

Pure Math 30

EXPLAINED!

*Diploma Style
Practice Exam*

Statistics
-- QUESTIONS --

Formulas

These are the formulas for Statistics you will be given on your diploma

$$P(k) = {}_n C_k p^k (1-p)^{n-k}$$

$$z = \frac{x - \mu}{\sigma}$$

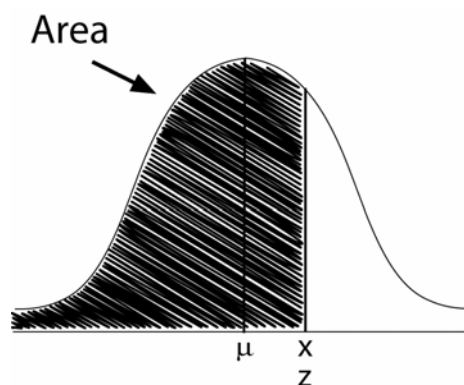
*You will also have a z-score
table (next two pages)*

<i>Use this sheet to record your answers</i>
--

- | | | | |
|-------|-------|-------|-------|
| 1. | 11. | 18. | 27. |
| NR 1) | NR 2) | 19. | 28. |
| 2. | NR 3) | 20. | NR 7) |
| 3. | 12. | 21. | 29. |
| 4. | 13. | 22. | 30. |
| 5. | 14. | 23. | 31. |
| 6. | 15. | 24. | 32. |
| 7. | 16. | NR 6) | 33. |
| 8. | NR 4) | 25. | |
| 9. | 17. | 26. | |
| 10. | NR 5) | | |

z-score Table

$$z = \frac{x - \mu}{\sigma}$$



z	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
-3.4	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
-3.3	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005
-3.2	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007
-3.1	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010
-3.0	0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013
-2.9	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019
-2.8	0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026
-2.7	0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035
-2.6	0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047
-2.5	0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062
-2.4	0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082
-2.3	0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107
-2.2	0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139
-2.1	0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179
-2.0	0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228
-1.9	0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287
-1.8	0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359
-1.7	0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446
-1.6	0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548
-1.5	0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668
-1.4	0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808
-1.3	0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968
-1.2	0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151
-1.1	0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357
-1.0	0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587
-0.9	0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841
-0.8	0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119
-0.7	0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420
-0.6	0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743
-0.5	0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085
-0.4	0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446
-0.3	0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821
-0.2	0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207
-0.1	0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602
-0.0	0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Statistics Diploma Style Practice Exam

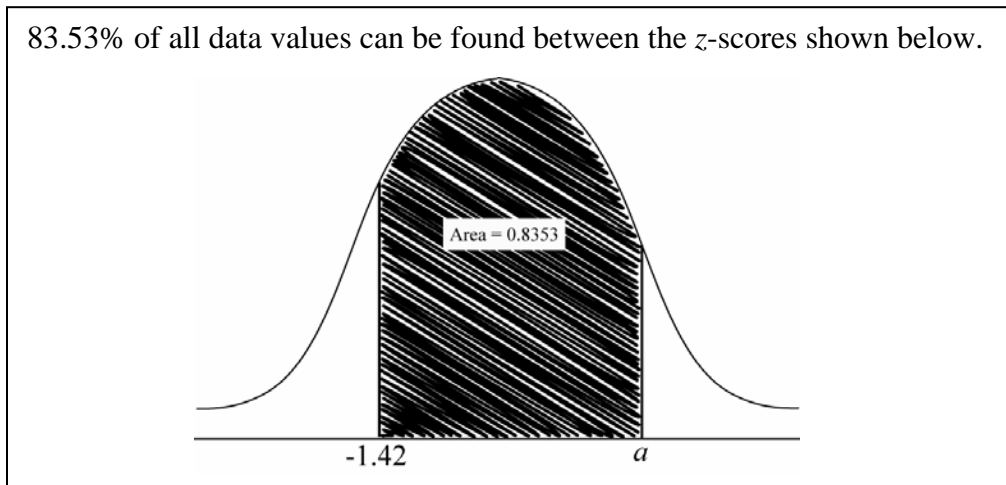
1. The number of kilometers that a car can drive before the engine needs replacement is normally distributed. The mean number of kilometers is 280 000, with a standard deviation of 23 000. If the car manufacturer plans on replacing only 1.5% of the engines, the guarantee should be for a maximum driving distance of
- A. 230 090 km
 - B. 235 600 km
 - C. 238 900 km
 - D. 240 150 km

Numerical Response

1. One letter is selected from the word **STATISTICS**. The probability the letter is an **S** or a **T**, to the nearest hundredth, is _____.
2. The results of a provincial diploma exam are normally distributed. The mean mark is 68, and the standard deviation is 6. If 14 000 students wrote the exam, then the number of students with a score greater than 80 is
- A. 2
 - B. 250
 - C. 319
 - D. 1025
3. A 5 digit PIN number can begin with any digit (except zero) and the remaining digits have no restriction. If repeated digits are allowed, the probability of the PIN code beginning with a 7 and ending with an 8 is
- A. $\frac{1}{10}$
 - B. $\frac{2}{5}$
 - C. $\frac{1}{100}$
 - D. $\frac{1}{90}$

4. The results of a test are normally distributed. A particular student scores 57, which is 1.4 standard deviations below the mean. If the mean is 68, then the standard deviation is
- A. 0.08
B. 1.4
C. 5.63
D. 7.86

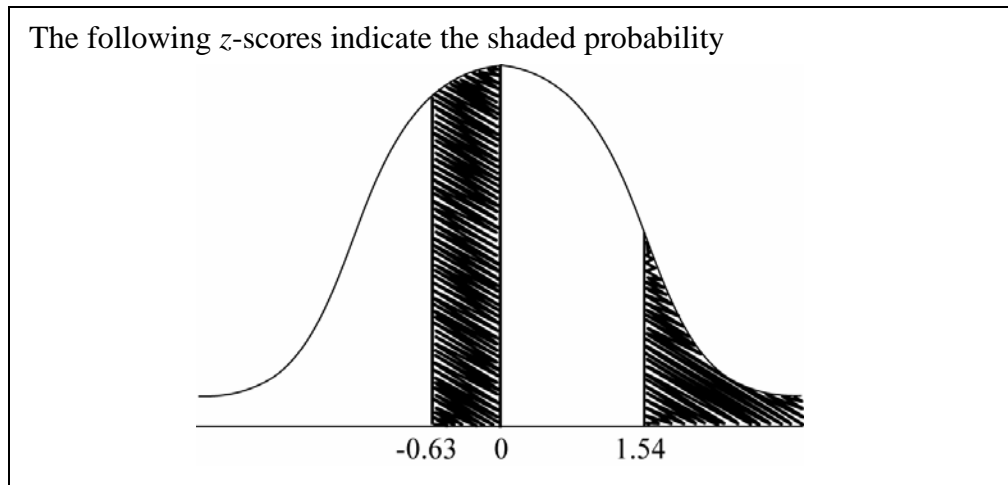
Use the following information to answer the next question.



5. The value of a , to the nearest hundredth, is
- A. 0.973
B. 0.975
C. 1.36
D. 2.00
6. A bookcase contains 6 different math books and 12 different physics books. If a student randomly selects two of these books, the probability they are both math books or both physics books is
- A. $\frac{1}{3}$
B. $\frac{4}{13}$
C. $\frac{2}{9}$
D. $\frac{9}{17}$

7. The results of a provincial diploma exam are normally distributed. If 5000 students scored between 45% and 65%, and these marks correspond to z -scores of -1.22 and 0.75 respectively, then the number of students who wrote the test is
- A. 6186
B. 6622
C. 7551
D. 9361

Use the following information to answer the next question.



8. The shaded probability is, to the nearest hundredth
- A. 0.1256
B. 0.2975
C. 0.3897
D. 0.4881
9. Three different DVD's and their corresponding DVD cases are randomly strewn about on a shelf. If a young child puts the DVD's in the cases at random, the probability of correctly matching all DVD's and cases is
- A. $\frac{1}{3!}$
B. $\frac{2}{3!}$
C. $\frac{3}{3!}$
D. $\frac{1}{6!}$

10. The mean for a set of M numbers is μ . If n is added to each number in the set, then the new mean will be
- A. μ .
 - B. $\mu + n$
 - C. $\mu + \frac{n}{M}$
 - D. $n\mu$.
11. The results of a test are normally distributed. A teacher tells the student her mark has a z -score of 1.5, but does not reveal any other information. A statement which is **always** true regarding the student's mark is
- A. The student received a mark below 50%
 - B. The student received a mark above 50%
 - C. The student received a mark below the mean
 - D. The student received a mark above the mean

Numerical Response

2. There are three different door prizes to be given out at an education conference. At the conference, there are 7 math teachers, 10 science teachers, 4 English teachers, and 8 social teachers. The probability all three prizes are won by teachers of the same subject is, to the nearest hundredth, _____.

Numerical Response

3. Kevin, Rachel, and 6 other students are standing in a line. The probability Kevin and Rachel are **not** standing together is _____.

12. A particular brand of light bulb has a life that is normally distributed with a standard deviation of 105 hours. If one light bulb is randomly selected, the probability it will last more than 1250 hours is 0.209. The mean life for this brand of light bulb is, to the nearest hour
- A. 1006
B. 1091
C. 1165
D. 1473
13. A student scores a mark of 82 on a standardized test, and is told that she did better than 96.5% of all students who wrote the test. If the mean score is 58, then the standard deviation on this test, to the nearest hundredth, is
- A. 8.91
B. 13.26
C. 14.15
D. 14.88
14. A jar contains 5 orange, 3 purple, 7 blue, and 5 green candies. If the total number of candies is 20, then the probability that a handful of four candies contains one of each color is
- A. $\frac{{}_5C_1 \times {}_3C_1 \times {}_7C_1 \times {}_5C_1}{{}_{20}C_4}$
B. $\frac{{}_5C_1 + {}_3C_1 + {}_7C_1 + {}_5C_1}{{}_{20}C_4}$
C. $\frac{4}{{}_{20}C_4}$
D. ${}_{20}C_4 (0.25)^4 (1-0.25)^{16}$

Use the following information to answer the next question.

The following table lists the marks a student received in four courses

Subject	Provincial Mean	Standard Deviation	Jake's Score
Pure Math 30	62%	4.8%	69%
Physics 30	68%	9.1%	72%
Chemistry 30	59%	7.7%	70%
Biology 30	65%	2.5%	64%

15. Relative to the sample of students taking the test, the course Jake performed best in is
- A. Pure Math 30
 - B. Physics 30
 - C. Chemistry 30
 - D. Biology 30
16. The mean length of a particular screw is 4.3 cm and a standard deviation of 0.2 cm. If 4% of screws have a length that is too long and must be rejected, the maximum allowed length of a screw is
- A. 4.65 cm
 - B. 4.70 cm
 - C. 5.12 cm
 - D. 5.50 cm

Numerical Response

4. A security code consists of 8 digits, which may be any number from 0 to 9. Repetitions are allowed. The probability a particular code begins with exactly two 7's, to the nearest hundredth, is _____.

17. The number of students registered at a particular high school is 982. If the mean age of a student is 17, with a standard deviation of 1.1 years, then the number of students older than 19 attending the school is
- A. 28
B. 30
C. 31
D. 34

Use the following information to answer the next question.

A bar code uses the first three digits to identify the store, and the last nine digits to identify the product. Digits may be repeated in the bar code.

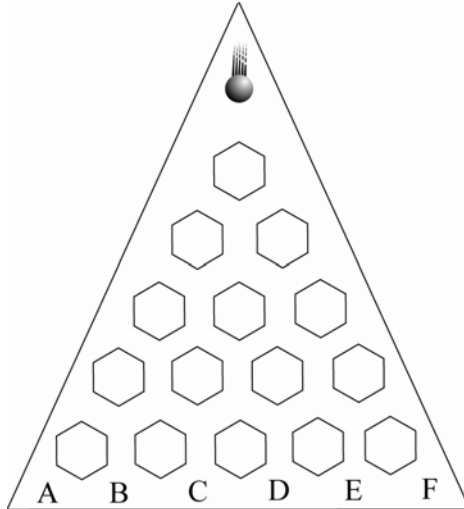


Numerical Response

5. If this particular store has a three digit code of 122 that is the same for all items in the store, the probability of a bar code being even is, to the nearest hundredth, _____.
18. There are 12 male athletes and 14 female athletes competing in a marathon. The probability of three different prizes being awarded to all males **or** all females is
- A. 0.1236
B. 0.1977
C. 0.2058
D. 0.2246
19. The probability a particular brand of MP3 player has a defect when it leaves the factory is 0.002. In a random sample of ten MP3 players, the probability of exactly two having a defect is
- A. 0.0002
B. 0.0004
C. 0.002
D. 0.05

Use the following information to answer the next question.

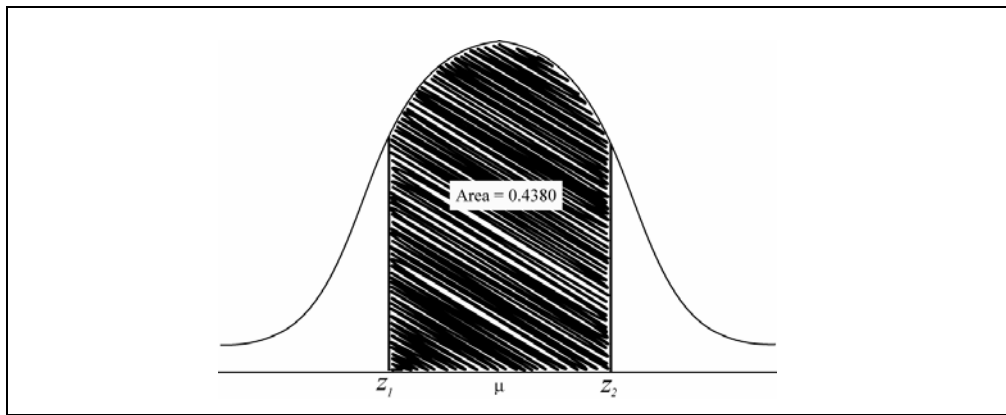
In a game, a ball is dropped through a series of pegs and a person wins by predicting which letter the ball lands on.



20. A player predicts the ball will land on **B**. The probability the player does **not** win is
- A. 0.79
 - B. 0.81
 - C. 0.84
 - D. 0.89
21. There is an equal chance a cat will give birth to a male or female kitten. If there are five kittens in a litter, the probability the litter contains 3 males and 2 females is
- A. 0.31
 - B. 0.33
 - C. 0.50
 - D. 0.66

22. In a particular city, the probability of a household having HDTV is 0.32. In a random sample of 20 households, the probability **at most** three households have HDTV is, to the nearest thousandth,
- A. 0.077
 - B. 0.094
 - C. 0.105
 - D. 0.130
23. The mean lifespan of a television set is 10 years with a standard deviation of 2 years. If 50000 televisions were sold, the number of televisions that worked for 12 to 14 years is
- A. 6795
 - B. 6946
 - C. 7004
 - D. 7155

Use the following information to answer the next question.



24. The shaded area in the normal distribution curve shown above is 43.8% of the total area. If z_1 and z_2 are symmetrical about the mean, then the value of z_1 is
- A. -2.77
 - B. -0.75
 - C. -0.58
 - D. -0.16

Numerical Response

6. An analysis of a hockey player reveals that the probability he will score a goal when he shoots the puck is 17%. If the player shoots 12 times, the probability he will **miss** exactly eight of those shots is, to the nearest hundredth _____.

25. The lengths of seven pencils were recorded. The results were: 4 cm, 8 cm, 8 cm, 10 cm, 3 cm, 7 cm, and 9 cm. The standard deviation of these heights is, to the nearest tenth,
- A. 2.14
 - B. 2.39
 - C. 2.58
 - D. 7.00

Use the following information to answer the next question.

Ranita wrote exams in Physics 30 and Chemistry 30. The physics exam had a class average of 58 and a standard deviation of 9. The chemistry test had a class average of 54 and a standard deviation of 12. Ranita's teacher told her that she scored better than 87.7% of the students in her physics class, and 98.5% better than the students in her chemistry class.

26. The difference between Ranita's mark on the chemistry exam and her mark on the physics exam is, to the nearest tenth of a mark,
- A. 5.5
 - B. 9.8
 - C. 11.6
 - D. 13.1

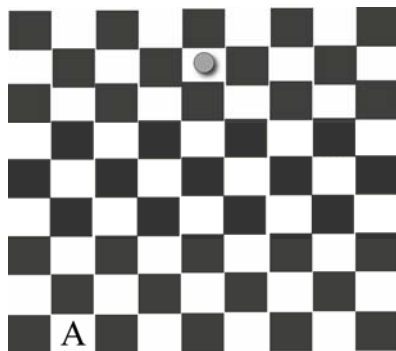
27. A teacher determined that the class average on an exam is 65 and the standard deviation is 7. After the class completes a review assignment, he adjusts the marks by adding 10 to each exam. An analysis of the two sets of marks showed that
- A. The standard deviation decreased while the mean increased
 - B. The standard deviation increased and the mean increased
 - C. The standard deviation stayed the same while the mean increased
 - D. The standard deviation and mean stayed the same
28. There are 12 people available for selection to a bowling team, but out of those 12, only eight have a bowling average over 250. If there are five people on the team, then the probability exactly 4 members of the team have a bowling average over 250 is
- A. $\frac{25}{69}$
 - B. $\frac{27}{71}$
 - C. $\frac{35}{99}$
 - D. $\frac{80}{243}$

Numerical Response

7. The probability of a bowler having an average over 250 is 0.67. If there are five people on the team, then the probability exactly 4 members of the team have a bowling average over 250 is, to the nearest hundredth _____.
29. A shopper brings \$30.00 worth of groceries to the checkout. The shopper has two \$5 bills, two \$10 bills, and two \$20 bills, and randomly pulls out two bills to pay for the groceries. The probability the two bills have a value at least as high as the cost of the groceries is
- A. $\frac{5}{{}_6P_2}$
 - B. $\frac{3}{{}_6P_2}$
 - C. $\frac{12}{6!}$
 - D. $\frac{1}{3}$

Use the following information to answer the next question.

A checker can only be moved diagonally, and it must stay on the white squares.



30. The probability the checker arrives at the square marked **A** is

A. 0.12
 B. 0.18
 C. 0.23
 D. 0.25

Use the following information to answer the next question.

A student drops the following tiles on the floor and randomly picks them up again.

N B Y U N

31. The probability the tiles are picked up in an order that spells **BUNNY** is

A. $\frac{1}{5!}$
 B. $\frac{2}{5!}$
 C. $\frac{1}{{}_5P_3 + {}_5P_2}$
 D. $\frac{1}{{}_3P_3 \times {}_2P_2}$

32. 26 students in a class each received a mark of 67% on a test, by pure coincidence. The teacher correctly concluded that
- A. The standard deviation is zero
 - B. The standard deviation is one.
 - C. The z -score is zero
 - D. The z -score is one.

Use the following information to answer the next question.

Glenn plays seven notes on his piano in the following order

F – G – A – B – C – D – E



33. If Victor now plays the same seven notes as Glenn, but in a random order, the probability the first six notes will be in the same order as Glenn is
- A. 0.143
 - B. 0.167
 - C. $\frac{1}{{}_7P_6}$
 - D. $\frac{1}{{}_7C_6}$

Use the following information to answer the next question.

A city has 700 000 households, and the probability that a household has exactly one vehicle is $\frac{17}{23}$.



Written Response – 10%

1.

- Determine the number of households that can be expected to have exactly one vehicle.
- A crescent in the residential area of the city is chosen at random. If there are 67 houses in this crescent, determine the probability that exactly 52 households will have one vehicle.

Use the following additional information to answer the next part of the question.

In a sample of households with a vehicle, four owned a truck, and five owned a car. Karen and Anna were asked the following question: *If three households were randomly selected from the sample, calculate the probability that two would have a car and one would have a truck.* Their solutions are shown below.

Karen's Solution

$$= \frac{{}_5P_2 \times {}_4P_1}{{}_9P_3} = \frac{80}{504} = \frac{10}{63}$$

Anna's Solution

$$= \frac{{}_5C_2 \times {}_4C_1}{{}_9C_3} = \frac{40}{84} = \frac{10}{21}$$

- Which calculation is correct? Justify your answer.

Use the following information to answer the next question.

A person rolls an 8-sided die 150 times and records the results in the frequency table shown on the right.



Value	Frequency
1	13
2	18
3	22
4	17
5	30
6	18
7	11
8	21

Written Response – 10%

2.

- Determine the mean and standard deviation of the data, to the nearest hundredth.
- Using data from the table, determine the probability a person will roll 1, 2, or 3.

Use the following additional information to answer the next part of the question.

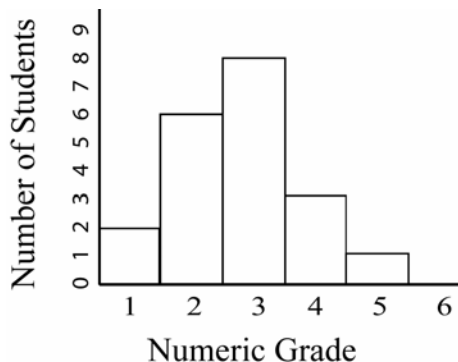
A student assumes the data in the table follows a binomial distribution, and wishes to use $\text{binompdf}[n, p, k]$ to calculate the probability a person will roll a 1, 2, or 3. To do this calculation, the student types the following commands into calculator

$\text{binompdf}[150, \frac{1}{8}, \{1, 2, 3\}] \rightarrow \text{Enter} \rightarrow \text{sum}(\text{ans})$

- Is this calculation appropriate to determine the probability of throwing a 1, 2, or 3 on an eight-sided die? Justify your answer.

Use the following information to answer the next question.

An English 30-1 teacher marks an assignment and records the grades in a histogram. For this particular assignment, students receive a numeric grade from 1 (lowest) to 6 (highest).



Written Response – 10%

3.

- Determine the mean and standard deviation of the data, to the nearest hundredth.
- The teacher now uses data from the histogram to predict the results for all English 30-1 students in the school. If she approximates the data using a normal distribution curve, and assumes the mean and standard deviation are the same as those found in the previous bullet, approximate how many students (If there are 325 English 30-1 students in the school) will receive a score of 5 or 6 on the exam.

Use the following additional information to answer the next part of the question.

The teacher now marks a Social 30 exam, and finds the class average is 47 with a standard deviation of 7. After the class completes a make-up assignment, she raises the score of each exam so the new mean is 59 and the new standard deviation is 6.

- If Clarissa scored a mark of 79 initially, and the z -score of this mark is the same z -score as the new mark, calculate her new mark on the exam.