ (E) 12

55. An investment is made in a fund that pays an annual percentage rate of 6%, compounded monthly. How long (to the nearest tenth of a year) will it take for the investment to double?
(A) 11.9 (B) 11.3 (C) 11.6 (D) 11.0 (E) 11.7

56. In town A, during a one week period, the probability that it is cloudy on any particular day is 0.35. If it is cloudy, the chance of rain is 0.72. What is the probability that it will rain at least once during the week?
(A) 0.131 (B) 0.869 (C) 0.999 (D) 0.855 (E) 0.900

57. What is the area of the largest isosceles triangle that can be inscribed in a circle with the equation $x^2 + y^2 + 6x + 10y - 87 = 0$?
(A) $\frac{121\sqrt{3}}{16}$ (B) $\frac{363\sqrt{3}}{16}$ (C) $\frac{121\sqrt{3}}{4}$ (D) $\frac{363}{4}$ (E) $\frac{363\sqrt{3}}{4}$

58. Find the constant term in the expansion of $\left(2x^2 - \frac{3}{x}\right)^9$.
(A) 19683 (B) -145152 (C) 979776 (D) 489888 (E) -326592

59. How many distinct arrangements are there of three letters chosen from the word COMBINATION?
(A) 165 (B) 990 (C) 399 (D) 133 (E) 495

60. If $\frac{x-8}{x+3} + \frac{x+3}{x-8}$ is equal to the mixed number $A\frac{B}{(x+3)(x-8)}$, then $B =$
(A) 64 (B) 8 (C) 121 (D) 24 (E) 9

2012-2013 TMSCA High School Mathematics Test 8 Key

1. E	21. C	41. C
2. D	22. B	42. A
3. D	23. B	43. A
4. D	24. E	44. D
5. D	25. E	45. E
6. A	26. D	46. E
7. C	27. E	47. D
8. A	28. D	48. C
9. D	29. B	49. D
10. A	30. E	50. E
11. D	31. E	51. D
12. E	32. C	52. A
13. C	33. A	53. B
14. D	34. C	54. D
15. A	35. E	55. C
16. D	36. E	56. B
17. B	37. D	57. E
18. B	38. C	58. D
19. E	39. B	59. C
20. A	40. E	60. C

2012 – 2013 TMSCA Solutions Mathematics Test Eight

1. $0.36\left(\frac{3}{9}+\frac{2}{9}\right)=\frac{9}{25}\cdot\frac{5}{9}=\frac{1}{5}$

2. $P(A\cup B)=P(A)+P(B)-P(A)\cdot P(B)=$
$P(A)+4P(A)-P(A)\cdot 4P(A)=0.84$
graph to solve $P(A)=0.20$

3. $72.9=k\left(4^2+11\right)$, $k=2.7$, so
$y=2.7\left(1^2+11\right)=32.4$

4. $\perp m=-0.8$, $y-3=-0.8(0-7)$, $y=8.6$

5. $1(2),2(3),3(5),4(8)...9(89)$, each term is the term number times a Fibonacci number, $9(89)=801$

6. $\left[\ln(x+2)\right]_2^k=\ln(k+2)-\ln 4=\ln 2$
$\ln(k+2)=3\ln 2=\ln 8$, $k+2=8$, $k=6$

7. $75r^2=27$, $r=\pm 0.6$, $S=\frac{75}{1-0.6}=187.5$

8. $P=80$ in, $s=16$ in, to find longest diagonal, $d^2=16^2+16^2-2(16)(16)\cos 108^\circ$, $d\approx 25.89$

9. let *r* be the rate of one digger. $3r\cdot 1=1$ hole.
$r=\frac{1}{3}$, $6\left(\frac{1}{3}\right)t=27$, t = 13.5 hours

10. one right triangle with legs 12 and 16 and 3 equilateral triangles with sides of 10.
$A=\frac{12(16)}{2}+3\left(\frac{10^2\sqrt{3}}{4}\right)=96+75\sqrt{3}$

11. $t=\frac{36^2\pi(41)}{3}\div 231\div 3.1\approx 77.70$ min

12. $ab+ai+4bi-4=17-31i$,so
$ab-4=17$, and $a+4b=-31$, solve system and $b=-7$, $a=-3$, so $a+b=-10$

13. golden ratio

14. $\frac{dy}{dx}=2\sin x=\frac{dx}{dy}$ for $2\sin x=\pm 1$, so
$\sin x=\pm\frac{1}{2}$ only at $x=\frac{\pi}{6}$ on domain

15. The fourth number any *n*th row is the sum of the first $n-3$ triangular numbers (11)

16. $\frac{180^\circ(12-2)}{12}=150^\circ$

17. $6(-3)^3-11(-3)^2+(-3)k+105=0$,
$k=-52$

18. $E(x)=\frac{1}{6}(1+1+2+3+3+6)=\frac{8}{3}$

19. $\int_{-1.255}^{4.932}\left|x^3-4x^2+x-12-6x+14\right|dx\approx 66.86$

20. $\cos x+\frac{\sin^2 x}{\cos x}=\frac{\cos^2 x+\sin^2 x}{\cos x}=\sec x$

21. definition of incenter

22. $a=-3$, $b=\frac{\pi}{6}$, $c=2$, $abc=-\pi$

23. $\frac{5}{\frac{1}{68}+\frac{1}{68}+\frac{1}{57}+\frac{1}{65}+\frac{1}{66}}\approx 64.52$

24. $\binom{9+2-1}{2}\cdot 3=\binom{10}{2}\cdot 3=135$

25. special triangle relationships, $9\sqrt{3}$

26. $\sum_{n=1}^{10}\left(n^2+n\right)=\frac{10(10+1)(2\cdot 10+1)}{6}+\frac{10(10+1)}{2}$
$=440$

27. substitute: 3, -2, 12, 48, -1152

28. $64\pi-\frac{5}{2}\cdot 8^2\sin 72^\circ\approx 48.89$

29. $\cos\theta\frac{d\theta}{dt}=-\frac{7}{x^2}\frac{dx}{dt}$, when $x=25$,
$\cos(0.284)\frac{d\theta}{dt}=-\frac{7}{25^2}(-2)=\frac{7}{300}$ rad/sec

30. $x=6\cos 12+5\cos 334$, $y=6\sin 12+5\sin 334$
$d=\sqrt{x^2+y^2}\approx 10.41$ miles

31. $-4\cos\frac{\pi}{6}\sin\frac{\pi}{6}=-\sqrt{3}$,
$g\left(-\sqrt{3}\right)=\left(-\sqrt{3}\right)^2+9=12$

32. $2s^2\sqrt{3}=64\sqrt{3}$, $s=4\sqrt{2}$

33. vocabulary

34. graph

35. $1=\frac{y+7}{9-4y}$, $y=0.4$

36. $k=1-\left(\frac{1}{3}+\frac{1}{12}+\frac{5}{24}+\frac{1}{12}+\frac{1}{6}\right)=\frac{1}{8}$
$E(x)=\frac{1}{3}+\frac{2}{12}+\frac{3}{8}+\frac{20}{24}+\frac{5}{12}+\frac{6}{6}=\frac{25}{8}$

37. $2x^3+18x^2-2x-210$, $a+b+c=-194$

38. vocabulary, only real numbers

39. $\frac{dy}{dx}=2x$, $\perp m=-\frac{1}{10}$, $y-14=-\frac{1}{10}(x-5)$
$x+10y-145=0$

40. $\left(7+\frac{50}{60}\right)\left(360^\circ\right)$

41. $\int\cos(2x)dx=\frac{\sin(2x)}{2}+C$
$=\frac{2\sin x\cos x}{2}+C=\sin x\cos x+C$

42. $z\approx -1.645$, $-1.645=\frac{x-9}{1.75}$, $x\approx 6.12$ years

43. $\binom{7}{3}\cdot\binom{5}{3}=350$

44. $1-(0.55)^4-4(0.55)^3(0.45)\approx 0.609$

45. expansion = $\sin 2\approx 0.9092974268$

46. $128(0.9+0.8+...+0.4)(1.0825)=540.38$

47. $2^8\cdot 3^4\cdot 5\cdot 7$ factors 1^4, 2^4 3^4, 4^4, 6^4, 12^4

48. $A=\sqrt{18(18-8)(18-11)(18-17)}\approx 35.50$

49. memory: equilateral triangles

50. $\log 100+\frac{1}{2}\log a+\frac{1}{2}\log b=2+\frac{1}{2}P+\frac{1}{2}Q$

51. solve system: $665=5(2a+9d)$ and
$2430=10(2a+19d)$, $d=11$

52. $f''(x)=12x^2-72x+96$,negative @ $x=3$

53. $\sqrt{1-\left(-\frac{7}{25}\right)^2}=\pm\frac{24}{25}$, sine will be (-) in domain, so $\tan\theta=\frac{-24}{-7}=\frac{24}{7}$

54. $y_1=\frac{39-3x}{2}$, substitute to obtain
$x^2+y_1^2+4x-6y_1-156=0$, graph to solve
$x=3,11$ yields points $(3,15)$ and $(11,3)$
$d=\sqrt{8^2+12^2}=4\sqrt{13}$

55. $2=\left(1+\frac{0.06}{12}\right)^{12t}$, $t\approx 11.6$

56. p(rain one day) = $0.35(0.72)\approx 0.252$
p(at least one rain) = 1-no rain
$1-0.748^7\approx 0.869$

57. circle radius 11,equilateral triangle $s=11\sqrt{3}$
$A=\frac{\left(11\sqrt{3}\right)^2\sqrt{3}}{4}=\frac{363\sqrt{3}}{4}$

58. $\binom{9}{3}\left(2x^2\right)^3\left(-\frac{3}{x}\right)^6=489888$

59. all different = $8\cdot 7\cdot 6=336$
two "O"s = $7\cdot 3=21$, same for "I" and "N"
$336+3(21)=399$

60. $(-8-3)^2=121$