

Subject: Mathematics

Grade: 09

Expectations: 56

Breakouts: 188

(a) Introduction.

1. The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.
2. The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-

- (B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
 - (i) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process
 - (ii) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the reasonableness of the solution
- (C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
 - (i) select tools, including real objects as appropriate, to solve problems
 - (ii) select tools, including manipulatives as appropriate, to solve problems
 - (iii) select tools, including paper and pencil as appropriate, to solve problems
 - (iv) select tools, including technology as appropriate, to solve problems
 - (v) select techniques, including mental math as appropriate, to solve problems
 - (vi) select techniques including estimation as appropriate, to solve problems
 - (vii) select techniques, including number sense as appropriate, to solve problems
- (D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
 - (i) communicate mathematical ideas using multiple representations, including symbols as appropriate
 - (ii) communicate mathematical ideas using multiple representations, including diagrams as appropriate
 - (iii) communicate mathematical ideas using multiple representations, including graphs as appropriate
 - (iv) communicate mathematical ideas using multiple representations, including language as appropriate
 - (v) communicate mathematical reasoning using multiple representations, including symbols as appropriate
 - (vi) communicate mathematical reasoning using multiple representations, including diagrams as appropriate
 - (vii) communicate mathematical reasoning using multiple representations, including graphs as appropriate
 - (viii) communicate mathematical reasoning using multiple representations, including language as appropriate
 - (ix) communicate [mathematical ideas'] implications using multiple representations, including symbols as appropriate
 - (x) communicate [mathematical ideas'] implications using multiple representations, including diagrams as appropriate
 - (xi) communicate [mathematical ideas'] implications using multiple representations, including graphs as appropriate
 - (xii) communicate [mathematical ideas'] implications using multiple representations, including language as appropriate
 - (xiii) communicate [mathematical reasoning's] implications using multiple representations, including symbols as appropriate

- (B) write linear equations in two variables in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points
- (i) write linear equations in two variables in various forms, including $y = mx + b$ given one point and the slope
 - (ii) write linear equations in two variables in various forms, including $y = mx + b$ given two points
 - (iii) write linear equations in two variables in various forms, including $Ax + By = C$, given one point and the slope
 - (iv) write linear equations in two variables in various forms, including $Ax + By = C$, given two points
 - (v) write linear equations in two variables in various forms, including $y - y_1 = m(x - x_1)$, given one point and the slope
 - (vi) write linear equations in two variables in various forms, including $y - y_1 = m(x - x_1)$, given two points
- (C) write linear equations in two variables given a tab

1. a. (0,3) b. (1,4) c. (2,5) d. (3,6) e. (4,7) f. (5,8) g. (6,9) h. (7,10) i. (8,11) j. (9,12) k. (10,13) l. (11,14) m. (12,15) n. (13,16) o. (14,17) p. (15,18) q. (16,19) r. (17,20) s. (18,21) t. (19,22) u. (20,23) v. (21,24) w. (22,25) x. (23,26) y. (24,27) z. (25,28) aa. (26,29) ab. (27,30) ac. (28,31) ad. (29,32) ae. (30,33) af. (31,34) ag. (32,35) ah. (33,36) ai. (34,37) aj. (35,38) ak. (36,39) al. (37,40) am. (38,41) an. (39,42) ao. (40,43) ap. (41,44) aq. (42,45) ar. (43,46) as. (44,47) at. (45,48) au. (46,49) av. (47,50) aw. (48,51) ax. (49,52) ay. (50,53) az. (51,54) ba. (52,55) bb. (53,56) bc. (54,57) bd. (55,58) be. (56,59) bf. (57,60) bg. (58,61) bh. (59,62) bi. (60,63) bj. (61,64) bk. (62,65) bl. (63,66) bm. (64,67) bn. (65,68) bo. (66,69) bp. (67,70) bq. (68,71) br. (69,72) bs. (70,73) bt. (71,74) bu. (72,75) bv. (73,76) bw. (74,77) bx. (75,78) by. (76,79) bz. (77,80) ca. (78,81) cb. (79,82) cc. (80,83) cd. (81,84) ce. (82,85) cf. (83,86) cg. (84,87) ch. (85,88) ci. (86,89) cj. (87,90) ck. (88,91) cl. (89,92) cm. (90,93) cn. (91,94) co. (92,95) cp. (93,96) cq. (94,97) cr. (95,98) cs. (96,99) ct. (97,100) cu. (98,101) cv. (99,102) cw. (100,103) cx. (101,104) cy. (102,105) cz. (103,106) da. (104,107) db. (105,108) dc. (106,109) dd. (107,110) de. (108,111) df. (109,112) dg. (110,113) dh. (111,114) di. (112,115) dj. (113,116) dk. (114,117) dl. (115,118) dm. (116,119) dn. (117,120) do. (118,121) dp. (119,122) dq. (120,123) dr. (121,124) ds. (122,125) dt. (123,126) du. (124,127) dv. (125,128) dw. (126,129) dx. (127,130) dy. (128,131) dz. (129,132) ea. (130,133) eb. (131,134) ec. (132,135) ed. (133,136) ee. (134,137) ef. (135,138) eg. (136,139) eh. (137,140) ei. (138,141) ej. (139,142) ek. (140,143) el. (141,144) em. (142,145) en. (143,146) eo. (144,147) ep. (145,148) eq. (146,149) er. (147,150) es. (148,151) et. (149,152) eu. (150,153) ev. (151,154) ew. (152,155) ex. (153,156) ey. (154,157) ez. (155,158) fa. (156,159) fb. (157,160) fc. (158,161) fd. (159,162) fe. (160,163) ff. (161,164) fg. (162,165) fh. (163,166) fi. (164,167) fj. (165,168) fk. (166,169) fl. (167,170) fm. (168,171) fn. (169,172) fo. (170,173) fp. (171,174) fq. (172,175) fr. (173,176) fs. (174,177) ft. (175,178) fu. (176,179) fv. (177,180) fw. (178,181) fx. (179,182) fy. (180,183) fz. (181,184) ga. (182,185) gb. (183,186) gc. (184,187) gd. (185,188) ge. (186,189) gf. (187,190) gg. (188,191) gh. (189,192) gi. (190,193) gj. (191,194) gk. (192,195) gl. (193,196) gm. (194,197) gn. (195,198) go. (196,199) gp. (197,200) gq. (198,201) gr. (199,202) gs. (200,203) gt. (201,204) gu. (202,205) gv. (203,206) gw. (204,207) gx. (205,208) gy. (206,209) gz. (207,210) ha. (208,211) hb. (209,212) hc. (210,213) hd. (211,214) he. (212,215) hf. (213,216) hg. (214,217) hh. (215,218) hi. (216,219) hj. (217,220) hk. (218,221) hl. (219,222) hm. (220,223) hn. (221,224) ho. (222,225) hp. (223,226) hq. (224,227) hr. (225,228) hs. (226,229) ht. (227,230) hu. (228,231) hv. (229,232) hw. (230,233) hx. (231,234) hy. (232,235) hz. (233,236) ia. (234,237) ib. (235,238) ic. (236,239) id. (237,240) ie. (238,241) if. (239,242) ig. (240,243) ih. (241,244) ii. (242,245) ij. (243,246) ik. (244,247) il. (245,248) im. (246,249) in. (247,250) io. (248,251) ip. (249,252) iq. (250,253) ir. (251,254) is. (252,255) it. (253,256) iu. (254,257) iv. (255,258) iw. (256,259) ix. (257,260) iy. (258,261) iz. (259,262) ja. (260,263) jb. (261,264) jc. (262,265) jd. (263,266) je. (264,267) jf. (265,268) jg. (266,269) jh. (267,270) ji. (268,271) jj. (269,272) jk. (270,273) jl. (271,274) jm. (272,275) jn. (273,276) jo. (274,277) jp. (275,278) jq. (276,279) jr. (277,280) js. (278,281) jt. (279,282) ju. (280,283) jv. (281,284) jw. (282,285) jx. (283,286) jy. (284,287) jz. (285,288) ka. (286,289) kb. (287,290) kc. (288,291) kd. (289,292) ke. (290,293) kf. (291,294) kg. (292,295) kh. (293,296) ki. (294,297) kj. (295,298) kk. (296,299) kl. (297,300) km. (298,301) kn. (299,302) ko. (300,303) kp. (301,304) kq. (302,305) kr. (303,306) ks. (304,307) kt. (305,308) ku. (306,309) kv. (307,310) kw. (308,311) kx. (309,312) ky. (310,313) kz. (311,314) la. (312,315) lb. (313,316) lc. (314,317) ld. (315,318) le. (316,319) lf. (317,320) lg. (318,321) lh. (319,322) li. (320,323) lj. (321,324) lk. (322,325) ll. (323,326) lm. (324,327) ln. (325,328) lo. (326,329) lp. (327,330) lq. (328,331) lr. (329,332) ls. (330,333) lt. (331,334) lu. (332,335) lv. (333,336) lw. (334,337) lx. (335,338) ly. (336,339) lz. (337,340) ma. (338,341) mb. (339,342) mc. (340,343) md. (341,344) me. (342,345) mf. (343,346) mg. (344,347) mh. (345,348) mi. (346,349) mj. (347,350) mk. (348,351) ml. (349,352) mm. (350,353) mn. (351,354) mo. (352,355) mp. (353,356) mq. (354,357) mr. (355,358) ms. (356,359) mt. (357,360) mu. (358,361) mv. (359,362) mw. (360,363) mx. (361,364) my. (362,365) mz. (363,366) na. (364,367) nb. (365,368) nc. (366,369) nd. (367,370) ne. (368,371) nf. (369,372) ng. (370,373) nh. (371,374) ni. (372,375) nj. (373,376) nk. (374,377) nl. (375,378) nm. (376,379) nn. (377,380) no. (378,381) np. (379,382) nq. (380,383) nr. (381,384) ns. (382,385) nt. (383,386) nu. (384,387) nv. (385,388) nw. (386,389) nx. (387,390) ny. (388,391) nz. (389,392) oa. (390,393) ob. (391,394) oc. (392,395) od. (393,396) oe. (394,397) of. (395,398) og. (396,399) oh. (397,400) oi. (398,401) oj. (399,402) ok. (400,403) ol. (401,404) om. (402,405) on. (403,406) oo. (404,407) op. (405,408) oq. (406,409) or. (407,410) os. (408,411) ot. (409,412) ou. (410,413) ov. (411,414) ow. (412,415) ox. (413,416) oy. (414,417) oz. (415,418) pa. (416,419) pb. (417,420) pc. (418,421) pd. (419,422) pe. (420,423) pf. (421,424) pg. (422,425) ph. (423,426) pi. (424,427) pj. (425,428) pk. (426,429) pl. (427,430) pm. (428,431) pn. (429,432) po. (430,433) pp. (431,434) pq. (432,435) pr. (433,436) ps. (434,437) pt. (435,438) pu. (436,439) pv. (437,440) pw. (438,441) px. (439,442) py. (440,443) pz. (441,444) qa. (442,445) qb. (443,446) qc. (444,447) qd. (445,448) qe. (446,449) qf. (447,450) qg. (448,451) qh. (449,452) qi. (450,453) qj. (451,454) qk. (452,455) ql. (453,456) qm. (454,457) qn. (455,458) qo. (456,459) qp. (457,460) qq. (458,461) qr. (459,462) qs. (460,463) qt. (461,464) qu. (462,465) qv. (463,466) qw. (464,467) qx. (465,468) qy. (466,469) qz. (467,470) ra. (470,473) rb. (471,474) rc. (472,475) rd. (473,476) re. (474,477) rf. (475,478) rg. (476,479) rh. (477,480) ri. (478,481) rj. (479,482) rk. (480,483) rl. (481,484) rm. (482,485) rn. (483,486) ro. (484,487) rp. (485,488) rq. (486,489) rr. (487,490) rs. (488,491) rt. (489,492) ru. (490,493) rv. (491,494) rw. (492,495) rx. (493,496) ry. (494,497) rz. (495,498) sa. (496,499) sb. (497,500) sc. (498,501) sd. (499,502) se. (500,503) sf. (501,504) sg. (502,505) sh. (503,506) si. (504,507) sj. (505,508) sk. (506,509) sl. (507,510) sm. (508,511) sn. (509,512) so. (510,513) sp. (511,514) sq. (512,515) sr. (513,516) ss. (514,517) st. (515,518) su. (516,519) sv. (517,520) sw. (518,521) sx. (519,522) sy. (520,523) sz. (521,524) ta. (522,525) tb. (523,526) tc. (524,527) td. (525,528) te. (526,529) tf. (527,530) tg. (528,531) th. (529,532) ti. (530,533) tj. (531,534) tk. (532,535) tl. (533,536) tm. (534,537) tn. (535,538) to. (536,539) tp. (537,540) tq. (538,541) tr. (539,542) ts. (540,543) tt. (541,544) tu. (542,545) tv. (543,546) tw. (544,547) tx. (545,548) ty. (546,549) tz. (547,550) ua. (550,553) ub. (551,554) uc. (552,555) ud. (553,556) ue. (554,557) uf. (555,558) ug. (556,559) uh. (557,560) ui. (558,561) uj. (559,562) uk. (560,563) ul. (561,564) um. (562,565) un. (563,566) uo. (564,567) up. (565,568) uq. (566,569) ur. (567,570) us. (568,571) ut. (569,572) uu. (570,573) uv. (571,574) uw. (572,575) ux. (573,576) uy. (574,577) uz. (575,578) va. (578,581) vb. (579,582) vc. (580,583) vd. (581,584) ve. (582,585) vf. (583,586) vg. (584,587) vh. (585,588) vi. (586,589) vj. (587,590) vk. (588,591) vl. (589,592) vm. (590,593) vn. (591,594) vo. (592,595) vp. (593,596) vq. (594,597) vr. (595,598) vs. (596,599) vt. (597,600) vu. (600,603) vv. (601,604) vw. (602,605) vx. (603,606) vy. (604,607) vz. (605,608) wa. (608,611) wb. (609,612) wc. (610,613) wd. (611,614) we. (612,615) wf. (613,616) wg. (614,617) wh. (615,618) wi. (616,619) wj. (617,620) wk. (618,621) wl. (619,622) wm. (620,623) wn. (621,624) wo. (622,625) wp. (623,626) wq. (624,627) wr. (625,628) ws. (626,629) wt. (627,630) wu. (628,631) wv. (629,632) ww. (630,633) wx. (631,634) wy. (632,635) wz. (633,636) xa. (636,639) xb. (637,640) xc. (638,641) xd. (639,642) xe. (640,643) xf. (641,644) xg. (642,645) xh. (643,646) xi. (644,647) xj. (645,648) xk. (646,649) xl. (647,650) xm. (648,651) xn. (649,652) xo. (650,653) xp. (651,654) xq. (652,655) xr. (653,656) xs. (654,657) xt. (655,658) xu. (656,659) xv. (657,660) xw. (658,661) xx. (659,662) xy. (660,663) xz. (661,664) ya. (664,667) yb. (665,668) yc. (666,669) yd. (667,670) ye. (668,671) yf. (669,672) yg. (670,673) yh. (671,674) yi. (672,675) yj. (673,676) yk. (674,677) yl. (675,678) ym. (676,679) yn. (677,680) yo. (678,681) yp. (679,682) yq. (680,683) yr. (681,684) ys. (682,685) yt. (683,686) yu. (684,687) yv. (685,688) yw. (686,689) yx. (687,690) yy. (688,691) yz. (689,692) za. (692,695) zb. (693,696) zc. (694,697) zd. (695,698) ze. (696,699) zf. (697,700) zg. (700,703) zh. (701,704) zi. (702,705) zj. (703,706) zk. (704,707) zl. (705,708) zm. (706,709) zn. (707,710) zo. (708,711) zp. (709,712) zq. (710,713) zr. (711,714) zs. (712,715) zt. (713,716) zu. (714,717) zv. (715,718) zw. (716,719) zx. (717,720) zy. (718,721) zz. (719,722)

- (3) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without

- (ii) solve linear inequalities in one variable, including those for which variables are included on both sides
- (C) solve systems of two linear equations with two variables for mathematical and real-world problems.
 - (i) solve systems of two linear equations with two variables for mathematical problems
 - (ii) solve systems of two linear equations with two variables for real-world problems
- (6) Quadratic functions and equations. The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. The student is expected to:
 - (A) determine the domain and range of quadratic functions and represent the domain and range using inequalities;
 - (i) determine the domain of quadratic functions
 - (ii) determine the range of quadratic functions
 - (iii) represent the domain using inequalities
 - (iv) represent the range using inequalities
 - (B) write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form $(f(x) = a(x - h)^2 + k)$, and rewrite the equation from vertex form to standard form $(f(x) = ax^2 + bx + c)$; and
 - (i) write equations of quadratic functions given the vertex and another point on the graph
 - (ii) write the equation [of quadratic functions] in vertex form $(f(x) = a(x - h)^2 + k)$
 - (iii) rewrite the equation [of quadratic functions] from vertex form to standard form $(f(x) = ax^2 + bx + c)$
 - (C) write quadratic functions when given real solutions and graphs of their related equations.
 - (i) write quadratic functions when given real solutions
 - (ii) write quadratic functions when given graphs of their related equations

- (i) describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions
- (C) determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of a , b , c , and d
 - (i) determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$ for specific values of a
 - (ii) determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $f(x) + d$ for specific values of d
 - (iii) determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $f(x - c)$ for specific values of c

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- (ii) multiply polynomials of degree two
 - (iii) multiply polynomials of degree one and two
- (C) determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend;
- (i) determine the quotient of a polynomial of degree one when divided by a polynomial of degree one
 - (ii)

- (B) evaluate functions, expressed in function notation, given one or more elements in their domains;
 - (i) evaluate functions, expressed in function notation, given one or more elements in their domains
- (C) identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes;
 - (i) identify terms of arithmetic sequences when the sequences are given in function form using recursive processes
 - (ii) identify terms of geometric sequences when the sequences are given in function form using recursive processes
- (D) write a formula for the n^{th} term of arithmetic and geometric sequences, given the value of several of their terms; and
 - (i) write a formula for the n^{th} term of arithmetic sequences, given the value of several of their terms
 - (ii) write a formula for the n^{th} term of geometric sequences, given the value of several of their terms
- (E) solve mathematic and scientific formulas, and other literal equations, for a specified variable.
 - (i) solve mathematic formulas for a specified variable
 - (ii) solve scientific formulas for a specified variable
 - (iii)