Hybrid exponentially weighted moving average control chart based on product-difference estimator

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Abstract

In this paper, we have proposed a Hybrid Exponentially Weighted Moving Average HEWMA control chart. The proposed control chart is based on Product- Difference Estimator of Mean using one Auxiliary variable. We call it as PD-HEWMA control chart. From this study the fact is revealed that PD-HEWMA control chart shows more efficient results to traditional/simple EWMA chart and EWMA control chart proposed by Saghir et al (2018). The comparison of the PD-HEWMA control chart is also performed with the EWMA chart based on Product-Difference Estimator ((cf. Saghir et al. 2018)). The proposed chart also out performs to all the other control charts in comparison. The PD-HEWMA chart can be used for efficient monitoring of the production process in manufacturing industries. The control limits of the proposed chart are based on estimator, its mean square errors and bias. A simulated example has been used to compare the proposed and traditional/simple EWMA chart and EWMA control chart proposed by Saghir et al. (2018). The control charts performance is measured using the average run length-out of control (ARL_1). It is observed that the proposed chart performs better than existing EWMA control charts.

Keywords: Hybrid, EWMA, CUSUM, Product- Difference Estimator, average run length.

Introduction

Statistical Process Control is usually referred as SPC. It is a method which includes monitoring, controlling and refining of a process. The

real life application clearly states that all processes inherent some variation. But sometimes the process shows a great level of discrepancy and results in the occurrence of offensive/unpredictable results. One of the uses of the SPC is to reduce variation to achieve the best objective value.

The Control charts are the most important tool of SPC tool kit. It is commonly used to differentiate between the assignable and un-assignable causes. The purpose of the effective process monitoring system is to detect the presence of an assignable cause as rapidly as possible without stopping checking too often or too late. The control charts are of different types. Some are memory control charts and other are memory-less control charts. Shewhart are memory-less control charts and are being used to detect a large size shift whereas the memory type charts are used for dealing with small size shifts.

The use of statistical quality control charts in different fields of life revealed that the most of the control charts are structured to cater information about the quality characteristic/ studied variable. If we are able to acquire some information about some other variable(s) which is correlated with our variable of interest, we can enhance the efficiency of the control chart by the efficient charting statistic. The additional information is known as auxiliary information and the variable providing the additional information is referred as auxiliary variable. This additional/auxiliary information is used at different points in survey sampling to estimate the unknown parameters. Whenever the auxiliary information is used in the parameter estimation process, the precision of the estimating the parameter is improved.

Literature Review

Watson (1937) proposed some estimation procedures using auxiliary information. It was the initial work in the field of auxiliary information. Mandel (1969) gave regression control chart and Zhang (1984 & 1985) used the additional/auxiliary information in preparation of cause-selecting-type control chart. Wade and Woodall (1993) proposed the prediction limits by inserting some modifications in Zhang (1984)

control limits. Many efficient estimators can be obtained/developed by the use of auxiliary variables, for example, see the researches by Hidiroglou (2001), Kadilar and Cingi(2005), Singh and Vishwakarma (2007), Singh et al. (2008), Hanif et al.(2009), Hamad et al.(2013), Awan and Shabbir (2014).

Riaz (2008) and Riaz and Does (2009) proposed the control chart for the variability using one auxiliary variable for Phase-I. When the additional/auxiliary information is incorporated in the construction of quality control charting attributes, efficiency of such charts is improved. Riaz (2009 & 2011) suggested control chart for location parameter using one auxiliary variable for Phase I.

Woodall et al (2004) and Rashid et al (2010) proposed control charts using regression estimators' incorporation the use of auxiliary information. Ahmed et al (2014) also used auxiliary information in designing control charts.

During recent years the use of an auxiliary variable in the literature of the SPC has attracted the attention many researches of the quality control for the efficient estimator of the variable under study. The auxiliary variable may be defined as the variable which is available for every unit of the population under study in addition to the original variable of interest. Many researchers in the area of control charts have explored the technique of auxiliary variable (Riaz (2008); Cheng and Chen (2011); Sodipo (2010); Riaz (2013); Yadav (2011), Noor-ul-Amin et al (2020).

Riaz, (2008) proposed the average control chart using the auxiliary information based upon the product difference and described that the auxiliary information proved to be a comparatively good tool for the effective monitoring of the production process.

Extending the Riaz, (2008) work, we have proposed the PD-HEWMA chart. The chart is different from Z-HEWMA charts. In Z-HEWMA control chart by Raza et al. (2019), the exponential type estimator for mean using two auxiliary variables by Noor-ul-Amin and Hanif (2012) is used, whereas, the proposed charts is based on Product ratio

estimator of mean using only one auxiliary variable. So, both charts implementation in the industry is different.

We have developed Hybrid EWMA scheme on product difference estimator developed by Saghir et al (2018) using the auxiliary information, the information of interested quality characteristic and the correlation existing between these two variables. The developed scheme is better in applicability as the existing one ignores the Hybrid EWMA technique using the product difference estimator. Thus, it is a big gap in the literature and the current article is proposed to be filled.

To fulfill the research gap, we propose a new Hybrid Exponentially Weighted Moving Average (EWMA) control chart based on Product-Difference Estimator of Mean using one Auxiliary variable. In the later sections of the paper we have given the expressions for control limits of the proposed PD-HEWMA control charts. A simulated example has also been included to compare the performance PD-HEWMA control charts with simple Exponentially Weighted Moving Average (EWMA) control chart and Cumulative-sum CUSUM) control chart. The performance is measured on average run length-out of control (ARL_1). The chart showing less ARL_1 will be awarded as more efficient chart as it will be more sensitive to the change and it will be detecting it more rapidly than other chart in comparison.

Methodology

2.1 The Proposed PD-Hybrid EWMA (PD-HEWMA) Control Chart

In this study, we propose a new Hybrid Exponentially Weighted Moving Average (EWMA) control chart based on Product- Difference Estimator of Mean using one Auxiliary variable. The estimator used for the control chart development (cf. Saghir et al. 2018) is given as:

$$M_t = \bar{Y}_t((\mu x - \bar{X}_t)^2)^{\rho^2} \quad (1)$$

Whereas, *Y* denotes the main quality characteristic having mean μ_y and variance σ_y^2 and X denotes an auxiliary variable with mean μ_x and variance σ_x^2. Further, let ρ be the correlation coefficient between *Y* and *X*. Assume that the variables *Y* and *X* follow a bivariate normal distribution i.e. $(Y, X) \sim N(\mu_y, \mu_x, \sigma_y^2, \sigma_x^2, \rho)$

We adopted the procedure for the simple EWMA control chart based on Product- Difference Estimator of Mean using one Auxiliary variable from Saghir et al (2018).

Now we define two the new sequences $E_1, E_2, \ldots\ldots$ and $HE_1, HE_2, \ldots\ldots$ as follow:

$$E_t = \lambda_1 \overline{G_i} + (1-\lambda_1) E_{t-1}$$

(2)

Where E_t shows EWMA charting statistics and $\overline{G_i}$ is the mean of the data and E_{t-1} shows previous statistics value information.

$$HE_t = \lambda_2 E_t + (1-\lambda_2) HE_{t-1}$$

(3)

The HE_t statistics is the Hybrid charting statistics, $\lambda_1 \& \lambda_2$ are the smoothing parameters and the control limits of the proposed chart will be derived as:

$$E(HE_t) = \overline{M_t}$$

(4)

And variance of HE_t:

$$V(HE_t) = \frac{\lambda_1^2 \lambda_2^2 \sigma^2_{Mt}}{(\lambda_1 - \lambda_2)^2} \left[\frac{(1-\lambda_1)^2(1-(1-\lambda_1)^{2i})}{1-(1-\lambda_1)^2} + \frac{(1-\lambda_2)^2(1-(1-\lambda_2)^{2i})}{1-(1-\lambda_2)^2} - \frac{2(1-\lambda_1)(1-\lambda_2)\left\{1-(1-\lambda_1)^i(1-\lambda_2)^i\right\}}{1-(1-\lambda_1)(1-\lambda_2)} \right] \quad (5)$$

So the control limits are:

$$\text{UCL} = \mu_0 + L_{\text{PD-HEWMA1}} \sqrt{Var(HE_t)} \quad (6)$$

$$\text{LCL} = \mu_0 - L_{\text{PD-HEWMA2}} \sqrt{Var(HE_t)}$$

Where $L_{\text{PD-HEWMAi}}$ is the 99.73 quantile point of the distribution under study and σ^2_M is the variance of the M-estimator.

1.2 Algorithm for PD-Hybrid EWMA Control Chart

To evaluate the *PD-HEWMA* control chart we need to find the corresponding UCL and LCL of the control chart. The steps to compute constant control limits are given as under: i) Take a population of size N.

ii) The population means of the variables y_t and x_t are $\bar{Y}$ and $\bar{X}$ respectively.

iii) Take a sample of size n by simple random sampling (SRS) with replacement from the population of N units. Compute the Plotting Statistics values using the equation 1. Simulate steps iii-iv 2000 times and estimate the $L_{\text{PD-HEWMA}}$ value.

iv) There are two way to find the value of $L_{PD\text{-}HEWMA}$. The distribution of the estimator is required for the selection of $L_{PD\text{-}HEWMA}$ (99.73) quantile point of the estimator calculated data. First calculate the values for M_t and then use any distribution fitting software like Vose Model Risk, Easy fit 5.6 or Minitab 16 to get the most closely fitted distribution to the data. Now get the 99.73 quantile point of fitted distribution. If the distribution of estimator given in equation 1 is unknown still one can estimate the 99.73 quantile points of the estimated data by identifying the point value under which 99.73% data points falls. Now compute the constant control limits of PD-HEWMA control chart given in equation 6.

Result and Discussion

3.1 Illustrative Example

To study the features of the proposed *PD-HEWMA* control chart, we have used the simulated data and applied the proposed control charting parameters. The simulated data consists of variables; *Y* denoting the main quality characteristic having mean μ_y and variance σ_y^2 and X denoting an auxiliary variable with mean μ_x and variance σ_x^2. Further, let ρ be the correlation coefficient between *Y* and *X*. Assume that the variables *Y* and *X* follow a bivariate normal distribution i.e.

$$(Y, X) \sim N(\mu_y, \mu_x, \sigma_y^2, \sigma_x^2, \rho)$$

The procedure proposed in section 2 is evaluated using different choices of sample size (n), EWMA weight (λ_1) and HEWMA weight (λ_2) and correlation coefficient among variables (ρ). Among these some results are presented here for discussion purpose. Tables 1–2 give the ARLs of the proposed PD-HEWMA control and it comparison with the existing EWMA control chart. We have considered n = 20, 40 and $\lambda_1 = 0.05$ and $\lambda_2 = 0.03$ for $ARL_0 = 220.00$ and Tables 3 report the results for $ARL_0 = 370.00$. Four cases of the correlation among variables are considered, which include 0.0, 0.10, 0.30, and 0.50. The standard deviation of the run length is also given in parenthesis.

Table 1. ARLs of the proposed PD-HEWMA chart and conventional EWMA chart for n = 20, ARL_0 = 220 and $\lambda_1 = 0.05$ and $\lambda_2=0.02$

	0.5		**0.3**		**0.1**		**0**	
L=2.26	$L_{PD\text{-}HEWMA}$ **=5.6**		$L_{PD\text{-}HEWMA}$ **=5.3**		$L_{PD\text{-}HEWMA}$ **=3.3**		$L_{PD\text{-}HEWMA}$ **=2.6**	
Conventional EWMA	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**
216.62(208.92)	219.46(200.56)	220.53(202.19)	222.4(204.04)	220.35(206.31)	215.45(213.27)	216.5(210.92)	216.62(206.4)	219.5(205.94)
142.75(133.58)	89.55(79.53)	89.3(77.39)	77.04(68.29)	76.72(67.79)	79.59(75.23)	80(71.59)	105.41(104.09)	105.71(102.01)
74.28(60.83)	22.95(18.04)	20.13(18.17)	20.65(19.44)	16.97(16.11)	18.24(16.95)	15.07(16.59)	29.32(20.91)	27.87(101.04)
41.22(1.39)	5.12(5.64)	6.55(4.53)	3.82(2.73)	5.21(3.17)	1.22(2.13)	1.31(2.36)	5.68(4.86)	8.17(4.46)
2.42(9.18)	2.81(2.81)	2.29(2.14)	1.64(1.36)	1(1.3)	1.96(1.42)	1.4(1.38)	3.05(2.47)	2.4(2.49)
22.41(2.73)	1.26(1.16)	1.42(1.07)	1(1)	1(1)	1(1)	1(1)	1.78(1.18)	1.89(0.42)

Table 2. ARLs of the proposed PD-HEWMA chart and conventional EWMA chart for n = 40, ARL_0= 220 and λ_1 = 0.05 and λ_2=0.02

	0.5		**0.3**		**0.1**		**0**	
L=2.26	$L_{PD\text{-}HEWMA}$ **=5.6**		$L_{PD\text{-}HEWMA}$ **=5.3**		$L_{PD\text{-}HEWMA}$ **=3.3**		$L_{PD\text{-}HEWMA}$ **=2.6**	
Conventional EWMA	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**
221.13 (210.21)	224.80(212.83)	222.47(212.38)	225.60(217.14)	225.32(215.31)	218.81(215.92)	218.75(215.62)	222.05(216.30)	219.06(214.17)
11021 (101.98)	90.60(81.50)	88.51(80.36)	43.41(42.55)	41.23(41.48)	42.87(39.51)	40.07(39.16)	60.55(61.03)	57.48(60.48)
51.09 (35.64)	24.23(20.50)	22.36(19.62)	7.05(6.88)	6.13(5.51)	6.85(623)	4.56(622.72)	10.44(9.88)	9.09(9.26)
25.47 (19.80)	8.78(7.99)	8.06(7.3)	1.95(1.84)	1.27(1.47)	1.88(1.65)	1.59(1.15)	2.81(2.52)	2.62(2)
17.66 (11.29)	3.30(2.87)	2.94(2.34)	1.01(0.96)	1.00(0.75)	1.00(0.30)	1.00(0.08)	1.40(1.01)	1.03(0.55)
8.03 (5.50)	1.87(1.79)	1.36(1.62)	1.00(0.20)	1.00(0.04)	1.00(0.00)	1.00(0.01)	1.00(0.02)	1.00(0.11)

Table 3. ARLs of the proposed PD-HEWMA chart and conventional EWMA chart for n = 40, $ARL_0 = 370$ and $\lambda_1 = 0.05$ and λ_2=0.03

	0.5		**0.3**		**0.1**		**0**	
L=2.502	$L_{PD\text{-}HEWMA}$ **=5.9**		$L_{PD\text{-}HEWMA}$ **=5.7**		$L_{PD\text{-}HEWMA}$ **=3.6**		$L_{PD\text{-}HEWMA}$ **=2.8**	
Conventional EWMA	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**	**EWMA by Saghir et al (2018)**	**PD-HEWMA**
371.10 (368.97)	369.14(366.5)	367.86(364.82)	370.37(368.84)	368.78(367.22)	370.5(367.14)	370.23(366.62)	369.55(361.84)	368.3(360.82)
138.13 (110.19)	93.11(86.77)	91.71(86.05)	91.52(85.44)	89.51(84.79)	94.12(88.74)	91.14(87.52)	101.72(99.55)	99.04(98.64)
61.24 (53.07)	15.9(12.01)	14.29(11.2)	14.5(10.11)	12.18(8.99)	15.43(12.8)	14.11(12.54)	17.53(15.2)	15.88(15.14)
19.98 (11.09)	3.2(2.8)	2.15(1.22)	3.05(2.77)	2.34(2.2)	3.98(3.05)	2.32(1.62)	4.72(3.44)	4.04(2.3)
9.14 (5.09)	2.01(1.56)	1.23(0.51)	1.98(1.45)	1.07(1.08)	1.95(1.2)	1.68(0.31)	2.35(1.97)	1.64(1.31)
5.60 (2.88)	1.19(1.05)	1(0.56)	1.14(0.97)	1(0.69)	1.09(0.7)	1(0.61)	1.2(1.05)	1(0.94)

The Tables 1–3 shows that:

(i) The control chart constants for the control limits increase as the correlation coefficient increases. However, these remain unchanged when the sample size is increased.

(ii) The ARL for shifted process decreases rapidly when the variables are correlated as compared with the case of $\rho = 0$.

(iii) The proposed chart performs better at correlation $\rho = 0.1$ and 0.3 than at $\rho = 0.5$.

(iv) The ARL_1 increases as sample size increases for a fixed value of ARL_0 and λ's.

(v) The standard deviation of the run length is approximately same as the mean, which is expected as the run length for an independent sample follows a geometric distribution.

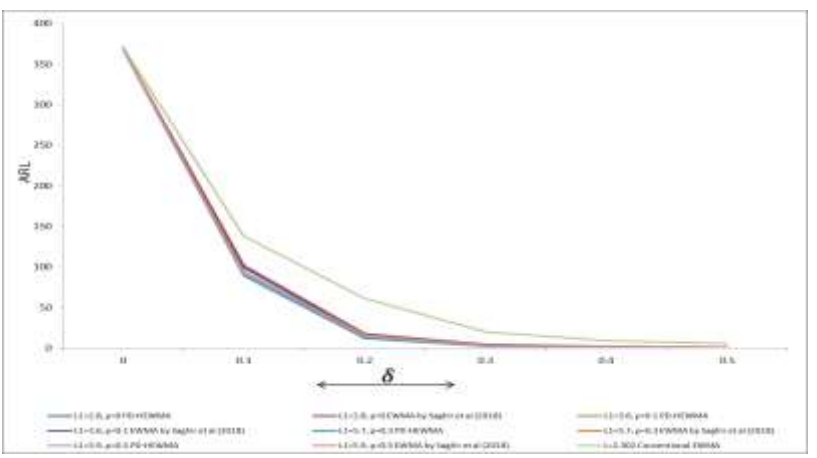

Figure 1. The ARL of the proposed PD-HEWMA chart for n = 40, ARL0 = 370 and $\lambda_1 = 0.05$ and λ_2=0.03

We use the of the out-of-control ARL_1 as a performance measure to compare the efficiency of the proposed chart to detect a small shift in mean. Figure 1 gives ARl1 for various choices of shifts and correlation coefficient. This figure shows that the proposed PD-HEWMA chart

performs better for smaller value of correlation coefficient (0, 0.1 and 0.3) than at $\rho = 0.5$.

For low correlation between variables i.e. from 0.1-0.3 the Control charts shows efficient performance whereas, for high correlation greater than 0.5 the control chart efficiency decreases. It is because as the MSE is a function containing ρ. If the correlation increases than MSE decreases and the quintile point $L_{(.)}$ value increases. Therefore, we observe better results for low correlations than the high correlations.

Application

To explain how this chart works in reality, the data is taken from Riaz (Singh and Solanki 2013). Let for this study, $\lambda_1 = 0.05$ and $\lambda_2=0.03$, n = 10, $L_{PD\text{-}HEWMA} = 5.9$. We suppose that the process is in-control with mean of $\mu_x = 210.24$. The central limit is 102.11. We plotted the values of PD-HEWMA statistic on the control chart in Figure 2.

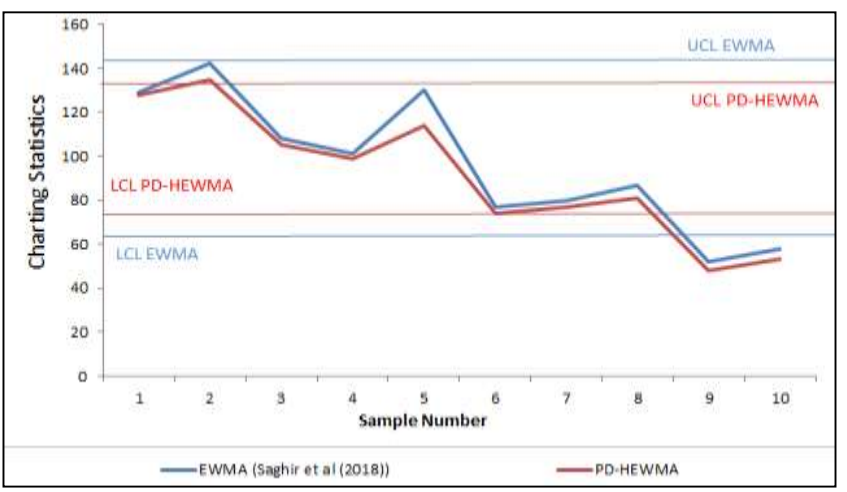

Figure 2. The proposed PD-HEWMA chart for n = 10, $ARL_0 = 370$ and $\lambda_1 = 0.05$ and $\lambda_2=0.03$

The figure 2 shows the application of the proposed control chart. It is observed that the proposed PD-HEWMA chart performs better than existing EWMA charts.

Conclusions and recommendations

This article proposed a PD-HEWMA control chart using the auxiliary information for efficient monitoring of process mean. The control chart constants have been determined using Monte Carlo Simulation for various values of correlation coefficients. The choice of correlation coefficient has a significant effect on the value of control chart constants which are used in the construction of the proposed PD-HEWMA chart. The performance of the proposed chart is assessed with respect to the average run length out-of-control situations for different values of correlation coefficient and sample sizes.

It is observed that ARL_1 is significantly reduced for small correlation (0.1–0.3) while it is not true for the large value of correlation coefficient (0.5). The performance of the proposed PD-HEWMA chart is also compared with simple EWMA chart and EWMA control chart proposed by Saghir et al (2018) for a fixed sample size and correlation coefficient. It has been observed that the proposed chart is more efficient to detect a small shift in the process mean than other two under study. Therefore, the use of the proposed PD-HEWMA chart is recommended when the statistics on the auxiliary variable is available along with the variable of interest for efficient detection of small mean shift of process.

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References

Ahmad, S., Abbasi, S. A., Riaz, M., & Abbas, N. (2014). On efficient use of auxiliary information for control charting in SPC. *Computers & Industrial Engineering*, *67*, 173-184.

Aczel, A. D. *Complete Business Statistics, Irwin, 1989*. ISBN 0-256-05710-8.

Aslam, M., Khan, N., & Jun, C. H. (2018). A hybrid exponentially weighted moving average chart for COM-Poisson distribution. *Transactions of the Institute of Measurement and Control*, *40*(2), 456-461.

Awan, W. H., & Shabbir, J. (2014). On optimum regression estimator for population mean using two auxiliary variables in simple random sampling. *Communications in Statistics-Simulation and Computation*, *43*(6), 1508-1522.

Azam, M., Aslam, M., & Jun, C. H. (2015). Designing of a hybrid exponentially weighted moving average control chart using repetitive sampling. *The International Journal of Advanced Manufacturing Technology*, *77*(9-12), 1927-1933.

Cheng, C. S., & Chen, P. W. (2011). An ARL-unbiased design of time-between-events control charts with runs rules. *Journal of Statistical Computation and Simulation*, *81*(7), 857-871.

Grant, E. L., & Leavenworth, R. S. (1980). Statistical process control.

Gupta, C. B., & Gupta, V. (2009). *Introduction to Statistical Methods*. Vikas Publishing House Pvt Ltd.

Haq, A. (2013). A new hybrid exponentially weighted moving average control chart for monitoring process mean. *Quality and Reliability Engineering International*, *29*(7), 1015-1025.

Kadılar, C., & Cıngı, H. (2006). An improvement in estimating the population mean by using the correlation coefficient. *hacettepe Journal of Mathematics and Statistics*, *35*(1), 103-109.

Keller, G. (2015). *Statistics for Management and Economics, Abbreviated*. Cengage Learning.

Kotz, S., Johnson, H. L., & Read, C. B. (1982). *Encyclopedia of statistical sciences* (No. 519.5 E5).

Mandel, B. J. (1969). The regression control chart. *Journal of Quality Technology*, *1*(1), 1-9.

Montgomery, D. C. (2007). *Introduction to statistical quality control*. John Wiley & Sons.

Noor-ul-Amin, M. and Hanif, M. (2012). Some exponential estimators in survey sampling, Pakistan Journal of Statistics, 28(3), p.367-374.

Noor-ul-Amin, M., Javaid, A., Hanif, M., & Dogu, E. (2020). Performance of maximum EWMA control chart in the presence of measurement error using auxiliary information. *Communications in Statistics-Simulation and Computation*, 1-25.

Rashid, N. A., Ghani, I. A., & Mehad, S. (2010, June). Control charts based on regression adjustment. In *Proceedings of the Regional Conference on Statistical Sciences* (pp. 117-127).

Riaz, M. (2008). Monitoring process mean level using auxiliary information. *Statistica Neerlandica*, *62*(4), 458-481.

Riaz, M. (2011). An improved control chart structure for process location parameter. *Quality and Reliability Engineering International*, *27*(8), 1033-1041.

Riaz, M., & Does, R. J. (2009). A process variability control chart. *Computational statistics*, *24*(2), 345-368.

Raza, S. M. M., Sial, M. H., Haider, M., & Butt, M. M. (2019). Hybrid exponentially weighted moving average (HEWMA) control chart based on exponential type estimator of mean. Journal of Reliability and Statistical Studies, 187-198.

Saghir, A., Ahmad, L., Aslam, M., & Jun, C. H. (2019). A EWMA control chart based on an auxiliary variable and repetitive sampling for monitoring process

location. *Communications in Statistics-Simulation and Computation*, *48*(7), 2034-2045.

Singh, H. P., & Vishwakarma, G. K. (2007). Modified exponential ratio and product estimators for finite population mean in double sampling. *Austrian journal of statistics*, *36*(3), 217-225.

Sodipo, A. A. (2010). Difference-type and regression-type estimators for the population mean based on post stratification and subsampling of the non-respondents. *European Journal of Scientific Research*, *43*(4), 445-451.

Wade, M. R., & Woodall, W. H. (1993). A review and analysis of cause-selecting control charts. *Journal of quality technology*, *25*(3), 161-169.

Watson, D. J. (1937). The estimation of leaf area in field crops. *The Journal of Agricultural Science*, *27*(3), 474-483.

Woodall, W. H., Spitzner, D. J., Montgomery, D. C., & Gupta, S. (2004). Using control charts to monitor process and product quality profiles. Journal of Quality Technology, 36(3), 309-320.

Yadav, S. K. (2011). Efficient estimators for population variance using auxiliary information. *Global Journal of Mathematical Sciences: Theory and Practical*, *3*(4), 369-376.

Zhang, G. X. (1984). A new type of control charts and a theory of diagnosis with control charts. In World Quality Congress Transactions (Vol. 3, pp. 175-185). Milwaukee, WI: American Society for Quality Control.

Appendix: Simulated Samples used for this study and M_t Charting Statistic values

X-bar	Y-bar	Mt	X-bar	Y-bar	Mt	X-bar	Y-bar	Mt
23.45832	27.23007	29.43659	24.34827	28.9264	26.78099	23.84946	18.71807	19.19657
27.45303	23.92135	28.11463	24.11329	21.93148	21.46193	28.9773	27.60302	35.39016
21.99548	31.335	38.19699	29.10436	29.3917	37.89735	26.11434	27.98798	28.53873
20.79956	26.32364	34.0831	22.01357	25.45114	30.99094	20.89405	22.56605	29.09847
25.65447	20.31967	18.82679	24.10403	27.45349	26.91597	21.33078	21.76219	27.49958
27.35163	25.7539	30.03929	27.37171	21.72093	25.37403	22.14504	21.56042	26.04146
27.12711	21.35721	24.46508	26.34935	22.60707	23.85979	25.09096	26.34144	17.10937
21.56194	24.22679	30.25744	22.02487	24.10854	29.33607	25.97459	27.7997	27.67121
22.99533	29.46728	33.39703	23.4165	27.67565	30.06277	24.31914	25.56734	23.85809
25.05446	21.51955	12.74454	26.59207	25.84079	28.09694	28.44908	26.82483	33.52151
31.33769	25.47047	35.51277	22.61341	31.78427	37.1717	22.49248	30.14621	35.57105
27.70785	29.06132	34.76865	28.08325	26.60804	32.58625	29.94787	21.29172	28.39266
28.47674	26.3807	33.01393	23.28613	29.16244	32.13214	27.77884	28.78371	34.5973
18.0267	25.16582	35.69686	24.2522	24.24228	23.00674	22.51843	22.28503	26.24606

23.51695	24.50069	26.30184	24.73443	19.6282	15.46082	25.2683	19.67564	15.52678
23.51957	24.81185	26.62741	26.24776	23.81962	24.78782	24.84238	21.85261	15.6702
24.33459	21.11642	19.62351	25.07899	24.30323	15.38961	24.68539	25.663	20.8404
27.10524	29.309	33.5116	26.74016	25.50425	28.17856	23.57584	23.49142	25.03512
25.2898	30.02758	24.02692	25.54184	23.16633	20.74697	21.76696	24.99447	30.87265
26.24606	20.91397	21.75872	28.16476	23.41125	28.8062	22.67411	25.59756	29.79783
27.3599	24.52383	28.6226	27.04061	21.51657	24.46413	28.56657	23.07107	29.005
26.80111	22.12311	24.5948	27.57226	27.69077	32.82402	25.01653	24.83095	11.86504
24.14449	20.76153	20.18643	26.22877	26.40962	27.40734	21.05847	23.00224	29.44352
22.35784	29.21512	34.79848	25.01673	29.10547	13.93834	20.63087	31.33778	40.86385
24.11006	28.81011	28.21173	24.16067	22.65207	21.94908	27.9079	22.38419	27.126
22.94914	24.35363	27.71484	22.25936	23.1006	27.69725	19.74096	23.29686	31.40947
23.18977	22.97675	25.56705	23.1123	25.32675	28.39536	22.37573	21.94554	26.10766
26.14062	22.08999	22.61939	27.8897	25.5792	30.96282	26.54476	27.50612	29.74571
25.02361	26.87654	13.69407	24.55039	26.69046	23.11354	24.59517	29.93734	25.44028
26.90951	32.32318	36.3145	26.34666	21.63346	22.82403	25.62281	28.23219	25.92562
22.96848	22.31808	25.35506	22.26203	25.76695	30.88874	22.67774	24.68114	28.72296
23.86	27.95	28.58	25.57	24.35	22.01	24.95	20.09	11.30

904	586	206	056	748	743	91	925	549
28.37 409	28.04 544	34.90 844	26.72 357	29.85 264	32.92 608	24.24 714	20.96 47	19.92 038
28.30 584	29.40 755	36.46 948	25.73 498	26.37 437	24.95 237	24.91 578	23.20 753	14.86 635
25.03 853	27.83 795	15.49 074	25.09 41	23.38 761	15.28 37	23.44 415	22.83 673	24.72 793
25.59 518	23.80 194	21.67 948	29.25 285	18.28 135	23.72 306	27.20 923	24.29 095	28.01 611
26.93 426	26.92 414	30.31 896	21.83 397	15.52 789	19.10 755	26.72 879	24.37 441	26.89 848
22.26 014	20.33 451	24.37 951	23.89 975	26.38 463	26.84 226	22.61 369	26.36 844	30.83 721
25.62 551	22.27 281	20.46 905	21.89 949	23.27 03	28.52 725	24.63 714	24.54 552	20.45 155
21.80 258	20.93 427	25.80 606	23.02 849	29.52 067	33.35 723	24.54 753	25.20 47	21.85 183
18.75 77	28.78 509	40.02 485	24.93 641	27.52 26	16.76 084	24.35 159	27.10 919	25.07 55
26.91 574	23.22 214	26.10 494	26.30 424	26.88 009	28.19 65	23.77 78	29.03 857	30.10 655
26.47 944	24.45 86	26.24 517	29.74 709	29.18 974	38.63 556	27.00 247	23.87 025	27.04 822
26.92 398	24.45 938	27.51 703	23.19 734	21.91 856	24.37 117	24.95 147	24.45 606	14.18 641
30.12 536	17.81 552	23.90 831	24.86 811	32.25 458	22.39 916	22.07 064	21.56 006	26.16 189
28.85 456	24.32 982	31.01 803	23.91 661	24.17 78	24.52 888	21.41 481	21.20 172	26.67 985
30.39 385	30.13 082	40.80 871	28.03 673	26.92 592	32.88 543	27.26 951	27.03 35	31.33 069
29.07 445	25.06 542	32.27 658	24.45 653	25.29 503	22.66 562	26.71 724	21.90 384	24.14 293
21.62 583	24.27 977	30.22 14	26.66 038	20.32 718	22.26 971	23.18 643	22.64 783	25.20 942

27.74572	27.17464	32.59281	23.74341	25.47777	26.54705	26.88683	25.54958	28.6428
29.81682	26.92876	35.73661	26.41044	26.78362	28.49397	22.76777	27.71585	32.02589
26.89159	26.40329	29.6133	20.70669	26.49638	34.44206	23.61259	21.46517	22.76834
25.67107	23.88731	22.23237	30.32388	27.41148	37.03852	24.00016	24.82402	24.8233
25.46704	19.57945	17.07198	24.96527	27.80765	15.18749	20.51043	28.71364	37.62575
27.28518	31.51311	36.56765	23.58897	22.87619	24.33884	28.43603	31.07017	38.80018
27.49979	24.9716	29.44889	23.90686	27.99545	28.44783	27.02048	28.11473	31.90919
25.5237	24.1245	21.473	20.3554	23.24277	30.64351	21.81816	26.80482	33.01375
25.41233	22.63562	19.29904	25.62243	20.36858	18.70237	23.44648	24.67906	26.71565
22.3699	29.75842	35.41643	25.74564	26.56019	25.19337	26.72565	24.18824	26.68428
30.42277	23.33442	31.6342	27.24761	21.56999	24.95512	23.71762	27.09198	28.33241
28.0607	28.81593	35.24361	24.81455	24.50564	18.09452	24.08017	27.67969	27.26647
20.47515	28.55447	37.46993	22.34543	25.35266	30.22334	27.30916	27.47956	31.94711
26.21877	19.81923	20.53775	23.32846	28.82542	31.61815	26.95046	24.7513	27.91403
25.99488	26.43323	26.40882	23.29069	26.36933	29.04069	24.49482	22.20456	19.63645
29.53094	24.85717	32.62613	23.76783	27.27784	28.32244	25.10984	23.37879	15.70931
27.17919	22.96857	26.42574	23.07571	23.33034	26.24762	21.0146	23.12171	29.65548
20.56	21.00	27.46	24.57	28.96	24.80	27.45	27.31	32.09

539	345	151	738	549	568	178	352	848
28.3846	25.51646	31.77838	25.34886	25.61068	21.18841	24.24873	26.25252	24.93526
23.68114	24.92174	26.19475	23.4407	27.00471	29.25275	23.90831	27.51088	27.94875
26.14881	21.94416	22.49901	28.61441	27.54748	34.71591	25.077	28.94752	18.24636
24.88885	22.1386	14.90769	23.91975	28.52238	28.92147	27.00055	24.54404	27.80693
21.81191	24.34599	29.99597	24.21663	24.76354	23.69881	26.67399	22.59238	24.78778
26.22685	24.45757	25.37439	28.1963	24.59599	30.31803	23.44215	23.06524	24.98115
24.28636	23.86083	22.45492	29.22475	32.0331	41.51864	27.06607	20.47845	23.33584
22.81898	22.81887	26.25747	25.74454	28.79072	27.30184	20.06726	27.34697	36.44727
22.05827	24.20781	29.39707	28.44033	26.23109	32.76457	24.80882	21.01287	15.60072
21.53758	25.54923	31.94965	22.80472	25.22339	29.0584	26.81663	26.25361	29.23189
24.2856	26.01828	24.48994	28.74511	27.53193	34.91888	27.46747	27.81034	32.71987
27.46193	28.67214	33.72017	27.86506	25.43004	30.73484	23.35549	23.41946	25.61319
27.99663	24.27844	29.58114	25.68275	24.12195	22.5206	22.5944	25.96319	30.40732
26.21807	27.63985	28.6389	32.58623	26.63569	38.35912	19.62351	29.48699	39.91354
21.95459	26.42134	32.28577	23.89661	21.59322	21.97903	27.90494	24.74799	29.98503
25.14091	24.34194	17.10668	28.52368	29.11906	36.52891	27.24428	24.98423	28.89747
25.86137	20.44133	19.89954	25.12078	25.09133	17.15085	25.29639	26.17833	21.03179

26.37136	27.51039	29.11951	22.96826	26.23723	29.80809	21.24947	21.7279	27.56478
25.46235	29.73474	25.87965	25.20743	19.41964	14.63118	24.78281	22.35093	16.97959
26.83653	23.90633	26.6706	27.85039	24.55822	29.65376	22.29292	23.16373	27.71141
24.26585	24.28033	22.96653	19.96315	29.80481	39.87264	23.61085	22.97537	24.37571
22.96207	24.39291	27.72795	22.99371	23.21098	26.31021	26.91785	20.29337	22.81712
21.56844	22.00906	27.47831	26.19903	26.99093	27.88737	23.72879	21.0286	21.95681
24.84617	29.0205	20.71911	22.22868	21.89223	26.30108	24.96779	26.79118	14.43562
25.26749	28.0394	22.11484	23.3818	24.83407	27.08155	24.17544	22.59729	21.82612
25.05444	19.90773	11.78937	19.9859	27.45474	36.69883	24.60578	26.59746	22.49435
23.55461	22.68447	24.23964	26.85153	24.42747	27.29191	24.0307	24.242	24.10634
22.94914	24.35363	27.71484	22.25936	23.1006	27.69725	19.74096	23.29686	31.40947
23.18977	22.97675	25.56705	23.1123	25.32675	28.39536	22.37573	21.94554	26.10766
26.14062	22.08999	22.61939	27.8897	25.5792	30.96282	26.54476	27.50612	29.74571
25.02361	26.87654	13.69407	24.55039	26.69046	23.11354	24.59517	29.93734	25.44028
26.90951	32.32318	36.3145	26.34666	21.63346	22.82403	25.62281	28.23219	25.92562
22.96848	22.31808	25.35506	22.26203	25.76695	30.88874	22.67774	24.68114	28.72296
23.86904	27.95586	28.58206	25.57056	24.35748	22.01743	24.9591	20.09925	11.30549
28.37	28.04	34.90	26.72	29.85	32.92	24.24	20.96	19.92

409	544	844	357	264	608	714	47	038
28.30584	29.40755	36.46948	25.73498	26.37437	24.95237	24.91578	23.20753	14.86635
25.03853	27.83795	15.49074	25.0941	23.38761	15.2837	23.44415	22.83673	24.72793
25.59518	23.80194	21.67948	29.25285	18.28135	23.72306	27.20923	24.29095	28.01611
26.93426	26.92414	30.31896	21.83397	15.52789	19.10755	26.72879	24.37441	26.89848
22.26014	20.33451	24.37951	23.89975	26.38463	26.84226	22.61369	26.36844	30.83721
25.62551	22.27281	20.46905	21.89949	23.2703	28.52725	24.63714	24.54552	20.45155
21.80258	20.93427	25.80606	23.02849	29.52067	33.35723	24.54753	25.2047	21.85183
18.7577	28.78509	40.02485	24.93641	27.5226	16.76084	24.35159	27.10919	25.0755
26.91574	23.22214	26.10494	26.30424	26.88009	28.1965	23.7778	29.03857	30.10655
26.47944	24.4586	26.24517	29.74709	29.18974	38.63556	27.00247	23.87025	27.04822
26.92398	24.45938	27.51703	23.19734	21.91856	24.37117	24.95147	24.45606	14.18641
30.12536	17.81552	23.90831	24.86811	32.25458	22.39916	22.07064	21.56006	26.16189
28.85456	24.32982	31.01803	23.91661	24.1778	24.52888	21.41481	21.20172	26.67985
30.39385	30.13082	40.80871	28.03673	26.92592	32.88543	27.26951	27.0335	31.33069
29.07445	25.06542	32.27658	24.45653	25.29503	22.66562	26.71724	21.90384	24.14293
21.62583	24.27977	30.2214	26.66038	20.32718	22.26971	23.18643	22.64783	25.20942
27.74572	27.17464	32.59281	23.74341	25.47777	26.54705	26.88683	25.54958	28.6428

29.81682	26.92876	35.73661	26.41044	26.78362	28.49397	22.76777	27.71585	32.02589
26.89159	26.40329	29.6133	20.70669	26.49638	34.44206	23.61259	21.46517	22.76834
25.67107	23.88731	22.23237	30.32388	27.41148	37.03852	24.00016	24.82402	24.8233
25.46704	19.57945	17.07198	24.96527	27.80765	15.18749	20.51043	28.71364	37.62575
27.28518	31.51311	36.56765	23.58897	22.87619	24.33884	28.43603	31.07017	38.80018
27.49979	24.9716	29.44889	23.90686	27.99545	28.44783	27.02048	28.11473	31.90919
25.5237	24.1245	21.473	20.3554	23.24277	30.64351	21.81816	26.80482	33.01375
25.41233	22.63562	19.29904	25.62243	20.36858	18.70237	23.44648	24.67906	26.71565
22.3699	29.75842	35.41643	25.74564	26.56019	25.19337	26.72565	24.18824	26.68428
30.42277	23.33442	31.6342	27.24761	21.56999	24.95512	23.71762	27.09198	28.33241
28.0607	28.81593	35.24361	24.81455	24.50564	18.09452	24.08017	27.67969	27.26647
20.47515	28.55447	37.46993	22.34543	25.35266	30.22334	27.30916	27.47956	31.94711
26.21877	19.81923	20.53775	23.32846	28.82542	31.61815	26.95046	24.7513	27.91403
25.99488	26.43323	26.40882	23.29069	26.36933	29.04069	24.49482	22.20456	19.63645
29.53094	24.85717	32.62613	23.76783	27.27784	28.32244	25.10984	23.37879	15.70931
27.17919	22.96857	26.42574	23.07571	23.33034	26.24762	21.0146	23.12171	29.65548
20.56539	21.00345	27.46151	24.57738	28.96549	24.80568	27.45178	27.31352	32.09848
28.38	25.51	31.77	25.34	25.61	21.18	24.24	26.25	24.93

46	646	838	886	068	841	873	252	526
23.68	24.92	26.19	23.44	27.00	29.25	23.90	27.51	27.94
114	174	475	07	471	275	831	088	875
26.14	21.94	22.49	28.61	27.54	34.71	25.07	28.94	18.24
881	416	901	441	748	591	7	752	636
24.88	22.13	14.90	23.91	28.52	28.92	27.00	24.54	27.80
885	86	769	975	238	147	055	404	693
21.81	24.34	29.99	24.21	24.76	23.69	26.67	22.59	24.78
191	599	597	663	354	881	399	238	778
26.22	24.45	25.37	28.19	24.59	30.31	23.44	23.06	24.98
685	757	439	63	599	803	215	524	115
24.28	23.86	22.45	29.22	32.03	41.51	27.06	20.47	23.33
636	083	492	475	31	864	607	845	584
22.81	22.81	26.25	25.74	28.79	27.30	20.06	27.34	36.44
898	887	747	454	072	184	726	697	727
22.05	24.20	29.39	28.44	26.23	32.76	24.80	21.01	15.60
827	781	707	033	109	457	882	287	072
21.53	25.54	31.94	22.80	25.22	29.05	26.81	26.25	29.23
758	923	965	472	339	84	663	361	189
24.28	26.01	24.48	28.74	27.53	34.91	27.46	27.81	32.71
56	828	994	511	193	888	747	034	987
27.46	28.67	33.72	27.86	25.43	30.73	23.35	23.41	25.61
193	214	017	506	004	484	549	946	319
27.99	24.27	29.58	25.68	24.12	22.52	22.59	25.96	30.40
663	844	114	275	195	06	44	319	732
26.21	27.63	28.63	32.58	26.63	38.35	19.62	29.48	39.91
807	985	89	623	569	912	351	699	354
21.95	26.42	32.28	23.89	21.59	21.97	27.90	24.74	29.98
459	134	577	661	322	903	494	799	503
25.14	24.34	17.10	28.52	29.11	36.52	27.24	24.98	28.89
091	194	668	368	906	891	428	423	747
25.86	20.44	19.89	25.12	25.09	17.15	25.29	26.17	21.03
137	133	954	078	133	085	639	833	179
26.37	27.51	29.11	22.96	26.23	29.80	21.24	21.72	27.56
136	039	951	826	723	809	947	79	478

28.98279	22.0558	28.28502	29.39768	29.88459	39.01463	29.87939	22.22066	29.55716
26.8915	25.83401	28.97457	29.76047	25.33879	33.55543	31.94248	25.97904	36.82102
27.66032	24.55785	29.28724	25.66311	20.65348	19.18131	28.80614	25.07536	31.89587
25.15725	24.59858	17.63186	28.30693	22.15197	27.47317	24.12652	27.27024	26.61425
27.07842	24.39315	27.82658	27.26234	27.65624	32.03418	24.64123	21.78756	18.11658
23.64634	25.97245	27.42741	24.46264	19.41085	17.35768	26.94484	23.73161	26.75014
23.72632	26.00132	27.15855	26.11213	31.40327	32.00981	22.96717	27.4869	31.23086
24.44937	25.29354	22.71771	19.33555	23.47234	32.07191	21.02942	21.96923	28.15844
24.71567	32.38706	25.82612	22.49446	23.53443	27.76554	28.04993	25.74441	31.46698
25.6877	23.65128	22.10986	20.66221	26.30688	34.25924	24.22615	29.05303	27.74274
24.32738	28.80393	26.81945	22.32209	21.7055	25.91631	19.48452	27.36128	37.20672
25.71613	26.46398	24.92035	26.73526	24.4283	26.97608	25.76638	25.63593	24.43707
27.23473	22.55266	26.06504	27.43148	20.13297	23.62459	23.65026	27.63921	29.1723
28.47158	24.75539	30.97166	23.50878	19.83173	21.31072	24.59413	24.32533	20.68085
25.27265	27.27415	21.58542	25.81304	20.67715	19.92099	23.14177	24.07067	26.91077
22.35657	21.49837	25.60919	28.41853	29.80115	37.18126	21.93851	27.78954	33.98986
23.75465	27.54059	28.65006	29.33712	21.18805	27.59226	22.51282	23.47446	27.65815
25.59	31.34	28.51	23.87	19.81	20.23	26.68	27.39	30.08

101	326	219	577	683	895	285	085	111
23.7674	28.51358	29.60738	23.09097	27.2974	30.66672	19.29107	30.24059	41.37806
30.26987	25.9296	34.97194	23.49683	30.35494	32.66562	26.02084	24.18799	24.27794
32.28632	25.76991	36.84379	23.97187	21.76993	21.87892	23.80129	26.94479	27.83835
29.71753	22.64416	29.93814	26.67186	24.94792	27.36593	23.79746	28.40951	29.3685
23.39988	20.9823	22.83498	27.95949	23.60085	28.69106	26.80914	32.11426	35.7308
22.36867	19.20678	22.86051	21.07296	28.80378	36.84522	19.1076	23.35642	32.14096
31.15332	26.7359	37.07957	23.61936	26.08076	27.63979	26.53722	22.82528	24.66203
23.26695	18.67973	20.62322	28.55375	22.89458	28.76446	25.3735	27.19515	22.77737
27.31226	24.49146	28.48007	23.46331	24.09686	26.03429	23.79605	22.41064	23.17202
23.4119	25.03356	27.20698	28.69158	25.21035	31.89166	26.52914	28.87977	31.17412
26.55157	27.40563	29.66052	28.31199	27.17627	33.71365	27.93631	21.06454	25.5715
24.62587	21.72306	18.19975	22.89373	23.56715	26.94881	24.94805	25.36602	14.89553
28.67423	22.72818	28.72729	23.23356	21.52091	23.84176	23.23295	24.0588	26.655
27.94456	28.42593	34.52538	26.61752	26.85326	29.28127	25.43537	23.70715	20.41143
25.59716	22.72456	20.71054	26.78894	30.55866	33.93138	29.95404	18.93475	25.25528
24.23185	24.42152	23.28909	27.10381	26.51923	30.31812	20.896	23.34675	30.10258
25.14968	26.40712	18.76071	23.97969	26.32882	26.4243	22.52236	23.76014	27.97537

27.01849	26.25788	29.79643	22.79509	20.24107	23.33695	23.70967	25.68687	26.89287
26.03599	27.95887	28.13738	27.01021	21.86601	24.79435	25.17761	24.3124	17.81281
22.88668	21.36684	24.44747	28.53448	21.17341	26.57599	26.64063	28.13854	30.7612
30.78018	25.24357	34.61786	25.38125	22.49391	18.90961	21.73519	25.27667	31.27623
24.4867	25.33477	22.469	26.48807	29.09627	31.25429	24.43087	27.61904	24.9544
28.88034	23.9446	30.56357	27.68211	29.01817	34.65739	28.21031	21.06101	25.9811
23.95995	23.99022	24.16038	27.46009	24.23224	28.49474	23.8922	24.58044	25.03758
27.44512	27.89251	32.76286	29.84621	27.09833	36.00103	26.84034	20.1969	22.54064
28.44015	21.83297	27.27074	27.03538	27.12488	30.8265	29.75453	22.70859	30.06557
25.10128	25.28004	16.74053	28.43509	23.58998	29.45754	23.21992	22.00236	24.4089
21.29502	27.03123	34.21742	24.4822	25.18583	22.37207	26.64033	26.86964	29.37309
27.16514	24.8425	28.54846	25.08566	21.19823	13.6208	23.93322	24.03224	24.3135
24.57175	26.05332	22.36498	25.31815	21.36714	17.38682	23.70485	26.82975	28.1083
25.26725	27.07187	21.34832	23.82812	24.66198	25.37621	24.02755	24.01031	23.88988
28.19592	25.56146	31.50743	23.69094	28.06687	29.46094	23.40054	29.69757	32.31738
23.68852	24.71827	25.95463	24.98898	25.44417	11.30342	24.56912	25.92801	22.28192
24.19694	25.70224	24.70729	25.41842	25.41049	21.7222	23.44277	21.84859	23.66176
27.78	21.40	25.73	26.19	26.17	27.03	31.06	18.88	26.11

581	354	811	822	063	654	417	137	754
25.50239	27.17178	24.00518	26.0049	21.08607	21.10462	25.82641	28.24644	27.29347
24.29213	25.53247	23.993	31.47188	26.85242	37.58106	27.67968	21.03765	25.12187
21.5705	27.5719	34.4198	27.06971	29.69991	33.85469	24.10425	32.80207	32.15845
25.553	24.62743	22.13654	23.8154	25.8447	26.64494	24.33526	24.9084	23.14322
27.22737	21.23473	24.52729	24.61761	24.38607	20.51124	27.7026	29.04622	34.73843
18.97509	22.50474	31.09317	24.95163	25.29984	14.66718	22.94545	24.56422	27.96352
22.11264	30.00449	36.31419	19.88545	29.27029	39.26561	23.89209	27.42713	27.93771
26.70924	21.71461	23.91425	19.32349	28.0518	38.34382	28.50385	23.82832	29.8615
24.70379	24.58468	19.74939	21.46622	25.01784	31.40023	26.20973	23.93587	24.77042
22.85649	23.25268	26.67324	23.88417	19.89739	20.29381	19.90353	20.83535	27.93246
23.03499	18.3156	20.68363	22.9759	30.93449	35.12083	26.33126	23.35495	24.58931
26.17187	28.32817	29.14857	30.10496	25.22481	33.82725	22.97171	25.21892	28.64243
22.12027	21.25782	25.71592	23.7403	24.66048	25.70688	25.11678	20.93855	14.22572
24.1528	25.84042	25.08054	27.08753	24.71432	28.21515	22.87815	25.78106	29.51952
26.20395	22.7569	23.53003	25.08418	22.48954	14.40531	25.6234	30.34731	27.87262
21.00095	22.96782	29.47623	30.48404	27.44823	37.28657	23.93778	27.80073	28.10444
21.81514	23.99135	29.55364	30.12833	24.81834	33.30952	25.58437	20.89865	18.97241

24.68773	25.40847	20.60596	23.46221	30.44663	32.89886	25.54531	19.57714	17.55274
28.30548	23.53901	29.19109	20.05627	21.4576	28.60955	24.61426	27.96117	23.55527
28.22404	29.13862	35.97337	24.83302	24.17684	17.51776	22.36067	27.4546	32.6952
24.23489	25.73618	24.52533	26.16961	29.8449	30.69852	25.55778	27.39954	24.66644
23.01174	27.11704	30.68793	24.88513	22.75796	15.41587	20.53904	23.77613	31.11991
25.27991	26.33008	20.937	24.36128	19.05436	17.57724	22.88101	19.69361	22.54387
25.64813	27.25362	25.20714	31.86695	23.0081	32.54604	24.43501	18.97094	17.11813
25.33942	24.52904	20.19363	22.57769	22.80377	26.74041	26.22661	23.19284	24.06142
23.03635	22.11184	24.96758	23.20991	24.13265	26.79924	23.69269	25.97907	27.26289
24.58074	29.42554	25.16352	22.33673	20.15461	24.04081	22.95187	26.63553	30.30439
28.07818	25.50789	31.22967	26.96073	27.98095	31.58622	21.66547	24.57391	30.52254
22.37896	26.57152	31.60398	27.84644	19.63864	23.70749	24.92727	24.26952	15.14143
20.18907	24.60426	32.64461	25.29142	27.00018	21.6262	26.23236	24.25815	25.1878
26.231	22.82013	23.68998	24.62836	25.45841	21.30358	26.03607	31.07463	31.27347
25.34563	27.13295	22.41026	19.04542	27.72173	38.22025	19.83856	20.96801	28.17448
23.97223	28.25253	28.39219	20.80838	25.83143	33.43315	24.94142	28.43082	17.06017
21.08189	22.49131	28.75866	29.39356	25.74061	33.59895	25.37592	26.70587	22.39361
24.40	25.07	22.80	30.77	24.21	33.19	18.61	24.96	34.85

921	586	938	443	359	945	405	26	222
28.12896	24.08429	29.57371	25.17387	23.38125	17.06504	21.3255	23.53431	29.74659
30.97031	20.74876	28.62013	22.65534	24.16181	28.1672	22.02361	24.00645	29.21407
24.55631	24.3727	21.0561	28.28361	28.19222	34.91986	26.57348	25.63236	27.81146
27.81917	29.00745	34.95678	22.76287	31.63931	36.57391	23.71249	27.30806	28.57892
27.57599	21.33588	25.29767	28.02196	26.01992	31.75103	27.29135	21.40063	24.84522
25.37636	32.024	26.85865	26.0005	23.57778	23.57989	26.48044	27.96983	30.01651
23.64686	23.70633	25.03259	27.29631	26.80322	31.12951	26.36129	25.18305	26.62071
27.07745	25.81191	29.44257	24.64548	26.35028	21.8635	26.39016	22.41716	23.7866
22.07835	30.38851	36.85721	25.68767	25.85201	24.16698	25.78253	24.06124	23.02228
26.66636	30.70167	33.65738	25.29964	20.00359	16.10261	25.04942	28.21571	16.42097
24.63623	16.34789	13.62733	24.22675	26.86735	25.65206	26.2997	24.80169	25.99997
29.81328	26.58683	35.27816	25.05361	26.6022	15.71017	23.50719	27.17422	29.20641
25.5954	26.14533	23.8155	26.15281	28.04498	28.7721	21.27673	24.63435	31.21099
23.58572	24.94645	26.55247	26.82297	25.47078	28.37804	36.14086	27.09379	41.81337
25.1947	28.39567	21.15135	26.82586	26.02811	29.00728	28.18985	29.28524	36.08506
24.20141	30.40277	29.19652	26.9332	28.57527	32.17513	26.21658	22.00545	22.79583
22.76653	21.25305	24.56053	25.0555	26.22237	15.58263	29.75744	23.80194	31.51661

23.69757	28.8919	30.29923	28.96056	28.80024	36.8971	23.51373	22.04025	23.66979
23.61193	20.49165	21.73755	26.65932	28.25771	30.95453	22.12039	28.2628	34.18969
28.5266	21.48896	26.96122	26.87944	25.05611	28.06977	24.79374	26.14862	19.68076
27.56283	27.09768	32.09976	26.19419	23.78762	24.55975	32.44566	23.45903	33.67074
22.32783	25.71178	30.68794	24.58494	24.46344	20.8823	25.2133	19.55092	14.80417
24.85582	22.99169	16.22467	25.19223	25.79025	19.16645	24.96809	22.23989	11.96306
24.01196	28.51239	28.45073	22.28511	21.93716	26.25766	25.88388	29.05695	28.41848
27.15925	29.34065	33.70112	22.41149	24.29095	28.8266	21.82073	28.44644	35.03055
23.64521	24.38953	25.75967	27.37887	24.60812	28.76241	24.32468	22.23159	20.71488
21.79016	21.44635	26.45577	27.4554	30.87913	36.29835	26.20981	21.00414	21.73673
27.74136	23.91871	28.67951	24.06281	26.08282	25.78005	20.87794	21.34254	27.54017
22.29429	26.58426	31.80058	27.18025	22.46292	25.84625	28.40151	20.59528	25.67253
21.29872	29.03603	36.74857	30.34239	24.36212	32.93878	25.95852	26.74632	26.54313
27.88095	28.72417	34.75073	22.65281	28.35316	33.05979	23.43137	25.44223	27.58982
24.40501	29.13925	26.53931	27.51613	24.50952	28.9379	23.94256	23.28078	23.51602
22.99858	23.39186	26.50364	25.72413	29.55114	27.8831	23.69188	28.1986	29.59539
25.05009	23.80694	13.88878	22.55831	25.17448	29.56276	26.07262	21.80748	22.08439
24.13	24.05	23.42	28.56	26.36	33.14	27.22	19.16	22.12

746	557	37	212	682	098	001	713	59
27.85 11	22.64 997	27.35 079	27.12 833	22.64 946	25.94 805	27.98 157	19.72 372	24.00 983
20.49 085	25.22 617	33.08 175	27.36 621	23.85 265	27.85 263	21.26 937	29.73 512	37.68 69
27.76 733	23.18 526	27.84 73	26.71 164	26.23 781	28.90 293	26.38 348	30.51 124	32.34 706
25.05 926	29.54 533	17.76 601	21.90 535	27.55 831	33.77 245	27.93 319	24.95 582	30.28 957
22.75 325	25.12 039	29.06 071	21.70 799	26.62 674	32.99 597	21.15 362	26.18 838	33.37 475
21.93 829	25.94 56	31.73 492	23.54 884	26.84 281	28.70 361	21.65 024	29.07 092	36.13 777
24.15 71	23.40 414	22.69 511	22.01 015	21.20 558	25.82 659	26.84 441	22.22 931	24.81 878
24.79 136	17.20 482	12.97 6	26.50 655	28.44 418	30.62 179	23.18 961	27.06 168	30.11 299
22.04 725	22.00 597	26.74 122	20.32 657	21.59 805	28.50 683	24.05 2	22.33 899	22.12 531
27.66 697	24.21 597	28.89 251	26.58 341	20.23 273	21.97 765	21.37 09	26.42 124	33.32 092
24.90 624	27.39 777	17.89 291	23.90 492	23.82 876	24.22 153	26.49 124	20.26 146	21.77 255
27.96 519	24.51 631	29.81 43	22.47 304	30.41 149	35.93 399	27.47 692	20.81 007	24.50 066
24.91 383	27.48 045	17.67 629	24.08 43	24.93 138	24.53 927	27.68 457	31.40 147	37.51 002
25.03 358	25.18 851	13.67 423	26.75 06	20.25 616	22.40 426	24.72 055	19.01 736	15.11 768
25.61 093	19.91 034	18.22 036	24.84 202	26.98 31	19.35 707	22.40 884	30.60 521	36.32 655
22.71 923	31.47 564	36.51 148	24.76 693	25.06 88	19.28 768	24.31 37	25.74 041	24.05 403
23.51 695	24.50 069	26.30 184	24.73 443	19.62 82	15.46 082	25.26 83	19.67 564	15.52 678

23.51957	24.81185	26.62741	26.24776	23.81962	24.78782	24.84238	21.85261	15.6702
24.33459	21.11642	19.62351	25.07899	24.30323	15.38961	24.68539	25.663	20.8404
27.10524	29.309	33.5116	26.74016	25.50425	28.17856	23.57584	23.49142	25.03512
25.2898	30.02758	24.02692	25.54184	23.16633	20.74697	21.76696	24.99447	30.87265
26.24606	20.91397	21.75872	28.16476	23.41125	28.8062	22.67411	25.59756	29.79783
27.3599	24.52383	28.6226	27.04061	21.51657	24.46413	28.56657	23.07107	29.005
26.80111	22.12311	24.5948	27.57226	27.69077	32.82402	25.01653	24.83095	11.86504
24.14449	20.76153	20.18643	26.22877	26.40962	27.40734	21.05847	23.00224	29.44352
22.35784	29.21512	34.79848	25.01673	29.10547	13.93834	20.63087	31.33778	40.86385
24.11006	28.81011	28.21173	24.16067	22.65207	21.94908	27.9079	22.38419	27.126
22.94914	24.35363	27.71484	22.25936	23.1006	27.69725	19.74096	23.29686	31.40947
23.18977	22.97675	25.56705	23.1123	25.32675	28.39536	22.37573	21.94554	26.10766
26.14062	22.08999	22.61939	27.8897	25.5792	30.96282	26.54476	27.50612	29.74571
25.02361	26.87654	13.69407	24.55039	26.69046	23.11354	24.59517	29.93734	25.44028
26.90951	32.32318	36.3145	26.34666	21.63346	22.82403	25.62281	28.23219	25.92562
22.96848	22.31808	25.35506	22.26203	25.76695	30.88874	22.67774	24.68114	28.72296
23.86904	27.95586	28.58206	25.57056	24.35748	22.01743	24.9591	20.09925	11.30549
28.37	28.04	34.90	26.72	29.85	32.92	24.24	20.96	19.92

409	544	844	357	264	608	714	47	038
28.30584	29.40755	36.46948	25.73498	26.37437	24.95237	24.91578	23.20753	14.86635
25.03853	27.83795	15.49074	25.0941	23.38761	15.2837	23.44415	22.83673	24.72793
25.59518	23.80194	21.67948	29.25285	18.28135	23.72306	27.20923	24.29095	28.01611
26.93426	26.92414	30.31896	21.83397	15.52789	19.10755	26.72879	24.37441	26.89848
22.26014	20.33451	24.37951	23.89975	26.38463	26.84226	22.61369	26.36844	30.83721
25.62551	22.27281	20.46905	21.89949	23.2703	28.52725	24.63714	24.54552	20.45155
21.80258	20.93427	25.80606	23.02849	29.52067	33.35723	24.54753	25.2047	21.85183
18.7577	28.78509	40.02485	24.93641	27.5226	16.76084	24.35159	27.10919	25.0755
26.91574	23.22214	26.10494	26.30424	26.88009	28.1965	23.7778	29.03857	30.10655
26.47944	24.4586	26.24517	29.74709	29.18974	38.63556	27.00247	23.87025	27.04822
26.92398	24.45938	27.51703	23.19734	21.91856	24.37117	24.95147	24.45606	14.18641
30.12536	17.81552	23.90831	24.86811	32.25458	22.39916	22.07064	21.56006	26.16189
28.85456	24.32982	31.01803	23.91661	24.1778	24.52888	21.41481	21.20172	26.67985
30.39385	30.13082	40.80871	28.03673	26.92592	32.88543	27.26951	27.0335	31.33069
29.07445	25.06542	32.27658	24.45653	25.29503	22.66562	26.71724	21.90384	24.14293
21.62583	24.27977	30.2214	26.66038	20.32718	22.26971	23.18643	22.64783	25.20942
27.74572	27.17464	32.59281	23.74341	25.47777	26.54705	26.88683	25.54958	28.6428

29.81682	26.92876	35.73661	26.41044	26.78362	28.49397	22.76777	27.71585	32.02589
26.89159	26.40329	29.6133	20.70669	26.49638	34.44206	23.61259	21.46517	22.76834
25.67107	23.88731	22.23237	30.32388	27.41148	37.03852	24.00016	24.82402	24.8233
25.46704	19.57945	17.07198	24.96527	27.80765	15.18749	20.51043	28.71364	37.62575
27.28518	31.51311	36.56765	23.58897	22.87619	24.33884	28.43603	31.07017	38.80018
27.49979	24.9716	29.44889	23.90686	27.99545	28.44783	27.02048	28.11473	31.90919
25.5237	24.1245	21.473	20.3554	23.24277	30.64351	21.81816	26.80482	33.01375
25.41233	22.63562	19.29904	25.62243	20.36858	18.70237	23.44648	24.67906	26.71565
22.3699	29.75842	35.41643	25.74564	26.56019	25.19337	26.72565	24.18824	26.68428
30.42277	23.33442	31.6342	27.24761	21.56999	24.95512	23.71762	27.09198	28.33241
28.0607	28.81593	35.24361	24.81455	24.50564	18.09452	24.08017	27.67969	27.26647
20.47515	28.55447	37.46993	22.34543	25.35266	30.22334	27.30916	27.47956	31.94711
26.21877	19.81923	20.53775	23.32846	28.82542	31.61815	26.95046	24.7513	27.91403
25.99488	26.43323	26.40882	23.29069	26.36933	29.04069	24.49482	22.20456	19.63645
29.53094	24.85717	32.62613	23.76783	27.27784	28.32244	25.10984	23.37879	15.70931
27.17919	22.96857	26.42574	23.07571	23.33034	26.24762	21.0146	23.12171	29.65548
20.56539	21.00345	27.46151	24.57738	28.96549	24.80568	27.45178	27.31352	32.09848
28.38	25.51	31.77	25.34	25.61	21.18	24.24	26.25	24.93

46	646	838	886	068	841	873	252	526
23.68	24.92	26.19	23.44	27.00	29.25	23.90	27.51	27.94
114	174	475	07	471	275	831	088	875
26.14	21.94	22.49	28.61	27.54	34.71	25.07	28.94	18.24
881	416	901	441	748	591	7	752	636
24.88	22.13	14.90	23.91	28.52	28.92	27.00	24.54	27.80
885	86	769	975	238	147	055	404	693
21.81	24.34	29.99	24.21	24.76	23.69	26.67	22.59	24.78
191	599	597	663	354	881	399	238	778
26.22	24.45	25.37	28.19	24.59	30.31	23.44	23.06	24.98
685	757	439	63	599	803	215	524	115
24.28	23.86	22.45	29.22	32.03	41.51	27.06	20.47	23.33
636	083	492	475	31	864	607	845	584
22.81	22.81	26.25	25.74	28.79	27.30	20.06	27.34	36.44
898	887	747	454	072	184	726	697	727
22.05	24.20	29.39	28.44	26.23	32.76	24.80	21.01	15.60
827	781	707	033	109	457	882	287	072
21.53	25.54	31.94	22.80	25.22	29.05	26.81	26.25	29.23
758	923	965	472	339	84	663	361	189
24.28	26.01	24.48	28.74	27.53	34.91	27.46	27.81	32.71
56	828	994	511	193	888	747	034	987
27.46	28.67	33.72	27.86	25.43	30.73	23.35	23.41	25.61
193	214	017	506	004	484	549	946	319
27.99	24.27	29.58	25.68	24.12	22.52	22.59	25.96	30.40
663	844	114	275	195	06	44	319	732
26.21	27.63	28.63	32.58	26.63	38.35	19.62	29.48	39.91
807	985	89	623	569	912	351	699	354
21.95	26.42	32.28	23.89	21.59	21.97	27.90	24.74	29.98
459	134	577	661	322	903	494	799	503
25.14	24.34	17.10	28.52	29.11	36.52	27.24	24.98	28.89
091	194	668	368	906	891	428	423	747
25.86	20.44	19.89	25.12	25.09	17.15	25.29	26.17	21.03
137	133	954	078	133	085	639	833	179
26.37	27.51	29.11	22.96	26.23	29.80	21.24	21.72	27.56
136	039	951	826	723	809	947	79	478

23.51695	24.50069	26.30184	24.73443	19.6282	15.46082	25.2683	19.67564	15.52678
23.51957	24.81185	26.62741	26.24776	23.81962	24.78782	24.84238	21.85261	15.6702
24.33459	21.11642	19.62351	25.07899	24.30323	15.38961	24.68539	25.663	20.8404
27.10524	29.309	33.5116	26.74016	25.50425	28.17856	23.57584	23.49142	25.03512
25.2898	30.02758	24.02692	25.54184	23.16633	20.74697	21.76696	24.99447	30.87265
26.24606	20.91397	21.75872	28.16476	23.41125	28.8062	22.67411	25.59756	29.79783
27.3599	24.52383	28.6226	27.04061	21.51657	24.46413	28.56657	23.07107	29.005
26.80111	22.12311	24.5948	27.57226	27.69077	32.82402	25.01653	24.83095	11.86504
24.14449	20.76153	20.18643	26.22877	26.40962	27.40734	21.05847	23.00224	29.44352
22.35784	29.21512	34.79848	25.01673	29.10547	13.93834	20.63087	31.33778	40.86385
24.11006	28.81011	28.21173	24.16067	22.65207	21.94908	27.9079	22.38419	27.126
22.94914	24.35363	27.71484	22.25936	23.1006	27.69725	19.74096	23.29686	31.40947
23.18977	22.97675	25.56705	23.1123	25.32675	28.39536	22.37573	21.94554	26.10766
26.14062	22.08999	22.61939	27.8897	25.5792	30.96282	26.54476	27.50612	29.74571
25.02361	26.87654	13.69407	24.55039	26.69046	23.11354	24.59517	29.93734	25.44028
26.90951	32.32318	36.3145	26.34666	21.63346	22.82403	25.62281	28.23219	25.92562
22.96848	22.31808	25.35506	22.26203	25.76695	30.88874	22.67774	24.68114	28.72296
23.86	27.95	28.58	25.57	24.35	22.01	24.95	20.09	11.30

904	586	206	056	748	743	91	925	549
28.37 409	28.04 544	34.90 844	26.72 357	29.85 264	32.92 608	24.24 714	20.96 47	19.92 038
28.30 584	29.40 755	36.46 948	25.73 498	26.37 437	24.95 237	24.91 578	23.20 753	14.86 635
25.03 853	27.83 795	15.49 074	25.09 41	23.38 761	15.28 37	23.44 415	22.83 673	24.72 793
25.59 518	23.80 194	21.67 948	29.25 285	18.28 135	23.72 306	27.20 923	24.29 095	28.01 611
26.93 426	26.92 414	30.31 896	21.83 397	15.52 789	19.10 755	26.72 879	24.37 441	26.89 848
22.26 014	20.33 451	24.37 951	23.89 975	26.38 463	26.84 226	22.61 369	26.36 844	30.83 721
25.62 551	22.27 281	20.46 905	21.89 949	23.27 03	28.52 725	24.63 714	24.54 552	20.45 155
21.80 258	20.93 427	25.80 606	23.02 849	29.52 067	33.35 723	24.54 753	25.20 47	21.85 183
18.75 77	28.78 509	40.02 485	24.93 641	27.52 26	16.76 084	24.35 159	27.10 919	25.07 55
26.91 574	23.22 214	26.10 494	26.30 424	26.88 009	28.19 65	23.77 78	29.03 857	30.10 655
26.47 944	24.45 86	26.24 517	29.74 709	29.18 974	38.63 556	27.00 247	23.87 025	27.04 822
26.92 398	24.45 938	27.51 703	23.19 734	21.91 856	24.37 117	24.95 147	24.45 606	14.18 641
30.12 536	17.81 552	23.90 831	24.86 811	32.25 458	22.39 916	22.07 064	21.56 006	26.16 189
28.85 456	24.32 982	31.01 803	23.91 661	24.17 78	24.52 888	21.41 481	21.20 172	26.67 985
30.39 385	30.13 082	40.80 871	28.03 673	26.92 592	32.88 543	27.26 951	27.03 35	31.33 069
29.07 445	25.06 542	32.27 658	24.45 653	25.29 503	22.66 562	26.71 724	21.90 384	24.14 293
21.62 583	24.27 977	30.22 14	26.66 038	20.32 718	22.26 971	23.18 643	22.64 783	25.20 942

27.74572	27.17464	32.59281	23.74341	25.47777	26.54705	26.88683	25.54958	28.6428
29.81682	26.92876	35.73661	26.41044	26.78362	28.49397	22.76777	27.71585	32.02589
26.89159	26.40329	29.6133	20.70669	26.49638	34.44206	23.61259	21.46517	22.76834
25.67107	23.88731	22.23237	30.32388	27.41148	37.03852	24.00016	24.82402	24.8233
25.46704	19.57945	17.07198	24.96527	27.80765	15.18749	20.51043	28.71364	37.62575
27.28518	31.51311	36.56765	23.58897	22.87619	24.33884	28.43603	31.07017	38.80018
27.49979	24.9716	29.44889	23.90686	27.99545	28.44783	27.02048	28.11473	31.90919
25.5237	24.1245	21.473	20.3554	23.24277	30.64351	21.81816	26.80482	33.01375
25.41233	22.63562	19.29904	25.62243	20.36858	18.70237	23.44648	24.67906	26.71565
22.3699	29.75842	35.41643	25.74564	26.56019	25.19337	26.72565	24.18824	26.68428
30.42277	23.33442	31.6342	27.24761	21.56999	24.95512	23.71762	27.09198	28.33241
28.0607	28.81593	35.24361	24.81455	24.50564	18.09452	24.08017	27.67969	27.26647
20.47515	28.55447	37.46993	22.34543	25.35266	30.22334	27.30916	27.47956	31.94711
26.21877	19.81923	20.53775	23.32846	28.82542	31.61815	26.95046	24.7513	27.91403
25.99488	26.43323	26.40882	23.29069	26.36933	29.04069	24.49482	22.20456	19.63645
29.53094	24.85717	32.62613	23.76783	27.27784	28.32244	25.10984	23.37879	15.70931
27.17919	22.96857	26.42574	23.07571	23.33034	26.24762	21.0146	23.12171	29.65548
20.56	21.00	27.46	24.57	28.96	24.80	27.45	27.31	32.09

539	345	151	738	549	568	178	352	848
28.3846	25.51646	31.77838	25.34886	25.61068	21.18841	24.24873	26.25252	24.93526
23.68114	24.92174	26.19475	23.4407	27.00471	29.25275	23.90831	27.51088	27.94875
26.14881	21.94416	22.49901	28.61441	27.54748	34.71591	25.077	28.94752	18.24636
24.88885	22.1386	14.90769	23.91975	28.52238	28.92147	27.00055	24.54404	27.80693
21.81191	24.34599	29.99597	24.21663	24.76354	23.69881	26.67399	22.59238	24.78778
26.22685	24.45757	25.37439	28.1963	24.59599	30.31803	23.44215	23.06524	24.98115
24.28636	23.86083	22.45492	29.22475	32.0331	41.51864	27.06607	20.47845	23.33584
22.81898	22.81887	26.25747	25.74454	28.79072	27.30184	20.06726	27.34697	36.44727
22.05827	24.20781	29.39707	28.44033	26.23109	32.76457	24.80882	21.01287	15.60072
21.53758	25.54923	31.94965	22.80472	25.22339	29.0584	26.81663	26.25361	29.23189
24.2856	26.01828	24.48994	28.74511	27.53193	34.91888	27.46747	27.81034	32.71987
27.46193	28.67214	33.72017	27.86506	25.43004	30.73484	23.35549	23.41946	25.61319
27.99663	24.27844	29.58114	25.68275	24.12195	22.5206	22.5944	25.96319	30.40732
26.21807	27.63985	28.6389	32.58623	26.63569	38.35912	19.62351	29.48699	39.91354
21.95459	26.42134	32.28577	23.89661	21.59322	21.97903	27.90494	24.74799	29.98503
25.14091	24.34194	17.10668	28.52368	29.11906	36.52891	27.24428	24.98423	28.89747
25.86137	20.44133	19.89954	25.12078	25.09133	17.15085	25.29639	26.17833	21.03179

26.37136	27.51039	29.11951	22.96826	26.23723	29.80809	21.24947	21.7279	27.56478
25.46235	29.73474	25.87965	25.20743	19.41964	14.63118	24.78281	22.35093	16.97959
26.83653	23.90633	26.6706	27.85039	24.55822	29.65376	22.29292	23.16373	27.71141
24.26585	24.28033	22.96653	19.96315	29.80481	39.87264	23.61085	22.97537	24.37571
22.96207	24.39291	27.72795	22.99371	23.21098	26.31021	26.91785	20.29337	22.81712
21.56844	22.00906	27.47831	26.19903	26.99093	27.88737	23.72879	21.0286	21.95681
24.84617	29.0205	20.71911	22.22868	21.89223	26.30108	24.96779	26.79118	14.43562
25.26749	28.0394	22.11484	23.3818	24.83407	27.08155	24.17544	22.59729	21.82612
25.05444	19.90773	11.78937	19.9859	27.45474	36.69883	24.60578	26.59746	22.49435
23.55461	22.68447	24.23964	26.85153	24.42747	27.29191	24.0307	24.242	24.10634
22.94914	24.35363	27.71484	22.25936	23.1006	27.69725	19.74096	23.29686	31.40947
23.18977	22.97675	25.56705	23.1123	25.32675	28.39536	22.37573	21.94554	26.10766
26.14062	22.08999	22.61939	27.8897	25.5792	30.96282	26.54476	27.50612	29.74571
25.02361	26.87654	13.69407	24.55039	26.69046	23.11354	24.59517	29.93734	25.44028
26.90951	32.32318	36.3145	26.34666	21.63346	22.82403	25.62281	28.23219	25.92562
22.96848	22.31808	25.35506	22.26203	25.76695	30.88874	22.67774	24.68114	28.72296
23.86904	27.95586	28.58206	25.57056	24.35748	22.01743	24.9591	20.09925	11.30549
28.37	28.04	34.90	26.72	29.85	32.92	24.24	20.96	19.92

409	544	844	357	264	608	714	47	038
28.30584	29.40755	36.46948	25.73498	26.37437	24.95237	24.91578	23.20753	14.86635
25.03853	27.83795	15.49074	25.0941	23.38761	15.2837	23.44415	22.83673	24.72793
25.59518	23.80194	21.67948	29.25285	18.28135	23.72306	27.20923	24.29095	28.01611
26.93426	26.92414	30.31896	21.83397	15.52789	19.10755	26.72879	24.37441	26.89848
22.26014	20.33451	24.37951	23.89975	26.38463	26.84226	22.61369	26.36844	30.83721
25.62551	22.27281	20.46905	21.89949	23.2703	28.52725	24.63714	24.54552	20.45155
21.80258	20.93427	25.80606	23.02849	29.52067	33.35723	24.54753	25.2047	21.85183
18.7577	28.78509	40.02485	24.93641	27.5226	16.76084	24.35159	27.10919	25.0755
26.91574	23.22214	26.10494	26.30424	26.88009	28.1965	23.7778	29.03857	30.10655
26.47944	24.4586	26.24517	29.74709	29.18974	38.63556	27.00247	23.87025	27.04822
26.92398	24.45938	27.51703	23.19734	21.91856	24.37117	24.95147	24.45606	14.18641
30.12536	17.81552	23.90831	24.86811	32.25458	22.39916	22.07064	21.56006	26.16189
28.85456	24.32982	31.01803	23.91661	24.1778	24.52888	21.41481	21.20172	26.67985
30.39385	30.13082	40.80871	28.03673	26.92592	32.88543	27.26951	27.0335	31.33069
29.07445	25.06542	32.27658	24.45653	25.29503	22.66562	26.71724	21.90384	24.14293
21.62583	24.27977	30.2214	26.66038	20.32718	22.26971	23.18643	22.64783	25.20942
27.74572	27.17464	32.59281	23.74341	25.47777	26.54705	26.88683	25.54958	28.6428

29.81682	26.92876	35.73661	26.41044	26.78362	28.49397	22.76777	27.71585	32.02589
26.89159	26.40329	29.6133	20.70669	26.49638	34.44206	23.61259	21.46517	22.76834
25.67107	23.88731	22.23237	30.32388	27.41148	37.03852	24.00016	24.82402	24.8233
25.46704	19.57945	17.07198	24.96527	27.80765	15.18749	20.51043	28.71364	37.62575
27.28518	31.51311	36.56765	23.58897	22.87619	24.33884	28.43603	31.07017	38.80018
27.49979	24.9716	29.44889	23.90686	27.99545	28.44783	27.02048	28.11473	31.90919
25.5237	24.1245	21.473	20.3554	23.24277	30.64351	21.81816	26.80482	33.01375
25.41233	22.63562	19.29904	25.62243	20.36858	18.70237	23.44648	24.67906	26.71565
22.3699	29.75842	35.41643	25.74564	26.56019	25.19337	26.72565	24.18824	26.68428
30.42277	23.33442	31.6342	27.24761	21.56999	24.95512	23.71762	27.09198	28.33241
28.0607	28.81593	35.24361	24.81455	24.50564	18.09452	24.08017	27.67969	27.26647
20.47515	28.55447	37.46993	22.34543	25.35266	30.22334	27.30916	27.47956	31.94711
26.21877	19.81923	20.53775	23.32846	28.82542	31.61815	26.95046	24.7513	27.91403
25.99488	26.43323	26.40882	23.29069	26.36933	29.04069	24.49482	22.20456	19.63645
29.53094	24.85717	32.62613	23.76783	27.27784	28.32244	25.10984	23.37879	15.70931
27.17919	22.96857	26.42574	23.07571	23.33034	26.24762	21.0146	23.12171	29.65548
20.56539	21.00345	27.46151	24.57738	28.96549	24.80568	27.45178	27.31352	32.09848
28.38	25.51	31.77	25.34	25.61	21.18	24.24	26.25	24.93

46	646	838	886	068	841	873	252	526
23.68 114	24.92 174	26.19 475	23.44 07	27.00 471	29.25 275	23.90 831	27.51 088	27.94 875
26.14 881	21.94 416	22.49 901	28.61 441	27.54 748	34.71 591	25.07 7	28.94 752	18.24 636
24.88 885	22.13 86	14.90 769	23.91 975	28.52 238	28.92 147	27.00 055	24.54 404	27.80 693
21.81 191	24.34 599	29.99 597	24.21 663	24.76 354	23.69 881	26.67 399	22.59 238	24.78 778
26.22 685	24.45 757	25.37 439	28.19 63	24.59 599	30.31 803	23.44 215	23.06 524	24.98 115
24.28 636	23.86 083	22.45 492	29.22 475	32.03 31	41.51 864	27.06 607	20.47 845	23.33 584
22.81 898	22.81 887	26.25 747	25.74 454	28.79 072	27.30 184	20.06 726	27.34 697	36.44 727
22.05 827	24.20 781	29.39 707	28.44 033	26.23 109	32.76 457	24.80 882	21.01 287	15.60 072
21.53 758	25.54 923	31.94 965	22.80 472	25.22 339	29.05 84	26.81 663	26.25 361	29.23 189
24.28 56	26.01 828	24.48 994	28.74 511	27.53 193	34.91 888	27.46 747	27.81 034	32.71 987
27.46 193	28.67 214	33.72 017	27.86 506	25.43 004	30.73 484	23.35 549	23.41 946	25.61 319
27.99 663	24.27 844	29.58 114	25.68 275	24.12 195	22.52 06	22.59 44	25.96 319	30.40 732
26.21 807	27.63 985	28.63 89	32.58 623	26.63 569	38.35 912	19.62 351	29.48 699	39.91 354
21.95 459	26.42 134	32.28 577	23.89 661	21.59 322	21.97 903	27.90 494	24.74 799	29.98 503
25.14 091	24.34 194	17.10 668	28.52 368	29.11 906	36.52 891	27.24 428	24.98 423	28.89 747
25.86 137	20.44 133	19.89 954	25.12 078	25.09 133	17.15 085	25.29 639	26.17 833	21.03 179
26.37 136	27.51 039	29.11 951	22.96 826	26.23 723	29.80 809	21.24 947	21.72 79	27.56 478

25.46235	29.73474	25.87965	25.20743	19.41964	14.63118	24.78281	22.35093	16.97959
26.83653	23.90633	26.6706	27.85039	24.55822	29.65376	22.29292	23.16373	27.71141
24.26585	24.28033	22.96653	19.96315	29.80481	39.87264	23.61085	22.97537	24.37571
22.96207	24.39291	27.72795	22.99371	23.21098	26.31021	26.91785	20.29337	22.81712
21.56844	22.00906	27.47831	26.19903	26.99093	27.88737	23.72879	21.0286	21.95681
24.84617	29.0205	20.71911	22.22868	21.89223	26.30108	24.96779	26.79118	14.43562
25.26749	28.0394	22.11484	23.3818	24.83407	27.08155	24.17544	22.59729	21.82612
25.05444	19.90773	11.78937	19.9859	27.45474	36.69883	24.60578	26.59746	22.49435
23.51695	24.50069	26.30184	24.73443	19.6282	15.46082	25.2683	19.67564	15.52678
23.51957	24.81185	26.62741	26.24776	23.81962	24.78782	24.84238	21.85261	15.6702
24.33459	21.11642	19.62351	25.07899	24.30323	15.38961	24.68539	25.663	20.8404
27.10524	29.309	33.5116	26.74016	25.50425	28.17856	23.57584	23.49142	25.03512
25.2898	30.02758	24.02692	25.54184	23.16633	20.74697	21.76696	24.99447	30.87265
26.24606	20.91397	21.75872	28.16476	23.41125	28.8062	22.67411	25.59756	29.79783
27.3599	24.52383	28.6226	27.04061	21.51657	24.46413	28.56657	23.07107	29.005
26.80111	22.12311	24.5948	27.57226	27.69077	32.82402	25.01653	24.83095	11.86504
24.14449	20.76153	20.18643	26.22877	26.40962	27.40734	21.05847	23.00224	29.44352
22.35	29.21	34.79	25.01	29.10	13.93	20.63	31.33	40.86

784	512	848	673	547	834	087	778	385
24.11006	28.81011	28.21173	24.16067	22.65207	21.94908	27.9079	22.38419	27.126
22.94914	24.35363	27.71484	22.25936	23.1006	27.69725	19.74096	23.29686	31.40947
23.18977	22.97675	25.56705	23.1123	25.32675	28.39536	22.37573	21.94554	26.10766
26.14062	22.08999	22.61939	27.8897	25.5792	30.96282	26.54476	27.50612	29.74571
25.02361	26.87654	13.69407	24.55039	26.69046	23.11354	24.59517	29.93734	25.44028
26.90951	32.32318	36.3145	26.34666	21.63346	22.82403	25.62281	28.23219	25.92562
22.96848	22.31808	25.35506	22.26203	25.76695	30.88874	22.67774	24.68114	28.72296
23.86904	27.95586	28.58206	25.57056	24.35748	22.01743	24.9591	20.09925	11.30549
28.37409	28.04544	34.90844	26.72357	29.85264	32.92608	24.24714	20.9647	19.92038
28.30584	29.40755	36.46948	25.73498	26.37437	24.95237	24.91578	23.20753	14.86635
25.03853	27.83795	15.49074	25.0941	23.38761	15.2837	23.44415	22.83673	24.72793
25.59518	23.80194	21.67948	29.25285	18.28135	23.72306	27.20923	24.29095	28.01611
26.93426	26.92414	30.31896	21.83397	15.52789	19.10755	26.72879	24.37441	26.89848
22.26014	20.33451	24.37951	23.89975	26.38463	26.84226	22.61369	26.36844	30.83721
25.62551	22.27281	20.46905	21.89949	23.2703	28.52725	24.63714	24.54552	20.45155
21.80258	20.93427	25.80606	23.02849	29.52067	33.35723	24.54753	25.2047	21.85183
18.7577	28.78509	40.02485	24.93641	27.5226	16.76084	24.35159	27.10919	25.0755

26.91574	23.22214	26.10494	26.30424	26.88009	28.1965	23.7778	29.03857	30.10655
26.47944	24.4586	26.24517	29.74709	29.18974	38.63556	27.00247	23.87025	27.04822
26.92398	24.45938	27.51703	23.19734	21.91856	24.37117	24.95147	24.45606	14.18641
30.12536	17.81552	23.90831	24.86811	32.25458	22.39916	22.07064	21.56006	26.16189
28.85456	24.32982	31.01803	23.91661	24.1778	24.52888	21.41481	21.20172	26.67985
30.39385	30.13082	40.80871	28.03673	26.92592	32.88543	27.26951	27.0335	31.33069
29.07445	25.06542	32.27658	24.45653	25.29503	22.66562	26.71724	21.90384	24.14293
21.62583	24.27977	30.2214	26.66038	20.32718	22.26971	23.18643	22.64783	25.20942
27.74572	27.17464	32.59281	23.74341	25.47777	26.54705	26.88683	25.54958	28.6428
29.81682	26.92876	35.73661	26.41044	26.78362	28.49397	22.76777	27.71585	32.02589
26.89159	26.40329	29.6133	20.70669	26.49638	34.44206	23.61259	21.46517	22.76834
25.67107	23.88731	22.23237	30.32388	27.41148	37.03852	24.00016	24.82402	24.8233
25.46704	19.57945	17.07198	24.96527	27.80765	15.18749	20.51043	28.71364	37.62575
27.28518	31.51311	36.56765	23.58897	22.87619	24.33884	28.43603	31.07017	38.80018
27.49979	24.9716	29.44889	23.90686	27.99545	28.44783	27.02048	28.11473	31.90919
25.5237	24.1245	21.473	20.3554	23.24277	30.64351	21.81816	26.80482	33.01375
25.41233	22.63562	19.29904	25.62243	20.36858	18.70237	23.44648	24.67906	26.71565
22.36	29.75	35.41	25.74	26.56	25.19	26.72	24.18	26.68

99	842	643	564	019	337	565	824	428
30.42277	23.33442	31.6342	27.24761	21.56999	24.95512	23.71762	27.09198	28.33241
28.0607	28.81593	35.24361	24.81455	24.50564	18.09452	24.08017	27.67969	27.26647
20.47515	28.55447	37.46993	22.34543	25.35266	30.22334	27.30916	27.47956	31.94711
26.21877	19.81923	20.53775	23.32846	28.82542	31.61815	26.95046	24.7513	27.91403
25.99488	26.43323	26.40882	23.29069	26.36933	29.04069	24.49482	22.20456	19.63645
29.53094	24.85717	32.62613	23.76783	27.27784	28.32244	25.10984	23.37879	15.70931
27.17919	22.96857	26.42574	23.07571	23.33034	26.24762	21.0146	23.12171	29.65548
20.56539	21.00345	27.46151	24.57738	28.96549	24.80568	27.45178	27.31352	32.09848
28.3846	25.51646	31.77838	25.34886	25.61068	21.18841	24.24873	26.25252	24.93526
23.68114	24.92174	26.19475	23.4407	27.00471	29.25275	23.90831	27.51088	27.94875
26.14881	21.94416	22.49901	28.61441	27.54748	34.71591	25.077	28.94752	18.24636
24.88885	22.1386	14.90769	23.91975	28.52238	28.92147	27.00055	24.54404	27.80693
21.81191	24.34599	29.99597	24.21663	24.76354	23.69881	26.67399	22.59238	24.78778
26.22685	24.45757	25.37439	28.1963	24.59599	30.31803	23.44215	23.06524	24.98115
24.28636	23.86083	22.45492	29.22475	32.0331	41.51864	27.06607	20.47845	23.33584
22.81898	22.81887	26.25747	25.74454	28.79072	27.30184	20.06726	27.34697	36.44727
22.05827	24.20781	29.39707	28.44033	26.23109	32.76457	24.80882	21.01287	15.60072

21.53758	25.54923	31.94965	22.80472	25.22339	29.0584	26.81663	26.25361	29.23189
24.2856	26.01828	24.48994	28.74511	27.53193	34.91888	27.46747	27.81034	32.71987
27.46193	28.67214	33.72017	27.86506	25.43004	30.73484	23.35549	23.41946	25.61319
27.99663	24.27844	29.58114	25.68275	24.12195	22.5206	22.5944	25.96319	30.40732
26.21807	27.63985	28.6389	32.58623	26.63569	38.35912	19.62351	29.48699	39.91354
21.95459	26.42134	32.28577	23.89661	21.59322	21.97903	27.90494	24.74799	29.98503
25.14091	24.34194	17.10668	28.52368	29.11906	36.52891	27.24428	24.98423	28.89747
25.86137	20.44133	19.89954	25.12078	25.09133	17.15085	25.29639	26.17833	21.03179
26.37136	27.51039	29.11951	22.96826	26.23723	29.80809	21.24947	21.7279	27.56478
25.46235	29.73474	25.87965	25.20743	19.41964	14.63118	24.78281	22.35093	16.97959
26.83653	23.90633	26.6706	27.85039	24.55822	29.65376	22.29292	23.16373	27.71141
24.26585	24.28033	22.96653	19.96315	29.80481	39.87264	23.61085	22.97537	24.37571
22.96207	24.39291	27.72795	22.99371	23.21098	26.31021	26.91785	20.29337	22.81712
21.56844	22.00906	27.47831	26.19903	26.99093	27.88737	23.72879	21.0286	21.95681
24.84617	29.0205	20.71911	22.22868	21.89223	26.30108	24.96779	26.79118	14.43562
25.26749	28.0394	22.11484	23.3818	24.83407	27.08155	24.17544	22.59729	21.82612
25.05444	19.90773	11.78937	19.9859	27.45474	36.69883	24.60578	26.59746	22.49435
23.55	22.68	24.23	26.85	24.42	27.29	24.03	24.24	24.10

461	447	964	153	747	191	07	2	634
22.94914	24.35363	27.71484	22.25936	23.1006	27.69725	19.74096	23.29686	31.40947
23.18977	22.97675	25.56705	23.1123	25.32675	28.39536	22.37573	21.94554	26.10766
26.14062	22.08999	22.61939	27.8897	25.5792	30.96282	26.54476	27.50612	29.74571
25.02361	26.87654	13.69407	24.55039	26.69046	23.11354	24.59517	29.93734	25.44028
26.90951	32.32318	36.3145	26.34666	21.63346	22.82403	25.62281	28.23219	25.92562
22.96848	22.31808	25.35506	22.26203	25.76695	30.88874	22.67774	24.68114	28.72296
23.86904	27.95586	28.58206	25.57056	24.35748	22.01743	24.9591	20.09925	11.30549
28.37409	28.04544	34.90844	26.72357	29.85264	32.92608	24.24714	20.9647	19.92038
28.30584	29.40755	36.46948	25.73498	26.37437	24.95237	24.91578	23.20753	14.86635
25.03853	27.83795	15.49074	25.0941	23.38761	15.2837	23.44415	22.83673	24.72793
25.59518	23.80194	21.67948	29.25285	18.28135	23.72306	27.20923	24.29095	28.01611
26.93426	26.92414	30.31896	21.83397	15.52789	19.10755	26.72879	24.37441	26.89848
22.26014	20.33451	24.37951	23.89975	26.38463	26.84226	22.61369	26.36844	30.83721
25.62551	22.27281	20.46905	21.89949	23.2703	28.52725	24.63714	24.54552	20.45155
21.80258	20.93427	25.80606	23.02849	29.52067	33.35723	24.54753	25.2047	21.85183
18.7577	28.78509	40.02485	24.93641	27.5226	16.76084	24.35159	27.10919	25.0755
26.91574	23.22214	26.10494	26.30424	26.88009	28.1965	23.7778	29.03857	30.10655

26.47944	24.4586	26.24517	29.74709	29.18974	38.63556	27.00247	23.87025	27.04822
26.92398	24.45938	27.51703	23.19734	21.91856	24.37117	24.95147	24.45606	14.18641
30.12536	17.81552	23.90831	24.86811	32.25458	22.39916	22.07064	21.56006	26.16189
28.85456	24.32982	31.01803	23.91661	24.1778	24.52888	21.41481	21.20172	26.67985
30.39385	30.13082	40.80871	28.03673	26.92592	32.88543	27.26951	27.0335	31.33069
29.07445	25.06542	32.27658	24.45653	25.29503	22.66562	26.71724	21.90384	24.14293
21.62583	24.27977	30.2214	26.66038	20.32718	22.26971	23.18643	22.64783	25.20942
27.74572	27.17464	32.59281	23.74341	25.47777	26.54705	26.88683	25.54958	28.6428
29.81682	26.92876	35.73661	26.41044	26.78362	28.49397	22.76777	27.71585	32.02589
26.89159	26.40329	29.6133	20.70669	26.49638	34.44206	23.61259	21.46517	22.76834
25.67107	23.88731	22.23237	30.32388	27.41148	37.03852	24.00016	24.82402	24.8233
25.46704	19.57945	17.07198	24.96527	27.80765	15.18749	20.51043	28.71364	37.62575
27.28518	31.51311	36.56765	23.58897	22.87619	24.33884	28.43603	31.07017	38.80018
27.49979	24.9716	29.44889	23.90686	27.99545	28.44783	27.02048	28.11473	31.90919
25.5237	24.1245	21.473	20.3554	23.24277	30.64351	21.81816	26.80482	33.01375
25.41233	22.63562	19.29904	25.62243	20.36858	18.70237	23.44648	24.67906	26.71565
22.3699	29.75842	35.41643	25.74564	26.56019	25.19337	26.72565	24.18824	26.68428
30.42	23.33	31.63	27.24	21.56	24.95	23.71	27.09	28.33

277	442	42	761	999	512	762	198	241
28.06 07	28.81 593	35.24 361	24.81 455	24.50 564	18.09 452	24.08 017	27.67 969	27.26 647
20.47 515	28.55 447	37.46 993	22.34 543	25.35 266	30.22 334	27.30 916	27.47 956	31.94 711
26.21 877	19.81 923	20.53 775	23.32 846	28.82 542	31.61 815	26.95 046	24.75 13	27.91 403
25.99 488	26.43 323	26.40 882	23.29 069	26.36 933	29.04 069	24.49 482	22.20 456	19.63 645
29.53 094	24.85 717	32.62 613	23.76 783	27.27 784	28.32 244	25.10 984	23.37 879	15.70 931
27.17 919	22.96 857	26.42 574	23.07 571	23.33 034	26.24 762	21.01 46	23.12 171	29.65 548
20.56 539	21.00 345	27.46 151	24.57 738	28.96 549	24.80 568	27.45 178	27.31 352	32.09 848
28.38 46	25.51 646	31.77 838	25.34 886	25.61 068	21.18 841	24.24 873	26.25 252	24.93 526
23.68 114	24.92 174	26.19 475	23.44 07	27.00 471	29.25 275	23.90 831	27.51 088	27.94 875
26.14 881	21.94 416	22.49 901	28.61 441	27.54 748	34.71 591	25.07 7	28.94 752	18.24 636
24.88 885	22.13 86	14.90 769	23.91 975	28.52 238	28.92 147	27.00 055	24.54 404	27.80 693
21.81 191	24.34 599	29.99 597	24.21 663	24.76 354	23.69 881	26.67 399	22.59 238	24.78 778
26.22 685	24.45 757	25.37 439	28.19 63	24.59 599	30.31 803	23.44 215	23.06 524	24.98 115
24.28 636	23.86 083	22.45 492	29.22 475	32.03 31	41.51 864	27.06 607	20.47 845	23.33 584
22.81 898	22.81 887	26.25 747	25.74 454	28.79 072	27.30 184	20.06 726	27.34 697	36.44 727
22.05 827	24.20 781	29.39 707	28.44 033	26.23 109	32.76 457	24.80 882	21.01 287	15.60 072
21.53 758	25.54 923	31.94 965	22.80 472	25.22 339	29.05 84	26.81 663	26.25 361	29.23 189

24.28 56	26.01 828	24.48 994	28.74 511	27.53 193	34.91 888	27.46 747	27.81 034	32.71 987
27.46 193	28.67 214	33.72 017	27.86 506	25.43 004	30.73 484	23.35 549	23.41 946	25.61 319
27.99 663	24.27 844	29.58 114	25.68 275	24.12 195	22.52 06	22.59 44	25.96 319	30.40 732
26.21 807	27.63 985	28.63 89	32.58 623	26.63 569	38.35 912	19.62 351	29.48 699	39.91 354
21.95 459	26.42 134	32.28 577	23.89 661	21.59 322	21.97 903	27.90 494	24.74 799	29.98 503
25.14 091	24.34 194	17.10 668	28.52 368	29.11 906	36.52 891	27.24 428	24.98 423	28.89 747
25.86 137	20.44 133	19.89 954	25.12 078	25.09 133	17.15 085	25.29 639	26.17 833	21.03 179
26.37 136	27.51 039	29.11 951	22.96 826	26.23 723	29.80 809	21.24 947	21.72 79	27.56 478
23.55 461	22.68 447	24.23 964	26.85 153	24.42 747	27.29 191	24.03 07	24.24 2	24.10 634
22.94 914	24.35 363	27.71 484	22.25 936	23.10 06	27.69 725	19.74 096	23.29 686	31.40 947
23.18 977	22.97 675	25.56 705	23.11 23	25.32 675	28.39 536	22.37 573	21.94 554	26.10 766
26.14 062	22.08 999	22.61 939	27.88 97	25.57 92	30.96 282	26.54 476	27.50 612	29.74 571
25.02 361	26.87 654	13.69 407	24.55 039	26.69 046	23.11 354	24.59 517	29.93 734	25.44 028
26.90 951	32.32 318	36.31 45	26.34 666	21.63 346	22.82 403	25.62 281	28.23 219	25.92 562
22.96 848	22.31 808	25.35 506	22.26 203	25.76 695	30.88 874	22.67 774	24.68 114	28.72 296
23.86 904	27.95 586	28.58 206	25.57 056	24.35 748	22.01 743	24.95 91	20.09 925	11.30 549
28.37 409	28.04 544	34.90 844	26.72 357	29.85 264	32.92 608	24.24 714	20.96 47	19.92 038
28.30	29.40	36.46	25.73	26.37	24.95	24.91	23.20	14.86

584	755	948	498	437	237	578	753	635
25.03853	27.83795	15.49074	25.0941	23.38761	15.2837	23.44415	22.83673	24.72793
25.59518	23.80194	21.67948	29.25285	18.28135	23.72306	27.20923	24.29095	28.01611
26.93426	26.92414	30.31896	21.83397	15.52789	19.10755	26.72879	24.37441	26.89848
22.26014	20.33451	24.37951	23.89975	26.38463	26.84226	22.61369	26.36844	30.83721
25.62551	22.27281	20.46905	21.89949	23.2703	28.52725	24.63714	24.54552	20.45155
21.80258	20.93427	25.80606	23.02849	29.52067	33.35723	24.54753	25.2047	21.85183
18.7577	28.78509	40.02485	24.93641	27.5226	16.76084	24.35159	27.10919	25.0755
26.91574	23.22214	26.10494	26.30424	26.88009	28.1965	23.7778	29.03857	30.10655
26.47944	24.4586	26.24517	29.74709	29.18974	38.63556	27.00247	23.87025	27.04822
26.92398	24.45938	27.51703	23.19734	21.91856	24.37117	24.95147	24.45606	14.18641
30.12536	17.81552	23.90831	24.86811	32.25458	22.39916	22.07064	21.56006	26.16189
28.85456	24.32982	31.01803	23.91661	24.1778	24.52888	21.41481	21.20172	26.67985
30.39385	30.13082	40.80871	28.03673	26.92592	32.88543	27.26951	27.0335	31.33069
29.07445	25.06542	32.27658	24.45653	25.29503	22.66562	26.71724	21.90384	24.14293
21.62583	24.27977	30.2214	26.66038	20.32718	22.26971	23.18643	22.64783	25.20942
27.74572	27.17464	32.59281	23.74341	25.47777	26.54705	26.88683	25.54958	28.6428
29.81682	26.92876	35.73661	26.41044	26.78362	28.49397	22.76777	27.71585	32.02589

26.89159	26.40329	29.6133	20.70669	26.49638	34.44206	23.61259	21.46517	22.76834
25.67107	23.88731	22.23237	30.32388	27.41148	37.03852	24.00016	24.82402	24.8233
25.46704	19.57945	17.07198	24.96527	27.80765	15.18749	20.51043	28.71364	37.62575
27.28518	31.51311	36.56765	23.58897	22.87619	24.33884	28.43603	31.07017	38.80018
27.49979	24.9716	29.44889	23.90686	27.99545	28.44783	27.02048	28.11473	31.90919
25.5237	24.1245	21.473	20.3554	23.24277	30.64351	21.81816	26.80482	33.01375
25.41233	22.63562	19.29904	25.62243	20.36858	18.70237	23.44648	24.67906	26.71565
22.3699	29.75842	35.41643	25.74564	26.56019	25.19337	26.72565	24.18824	26.68428
30.42277	23.33442	31.6342	27.24761	21.56999	24.95512	23.71762	27.09198	28.33241
28.0607	28.81593	35.24361	24.81455	24.50564	18.09452	24.08017	27.67969	27.26647
20.47515	28.55447	37.46993	22.34543	25.35266	30.22334	27.30916	27.47956	31.94711
26.21877	19.81923	20.53775	23.32846	28.82542	31.61815	26.95046	24.7513	27.91403
25.99488	26.43323	26.40882	23.29069	26.36933	29.04069	24.49482	22.20456	19.63645
29.53094	24.85717	32.62613	23.76783	27.27784	28.32244	25.10984	23.37879	15.70931
27.17919	22.96857	26.42574	23.07571	23.33034	26.24762	21.0146	23.12171	29.65548
20.56539	21.00345	27.46151	24.57738	28.96549	24.80568	27.45178	27.31352	32.09848
28.3846	25.51646	31.77838	25.34886	25.61068	21.18841	24.24873	26.25252	24.93526
23.68	24.92	26.19	23.44	27.00	29.25	23.90	27.51	27.94

114	174	475	07	471	275	831	088	875
26.14 881	21.94 416	22.49 901	28.61 441	27.54 748	34.71 591	25.07 7	28.94 752	18.24 636
24.88 885	22.13 86	14.90 769	23.91 975	28.52 238	28.92 147	27.00 055	24.54 404	27.80 693
21.81 191	24.34 599	29.99 597	24.21 663	24.76 354	23.69 881	26.67 399	22.59 238	24.78 778
26.22 685	24.45 757	25.37 439	28.19 63	24.59 599	30.31 803	23.44 215	23.06 524	24.98 115
24.28 636	23.86 083	22.45 492	29.22 475	32.03 31	41.51 864	27.06 607	20.47 845	23.33 584
22.81 898	22.81 887	26.25 747	25.74 454	28.79 072	27.30 184	20.06 726	27.34 697	36.44 727
22.05 827	24.20 781	29.39 707	28.44 033	26.23 109	32.76 457	24.80 882	21.01 287	15.60 072
21.53 758	25.54 923	31.94 965	22.80 472	25.22 339	29.05 84	26.81 663	26.25 361	29.23 189
24.28 56	26.01 828	24.48 994	28.74 511	27.53 193	34.91 888	27.46 747	27.81 034	32.71 987
27.46 193	28.67 214	33.72 017	27.86 506	25.43 004	30.73 484	23.35 549	23.41 946	25.61 319
27.99 663	24.27 844	29.58 114	25.68 275	24.12 195	22.52 06	22.59 44	25.96 319	30.40 732
26.21 807	27.63 985	28.63 89	32.58 623	26.63 569	38.35 912	19.62 351	29.48 699	39.91 354
21.95 459	26.42 134	32.28 577	23.89 661	21.59 322	21.97 903	27.90 494	24.74 799	29.98 503
25.14 091	24.34 194	17.10 668	28.52 368	29.11 906	36.52 891	27.24 428	24.98 423	28.89 747
25.86 137	20.44 133	19.89 954	25.12 078	25.09 133	17.15 085	25.29 639	26.17 833	21.03 179
26.37 136	27.51 039	29.11 951	22.96 826	26.23 723	29.80 809	21.24 947	21.72 79	27.56 478