THE
Gentleman's Diary,

OR THE

MATHEMATICAL REPOSITORY;

An ALMANACK

For the YEAR of our LORD 1779:

BEING

The Third after BISSEXTILE, or LEAP-YEAR.

Containing many useful and entertaining Particulars,
peculiarly adapted to the ingenious Gentlemen engaged
in the delightful Study and Practice of the

MATHEMATICKS.

The Thirty-ninth ALMANACK published of this Kind,
and the Twenty-seventh of the NEW-STYLE in ENGLAND.

——— With wise Intent
The Hand of Nature on peculiar Minds
Imprints a different Byafs, and to each
Decrees its Province in the common Toil.
To some she taught the Fabric of the Sphere,
The changeful Moon, the Circuit of the Stars,
The golden Zones of Heaven : to some she gave
To weigh the Moment of eternal Things,
Of Time, and Space, and Fate's unbroken Chain,
And Will's quick Impulse.——— AKENSIDE.

THE Author again returns moſt ſincere Thanks to all his kind Contributors; and intreats the Continuance of their Favours; and, as he is now removed to his old Town of *fair Nottingham*, humbly requeſts, that ſuch Contributors who live convenient for *that* POST-OFFICE, will order Letters for *him* to be left *there* Poſt-paid: And the others with Mr. *Hawkins*, at *Stationers-Hall*, LONDON, Poſt-paid alſo, before EASTER DAY, 1779.

JANUARY hath xxxi Days.

Full Moon the 2d	⎫	13 m. paſt 4 Afternoon.	1 23°	0
Laſt Quarter the 9th	⎬ Day at	3 t min. p 1ſt Noon.	6 22	29
New Moon the 17th	⎬	Half paſt 5 at Night.	11 21	47
Firſt Quarter the 25th	⎭	Half paſt 11 Forenoon.	16 20	54
			21 19	52
⊙ in ♒ 20 Day, Half paſt 2 Morning.			26 18	40

1	F	21	Circumciſion.	6M 41	11	17
2	S	22	Jan. WEATHER, now, & to the End.	☽ Riſes	Morn.	
3	C	23	2 Sunday after Chriſtmas.	4A 52	1	25
4	M	24	The Days are now upon the Increaſe.	6 16	2	26
5	Tu	25	Old Chriſtmas Day.	7 41	3	21
6	W	26	Epiphany.	9 3	4	11
7	Th	27	Saliſbury, Wilts.	10 23	4	58
8	F	28	Lucian.	11 37	5	43
9	S	29	Canterbury.	Morn.	6	26
10	C	30	1 Sunday after Epiphany.	0 50	7	8
11	M	31	Day 8 hours 10 min. long.	1 59	7	52
12	Tu	Ja	Old New-Years Day.	3 8	8	36
13	W	2	Hilary. Camb. Term begins.	4 16	9	24
14	Th	3	Oxford Term begins.	5 21	10	12
15	F	4	Nottingham.	6 24	11	1
16	S	5	Hickford, Lanc.	7 21	11	51
17	C	6	2 Sunday after Epiphany.	☽ Sets	Aftern.	
18	M	7	Q. CHARLOTTE's Birth-day kept.	4 A 45	0	40
19	Tu	8	Day increaſed 44 min.	5 53	1	27
20	W	9	In 8 Days of St. Hil. 1 Ret.	7 5	2	13
21	Th	10	Agnes. Briſtol.	8 17	2	58
22	F	11	Vincent. Darby.	9 30	3	42
23	S	12	Hilary Term begins.	10 42	4	26
24	C	13	3 Sunday after Epiphany.	11 58	5	12
25	M	14	Converſion of St. PAUL.	Morn.	5	59
26	Tu	15	Day 8 hours 48 min. long.	1 18	6	51
27	W	16	Pr. A. F. b. In 15 D. of S. Hil. 2 R.	2 40	7	46
28	Th	17	Days increaſed 1 hour 10 min.	4 4	8	46
29	F	18	Grampound, Cornw.	5 24	9	49
30	S	19	K. Charles I. Mart.	6 33	10	54
31	C	20	Septuageſima Sunday.	7 26	11	57

M D	⊙ Riſes	⊙ Sets	♄ Riſes	♃ Riſes	♂ Riſes	♀ Sets	D. Break	Cl. faſt
1	8 4	3 56	4 M 26	10 A 59	1 M 36	4A 35	5 59	4' 7"
6	8 0	4 0	4 0	10 36	1 29	Riſes	5 57	6 23
11	7 55	4 5	3 44	10 23	1 22	7M 34	5 53	8 28
16	7 50	4 10	3 22	9 50	1 15	7 4	5 49	10 18
21	7 44	4 16	2 58	9 27	1 8	6 39	5 44	11 51
26	7 36	4 24	2 35	9 4	1 2	6 13	5 38	13 4

FEBRUARY hath xxviii Days.

	M D	☉ Decl. South.

Full Moon the 1ft ⎫	3 in the Morning.	1	17°	3
Laft Quarter the 8th ⎬ Day at	Half paft 6 in the Morn.	6	15	34
New Moon the 16th ⎪	Half paft 11 Forenoon.	11	13	5
Firft Quarter the 23d ⎭	9 at Night.	16	12	16
☉ in ♓ 18 Day, 25 m. paft 5 Afternoon.		21	10	29
		26	8	39

M D	W D	O S	Sundays, Holy and remark. Days; Length, Inc. & Decr.Terms,Fairs.	☽ Rifes & Sets.	Moon South.
1	M	21	Days increafed 1 hour 28 min. *Faft.*	☽ Rifes	0 M 56
2	Tu	22	Purif. B. V. MARY.	6 A 26	1 50
3	W	23	BlafiusB. OntheMor.of Purif.3Ret.	7 48	2 48
4	Th	24	*Axbridge. Bath*, Som.	9 9	3 28
5	F	25	Agatha, Old S. Paul.	10 25	4 13
6	S	26	*Namptwich*, Chefh.	11 39	4 57
7	C	27	Sexagefima Sunday.	Morn.	5 42
8	M	28	Days incr. 2 hours.	0 50	6 27
9	Tu	29	In 8 Days of Purif. 4 Return.	2 2	7 14
10	W	30	*Llandyffel*, Monm.	3 9	8 0
11	Th	31	Day 9 h. 46 m. long.	4 13	8 52
12	F	Fe	Hilary Term ends.	5 11	9 42
13	S	2	Old Candlemas.	6 0	10 32
14	C	3	Quinq. Sunday. Valentine.	6 39	11 20
15	M	4	*Blaife*, Cornw. *Boxgrove*, Shopfh.	7 10	Aftern.
16	Tu	5	Shrove Tuefday	☽ Sets	0 8
17	W	6	Afh-Wednefday, 1ft Day of Lent.	6 A 3	0 54
18	Th	7	*Nun-Eaton*, Warw.	7 18	1 39
19	F	8	*Beverly*, Yorkfh.	8 32	2 23
20	S	9	Days incr. 2 h. 34 min.	9 47	3 9
21	C	10	1 Sunday in Lent.	11 6	3 56
22	M	11	*Norton*, Oxf.	Morn.	4 45
23	Tu	12	*Godalming*, Surrey. *Faft.*	0 27	5 38
24	W	13	St. MATTHIA. Pr. Adol. Fr. born	1 47	6 35
25	Th	14	*Feverfham*, Kent. [Ember Week	3 6	7 36
26	F	15	*Oundle*, Northamp.	4 21	8 38
27	S	16	Day 10 h. 50 min. long.	5 19	9 41
28	C	17	2 Sunday in Lent.	6 3	10 41

M D	Sun Rifes	Sun Sets	Saturn Rifes	Jupiter Rifes	Mars Rifes	Venus Rifes	Day Break	Clock too faft
1	7 20	4 35	2 M 20	8 A 39	0 M 51	5 M 50	5 30	14' 4''
6	7 16	4 45	2 2	8 18	0 44	5 38	5 22	14 32
11	7 8	4 53	1 44	7 57	0 37	5 25	5 14	14 40
16	6 59	5 2	1 26	7 35	0 30	5 13	5 6	14 29
21	6 49	5 12	1 7	7 12	0 20	5 6	4 57	14 0
26	6 39	5 22	0 47	6 48	0 10	4 50	4 48	13 12

	M D	⊙ Decl. South.

Full Moon the 2d ⎱
Laſt Quarter the 10th ⎰ Day at
New Moon t e 18th ⎱
Firſt Quarter the 25th ⎰

{ 12 min. paſt 2 Afternoon.
42 m. paſt 2 ⎱
52 m. paſt 2 ⎰ Morning.
Half paſt 4 }

1	7° 31'
6	5 36
11	3 39
16	1 41
21	0 N. 18
26	2 18

⊙ in ♈ 20 Day, 55 min. paſt 5 Afternoon.

1	M	18	David. *Galgaeth,* Brecknockſh.	6M 34	11 36
2	Tu	19	Chad. *Stockport,* Cheſh.	☽ Riſes	0M 28
3	W	20	Days incr. 3 h. 34 min.	6A 44	1 18
4	Th	21	*Melton-Mowbray,* Leiceſt.	8 0	2 5
5	F	22	*Blanford,* Dorſetſh.	9 19	2 51
6	S	23	*Bowne,* Linc. *Walden,* Eſſex.	10 35	3 37
7	C	24	3 Sunday in Lent. Perpetua. Old S.	11 47	4 23
8	M	25	*Nottingham.* [Matth.	Morn.	5 11
9	Tu	26		0 59	5 59
10	W	27	Day 11 h. 32 min. long.	2 6	6 49
11	Th	28	Incr. 3 h. 56 min.	3 7	7 39
12	F	M	Gregory M. *Culliford,* Devon.	3 59	8 29
13	S	2	*Theodore.*	4 45	9 19
14	C	3	Mid-Lent Sunday.	5 17	10 7
15	M	4	*Langadock,* Caerm. *Oakham,* Rutl.	5 44	10 54
16	Tu	5	*Penzance,* Cornw. *Malmeſbury,* Wilts.	6 6	11 40
17	W	6	St. Patrick. *Loughborough,* Leic.	6 25	Aftern.
18	Th	7	Edw.K.of Weſt Sax. *Workſop,* Nott.	☽ Sets	0 25
19	F	8	*Abbots-Bromley,* Staff.	7A 42	1 11
20	S	9	Equal Day and Night.	9 2	1 59
21	C	10	5 Sunday in Lent. Benedict.	10 22	2 48
22	M	11	Paulinus.	11 45	3 41
23	Tu	12	*Skipton,* Yorkſ. Woburn, Bedf. *Wrex-*	Morn.	4 37
24	W	13	*Lanercemith,* Caerm. [*ham,* D. *Faſt.*	1 6	5 37
25	Th	14	Annunciation B. V. Mary.	2 20	6 38
26	F	15	Camb. Term ends. *Gloucester.*	3 23	7 39
27	S	16	Oxford Term ends.	4 8	8 38
28	C	17	6 Sunday in Lent. Palm-Sunday.	4 44	9 33
29	M	18	*Stourbridge,* Worceſt.	5 11	10 26
30	Tu	19	Day 12 hours 48 min. long.	5 31	11 16
31	W	20	*Northmore,* Suſſex.	5 48	0M 3

M D	Sun Riſes	Sun Sets	Saturn Riſes	Jupiter South	Mars Riſes	Venus Riſes	Day Break	Clock bef. Sun
1	6 34	5 27	0M 2	0M 50	0M 8	4 M 55	4 43	12" 40"
6	6 24	5 37	11A 55	0 29	11A 57	4 49	4 32	11 32
11	6 14	5 47	11 48	0 9	11 41	4 43	4 21	10 15
16	6 4	5 57	11 39	11A 48	11 36	4 37	4 11	8 51
21	5 54	6 7	11 23	11 27	11 22	4 31	4 0	7 21
26	5 44	6 17	11 5	11 6	11 8	4 24	3 48	5 48

APRIL hath xxx Days.

	M D	☉ Decl. North.

Full Moon the 1ft
Laft Quarter the 8th
New Moon the 16th ⎰Day at⎱
Firft Quarter the 23d
Full Moon the 30th

	2 in the Morning.	1	4°	36
52 m. paft 10 at Night.	6	6	30
16 m. paft 3 Afternoon.	11	8	22
40 m. paft 10 Forenoon.	16	10	10
51 m. paft 2 Afternoon.	21	11	54

☉ in ♉ 20 Day, 42 min. paft 6 Morning.   26 | 13 | 33

1	Th	21	Nottingham.	☽ Rifes	0 M 49
2	F	22	Good Friday.	8 A 21	1 36
3	S	23	Richard Bp. of Chichefter.	9 36	2 22
4	C	24	Eafter Sunday.	10 48	3 10
5	M	25	Monday. Old Lady-Day.	11 59	3 59
6	Tu	26	Tuefday.	Morn.	4 49
7	W	27	Atherftone, Warw.	1 5	5 39
8	Th	28	Day 13 hours 24 min. long.	2 2	6 29
9	F	29	Days incr. 5 hours 40 min.	2 50	7 19
10	S	30	Apr. Sh. when it rains in this Month.	3 27	8 7
11	C	31	1 Sund. after Eafter: Low Sunday.	3 55	8 54
12	M	A	Haltwhiftle, Northumb.	4 18	9 40
13	Tu	2	Afhburn, Derb. Budworth, Chefh.	4 37	10 26
14	W	3	Oxford and Camb. Terms begin.	4 55	11 12
15	Th	4	Bewley, Hampfh.	5 10	11 59
16	F	5	Dilton's Marfh, Wilts. Piddle-Town,	☽ Sets	Aftern.
17	S	6	Malmfbury, Wilts. [Dorfet.	8 A 11	0 49
18	C	7	2 Sunday after Eafter.	9 36	1 42
19	M	8	From the Day of Eafter in 2 Weeks.	11 0	2 38
20	Tu	9	Cane, Staff. Worcefter. [1 Ret.	Morn.	3 38
21	W	10	Eafter Term begins.	0 18	4 40
22	Th	11	Gifborough, Yorkfh. Shrewfbury.	1 27	5 41
23	F	12	St. George, Northampton.	2 18	6 40
24	S	13	Cirencefter, Glouc. Lincoln City.	2 55	7 36
25	C	14	3 Su.aft.Eafter. St MARK.Prs.M.b.	3 23	8 29
26	M	15	FromEafter in 3Weeks.2Ret.[1776.	3 43	9 18
27	Tu	16	Boroughbridge, Yorkfh.	4 1	10 5
28	W	17	Soham Cambridgefh.	4 17	10 50
29	Th	18	Market Harborough, Leic.	4 33	11 36
30	F	19	Gifborough, Yorkfh.	☽ Rifes	0 M 21

M D	Sun Rifes	Sun Sets	Saturn Rifes	Jupiter South	Mars Rifes	Venus Rifes	Day Break	Clock bef. Sun
1	5 33	6 28	10 A 40	10 A 43	10 50	4 M 16	3 33	3' 56''
6	5 23	6 38	10 21	10 23	10 31	4 9	3 20	2 26
11	5 13	6 48	10 2	10 3	10 11	4 1	3 6	1 1
16	5 4	6 57	9 42	9 43	9 52	3 53	2 54	0 after 1
21	4 54	7 7	9 20	9 21	9 27	3 45	2 40	1 24
26	4 45	7 16	9 1	9 0	9 2	3 36	2 23	2 22

Laſt Quarter the 8th ⎫	10 min. paſt 5 Afternoon.	1 15° 6'
New Moon the 16th ⎪ Day at	6 min. paſt 1 Morning.	6 16 34
Firſt Quarter the 22d ⎬	36 min. paſt 4 Afternoon.	11 17 54
Full Moon the 30th ⎭	52 min. paſt 4 Morning.	16 19 7
		21 20 12
☉ in ♊ 21 Day, 19 min. paſt 7 Morning.		26 21 9

1	S	20	St. Philip and St. James.	8A 38 1M10
2	C	21	4 Sunday after Eaſter.	9 51 1 57
3	M	22	From Eaſter in 1 Month, 3 Ret.	11 0 2 47
4	Tu	23	*Boſton*, Linc. *Cheſterfield*, Derb. *Tam-*	11 59 3 37
5	W	24	*Louth*, Linc. *Monmouth*. [*worth* St.	Morn. 4 26
6	Th	25	John Ev. ante Port Lat.	0 51 5 16
7	F	26	*Bath* City, *Newton*, Lanc.	1 32 6 5
8	S	27	*Phillips Norton*, Som.	2 3 6 52
9	C	28	Rogation Sunday.	2 28 7 37
10	M	29	From Eaſter in 5 Weeks, 4 Ret.	2 47 8 21
11	Tu	30	*Dunſtable*, Bedf. *Stanes*, Midd.	3 4 9 7
12	W	M	Old May Day.	3 21 9 53
13	Th	2	Holy Thurſday.	3 37 10 41
14	F	3	On the Morrow of the Aſcen. 5 Ret.	3 52 11 33
15	S	4	☉ eclipſed inviſible.	4 10 Aftern.
16	C	5	Sunday after Aſcenſion Day,	☽ Sets 0 27
17	M	6	Eaſter TERM ends.	10A 3 1 28
18	Tu	7	*Hateſbury*, Bucks. *Thunderly*, Eſſex.	11 18 2 31
19	W	8	Queen CHARLOTTE bo. 1744,	Morn. 3 35
20	Th	9	Oxford Term ends.	0 18 4 36
21	F	10	*Aſhborn*, Derb. *Cromſtock*, Devon.	1 0 5 34
22	S	11	Prs. Elizabeth born 1770,	1 31 6 28
23	C	12	Whit-Sunday.	1 53 7 18
24	M	13	Monday.	2 11 8 5
25	Tu	14	Tueſday.	2 27 8 49
26	W	15	Auguſt. I. Abp. of Cant. Ember	2 42 9 34
27	Th	16	Venerable Bede. Week.	2 58 10 19
28	F	17	*Bala-Merioneth*.	3 13 11 4
29	S	18	K. Cha. II. Birth and Return.	3 32 11 50
30	C	19	Trinity Sunday, ☽ ecl. Part viſible.	☽ Riſes 0M39
31	M	20	On the Mor. of the H.Trin. 1 Ret.	9A 49 1 29

M D	Sun Riſes	Sun Sets	Saturn South	Jupiter South	Mars South	Venus Riſes	Day Break	Clock after Sun
1	4 36	7 25	0M59	8 A 42	0M55	3M 28	2 6	3' 8"
6	4 28	7 33	0 27	8 22	0 29	3 18	1 50	3 40
11	4 20	7 41	0 16	8 2	0 2	3 9	1 28	3 57
16	4 12	7 48	11 A 54	7 42	11 A 36	3 0	1 4	4 0
21	4 5	7 55	11 33	7 20	11 19	2 49	0 24	3 49
26	3 59	8 1	11 12	7 2	10 41	2 39	No Night	3 25

JUNE hath xxx Days.

	M D	⊙ Decl. North.	

1	Tu	21	Nicomede.	10A 44	2M 19
2	W	22	Oxford and Camb. Terms begin.	11 29	3 9
3	Th	23	Kerby Stephen, Weftm.	Morn.	3 57
4	F	24	K. GEO. III. bo. 1738. TERM beg.	0 1	4 44
5	S	25	P. ERN.AUG. bo. 1771. Bonif. Bp.	0 30	5 29
6	C	26	1 Sunday after Trinity.	0 50	6 13
7	M	27	In 8 Days of the H. Trin. 2 Ret.	1 9	6 56
8	Tu	28	St. Germains, Cornw.	1 24	7 40
9	W	29	Hadderfield, Suffex.	1 38	8 26
10	Th	30	Prs AMELIA born 1711.	1 53	9 15
11	F	31	St. BARNABAS.	2 10	10 8
12	S	Ju	Bartlow, Effex, Hadlow, Kent.	2 29	11 5
13	C	2	2 Sunday after Trinity.	2 55	Aftern.
14	M	3	In 15 Days of H.T. 3R ⊙ecl.vifible.	) Sets	0 8
15	Tu	4	Royfton, Somerfetfh.	10 A 1	1 13
16	W	5	Wrexham, Denb.	10 51	2 18
17	Th	6	St. Alban.	11 28	3 20
18	F	7	Ingleton, Y. Wiggan, Lanc.	11 53	4 17
19	S	8	Abingdon, Berks.	Morn.	5 9
20	C	9	3 Sunday after Trinity.	0 14	5 58
21	M	10	In 3 Weeks of H.T. 4 Ret Long.D.	0 31	6 44
22	Tu	11	Old St. Barnabas.	0 46	7 28
23	W	12	TERM ends. Feft.	1 0	8 12
24	Th	13	St. JOHN Baptift.	1 16	8 56
25	F	14	Days will foon be upon the Decreafe.	1 33	9 42
26	S	15	Chapel Silvas Kent. Perfhore, Worc.	1 55	10 3C
27	C	16	4 Sunday after Trinity.	2 23	11 19
28	M	17	Higham-Ferrers, Northamp. Faft.	) Rifes	0M 1C
29	Tu	18	St. PETER.	9A 22	1 0
30	W	19	Bridgenorth, Shropfh.	9 59	1 48

M D	Sun Rifes	Sun Sets	Saturn South	Jupiter Sets	Mars So th	Venus Rifes	Day Break	Clock after Sun
1	3 53	8 7	10A 46	0M 29	10A 1c	2M 27	No real	2' 40"
6	3 49	8 11	10 24	0 21	9 46	2 19	Night;	1 52
11	3 46	8 14	10 2	0 14	9 22	2 12	but al	0 55
16	3 44	8 16	9 40	0 6	8 58	2 4	but al	0 before 7
21	3 4	8 17	9 18	11A 47	8 38	2 0	Twi-	1 13
26	3 44	8 16	8 54	11 28	8 18	1 5	light.	2 16

JULY hath xxxi Days.

	M D	☉ Decl. North.

1	Th	20	Thorney-Abby, Ely. Workſop, Nott.	10A 28	2M 35
2	F	21	Viſitation of the B. V. Mary.	10 50	3 21
3	S	22	Dog-Days begin	11 8	4 4
4	C	23	5 Sunday after Trinity.	11 24	4 47
5	M	24	Old Midſummer.	11 39	5 29
6	Tu	25	Cambridge Commencement.	11 53	6 14
7	W	26	Thomas à Becket.	Morn.	7 c
8	Th	27	Folkeſtone, Kent.	0 9	7 49
9	F	28	Cambridge Term ends.	0 27	8 42
10	S	29	Old St. Peter.	0 50	9 41
11	C	30	6 Sund. after Trinity. Oxford Act.	1 20	10 44
12	M	Ju	Canterbury.	2 2	11 51
13	Tu	2	Huntingdon. Wobourn, Bedf.	D Sets	Aftern.
14	W	3	Days decr. 28 min,	9A 17	0 57
15	Th	4	Swithun.	9 49	1 58
16	F	5	Wincheſter. Woodhurſt, Dorſetſh.	10 12	2 51
17	S	6	Oxford Term ends.	10 31	3 46
18	C	7	7 Sunday after Trinity.	10 47	4 34
19	M	8	Kenninghall, Norf.	11 2	5 20
20	Tu	9	Margaret.	11 18	6 5
21	W	10	Foulneſs, Kent. Swaffham, Norf.	11 35	6 50
22	Th	11	Magdalen.	11 56	7 36
23	F	12	Daventry, Northamp.	Morn.	8 24
24	S	13	Faringhay, Kent. Faſt.	0 23	9 13
25	C	14	8 Sunday after Trinity. St. James.	0 57	10 3
26	M	15	St. Anne, Mother to the B.V.Mary.	1 37	10 53
27	Tu	16	Headon, Yorkſh. Milſon, Wilts.	2 30	11 42
28	W	17	Emlin, Worc. Portſdown, Hants.	D Riſes	0M 3c
29	Th	18	Days decreaſed 1 hour 6 min.	8A 53	1 16
30	F	19	Caerlton, Monm. Linton. Camb.	9 12	2 1
31	S	20	Honiton, Dev. Uxbridge, Midd.	9 28	2 44

M D	Sun Riſes	Sun Sets	Saturn Sets	Jupiter Sets	Mars Sets	Venus Riſes	Day Break	Clock before Sun
1	3 46	8 14	0M 58	11 7	0M 36	1M 52	No	3' 16''
6	3 49	8 11	0 38	10 47	0 18	1 54		4 10
11	3 53	8 7	0 18	10 27	0 1	1 56	real	4 56
16	3 58	8 2	11 58	10 7	11A 43	1 59		5 32
21	4 4	7 56	11 41	9 50	11 28	2 2	Night	5 54
26	4 11	7 49	11 25	9 32	11 13	2 6	0 52	5 2

AUGUST hath xxxi Days.

	M D	☉ Decl. North.
Last Quarter the 5th — 29 min. past 7 Morning.	1	18° 2'
New Moon the 11th ⎱ Day at ⎰ 51 m. past 10 at Night	6	16 43
First Quarter the 18th ⎰ 10 at Night.	11	15 17
Full Moon the 27th — 2 in the Morning.	16	13 45
	21	12 7
☉ in ♍ 23 Day, 13 min. past 9 Forenoon.	26	10 25

1	C	21	9 Sund. aft. Trinity. Lammas Day	9A 40	3M 26
2	M	22	Dartford, Kent. Winchester.	9 54	4 9
3	Tu	23	Daventry, North. Epsom, Surry.	10 12	4 53
4	W	24	Ravenglass, Cumb. Thursk, Yorksh.	10 28	5 40
5	Th	25	Old St. James.	10 48	6 31
6	F	26	Transfig. of our Lord.	11 15	7 26
7	S	27	Name of Jesus.	11 50	8 26
8	C	28	10 Sunday after Trinity.	Morn.	9 30
9	M	29	Ruthin, Denb. Shirkin, Midd.	0 41	10 35
10	Tu	30	St. Lawrence.	1 50	11 38
11	W	31	Prs.of Brunsw. bo. Dog-Days end.	☽ Sets	Aftern.
12	Th	A	Pr.of Wales b.1762.OldLammas.	8A 14	0 40
13	F	2	Northampton, St. Eades, Hertf.	8 37	1 35
14	S	3	Stow, Suffolk.	8 55	2 26
15	C	4	11 Sunday after Trinity.	9 11	3 14
16	M	5	Prince Frederick born 1763.	9 23	4 1
17	Tu	6	Bardney, Hampsh.	9 42	4 47
18	W	7	Day 14 hours 24 min. long.	10 1	5 34
19	Th	8	Dartington, Devonsh.	10 25	6 22
20	F	9	Days decreased 2 hours 18 min.	10 57	7 11
21	S	10	Pr. William Henry bo. 1765.	11 39	8 1
22	C	11	12 Sunday after Trinity.	Morn.	8 52
23	M	12	Belford,Northumb.Dinton,Oxf.Fast	0 28	9 42
24	Tu	13	St. Bartholomew.	1 26	10 31
25	W	14	Milverton, Som.	2 33	11 18
26	Th	15	Huntingdon, Worcester.	3 43	0M 4
27	F	16	Coventry City, Gisborough, Yorksh.	☽ Rises	0 48
28	S	17	St. Augustine.	7A 56	1 30
29	C	18	13 Su. a.Trin. St. J. Bp. beheaded.	8 8	2 14
30	M	19	Day 13 hours 38 min. long.	8 24	2 57
31	Tu	20	Days decreased 3 hours.	8 39	3 42

M D	Sun Rises	Sun Sets	Saturn Sets	Jupiter Sets	Mars Sets	Venus Rises	Day Break	Clock after Sun
1	4 20	7 46	10A 49	9A 10	10A 52	2M 28	1 24	5' 52"
6	4 27	7 32	10 31	8 52	10 40	2 42	1 44	5 27
11	4 35	7 24	10 14	8 34	10 28	2 56	2 4	49
16	4 44	7 15	9 56	8 16	10 16	3 10	2 20	56
21	4 53	7 6	9 37	7 58	10 4	3 25	2 30	50
26	5 2	6 57	9 19	7 43	9 54	3 40	2 46	32

SEPTEMBER hath xxx Days.

			M/D	☉ Decl. North
Laſt Quarter the 3d		49 m. paſt 3 Afternoon.	1	8° 16'
New Moon the 10th	Day at	7 in the Morning.	6	6 26
Firſt Quarter the 17th		Half paſt 2 Afternoon.	11	4 32
Full Moon the 25th		51 m. paſt 4 Afternoon.	16	2 37
			21	0 40
☉ in ♎ 23 Day, 35 min. paſt 5 Morning.			26	1 So. 16

1	W	21	Giles, Abbot. *Northmoor*, Wilts.	8 A 58	4 M 32
2	Th	22	LONDON burnt 1666, O. S.	9 21	5 25
3	F	23	*Brecknock*, and five following Days.	9 52	6 21
4	S	24	OldBatholomew. *Aſhby-de-la-Zouch.*	10 35	7 23
5	C	25	14 Sunday after Trinity.	11 35	8 25
6	M	26	*Folkingham*, Linc.	Morn.	9 28
7	Tu	27	Enurchus. *Snaith*, Yorkſh.	0 50	10 28
8	W	28	Nativity of B.V.Mary, *Northampton.*	2 15	11 26
9	Th	29	*Atherſtone*, Warw. *Stourbridge,* Worc.	3 4*	Aftern.
10	F	30	Day 12 hours 56 min. long.	☽ Sets	0 19
11	S	31	*Followdown*, Dev.	7 A 19	1 10
12	C	Se	15 Sunday after Trinity.	7 35	1 58
13	M	2	*Newton*, Lanc. *Iron Actor*, Glouc.	7 52	2 46
14	Tu	3	Holy Croſs. *Woburn*, Bedf.	8 10	3 34
15	W	4	Ember Week.	8 33	4 23
16	Th	5	*Walſall*, Staff. *Lutterworth*, Leic.	9 2	5 13
17	F	6	Lambert. *Marſham*, Yorkſh.	9 39	6 3
18	S	7	*Southwark. Stirbitch,* Camb.	10 26	6 54
19	C	8	16 Sunday after Trinity.	11 22	7 45
20	M	9	*Mancheſter*,Lanc.*Newent*,Glou.*Faſt.*	Morn.	8 34
21	Tu	10	St. MATTHEW, *Buckingham.*	0 28	9 22
22	W	11	K.GEO.III.&Q.CH.crowned1761.	1 37	10 8
23	Th	12	Equal Day and Night.	2 50	10 53
24	F	13	*Cheſhunt*, Hertf. *Wickware*, Glouc.	4 1	11 37
25	S	14	*Cheſterfield*, Derb. *Denbigh.*	☽ Riſes	c M 20
26	C	15	17 Sunday after Trinity.	6 A 38	1 4
27	M	16	*Clapham*, Yorkſh. *Northall*, Midd.	6 56	1 49
28	Tu	17	*Gloucester. Tuxford*, Nott.	7 13	2 38
29	W	18	St.MICHAEL. Prs. CH.AUG. born.	7 36	3 30
30	Th	19	S. Jerom. *Wrexham.*	8 4	4 26

M D	Sun Riſes	Sun Sets	Saturn Sets	Jupiter Sets	Mars Sets	Venus Sets	Day Break	Clock before Sun
1	5 14	6 45	9 A 0	7 A 14	9 A 45	4 M 5	3 7	10' 14
6	5 23	6 36	8 44	7 2	9 38	4 22	3 21	1 50
11	5 33	6 26	8 29	6 49	9 31	4 40	3 34	3 32
16	5 43	6 16	8 14	6 37	9 24	4 57	3 45	16
21	5 53	6 4	7 54	6 20	9 10	5 9	3 56	7 0
26	6 3	5 56	7 34	6 3	9 13	5 21	4 7	8 45

OCTOBER hath xxxi Days.

	M D	☉ Decl. South.

		M D	☉ Decl. South.
Last Quarter the 2d	11 at Night.	1	3° 13'
New Moon the 9th	13 m. paſt 5 Afternoon.	6	5 6
Firſt Quarter the 17th > Day at	52 m. paſt 9 Forenoon.	11	7 4
Full Moon the 25th	52 m. paſt 6 Morning.	16	8 56
		21	10 45
☉ in ♏ 23 Day, 26 min. paſt 1 Afternoon,		26	12 30

1	F	20	Remigius,	8A 42	5M25
2	S	21	Old St.Matthew, *Nottingham*, laſts 8	9 33	6 26
3	C	22	18 Sunday after Trinity. [Days.	10 40	7 26
4	M	23	*Penkridge*, Staff.	Morn.	3 29
5	Tu	24	*Llanvilling*, Montg. *Lamport*, Som.	0 4	9 24
6	W	25	Faith. *Hull*, Yorkſh.	1 31	10 16
7	Th	26	*Bellericay*, Eſſex. *Counteſs*, Wilts.	2 57	11 7
8	F	27	*Abingdon*, Perks. *Challock*, Kent.	4 23	11 56
9	S	28	St. *Denys*, *Lancaſter*.	☽ Sets	Aftern.
10	C	29	19Sund.a.Trinity. Cam.Term beg.	6A 7	0 44
11	M	30	*Bedal*,Yorkſh.*Leiceſter*. Oxf.T.beg.	6 24	1 32
12	Tu	O	*Caxton*, Camb. *Saliſbury*, Wilts.	6 40	2 21
13	W	2	Tranſl. of K. Edw. Conf.	7 7	3 11
14	Th	3	*Workſop*, Nott. *Buttonmoor*, Shropſh.	7 43	4 2
15	F	4	*Faleſley*, Warw.	8 27	4 54
16	S	5	*Boſworth*, Leiceſt.	9 16	5 45
17	C	6	20 Sunday after Trinity.	10 20	6 35
18	M	7	St. LUKE. *Cank*, Staff.	11 28	7 23
19	Tu	8	*Oxford*. *Market-Harbro'*, Leic.	Morn.	8 10
20	W	9	*Aſhborn*, Derb. *Hereford*.	0 39	8 55
21	Th	10	*Banbury*, Oxf. *Gainbro'*, Linc.	1 50	9 38
22	F	11	*Rudgley*, Staff. *Wells*, Som.	3 2	10 22
23	S	12	*Ripley*, Derb. *Stockport*, Cheſh.	4 17	11 5
24	C	13	21 Sunday after Trinity.	5 32	11 50
25	M	14	K. GEO. III. Acceſſion, Criſpin.	☽ Riſes	0M39
26	Tu	15	K. GEO. III. Procl. 1760.	5A44	1 30
27	W	16	*Buckingham*. *Warwick*. Faſt.	6 7	2 25
28	Th	17	St. SIMON and St. JUDE.	6 44	3 24
29	F	18	Old St. Luke.	7 34	4 24
30	S	19	*Briagen r.b*, Shropſh.	8 37	5 27
31	C	20	22 Sunday after Trinity.	9 55	6 28

M D	Sun Riſes	Sun Sets	Saturn Sets	Jupiter Riſes	Mars Sets	Venus Riſes	Day Break	Clock after Sun
1	6 15	5 47	7 A 16	6M 15	9 A 9	5M 50	4 18	10' 22"
6	6 22	5 37	6 59	6 1	9 7	6 7	4 29	11 52
11	6 32	5 27	6 42	5 49	9 5	6 25	4 39	13 12
16	6 42	5 17	6 25	5 36	9 3	6 42	4 49	14 20
21	6 51	5 8	6 8	5 24	9 1	Sets	4 59	14 14
26	7 1	4 58	5 51	5 10	9 c	5 A 0	5 8	15 52

NOVEMBER hath xxx Days.

	M D	☉ Decl. South.

Laſt Quarter the 1ſt		47 m. paſt 5 Morning.	1 14° 30ʹ
New Moon the 8th		24 m. paſt 6 Morning.	6 16 3
Firſt Quarter the 16th	Day at	35 m. paſt 6 Morning.	11 17 29
Full Moon the 2 d		57 m. paſt 7 at Night.	16 18 48
Laſt Quarter the 30th		16 m. paſt 1 Afternoon.	21 19 59
☉ in ♐ 22 Day, 35 min. paſt 9 Morning.			26 21 0

1	M	21	All Saints.	11 A 19	7 M 21
2	Tu	22	All Souls. Pr. EDWARD bo. 1767.	Morn.	8 14
3	W	23	On the Morr. of Aʹl Souls, 1 Ret. Prs.	0 44	9 4
4	Th	24	Appleſhaw, Hants. [SOPHIA b.1777.	2 9	9 53
5	F	25	Powder Plot 1605.	3 29	10 38
6	S	26	TERM begins	4 49	11 25
7	C	27	23 Sun.aft.Trin. D.CUMB. b.1745.	6 5	Aftern.
8	M	28	Prs.A.SOPH.b.1768. O.Sim.&Jude.	☽ Sets	☉ 14
9	Tu	29	Lord Mayor's Day, at LONDON.	5 A 10	1 3
10	W	30	Lenton, Nott. Rocheſter, Kent.	5 40	1 54
11	Th	31	St. Martin.	6 18	2 46
12	F	N	On the Mor. of St. Mart. 2Ret. O.	7 6	3 37
13	S	2	Britius, York City. [All Saints.	8 6	4 28
14	C	3	24 Sunday after Trinity.	9 12	5 17
15	M	4	Machutus.	10 21	6 3
16	Tu	5	Launceſton, Cornw. Andover, Hampſh.	11 31	6 48
17	W	6	Hugh Bp. of Lincoln.	Morn.	7 31
18	Th	7	In 8 Days of St. Martin, 3 Ret.	0 42	8 13
19	F	8	Woodcot, Oxf. Yarmo, Y.	1 54	8 56
20	S	9	Edmund, K. and Mart.	3 7	9 39
21	C	10	25 Sunday after Trinity.	4 22	10 26
22	M	11	Cecilia. Old St. Martin.	5 43	11 15
23	Tu	12	St. Clement, ☽ eclipſed, viſible.	☽ Riſes	0 M 9
24	W	13	Days decr. 8 hours 12 min.	4 A 38	1 8
25	Th	14	D. of GLOUC. b. In 15 D. of S. Mart.	5 22	2 11
26	F	15	Caſtletown, Monm. [4 Ret.	6 20	3 14
27	S	16	TERM ends.	7 35	4 15
28	C	17	Advent Sunday.	9 0	5 13
29	M	18	Aſhbern, Derb. Faſt.	10 25	6 6
30	Tu	19	St. ANDREW.	11 49	6 56

M D	Sun Riſes	Sun Sets	Saturn Sets	Jupiter Riſes	Mars Sets	Venus Sets	Day Break	Clock after Sun
1,7	12	4 47	5 29	4 M 58	9 A 0	4 A 52	5 17	16ʹ 13ʺ
6 7	21	4 38	5 10	4 43	9 0	4 48	5 24	16 8
11 7	29	4 30	4 51	4 27	8 59	4 42	5 32	15 42
16 7	37	4 22	4 32	4 11	8 59	4 38	5 37	14 55
21 7	45	4 15	Riſes	3 57	8 59	4 36	5 43	13 48
26 7	51	4 9	7 M 51	3 42	9 0	4 14	5 49	12 21

DECEMBER hath xxxi Days.

New Moon	the 7th	31 min. paſt 10 at Night.	1 21° 52'
Firſt Quarter	the 16th	54 m. paſt 2 Morning.	6 22 33
Full Moon	the 23d	52 m. paſt 7 Morning.	11 23 3
Laſt Quarter	the 29th	37 m. paſt 10 at Night.	16 23 21
			21 23 28
	☉ in ♑ 21 Day, 57 min. paſt 9 at Night.		26 23 23

				Morn.	7 M 43
1	W	20	Rotherham, Yorkſh.	Morn.	7 M 43
2	Th	21	Hoxen, Suff.	1 11	8 29
3	F	22	Pennyfont, Som.	2 29	9 15
4	S	23	Atherſtone, Warw.	3 45	10 1
5	C	24	2 Sunday in Advent.	5 3	10 48
6	M	25	Nicholas.	6 21	11 37
7	Tu	26	Sun eclipſed inviſible.	☽ Sets	Aftern.
8	W	27	Concept. of B. V. Mary.	4 A 6	0 28
9	Th	28	Bradford, Wilts.	4 50	1 20
10	F	29	Newport, Shropſh.	5 45	2 12
11	S	30	Old St. Andrew.	6 48	3 1
12	C	D	3 Sunday in Advent.	7 55	3 48
13	M	2	Lucy, V. and Mart.	9 5	4 33
14	Tu	3	Namptwich, Cheſh.	10 14	5 16
15	W	4	Ember Week.	11 24	5 57
16	Th	5	O Sapientia, Camb. Term ends.	Morn.	6 38
17	F	6	Oxford Term ends.	0 36	7 19
18	S	7	Spalding, Linc.	1 48	8 3
19	C	8	4 Sunday in Advent.	3 3	8 50
20	M	9	The greateſt ſhorten. of D. is 8 h.	4 23	9 41
21	Tu	10	St. Thomas. [50 m. Faſt.	5 46	10 37
22	W	11	Shorteſt Day.	7 13	11 39
23	Th	12	It will be Chriſtmas Weather all	☽ Riſes	0 M 44
24	F	13	England over, the nextWeek. Faſt.	5 A 1	1 48
25	S	14	CHRISTMAS-DAY,	6 25	2 50
26	C	15	1 Sun. aft. Chriſtm. St. STEPHEN.	7 54	3 47
27	M	16	St. JOHN.	9 22	4 40
28	Tu	17	H. Innocents	10 45	5 29
29	W	18	Cockhill, Som.	Morn.	6 15
30	Th	19	Maiden Bradley, Wilts.	0 6	7 0
31	F	20	Silveſter.	1 24	7 45

M D	Sun Riſes	Sun Sets	Saturn Riſes	Jupiter Riſes	Mars Sets	Venus S-ts	Day Break	Clock before Sun
1	7 57	4 3	7 M 16	3 M 23	9 0	4 A 35	5 54	10' 35'
6	8 1	3 59	6 56	3 5	9 0	4 40	5 56	8 33
11	8 5	3 55	6 36	2 48	9 0	4 46	5 58	6 17
16	8 7	3 53	6 16	2 31	9 0	4 51	6 0	3 53
21	8 8	3 52	5 56	2 13	9 0	5 0	6 1	1 25
26	8 7	3 53	5 36	1 55	8 59	5 12	6 0	1 before 4

A TABLE of all the KINGS and QUEENS of *England* fince the Conqueft.

The Year of the Birth of each King and Queen; alfo the Year, Month, and Day, whereon they began to reign: beginning the Year the firft Day of January, 1779.			The Length of each Reign.			Years fince each Reign ended.
Names.	**Born**	**Began to Reign.**	**Y.**	**M.**	**D.**	**fince.**
William Conq.	1027	1066 October 14	20	10	26	692
William Rufus	1057	1087 Septem. 9	12	10	24	679
Henry I.	1068	1100 Auguft 2	35	3	29	644
Stephen	1105	1135 Decem. 1	18	10	24	625
Henry II.	1132	1154 October 25	34	8	11	590
Richard I.	1156	1189 July 6	9	9	0	580
John	1166	1199 April 6	17	6	13	563
Henry III.	1207	1216 October 19	56	0	28	507
Edward I.	1239	1272 Novem. 16	34	7	21	472
Edward II.	1284	1307 July 7	19	6	18	452
Edward III.	1312	1327 January 25	50	4	27	402
Richard II.	1366	1377 June 21	22	3	8	380
Henry IV.	1367	1399 Septem. 29	13	5	20	366
Henry V.	1389	1413 March 20	9	5	11	357
Henry VI.	1421	1422 Auguft 31	38	6	4	318
Edward IV.	1442	1461 March 4	22	1	5	296
Edward V.	1471	1483 April 9	0	2	13	296
Richard III.	1443	1483 June 22	2	2	0	294
Henry VII.	1457	1485 Auguft 22	23	8	0	270
Henry VIII.	1492	1509 April 22	37	9	6	232
Edward VI.	1537	1547 January 28	6	5	8	226
Mary I.	1516	1553 July 6	5	4	11	221
Elizabeth	1533	1558 Novem. 17	44	4	7	176
James I.	1566	1603 March 24	22	0	3	154
Charles I.	1600	1625 March 27	23	10	3	130
Charles II.	1630	1649 January 30	36	0	7	94
James II.	1633	1685 February 6	4	0	7	90
{ William III.	1650	} 1689 Feb. 13	13	0	23	77
{ Mary II.	1662		5	10	15	85
Anne	1665	1702 March 8	12	4	24	65
George I.	1660	1714 Auguft 1	12	10	10	52
George II.	1683	1727 June 11	33	4	14	19
George III.	1738	1760 October 25	whom God preferve.			

A Compendious Table of Interest,

SHEWING

The Interest of any Sum of Money, from a Million to a Pound, for any Number of Days, at any Rate of Interest.

Nº	l.	s.	d.	q.		Nº	l.	s.	d.	q.
1000000—	2739	14	6	0 ,99		1000—	2	14	9	2 ,14
900000—	2465	15	0	3 ,29		900—	2	9	3	3 ,12
800000—	2191	15	7	1 ,59		800—	2	3	10	0 ,11
700000—	1917	16	1	3 ,89		700—	1	18	4	1 ,10
600000—	1643	16	8	2 ,19		600—	1	12	10	2 ,80
500000—	1369	17	3	0 ,49		500—	1	7	4	3 ,70
400000—	1095	17	9	2 ,79		400—	1	1	11	0 ,50
300000—	821	18	4	1 ,09		300—	0	16	5	1 ,40
200000—	547	18	10	3 ,40		200—	0	10	11	2 ,30
100000—	273	19	5	1 ,70		100—	0	5	5	3 ,10
90000—	246	11	6	0 ,32		90—	0	4	11	0 ,71
80000—	219	3	6	0 ,96		80—	0	4	4	2 ,41
70000—	191	15	7	1 ,59		70—	0	3	10	0 ,11
60000—	164	7	8	0 ,22		60—	0	3	3	1 ,81
50000—	136	19	8	2 ,85		50—	0	2	8	3 ,51
40000—	109	11	9	1 ,48		40—	0	2	2	1 ,21
30000—	84	3	10	0 ,11		30—	0	1	7	0 ,90
20000—	54	15	10	2 ,74		20—	0	1	1	0 ,60
10000—	27	7	11	1 ,37		10—	0	0	6	2 ,30
9000—	24	13	1	3 ,23		9—	0	0	5	3 ,67
8000—	21	18	4	1 ,10		8—	0	0	5	1 ,04
7000—	19	3	6	2 ,96		7—	0	0	4	2 ,41
6000—	16	8	9	0 ,82		6—	0	0	3	3 ,78
5000—	13	13	11	2 ,58		5—	0	0	3	1 ,15
4000—	10	19	2	0 ,55		4—	0	0	2	2 ,52
3000—	8	4	4	2 ,41		3—	0	0	1	3 ,89
2000—	5	9	7	0 ,27		2—	0	0	1	1 ,26
1000—	2	14	9	2 ,14		1—	0	0	0	2 ,63

RULE.

Multiply the Sum by the Number of Days; and that Product by the Rate per Cent. Then cut off the two last Figures to the Right Hand, and the rest you must find in the Table.

Example, What is the Interest of 100l. for 365 Days at 5 per Cent?

Nº of Days 365		Then in the Table					
multiply by 100		against 1000		2	14	9	2 ,14
Product 36500		800	is	2	3	10	0 ,11
multiply by 5 Rate per Cent.		20		0	1	1	0 ,60
1825|00		And against 5		0	0	3	1 ,15
		Anf.		5	0	0	0 ,00

Of the ECLIPSES of the *Luminaries* happening in 1779.

THE *First* ; will be an *invisible* Eclipse of the SUN, on *Sunday* the 16th of *May*, at 1 in the Morning.

The *Second*, will be a *total* Eclipse of the MOON ; and part *visible :* on Trinity Sunday, the 30th of *May*, in the Morning.

	H.	M.
Beginning — — —	3	2
Beginning of total Darkness —	4	13
Middle — — — — —	4	55
End of total Darkness —	5	37
End of the Eclipse — — —	6	48

Digits eclipsed 15° 47′

The *Third* is a visible Eclipse of the SUN, on Monday the 14th of *June*, in the Morning :

	H.	M.
Beginning of the Eclipse —	7	18
Middle — — — —	7	59
End — — — —	8	43

Digits 3° 15′

The *Fourth*, will be a great and *visible* Eclipse of the MOON ; on Tuesday the 23d of *November*, at Night :

	H.	M.
Beginning of the Eclipse —	6	7
Beginning of total Darkness —	7	7
Middle — — —	7	57
End of total Darkness —	8	48
End of the Eclipse — —	9	47

Digits eclipsed 20° 42′

The *Fifth* and last, will be an *invisible* Eclipse of the SUN, on Tuesday the 7th of *December*, at half past 10 at Night.

Miss POLLY STOW's, are as under ;

See the *Eclipses,* how they run ;
Two of the MOON ; *one* of the SUN :
By *Polly Stow* your female Friend,
As She below the same has penn'd.

The MOON, on *May* 30, Morn.	The SUN, *June* 14, Morning.
	Beginning — 7 H. 22 m.
Beginning — 3 H. 7 m.	Middle — — 8 7
Moon Sets — 3 55	End — — 8 42

The MOON, on *November* 23, at Night.

		H.	m.	
Beginning of total Darkness —	7	10	48″
Middle — —	8	0	39
End of total Darkness — —	8	50	29
End of the Eclipse — — —	9	49	13

B
Mr.

Mr. RICHARD TODD, of *Alnwick*, *Northumberland*; sent the following computation of the SUN's Eclipse, on the 14th of *June*.

Sun eclipsed *June* 14, 1779.	Berwick, on *Tweed.*		Archangel.	
Beginning — —.—	7 H. 18′	P. M.	10 H. 57	P. M.
Middle — — —.—	8 02		11 42	
End — — —	8 53		12 26	
Digits eclipsed — —	4° 18		2° 18	

Gen. Appearances.	Time at Lond.		Latitude.	Longitude.	Country.
Eclipse begins at ⊙ rising	6 H. 5	P.M.	32° 00′N.	30° 29W.	Western ocean.
Greatest of all —	8 55		65 15N.	112 52W.	Unknown parts of
Under the Pole of the *Ecliptic,* at ⊙ rising.	9 05		66 31N.	128 42W.	N. *Amer.*
In the North Point of the Horizon.	9 11		69 42N.	137 45W.	Do.
Ends at Sun *Setting.*	10 50		43 22N.	134 42 E.	Oriental Sea.
Sun's lower limb, touched by the Moon's upper limb, in the *Meridian.*	9 3		55 23N.	44 15 E.	Russia.

Mr. JOHN NORMAN, of *Braybrook*, Northamptonshire, computed all the Eclipses from new manuscript TABLES of his *own* composing; with the general appearances, for LONDON, *York*, and *Edinburgh.*

And Mr. SAMUEL OLIVER, of *Popplewick*, Nottinghamshire, sent computations of the Eclipses, with a *Type* of that of the MOON on the 30th of *May*; which, for want of room cannot be inserted.

ANSWERS to the ÆNIGMAS, &c. in the last Year's DIARY.

1. SCANDAL.
2. DARKNESS.
3. MAGIC LANTHORN.
4. The FINGER NAILS.
5. A CORK.
6. TIME.
7. A SEXTON.
8. STRENGTH.

Prize. DICE.

1 *Rebus,* PEAT. 2 GOUGH, COLLEDGE, and SIMPKIN. 3 EXCISE.

The PRIZE ÆNIGMA answered by Mr. WILLIAM RICHARDSON.

DIARIAN WYLD, your riddle, I think
    May be the *Box* and DICE;
Therefore, my friend, let's have a drink,
    Then try to get a *prize.*

The same answered by Miss POLLY STOW, of Stow.
Make room——stand by.—Let me cast the DICE!
Who knows but kind *fortune* may give me the *prize* ?
Behold—how surprising!—Pray look down and see,
The DICE, they run *fixes*—— the PRIZE falls to me.

The

The fame anfwered by Mr. ROBERT MARSHAL, of *Hoole*, Lancafhire.
>   From the *hints* giv'n (which are quite nice)
>   Your meaning WYLD'S, a pair of DICE.

Mrs. AMELIA STANHOPE, anfwers the fame, thus;
>   Let *cards* nor DICE no more (ye fair)
>   Your hands employ, nor hearts enfnare,
>   For more fublime delights prepare.
>   KNOW! facred *time* the gift of gracious heav'n,
>   To wafte at *folly's* fhrine—was never given.

Mr. FRANCIS TURNER, anfwers it thus;
>   The PRIZE ÆNIGMA I've guef'd in a trice,
>   And nought could I make on't but *ivory* DICE.

Mr. THOMAS BARKER, anfwers the fame as under;
While fome parade in ufelefs wealth, thro' all the paths of vice,
Wafting their thoufands, time and health, at billiards, cards, or DICE:
To pleafe the contemplative mind, and not offend its GOD.
May I *Eliza's* cottage find, a peaceful, blef'd abode!

All the ÆNIGMAS and REBUSSES anfwered by Mr. WM. WYLD,
>   addreffed to *Lufedo*, in a diffuafive from DICE.

Will you *Lufedo* fport your TIME away	6
With DICE, at *hazard*, or *back-gammon* play?	Prize
Will you; defcended from a lineal race	
Of peers illuftrious! Thus yourfelf debafe?	
Suppofe you *win*—what caufe have you to boaft?	
When reputation in exchange is loft!	
Think what a SCANDAL 'tis: your fpotlefs fame	1
Will foon be fully'd with a GAMBLER's name.	
By facred friendfhip's tye, I now intreat,	
You will the CORK-tree fhun, where *gameflers* meet!	5
You—who may have a *tip-flaff* at command,	
Duteous, to walk before you with a WAND *;	7.
That undifturb'd by the tumultuous throng,	
With fafety you, in ftate, may pafs along;	
All which is *forfeit*, if you perfevere	
Will refolutely to the *box* adhere:	
If you defign to leave it. Do not throw,	
Do not yourfelf another *caft* allow.	
'Tis repetition which a bias lays,	
Upon the will, and the affection fways;	
Heightens the tafk the conqueft to acquire,	
Cuftom incites—gives STRENGTH to the defire.	8
At leifure hours, if I may *you* advife,	
Repair to PEAT's, the office of excife;	1 and 3 Reb.
Enquire there, for WILKIN, GOUGH, and COLLEDGE,	2 Reb.
Men of erudition, and fam'd for knowledge;	
What *darknefs* in *Lufedo* yet does dwell,	2 Æ.
They will by force of argument difpel;	
B 2	Will

* Alluding to a SEXTON.

Will make that LANTHORN, reafon, brighter fhine,   3
Enlarge conceptions; moral and divine:
With fuch affociate—genious to improve,
The leaft degree of ign'rance to remove;
Yet, fome remains we may expect to find
Of clouded notions in a youthful mind.
    If thefe reflections are of no avail,
Then be advis'd to fit and pare your NAIL.   4

All the ÆNIGMAS and RERUSSES, anfwered by Mr. WILLIAM
MASSOM.

Since COLLEDGE, GOUGH, and SIMKIN, are all deem'd   2 Reb.
Three tipling poets,——why fhould I be fcreen'd?
I love the bottle, and good company,
As well as any of the jovial three !
    One night when DARK, I to the tavern bound,   2 Æ.
When there I got, friend Simpkin foon I found;
Tho' TIME was fhort,——his company I join'd,   6
So we fhook hands,—our FINGER-NAILS combin'd;   4
No fop of pride, no SCANDALizing tongue,   1
No DICE, nor cards to either did belong: Prize
No brawling company at all was there,
So, next my friend, I took the corner chair;
Both freely drank (as we are apt to do)
Had call'd the reck'ning, ready for to go.
In came the SEXTON, and EXCISE man too! } 7 Æ. 3 Reb.
Diarians both, of wit and judgment nice
Some friendly welcomes pafs'd, when in a trice,
Another bottle we uncork'd in hafte   5
Drank health to PEAT, and ev'ry fon of tafte!   1 Reb.
The liquor fine, foon made us all fo wanton,
We look like figures in a MAGIC-LANTHORN !   3
We fung, laugh'd, jok'd, and drank, until at length,
We fairly found,—we'd try'd each other's STRENGTH.   8

All the ÆNIGMAS anfwered by Mr. WILLIAM WOODHOUSE.

In this night fcene——this DARK retreat   2
    With me, O LORD refide
My FINGERS Lord, and eke my feet   4
    As with a LANTHORN guide.   3
Be SCANDAL ne'er by me enjoy'd,   1
    While TIME I can call mine.   6
Oh! better be my STRENGTH employ'd;   8
    And form my will to thine.
Then when the SEXTON tolls my bell   7
    Light as a CORK I'll flee   5
Above where DICE, nor gamblers dwell   Prize
    To faints, to heav'n, to THEE !

Mr.

Mr. THOMAS ADCOCK of *Aſby-de-la-Zouch*, anſwers them as follows :

THE HAPPY MAN.

Happy ! the man, who free from noiſy ſports,
And all the pomp and pageantry of courts ;
Free from the venal world, can live ſecure——
Be moral honeſt ;——virtuous——tho' poor :
Who walking ſtill by equity's juſt rules.
Deteſting CORK iſhknaves, and SCANDALizing fools !　　5, 1
Regarding neither fortune, pow'r, nor ſtate,
Nor ever wiſhing to be vainly great ;
Door STRONG with NAILS he ſees old TIME defy,　　8, 4, 6
But what is that to him who's learn'd to die ?
A foe to DICE, no paſſions guilty friend,　　*Prize*
Obeying nature, faithful to the end.
Severe in manners, and in truth ſevere,
Juſt to himſelf, and to his friend ſincere ;
His temper even, and his ſteady mind
Refin'd by friendſhip, and by books refin'd ;
In ſome neat cottage holds the happy ſwain,
Unknown to DARKNESS, or the LANTHORN train ;　　2, 3
He ſtudying nature grows ſerenely wiſe,
Like to a SEXTON lives, or like him dies :　　7
He aſks no glory gain'd by hoſtile arms,
Nor ſighs for grandeur with her painted charms ;
With calm indiff'rence views the ſhifting ſcene,
Thro' all magnanimous, reſign'd, ſerene ;
On hopes ſuſtain'd he treads life's devious road,
And knows no fear, except *the fear of God !*
Would heav'n indulgent, grant my fond deſire,
Thus would I live——and thus ſhould life expire !

Mr. W. GOUGH ſent the following anſwer to the *Ænigmas* and *Rebuſſes*,

One evening young *Molly* I met in the vale,
Reſolved I was for to tell my fond tale ;
I ſtep'd to the *fair one*, and offer'd a kiſs,
Fye *Hodge* ! – She reply'd ; what a SCANDAL is this ?　　1
Pray haſte to your flock, mind your plough and your team,
Your vows and your ſighs are no more than a dream ;
And DARKNESS comes on—ſo I'll bid you adieu,　　2
What *fair* can be ſafe with ſuch rakes *Hodge* as you ?
No MAGICAL LANTHORN could e'er more ſurpriſe ;
I view'd her ſoft charms, and her black rolling eyes :
My heart was inflam'd with ſoft raptures of love !
But deaf to my ſighs ſtill the *fair one* did prove.
Reſolv'd then I was for to try her next day,
She happen'd to paſs me when turning my hay ;
I laid down my prong to embrace the ſweet fair,
And preſs'd her ſoft FINGERS 'twixt love and deſpair.　　4

Why

Why *Hodge* cry'd the *fair one*, you lately did own,
You'd *woo'd* all the *girls* that reſide in the town ;
Then, how can I truſt you ?—So take up your fork,
For your words are as light as a feather or CORK.   5
    Pray be not ſo harſh, cry'd the ſubtle young *ſwain*
I've a farm of my own, and a flock on the plain ;
No TIME then delay, but away let us hie   6
To the church on the brow, where the knot we will tie.
    She ſmil'd in my face, and the SEXTON call'd too,   3
Then *bluſh'd her compliance* ; and vow'd to be true ;
Saying, *Hodge* if you're conſtant (to end all the ſtrife)
I'll give you my hand, and be happy for life !
    My STRENGTH I renew'd, and without more delay.   8
To the altar of *Hymen* we haſten'd away ;
Where both were united in conjugal blifs.
To love and live happy ! What's equal to this ?
    The nuptials being crowned, to dinner we went,
At DICE, *whiſt*, and *cribbage*, the evening we ſpent :   *Prize*
No mortals ſo happy, nor ſo full of glee,
As th' EXCISEMAN and PEAT, *Simpkin, Colledge* and *Me. Reb.*

The ÆNIGMAS anſwered by Mr. B. CLEYPOLE ; on *Scurrility*.

    To a *puppet-ſhow* one TIME I did go,   6
(A mile and half did I wander)
    Some young *priggs* being there to whom I ſat near   3
Their *click-clacks* were all upon SLANDER.
    One ſaid that *Miſs Clark* was kiſs'd in the DARK ;
That ſhe was both wicked and wanton ;
    Becauſe ſhe did go for to ſee the odd ſhow
Performed by a MAGIC-LANTHORN.
    Thus, they run their *randans* with uplifted HANDS,   4
Their language, as light as a CORK,   5
    With one eye they would wink, which made me to think
They'd ne'er ſeen a SEXTON at work.   7
    'Till their *clacks* at the length, having ſpent all their
        STRENGTH   8
And all modeſty quite had bereft 'em,
    When up they did riſe, for play with TWO DIES,   *Prize*
Then I came away,——and there left 'em.

All the ÆNIGMAS anſwered by Mr. WILLIAM RICHARDSON, on
Morning.

See ! How *Aurora*, with her gilded fan,
Drives DARKNESS off,—and uſhers in the dawn :   2
Firſt of the feather'd tribe, the *lark* begins,
And poiz'd on high, his early matins ſings ;
Perch'd on the ſpray, the *black-bird* tunes his throat,
Makes woods reverb'rate with his ſwelling note.

                      Hear

Hear, how the *shepherd* his *bucolics* play,
To welcome in the rofy FINGER'd day.   4
The *gamester*——SCANDALOUS, the laft doth rife   1
Who fpends both TIME, and STRENGTH o'er rattling
   DICE.   6. 8. *Prize*
He, SEXTON difregards——or tolling bell,   7
Will draw another CORK, or filthy tale will tell.   5
Perhaps, a MAGIC-LANTHORN, he will fay,   3
By far excels the fweets of new-born day !
See yonder, how the *milk maids* trip along,
Cheering each other with a rural fong :
For, in the *morn*, all nature's blithe and gay,
But then, e'er noon——fhe droops, and fades away.

Anfwers to all the ÆNIGMAS, by Mr. WILLIAM SWIFT of *Stow*,
                  near *Lincoln*.

What a SCANDALOUS VIRGER * I paffed laft NIGHT !   1. 7. 2
With his *rod*, and his LANTHORN, he much did me fright :   3
I was all for *fighting*—but my STRENGTH—gentlemen   8
At that TIME did fail me—what could I do then ?   6
Yet,——a lucky chance after ! I FINGER'D the DICE ; 4. *Prize*
And as light as a CORK was my heart in a trice   5
When, at one fingle *caft*, I gained your PRIZE.

A general Anfwer to all the ÆNIGMAS, and REBUSSES; by Mr.
   THOMAS TRUSSWELL of *Nun-Eaton*, Warwickfhire.

Once more (my dear gents) your foft, rapturous ftrains
Invite me to tread the DIARIAN plains ;
Where *fcience* extends her fair branches around,
And bends with her clufters of fruit to the ground !
How happy was I, when permitted to rove,
Where learning now wears the foft emblems of love ;
Where truth and fair fcience, united agree,
In meanings abftrufe, tho' good natur'd and free.
   When firft, in my youth, I attempted the ftage
Kind PEAT me excus'd, and confider'd my age ;   1 *Reb.*
Thanks, thanks aged mafter, my thanks are your due ;
For all the kind favours received from you !
Then fortune ! O fortune, unto him be kind !
GOD grant him long life, and accomplifh his mind !
How oft I've perus'd the *Ænigmatic* lore,
Each *Rebus* and *Query*, I've conn'd them all o'er :
Such intricate *turnings* and *windings* appear,
I fcartely can folve th' *Ænigmas* this year.
   But ftop ! my dull mufe——and no longer defpair
For *riddles* are made a DARK *garment* to wear   2
But quickly unveil'd——by attention will fhow
An afpect that feems quite delightful and new ;
                  B 4   Like

                  * *Alluding to a* SEXTON.

Like MAGICAL LANTHORNS convey to the mind   3
Strange comical fancies—tho' always refin'd
By witty *Diarian's*—e'en fome of the *beft*,
As COLLEDGE, and SIMPKIN, GOUGH, *Gumley*, and *Weft*. 2 *Reb*.
    When SCANDAL takes place, how great is the fway,   1
(But TIME will foon bring fuch things to decay.)   6
How bufy their FINGERS, how fcornful their eye   4
Their hearts fo malicous, 'tis hard to defcry.
When the SEXTON he tolls, and the death-bell does call   7
Their STENGTH will have left 'em, and down they muft fall ! 8
    Then caft the fair DICE, let the number be thrown,   *Prize*
That each may partake a fair chance of his own ;
May mine be a chance that will lead me to heav'n
And grant that my fins be hereafter forgiv'n.
P. S. The fifth ÆNIG. is a *Cork*, and third REBUS. *Excife*.

Mr. BENJAMIN WEST anfwers the *Ænigmas*, as follows.

POLLY STOW, a LYRIC ESSAY : addrefs'd to Mr. W. SWIFT.
            Audentes fortuna juvat.   VIRG.

        LET *goffips* o'er their dear bohea,
        In *lies* and SCANDAL wafte the day   1
            And doat on empty fhow ;
        Be mine the tafk in lyric ftrains,
        To fing the *Clio* of the plains,——
            The tuneful POLLY STOW.

        When night appears, in DARKNESS dreft   2
        " Sleeping" (fhe fays) fhe " calls out WEST !"
            But let the charmer know,
        He, bleft already with a mate,
        Muft wifh fome worthier youth the fate
            To wed with——POLLY STOW.

        Say little patent *urchin*, fay
        What filent MAGIC waits thy fway   3
            That SWIFT fhould feem too SLOW ?
        Oh ! give the *bard* a voice to fing,
        And pow'r to wake the rapt'rous ftring
            To love——and POLLY STOW.

        When blufhing o'er the dewy lawn
        The dappled rofy FINGER'd dawn   4
            Difplays her brighteft glow,
        More beauteous than *Aurora's* dies
        More lovely far to *Billy's* eyes
            Appears his POLLY STOW.

        Courage ! fweet bard of Lincolnfhire !
        With heart as light as CORK appear   5
            Nor dread a rival foe ;
                                                            Your

Your parts, your merit, rife confeſt
Then ſue—fucceed—belov'd—be bleſt
  By——pretty POLLY STOW.

See ! beck'ning to the hallow'd dome
Propitious Hymen bids you come
  (His torch flames bright as tow)
Haſte then, fond youth !——no TIME delay   6
Preſs on——be happy while you may
  With——charming POLLY STOW.

With accents diſmal as the knell,
Deep—founding from the SEXTON's bell   7
  Tho' fools paint wedlock's woe,
Empty as air their words you'll prove,
And own a little heav'n in love,
  When yok'd with POLLY STOW.

Such ſenſe, with ſpotleſs virtue join'd,
An inexhauſted ſource you'll find,
  Whence pureſt joys will flow ;
When age your manly STRENGTH ſhall break   8
And ſteal the roſe-bluſh from the cheek
  Of——lovely POLLY STOW.

Sing, *Heliconian* virgins, ſing !
And wreaths of choiceſt flow'rets bring
  That on *Parnaſſus* blow ;——
With *Io Pæans* fill the ſkies !——
Fates DIE is caſt——and *Billy's prize*   9 *Prize*
  Is——peerleſs POLLY STOW.

General Solutions (in Verſe) were alſo given, by Meſſrs. *John Jackſon, Joſeph James, Benjamin Kemp, Robert Marſh, Samuel Oliver, William Percival, George Simpkin, Anthony Temple, Henry Walch,* and others.

  Anſwers to the REBUSSES in the laſt Year's DIARY.
    By Mr. Benjamin Kemp.

PEAT, and EXCISE, GOUGH, SIMPKIN and COLLEDGE,
Are your *Rebuſſes* three ; or you've out-done my knowledge.

Anſwered alſo by the *Maſter* of the RED-LYON Inn, Barnet.

Was my *beer*, worthy PEAT, from EXCISE but once free,   1. 3
With friend *Weſt*, and Miſs *Stow*, I merry would be ;
Good fare I'd provide 'em, with liquor ſo fine ;
GOUGH, COLLEDGE and SIMPKIN ſhould oft with me dine ; }
For *ſuch* be the *gents*, that help t' keep up my ſign. }

  Anſwers to the *Queries* in the laſt Year's DIARY.

   1. Anſwered by Mr. JOHN JACKSON.

This reaſon proceeds partly from all the three cauſes mentioned in the *Query*. 1. The air within it, not only ſupports the ambient air, but alſo the two abutted elliptical domes.——2. Thoſe elliptical domes

4   bear

bear a preffure equal to arches (every way) on this conftruction, which cannot be forced together, fo long as the materials laft;——therefore, 3dly, The hands being of a fofter texture than thefe materials cannot break it.

2. QUERY anfwered by Mr. BENJAMIN CLEYPOLE.

CROWNS are defined to be an ornament, &c. and as fuch, I find they were originally ufed; as may be feen, *Exodus* xxv. v. 11. where a golden crown was to ornament the ark, &c. and verfe 25, the fame ornament for the table, &c. and *(per query)* " and *who* may be faid to have wore the *firft* gold one !" If we compare the 30th verfe of the 29th *chap.* of *Exodus* with the 6th verfe of the 29th *chap.* it will appear that AARON was the *firft* that wore a GOLD CROWN, &c.

Mr. WILLIAM SWIFT; anfwers the 3d *Query,* thus:

One *Simon Eyre,* a fhoemaker, being chofen *Lord Mayor* of LONDON, made a *pancake-feaft* on *Shrove Tuefday,* for all the apprentices in LONDON ; and from that time it became a cuftom.

He ordered, that upon the ringing of a bell in every parifh, the *apprentices* fhould leave work, and fhut up their fhops for that day; which being ever fince yearly obferved, is called the *pancake bell.* He made them a large feaft of *pudding-pies,* and *pancakes :* and what remained when all had dined, was given to the poor. Then after, in that year, he built *Leadenhall.*

In anfwer to the 4th QUERY Mr. JOSEPH JAMES fays; That, COACHES were firft introduced into *England,* in the year 1155. But Mr. R. F. I. LONDON, fays, COACHES were firft introduced into *England,* in the year 1589; and *backney-coaches* in the year 1693. The firft *ftatefman* that ever fet up this equipage, was *John de Laval de Bois Dauphin ;* who could not travel on *borfeback* on account of his enormous bulk. Queen *Elizabeth,* as we find by hiftory, ufed to go even to the parliament houfe on horfeback.

Since the PARADOXES take up fo *much* room, and to fo *little* purpofe ; feveral ingenious correfpondents have advifed, and defired me, not to infert any fchemes of that kind this year : therefore fhall proceed to, NEW ÆNIGMAS to be anfwered in the next Year's DIARY.

1. ÆNIGMA 318. By Mr. GEORGE BRENTNAL, of *Normanton* upon Soar.

Each *Diarian* bard muft own my cafe hard !
    I'm black, both *without* and within :
My *mafter's* a clown, drags me up and down
    And has cut a great hole in my fkin ;
Before this was my lot, I fill'd many a pot,
    And rejoiced the young and the old,
Both my *Mafter* and *Mifs,* my lips they would kifs,
    Whilft a good merry ftory was told.
I was much with the poor, and out o' door,
    When the weather was pleafant and warm,
I was dragg'd by the nofe, and ne'er did oppofe,
    And they knew I fhould do them no harm ;

Was

Was not faucy nor nice—nor e'er play'd at DICE,
 And yet, fuch hard fate was my lot;
I came off a *cow*, but I cannot tell how :
 You may think by a *bull* I was got.

2. ÆNIGMA 319. By Mr. ANTHONY TEMPLE, of *Norton*, near
Sheffield, anfwering all the ÆNIGMAS in the laft year's DIARY.

Fierce *Boreas* bent on wild deftruction, raves,
Lafhes his fides, drives the tremendous waves;
From deep abyfs! th' impetuous furges roam,
And in the face of Heaven fpit their foam !
Whilft *Latium's* bard—he makes his *hero* rove,
Thro' unknown ftrands, the fugitive or JOVE.
To *him* I lent my aid ;—and as he pleas'd,
I rous'd the billows, or the ftorms appeas'd !
 I fkill'd in fong, in tuneful order ftand ;
Wonders to fhow of heaven, air, feas, and land :
Let MAGIC-LANTHORN *her* perfections fhow,   3. Æ.
When DARKNESS reigns, and brings her charms to view :   2
Let her roufe up heroes of STRENGTH from far,   8
Achilles, *Ajax*, or the *God of war* !
With nobler fcenes than thefe I feaft the eyes;
I lift each god-like mortal to the fkies !
Whilft only *fhe* dumb effigies purfue,
I bring both life and action up in view !
I truth can tell, or falfhood can devife,
Exceed the truth, or mingle truth with lies !
I'm call'd the darling of the *delphic* maid,
Honour, vice, virtue, SCANDAL, are my trade !   1
Slander, when urg'd by *me* (ye wits avaft)
Traverfe thro' nations, fwift as winged hafte !
In *Wales* I've been, t' heap honors on the *leek*,
To *Latin* I'm no ftranger   nor to *Greek* :
Princes—nay kings ! to *me* oft grant the bays,
When *I* from CORK'D up wine *ambrofia* raife.   5
My fhapes are many, and more arts endue,
Your friend (difguis'd) than ever *Proteus* knew !
Whether I in the realms of *Pluto* rove,
Or in the confines of *Idalian* JOVE,
(It matters not) I've oft fuch talents giv'n
As can defcribe hell, empty fpace, or heav'n !
I charms poffefs to pleafe the GRAVE, the gay ;
Frequent the *churches*, *mafquerades*, and *play* !
Garrick, poffefs'd of me, fteps on the *ftage*,
'Tis by *my* aid *he* charms the lift'ning age ;
'Tis *I* that makes *him* pleafe——whilft thro' the dome,
Claps (loud as thunder) fhake the vaulted room !
How far more great than *Helena* I prove,
Who facrific'd vaft numbers to her love ?

For,

For, when *I* chooſe *Olympian* duſt to raiſe,
I build on mortals, *monuments of praiſe !*
My merits are not known to ev'ry fool,
But oft abus'd by ſons of ridicule ;
Down to *time* preſent, from the days of yore   **6**
I've been obſerv'd in mathematic lore !
My dealing is ; with virtue, and with vice,
And can tell the viciſſitudes of *dice !*   *Prize*
When *jokes* are us'd, or waggiſh *puns* prevails,
I can delight men with their *finger-nails* ;   **4**
SIMKIN, GOUGH, COLLEDGE, have *me* ſeen in ſtate,   2 *Reb.*
Nor am *I* ſtranger unto ancient PEAT :   1 *Reb.*
My deeds are ever uſeleſs to th' EXCISE   3 *Reb.*
Declare *my* name, and win the laurel prize.

3. ÆNIGMA 320 By Mr. WILLIAM SWIFT, of *Stow*, near Lincoln.

Ten thouſand thouſands owe their birth to *me*,
To *me* ten thouſand thouſands bow the knee !
By *me*, unhappily ſome meet with death ;
To ſome — *I* ev'n deny the gift of breath :
Tho' now *I* live on earth, — to *me* you owe
Your being (under GOD) —— all that you know :
Poets are oft my friends — and oft my foes ;
I think, I need not any more diſcloſe.

4. ÆNIGMA 321. By Miſs POLLY STOW.

Of *arts* and *ſcience* MISTRESSES ! — we teach
Lay clerks to ſing, — and hallowed *ones* to preach !
Numbers we ſcan, — in *Euclid's* circles tread ;
We round the planets orbs, great NEWTON lead !
Does this perplex ? attend one myſt'ry more,
The *firſt* and *laſt*-plac'd of our race explore
And tell the names which ſeraphims adore !

5. ÆNIGMA 322. By Mr. WILLIAM WYLD, of *Leeds*.

Let others boaſt of their ſuperior birth,
Delin'ate their pre-eminence and worth ;
Be it my care, with caution to conceal
My pedigree, in ænigmatic tale :
Yet (without vaunting) will relate an age,
Few have attain'd who grace DIARIA's page !
E'er ſandy deſert, or the ſhady plain
Imbib d the lucid drops of pregnant rain :
E'er fruits nectarean from their bloſſoms grew,
Hung on a tree ; and bent the pliant bough :
E'er from a branch one virgin bud ſhot forth,
I took my riſe — and rang'd this globe of earth !
Nor am I now leſs active than before,
But ſtill retain the ſame progreſſive pow'r;
Viſit with ſoft ſalute umbrageous trees,
Lodge on the tops of *ſycamores* with eaſe,

Sometimes from *poachers* I the game defend,
To wand'ring birds, to quadrupedes a friend :
A friend to man——yet is my nature fuch,
Regardlefs of the bufy mortal s touch,
I his embrace elude——his grafp refufe,
Thwart his defigns——Invalidate his views ;
Baffle his fchemes his pleafure to fulfil,
Nor yield obedience to his felfifh will :
My empire o'er, when I'm no longer feen,
Silent memorials fhow where I have been.

If yet to greater honor you wou'd rife,
Draw back the curtain—take off this difguife ;
To each enquirer fpecify my name,
The clarion's found fhall then your praife proclaim !

6. ÆNIGMA 323. By Mr. GEORGE LANGLEY, of *Wrangle*, Lincolnfhire.

By whims in drefs, folks play the fool,
Invite contempt and ridicule !
Reafon in thefe feems meer pretence
As MODE predominates o'er *fenfe !*
  Thus (hear my tale and) you'll agree,
Fantaftic treatment's forc'd on me ;
For, fee me now my wings expand,
And by the fire take my ftand ;
Where drefs exub'rant I can boaft,
For, in *that* place I'm cloth'd the *moft !*
When fickle fancy's pow'rful fway
Commands, I'm ftript of clothing gay ;
Made a *reclufe* ;—nay, what is more,
Am turned naked out of door ;
Expos'd to wint'ry winds that blow ;
  In hoary frofts and fleeey fnow !
  Ufage moft ftrange you'll fay t'endure
Hard and fantaftic, to be fure
Yet, howe'er whimfical and vain,
I'm feldom drefs'd expos'd to rain !
  Again,—when *fummer-funs* pervade
The flocks that feek the noon-tide fhade ;
Burden'd, I move with clothing gay,
And front the potent fource of day !
Both fexes garbs I wear polite
At once !—tho' no *hermaphrodite*,
  Many there are (it is well known)
My drefs difcarded oft put on ;
And, as you GENTS the favour fhare,
I pray from hence my name declare.

7. ÆNIGMA 324. By the PILGRIM.

DIARIAN *Gents!* your attention a moment,
And then I request you to give me your comment.
It matters not from whence I came,
Or how I first receiv'd my name;
Let this suffice—In days of yore,
'Fore *England* saw a *black-a-moor*;
I ne'er was heard of—never seen,
By *subject*, nor by KING nor QUEEN!
But now, contrarieties take place,
And quite reverse you'll find the case:
You'll scarce an habitation find,
(Except for beasts) but there's assign'd;
A throne for me; where prim I stand,
Like one who sways with sole command!
When I was borne I was design'd,
A gen'ral friend to all mankind;
And yet (tho' few) some men will rail,
And think my services grown stale:
Unkindest treatment to the *fair*,
From whom I ev'ry blessing share!
True as the light that glads the day,
My welcom'd services I pay;
My *basis* when I stand upright,
Is broader than is requisite;
Yet,—sad catastrophe to tell!
'Tis known I from my throne have fell,
Down to the streaming flood below,
And caus'd an inundations flow;
For which offence no pardon's given,
No patronage receiv'd from Heaven;
And if not death,—revenge they cry!
Straightway I then am hurl'd on high,
And by the neck in ruthless chains,
I'm bound so long as life remains.
Now sons of the MUSES your talents display,
And tell who I am that's so tortur'd I pray.

8. ÆNIGMA 325. By Mr. THOMAS TRUSWELL, of NUN-EATON.

Ye prying wits, who can with half an eye,
The meaning of the darkest hint descry;
Attend to *me* an harmless stranger sure,
Who seems at present in a dress obscure;
My form (ye GENTS) is oft ambiguous found,
I'm square, I'm oval, and sometimes I'm round:
In various colours I am always seen,
In blue, or purple, or the verdant green;

With

With due attention, look but in my face,
The *rose* and *lily* there, perhaps you'll trace;
Woodbines and *vi'lets* curiously entwin'd,
Or, just what pleases best my master's mind:
I'm always handled with peculiar care,
Both morn and ev'ning wait upon the *fair*;
With elemental sweets I'm often grac'd,
Such sweets as please the fairest *lady's* taste:
Shou'd *Doll* by accident but make a trip,
Or loose her hold, or suffer me to slip;
Down falls a *tribe!* a most destructive band,
The bane of thousands in the *British* land.
    By what is said, I make no longer doubt,
    But ye DIARIAN bards will find me out.

9. ÆNIGMA 326. being the PRIZE ÆNIGMA this YEAR;
By Mr. BENJAMIN WEST, of *Weedon-beck.*

> Ardua prima via est;
> Ultima prono via est.——*Ovid.*

Two *travellers* in masquerade presume
To make a visit——RIDLERS! Give us room.
True *brothers* we, with each a gaping mouth,
And known from *East* to *West*——from *North* to *South*;
Strange one-ey'd monsters (let the truth be told)
Like *Brontes* and *Pyracmon*, fam'd of old!
Tho' small in stature, each exterior part,
Defies the spear, and mocks the pointed dart.
Above the earth we oft display our forms,
When angry JOVE bestrides the threat'ning storms;
Cas'd in bright armour, like old *Pælus'* son,
We feel no fears, no dangers strive to shun;
When thund'ring peals from heav'ns high arch resound,
And sheets of livid vengeance glare around:
When thro' the world *bellona* spreads alarms,
And bids the *British Lion* rouse to arms;
Each chief participates the martial flame,
And each impatient bosom pants for fame!
Anon the trump, shrill sounding from afar,
Inspires a pleasing dread!——The kindled war
Begins to rage——see "might oppos'd to might,"
And snorting steeds anticipate the fight.
    Now we appear amidst the marshal'd train,
And bear the hero o'er th' embattled plain;
With dauntless speed we rush upon the foe,
While thro' our mouths the crimson torrents flow.
Yet, not to scenes of war alone confin'd,
In sports and business we've our parts assign'd;

<div align="right">When</div>

When pleaſure calls, we join the jovial chace,
And never fail to mingle in the race ;——
Attend *electioneering* cavalcades ;
And, like the *dryads* haunt the ſylvan ſhades.
Purſu'd by *ſharpers*, oft we urge our flight
O'er dreary paths, involv'd in ſhades of night.
PRINCES and *courtiers* on our aid depend,
Prieſts, lawyers and *phyſicians* we befriend ;
But may perchance, deceive them in the end.
So frail (alaſs !) is ev'ry earthly truſt,
So ſoon my pride be humbled in the duſt !
This truth perpend——and ſcorn the thin diſguiſe——
By us, may *monarchs* fall——and *vaſſals* riſe.

1 Rebus by Mr. WILLIAM SWIFT.

FROM the reverſe to *beat* take a hundred, you'll ſee,
If you live to twice fifty, what then you will be.

2 Rebus by Mr. ANTHONY TEMPLE.

IF to a diverſion connected there be,
One half of the place where I can be moſt free ;
Theſe, when rightly united a name will complete,
Of an extenſive genius of an ancient date.

3 Rebus by Mr. BENJAMIN CLEYPOLE.

ONE *third* of a thing which boys oft whip about,
One *fifth* of what miſers will not do without ;
One *ſixth* of a man that's reputed a thief,
(Altho' he affords moſt people relief)
One *half* of a grain that's old *England*'s ſupport,
Will name a DIARIAN (you may take my word for't.)

1 Query by G. H. NOTTINGHAM.

Pray GENTLEMEN will you this *query* explain,
If a man with *long* feet, an advantage does gain ;
Of one who has *ſhorter* ?——Determine I pray ;
Tho' their legs of a length (in a long ſummer's day.)

2 Query by Mr. PATRICK HALL.

IT appears from *chronology*, that the firſt appearances of the *aurora
borealis*, or northern lights, was in the year 1718 ; and ſeveral mathe-
maticians ſince, have ſaid ; that they proceed from the vapours aſcending
by exhalation : if ſo ; what is the reaſon they did not appear before
the ſaid year 1718.

3 Query by Mr. JOHN JACKSON.

WHY do *haddocks*, as well as ſome other freſh fiſh, when hung up
in dark places, appear to reflect a ſtrong light.

ANSWERS

ANSWERS to the QUESTIONS in the last Year's DIARY.

1. QUEST. 429. answered by Mr. ALEXANDER ROWE.

FIRST; $3x+z$ ought to have been printed instead of $xvy+z$. Then, put $14158=a$; $43415089=b$; and $5276=c$. Then, from the first and third equations by reduction we have $z=\dfrac{a+x-xy}{y}$ $=c-3x \therefore y=\dfrac{a+x}{c-2x}$. Hence, z being $=c-3x$; $z^2=\overline{c-3x}|^2$; and $y^2=\overline{\dfrac{a+x}{c-2x}}\Big|^2$; which put for z, z^2, and y^2, in the second equation; we get $x\times\overline{c-3x}|^2+x^2\times\overline{c-3x}+\overline{\dfrac{a+x}{c-2x}}\Big|^2=b$. solved, gives $x=1754$; and thence $y=9$, and $z=14$, consequently this amiable Fair was 23 years of age the 14th day of *September*, 1777.

2. QUEST. 430. answered by Mr. WILLIAM WINN.

PUT $n=5$; $m=6$; $a=$ area of the triangle, $s=$ S $45°$, x and $y=$ S, and cos. $\angle$ CAD. $z=$ AD; then $sx+yx=s$. $<$ BED; and $n:m::z:$ $\dfrac{mz}{n}=$ BE, and 1 (Radius) : $\dfrac{mz}{n}::sx+sy:\dfrac{mz}{n}$ $\times sx+sy=$ BC; then zy (AC) : $\dfrac{mz}{n}\times sx+sy::1:$ $\dfrac{m}{ny}\times sx+sy=$ tang. $<$ BAC. and $\dfrac{m}{ny}\times sx+sy$ $=\dfrac{2xy}{y^2-x^2}$. Then put $e=\dfrac{2n}{ms}-1$; and y^3-x^3- $x^2y=ey^2x$; then by writing $\sqrt{1-x^2}$ for y its equal; x is easily found $=.434553$, let the area be what it it will. Then put $a=$ the given area; s, and c, $=$ the nat. sine and cosine of the $<$ BAC $=51°$ $38'$; then BC $=\dfrac{\sqrt{2sa}}{c}$ and AC $=\dfrac{\sqrt{2ca}}{s}$.
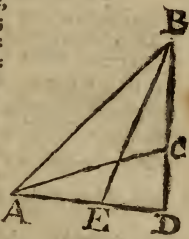
3. QUEST. 431. answered by Mr. ISAAC ROWBOTTOM.

LET CF, and GB; be the diameters of the given circles; K and L their centers; $abcd$ $=$ one half of the required parallelogram; draw DE and join aL, bK. Then $\overline{EL}|^2=$ EF. EC $=$ BE. EG $\therefore$ BE : EC : : EF : EG. and by comp. &c. BE $+$ EC : EF $+$ EG : : BE : EF, Whence
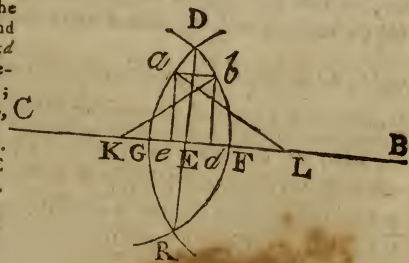
by

by diviſion as $BC - FG$ (40) : GF (9) : : $BE - EF$ (23) : $EF = 5\frac{7}{40}$

whence the area of the ſpace GDFR is very eaſily had $= 129,46844$. Alſo (by 47. *Eu.* 1.) $\sqrt{13^2 - x^2} = Kd$, and $\sqrt{16^2 - x^2} = Le$, where $x = bd - ae \therefore \sqrt{13^2 - x^2} + \sqrt{16^2 - x^2} - d \times x =$ the area *cabd*, a max. fluxed, &c. $x = 6, 265374$. and the area is $76,598394$. W. W. R.

    The ſame anſwered by Mr. WILLIAM SHERWIN.

    LET $x = GE$ (ſee laſt fig.) then $ED^2 = EF \times CE = BE \times GE = \overline{9 - x} \times \overline{17 + x} = \overline{32 - x} \times x$; whence $x = 3\frac{33}{40}$; and the area GDFR is eaſily had $= 129,5$. Now put $z = bd = ae$; then will $\overline{13^2 - z^2}|^{\frac{1}{2}} = KD$, and $\overline{16^2 - z^2}|^{\frac{1}{2}} = Le \therefore z \times \overline{13^2 - z^2}|^{\frac{1}{2}} + z \times \overline{16^2 - z^2}|^{\frac{1}{2}} - 11z =$ the area of the parallelogram *eabd* = a max. in fluxions, &c. $z = 6,265$, and the area $= 76,6$ nearly.

    The ſame anſwered alſo by Mr. WILLIAM WINN.

    DESCRIBE the two quadrants LRO, HRP. Then put $AR = 7,825 = a$; $DR = 12,175 = e$; radius $CR = r$, and $MR = n$; and $IG = KF = x$. Then $\sqrt{r^2 - x^2} = GB$. and $\sqrt{n^2 - x^2} = FE$. And $\sqrt{r^2 - x^2} - a = IN$. And $\sqrt{n^2 - x^2} - z = KN$. Then, $x \sqrt{r^2 - x^2} - ax + x \sqrt{n^2 - x^2} - ex = a$ max. per queſtion. And in fluxions $\frac{r^2 \dot{x} - 2x^2 \dot{x}}{\sqrt{r^2 - x^2}} - a\dot{x} + \frac{n^2 \dot{x} - 2x^2 \dot{x}}{\sqrt{nn - xx}} = e\dot{x} = c.$

and $\frac{r^2 - 2x^2}{\sqrt{r^2 - x^2}} + \frac{|n^2 - 2x^2}{\sqrt{n^2 - x^2}} = a + e = 20.$ And reduced, x is eaſily found $= 6,26534$; and the area of the greateſt inſcribed parallelogram is $76,5985$.

    4. QUEST. 432. anſwered by Mr. THOMAS WALKER.

    LET $R = 1,05$, $P = 8400$; and put $x =$ the time in which the debts will be equal. Then we ſhall have $1^3 R^x + 2^3 R^{x-1} + 3^3 R^{x-2} + 4^3 R^{x-3}$ &c. to x terms $=$ C's debt in the time $x = R^x \times : 1 + 2^3 a + 3^3 a^2 + 4^3 a^3$ &c. (by writing a for $\frac{1}{R}$) the ſum of which ſeries infinitely continued

will be $R^x \times \frac{1 + 4a + a^2}{1 - a|^4}$ (by p. 223 *Simpſon's Algebra*) but as x terms is only wanted, the ſum of the remaining terms muſt be found, and deducted from the whole infinite ſeries. Now it is evident (by the law of the ſeries) the x term will be $R^x \times x 3a^{x-1}$; and the following terms will be $R^x \times : \overline{x+1}|^3 \times a^x + \overline{x+2}|^3 \times a^{x+1} + \overline{x+3}|^3 \times a^{x+2} + $ &c. $= R^x \times : x^3 + 3x^2 + 3x + 1 \times a x + \overline{x^3 + 6x^2 + 12x + 8} \times a^{x+1} + \overline{x^3 + 9x^2 + 27x + 27} \times a^{x+2} + $ &c.

Now thefe terms properly collected will form the four following infinite feries.

$$R^x \times \begin{cases} x^3 \times : a^x + a^{x+1} + a^{x+2} + a^{x+3} + \&c. \\ 3x^2 \times : a^x + 2a^{x+1} + 3a^{x+2} + 4a^{x+3} + \&c. \\ 3x \times : a^x + 4a^{x+1} + 9a^{x+2} + 16a^{x+3} + \&c. \\ a^x + 8a^{x+1} + 27a^{x+2} + 64a^{x+3} + \&c. \end{cases}$$ Whofe Sums

if infinitely continued will be $x3R^x a^x \times \dfrac{1}{1-a}$; $3x^2 R^x a^x \times \dfrac{1}{\overline{1-a}|^2}$;

$3x R^x a^x \times \dfrac{1+a}{\overline{1-a}|^3}$; and $R^x a^x \times \dfrac{1+4a-a^2}{\overline{1-a}|^4}$; but $R^x a^x = \dfrac{R^x}{R^x} = 1$.

Therefore $\dfrac{x^3}{a}$; $\dfrac{3x^2}{\overline{1-a}|^2}$; $\dfrac{3x-3xa}{\overline{1-a}|^3}$; and $\dfrac{1-4a+a^2}{\overline{1-a}|^4}$ will be the fum

of each feries refpectively. Therefore the fum of x terms or C's debt

in the time x, will be $R^x \times \dfrac{1+4a+a^2}{\overline{1-a}|^4} - \dfrac{x^3}{1-a} - \dfrac{3x^2}{\overline{1-a}|^2} -$

$\dfrac{3x+3^xa}{\overline{1-a}|^3} - \dfrac{1+4a+a^2}{\overline{1-a}|^4}$. And A's debt in the time x will be $PR^x -$

$100 \times : R^x + 2R^{x-1} + 3R^{x-2} + 4R^{x-3} = PR^x - 100R^x \times : 1 + 2a + 3a^2 + 4a^3 + \&c.$ to x terms, which will be had by proceeding

as above, $= PR^x - 100 \times \dfrac{R^x}{\overline{1-a}|^2} - \dfrac{x}{1-a} - \dfrac{1}{\overline{1-a}|^2}$. Then

(per *Quefl.*) $R^x \times \dfrac{1+4a+a^2}{\overline{1-a}|^4} - \dfrac{x^3}{1-a} - \dfrac{3x^2}{\overline{1-a}|^2} - \dfrac{3x+3^xa}{\overline{1-a}|^3} -$

$\dfrac{1+4a+a^2}{\overline{1-a}|^4} = PR^x - 100 \times \dfrac{R^x}{\overline{1-a}|^2} - \dfrac{x}{1-a} - \dfrac{1}{\overline{1-a}|^2}$. Which

put into numbers and reduced, we have $54641R^x - x3 - 63x^2 - 2683x = 55041.$ folved, $x = 11,3985$ years nearly the time when the debts are equal; which anfwers the firft part of the queftion. Then, by making $R^x \times \dfrac{1+4a+a^2}{\overline{1-a}|^4} - \dfrac{x^3}{1-a} - \dfrac{3x^2}{\overline{1-a}|^2} - \dfrac{3x+3^xa}{\overline{1-a}|^3} -$

$\dfrac{1+4a+a^2}{\overline{1-a}|^4} = 8400$; we have $x = 12,524$ the time when C's debt will

be 8400l. Now it appears, from a little confideration ; that A's debt will be greateft, when the intereft thereof for any interval of time, becomes equal to his payment to B at the fame time ; confequently, PR^x

$-100 \times \dfrac{R^x}{\overline{1-a}|^2} - \dfrac{x}{1-a} - \dfrac{1}{\overline{1-a}|} = \dfrac{100 \times 1 + x}{,05}$. From whence,

we get $x = 3,575$ years, when A's debt will be the greateft. Again, by

by making $PR^x - 100 \times \dfrac{R^x}{\overline{1-a}|^2} - \dfrac{x}{1-a} - \dfrac{1}{\overline{1-a}|^2} = 0.$ We get

$= 15,865$

$=15,865$ years, the time when A's debt will be paid; at which time C's debt will be $21l.$ $15s.$ $8d.$

5. QUEST. 433. anſwered alſo (only) by the ſame.

LET P repreſent the pole, HO the horizon, &c. and S the place of the ſun when his altitude was $32°$ $17'$ $36''$; and s his place one hour after. Then, in the iſoſceles triangle SPs, there are the two ſides and the included angle given hence the perpendicular vP$=71°42'$ $13''$ and half the baſe $Sv=7°$ $7'$ $30''$; which taken from the complement of the given altitude; leaves $Zv=50°$ $34'$ $54''$. Then, in the right angled triangle ZvP we have Zv, and vP given; hence the latitude is $11°$ $30'$.
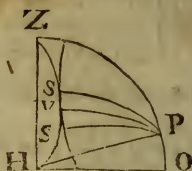
6. QUEST. 434. anſwered by Mr. WILLIAM WINN.

PUT $n=a+b^2$, then the given equation becomes $ny^2 - nx^2y^2 = x^2m$; and $y^2 = \dfrac{x^{2n}}{n-nx^2}$; then $y = \overline{n-nx^2}^{-\frac{1}{2}} \times x^m$; and the fluxion of the area is $\dot{z} = \overline{n-nx^2}^{\frac{1}{2}} \times x^m \dot{x}$; and the fluent by Form 16th of Mr. Emerſon's tables is $\dfrac{x^m+1}{\sqrt{a+b^2}\times m+1} + \dfrac{x^m+3}{2m+2+4} + \dfrac{x^m+5}{4m+4+16}$ &c.

The ſame anſwered by Mr. EDWARD PARNEL.

BY reducing the given equation of the curve we get $y = \sqrt{a+b^2} \times \sqrt{1-x^2}$; therefore the fluxion of the area $= \dot{x}y = \dfrac{1}{\sqrt{a+b^2}} \times \dfrac{x^n\dot{x}}{\sqrt{1-x^2}} = \dfrac{1}{\sqrt{a+b^2}} \times x^n\dot{x} + \dfrac{x^{n+2}\dot{x}}{2} + \dfrac{3x^n+4\dot{x}}{2 \cdot 4} + \dfrac{3 \cdot 5x^n+6\dot{x}}{2 \cdot 4 \cdot 6} + \dfrac{3 \cdot 5 \cdot 7x^{n+8}\dot{x}}{2 \cdot 4 \cdot 6 \cdot 8}$ &c. And its fluent $= \dfrac{1}{\sqrt{a+b^2}} \times \dfrac{x^{n+1}}{n+1} + \dfrac{x^{n+3}}{2 \cdot n+3} + \dfrac{3 \cdot x^{n+5}}{2 \cdot 4 \cdot n+5} + \dfrac{3 \cdot 5x^{n+7}}{2 \cdot 4 \cdot 6 \cdot n+7} + \dfrac{3 \cdot 5 \cdot 7 \cdot x^{n+9}}{2 \cdot 4 \cdot 6 \cdot 8n+9}$ &c. the required area.

The ſame anſwered by Mr. WILLIAM SHERWIN.

FROM the equation of the curve $y = \dfrac{x^m}{a^2+b^2 \times \sqrt{1-xx}}$; whence $\dot{x}y = \dfrac{x^m \dot{x}}{a^2+b^2 \times \sqrt{1-xx}}$ = fluxion of the area; and its fluent $\dfrac{x^m+1}{a^2+b^2} \times : \dfrac{1}{m+1} + \dfrac{xx}{2 \cdot m+3} + \dfrac{1 \cdot 3 \cdot x^4}{2 \cdot 4 \cdot m+5} + \dfrac{1 \cdot 3 \cdot 5 \cdot x^6}{2 \cdot 4 \cdot 6 \cdot m+7} +$

$$\frac{1 \cdot 3 \cdot 5 \cdot 7 \cdot x^8}{2 \cdot 4 \cdot 6 \cdot 8 \, m+9} \; \&c. = \text{the area required.}$$

7 QUEST. 435. anfwered by Mr. ISAAC ROWBOTTOM.

LET ABQS reprefent the garden; ACB and QCS the the two equal canals; FGH, and efgh the two nurferies; draw the ordinates PP; Pe; and PT, which will be a tangent to the curve at P. Put DC $= 15 = a$; AD $= 3 = b$; G$r = x$; and P$r =$ CR $= y$; then, from the given equation $p^2 x = y^3$; we have $\dot{x} = 3y^2\dot{y}$ (by making P $= 1$) ∴ $\frac{\dot{x}y}{\dot{y}} = 3x = $ RT $= 3$CR $= 3y$ (becaufe P$r =$ CR) and by the property of the curve ACB, we have PR $= b \sqrt[3]{\frac{y}{a}}$; whence by fimilar tri-

angles RT : PR :: Pr : $rt = \frac{b}{3} \sqrt[3]{\frac{y}{a}} = \sqrt[3]{\frac{y}{a}}$ (becaufe $b = 3$):
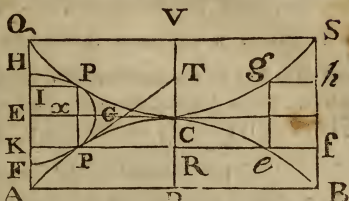
Again from the equation $px^2 = y^3$, we have $\dot{x} = \frac{3y^2\dot{y}}{2x}$ ∴ $\frac{\dot{x}y}{\dot{y}} = \frac{3}{2}$

$x = rt = \sqrt[3]{\frac{y}{a}}$ ∴ $y = \frac{27}{8}ax^3$; alfo, by the property of the femi-cubic parabola HGF, we have $\overline{G}r|^2 : \overline{P}r|^3 :: \overline{EG}|^2 : \overline{EF} = \frac{\overline{27}{8}ax^3|^3 \times \overline{\frac{2b-7x}{2}}|^2 \div x^2$. Confequently $\overline{\frac{27}{8}ax}|^3 \times \overline{\frac{2b-7x}{2}|^2 \div x^2}|^{\frac{1}{3}}$

$\times \overline{\frac{2b-7x}{2}} \times \frac{3}{5} = $ the area of the femiparabola EFG a Max. In fluxions $7x^6\dot{x} \times \overline{2b-7x}|^5 - 35x^7\dot{x} \times \overline{2b-7x}|^4$ reduced, $x = \frac{1}{6}b = \frac{1}{2}$ ∴ GE $= 1\frac{1}{4}$, & EF $= 1,16565$.

Again, as DC : DB^3 :: RC : R$e = b \sqrt[3]{\frac{y}{a}}$; then DB $-$ R$e = ef$

$= b - \sqrt[3]{\frac{y}{a}}$ ∴ $ef \times ge = \overline{b - b\sqrt[3]{\frac{y}{a}}} \times 2y$ area $efgh$, a max. fluxed $\&c. \; y = ,6328125$. Laftiy, from the equation $p^2x = y^3$, we have $y\dot{x} = 3y^3\dot{y}$ the fluxion of the area of the curve (or canal) ACB, whofe fluent is $\frac{3}{4}xy$; but when $x = a$, $y = b$ ∴ $\frac{3}{4}ab = 6,75$ fquare chains, the area of the canal ACB. Alfo, $1,748475 = $ the area of the nur-

fery

ſery HGF ; and, 94921875 ſquare chains = that of the nurſery *efgb*, from whence all that is required may be eaſily known.

Otherwiſe. Let ADQY = $\frac{1}{2}$ of the garden ; ACD and QCY = $\frac{1}{2}$ of the canals ; HGF, and IPKP the nurſeries. Produce KP to R, and put AD = *b* = 3 ; DC = $1\frac{1}{2}$ = *a*; PR = *y*. Then P*r* = CR = *ay*3*b*.—3 × $\overline{b}$ — *y* = the area of EKP*r*, a max. fluxed &c. *y* = $\frac{a}{4}$*b*. Now it is well known that the ſubtangent to the ſemicubic parabola is $\frac{2}{3}$ of its correſponding abſc. ∴ (by *Simpſon's* Geom. p. 201.) as $\frac{3}{2}$ G*r* : PP : : $\frac{3}{2}$ G*r* + E*r* : 2PP. Hence G*r* = $\frac{1}{2}$. Then, as $\frac{2}{2}$*a* : $\overline{P r}\rceil^3$: : $\overline{GE}\rceil^2$: $\overline{HF}\rceil^2$; and HF = 2,3313, the ſame as above.

The ſame anſwered by Mr. THOMAS WALKER.

LET ABCD repreſent half the garden, AVB one half of the canals, and half the parabolic nurſery ; and HIK half the rectangular one ; and let PT be a tangent to each curve at the point P ; and through P, draw H*e* parallel to CD, and put *x* = *vr*, and *y* = P*r* = RV ; *a* = SV = 3, and *b* = SA = $1\frac{1}{2}$. Then (Ex. 3 p. 203 *Emerſon's* fluxions) the ſubtangent *rt* = $\frac{3}{2}$ *rv* = $\frac{3x}{2}$;
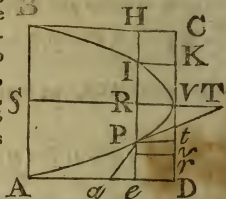
and the ſubtangent RT = 3RV = 3*y*, and by the property of the curve, *a* : *b*3 : : *y* : $\overline{RP}\rceil^3$ ∴ RP = $b\sqrt[3]{\dfrac{y}{a}}$; And (by ſimilar triangles) RT : RP : : P*r* : *rt* = $\dfrac{b}{3}\sqrt[3]{\dfrac{y}{a}} = \sqrt[3]{\dfrac{y}{8a}}$ (becauſe *b* = $1\frac{1}{2}$) therefore $\sqrt[3]{\dfrac{y}{8a}} = \dfrac{3x}{2}$ ∴ *y* = 27*ax*3, and D*v* = *b* — $b\sqrt[3]{\dfrac{y}{a}}$ + *x* = $\dfrac{3-7x}{2}$; then by the property of the curve, $\overline{rv}\rceil^2$: $\overline{Pr}\rceil^3$: : $\overline{Dv}\rceil^2$: $\overline{Da}\rceil^3$ ∴ D*a* = $\overline{27ax3}\rceil^3 \times \overline{\dfrac{3-7x}{2}}\rceil^2 \div x^2\rceil^{\frac{1}{3}}$ (and by Ex. 2. page 252 of the above quoted fluxions) $\overline{27ax3}\rceil^3 \times \overline{\dfrac{3-7x^2}{2}}\rceil^2 \div x^2\rceil^{\frac{1}{3}} \times \dfrac{3-7x}{2} \times \frac{2}{5}$ = the area of the ſemiparabola *avD*. In fluxions, &c. *x* = $\frac{1}{4}$ ∴ *y* = $\dfrac{81}{64}$; *v*D = $\frac{5}{8}$; D*a* = 2,3309 ; and the area of the ſemiparabola = 8742375 ; and, 8742375×2 = 1,748475 = the area of the whole nurſery.

Again, *a* : *b*3 : : *y* : RI = $b\sqrt{\dfrac{y}{a}}$; and $b - b\sqrt{\dfrac{y}{a}}$ = HI, and $by - by\sqrt{\dfrac{y}{a}}$ = the area of the parallelogram IHCK = a maximum

in

in fluxions and reduced $y = \frac{81}{64} = HC$ ∴ $IH = \frac{3}{8}$; and the area of

the whole nurfery $\frac{81}{64} \times \frac{3}{8} \times 2 =$, 94921875; and the area of each

of the canals $= \frac{3BA \times VS}{2} = 6,75$, and the remaining part of the

garden 1,80230625 fquare chains.

The fame anfwered by Mr. WILLIAM PERCIVAL.

PUT $b = 150 = AB$, and $a = 300 = DB$; $x = EF$. Then $p^2 x$

$= 3y^2 \dot{y}$, and $\dot{x} = \frac{3y^2 \dot{y}}{p^2}$ ∴ $\frac{3y^2 \dot{y}}{p^2}$

$=$ the fluxion of EFG; whofe

fluent $\frac{3y^4}{4p^2} = \frac{3p^2 xy}{4p^2} = \frac{3 xy}{4} =$

the area of the fpace EFG ∴

$\frac{3ab}{4} \times 4 = 3ab = 135000$ □ links
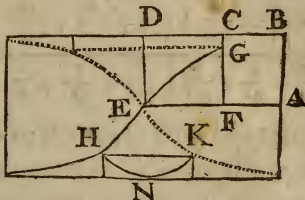
$= 1$ A. 1 R. 16 perches $=$ area of the canals. Then, by the nature of

the canals, $a : b3 :: x : \frac{xb3}{a} = \overline{FG}|^3$; and $FG = b3 \sqrt[3]{\frac{x}{a}}$

∴ $GC = b - b \sqrt[3]{\frac{x^4}{a}}$; and $bx - b \sqrt[3]{\frac{x^4}{a}}$; or $x - \sqrt[3]{\frac{x^4}{a}} =$

a maxim. which put into fluxions and reduced gives $2x = \frac{27a}{32} =$

253,125 links the length of the required rectangle; and putting $\frac{27a}{64}$

for x in the value GC above, we get $GC = \frac{1}{4} b = 37\frac{1}{2}$ links $=$
the breadth : hence the area $= 15$ perches. Now, from the curve
HNK, whofe equation is $px^2 = y^3$ ∴ $y = p^{\frac{1}{3}} x^{\frac{2}{3}}$; which $p^{\frac{1}{3}} x^{\frac{2}{3}} \dot{x}$ is

the fluxion of the required curve, whofe fluent is $\frac{3p^{\frac{1}{3}} x^{\frac{2}{3}}}{5} = \frac{3yx}{5}$; there-

fore this curve being $\frac{3}{5}$ of its circumfcribing rectangle, when the rect-
angle is the greateft, the curve will be fo too; whofe bafe and diameter
are $=$ the length and breadth of the rectangle $= \frac{253,125 \times 37,5 \times 3}{5}$

$= 5695,3125$ □ links $= 9$ perches the area of the required curve, the
remainder of the garden $= 1$ R. 08 P.

Mr. *Edward Parnel*, Mr. *Alexander Rowe*, and Mr. *Ralph Thompfon*, (the pro-
pofers) are exactly the fame; which want of room will not admit of infertion;
but take notice of the following remark. It appears that the two firft folutions
beft anfwer the conditions of the queftion : for the area of the nurfery in each
are the fame (although the canals are taken the contrary way of the parallelo-
gram) &c.

C 4   8. QUEST.

8 QUEST 436 anſwered by Mr. EDWARD PARNEL.

LET xz be wrote for y in the given equation, and it becomes $x^3 +$ $x^3z + x^3z^3 = ax^4z^3$; whence $1+z+z^3 = axz^3$; and therefore $x =$ $\dfrac{1+z+z^3}{az^3}$; $y = xz = \dfrac{1+z+z^3}{az^2}$; and $\dot{x} = \dfrac{3\dot{z}+2z\dot{z}}{-az^4}$; and conſe-

quently $py^2\dot{x} = p \times \overline{\dfrac{1+z+z^3}{az^2}}\Big|^2 \times \dfrac{3\dot{z}+2z\dot{z}}{-a^4} =$ the fluxion of the

ſolidity; the correct fluent of which is $\dfrac{p}{a^3}$

$$\times \dfrac{3}{7z^7} + \dfrac{4}{3z^6} + \dfrac{7}{5z^5} + \dfrac{2}{z^4} + \dfrac{10}{3z^3} + \dfrac{2}{z^2} + \dfrac{3}{z} + 2 \times \text{hyp. log.}$$

$$\dfrac{z}{b} - \dfrac{p}{a^3} \times \dfrac{3}{7b^7} + \dfrac{4}{3b^6} + \dfrac{7}{5b^5} + \dfrac{2}{b^4} + \dfrac{10}{3b^3} + \dfrac{2}{b^2} + \dfrac{3}{b} \text{(where } p =$$

$3,1416$ and $b =$ the value of z in the equation $x = \dfrac{1+z+z^3}{az^3}$, when x

$= 0$) or by writing $\dfrac{y}{x}$ for its equal z, we have $\dfrac{p}{a^3}$

$$\times \dfrac{3x^7}{7y^7} + \dfrac{4x^6}{3y^6} + \dfrac{7x^5}{5y^5} + \dfrac{2x^4}{y^4} + \dfrac{10x^3}{3y^3} + \dfrac{2x^2}{y^2} + \dfrac{3x}{y} + 2 \times \text{hyp. log. } \dfrac{y}{bx}$$

$$- \dfrac{p}{a^3} \times \dfrac{3}{7b^7} + \dfrac{4}{3b^6} + \dfrac{7}{5b^5} + \dfrac{2}{b^4} + \dfrac{10}{3b^3} + \dfrac{2}{b^2} + \dfrac{3}{b} = \text{the ſolidity}$$

required.

The ſame anſwered by Mr. ISAAC ROWBOTTOM.

PUT $\dfrac{x}{v} = y$; $3,1416 = p$; then $x = \dfrac{v^3+v^2+1}{a}$ whence $\dot{x} =$

$\dfrac{3v^2\dot{v}+2v\dot{v}}{a}$ and the fluxion of the ſolidity is $py^2\dot{y} = p \times \overline{\dfrac{v^3+v^2+1}{av}}\Big|^z \times$

$\dfrac{3v^2\dot{v}+2v\dot{v}}{a}$ whoſe fluent is $\dfrac{p}{a^3} \times$

$\dfrac{3}{7}v^7 + \dfrac{4}{3}v^6 + \dfrac{7}{5}v^5 + 2v^4 + \dfrac{10}{3}v^3 + 2v^2 + 3v + 2,$ hyp. log. v; in which,

placing $\dfrac{x}{y}$ for v, gives (when x or y is a given quantity) the ſolidity

required.

9 QUEST. 437. anſwered by Mr. THOMAS WALKER.

PUT $s =$ the ſum of the two ſides; $a =$ the baſe; $m = 16\frac{1}{12}$; and $x =$ the greater ſide; then $s - x =$ the leſſer ſide, and (prop. 24. B. 2. Emerſon's Geom.) $a : s :: 2x - s : \dfrac{2sx-x^2}{a} =$ the difference of the

ſegments of the baſe $\therefore \dfrac{a^2+2sx-s^2}{2a} =$ the greater ſegment; and

$4a^2$

$$\frac{\overline{4a^2x^2 - a^x + 2sx - s^2}\,|^{\frac{1}{2}}}{2a} = \text{the perpendicular.}$$ And by the laws of

falling bodies $\dfrac{1}{m^{\frac{1}{2}}} \times \dfrac{\overline{4a^2x^2 - a^2 + 2sx - s^2}\,|^2\,|^{\frac{1}{4}}}{4a^2} = $ the time down the

perpendicular; and $x \sqrt{\dfrac{2a}{m}} \times \overline{4a^2x^2 - a^2 + 2sx - s^2}\,|^2\,|^{-\frac{1}{4}}$ and $\overline{s-x}$

$\times \sqrt{\dfrac{2a}{m}} \times \overline{4a^2x^2 - a^2 + 2sx - s^2}\,|^2\,|^{-\frac{1}{4}} = $ the time of falling down

the fides. Therefore, $s \sqrt{\dfrac{2a}{m}} \times \overline{4a^2x^2 - a^2 + 2sx - s^2}\,|^2\,|^{-\frac{1}{4}} = a$

minimum. In fluxions, &c. $x = \dfrac{\overline{s^3 - sa^2}}{2s^2 - 2a} = \dfrac{s}{2}$; therefore the $\triangle$ is

ifofceles.

The fame anfwered by Mr. EDWARD PARNEL.

By the principles of *mechanics*; the
time of defcent down any inclined plane,
is as the length of the plane directly; and
as the fquare root of its height recipro-
cally: therefore the times of defcent down
the fides CA and CB (of the triangle
ABC will be as $\dfrac{AC}{\sqrt{DC}}$ and $\dfrac{BC}{\sqrt{DC}}$ re-

fpectively; and their fum as $\dfrac{AC \times BC}{\sqrt{DC}}$;
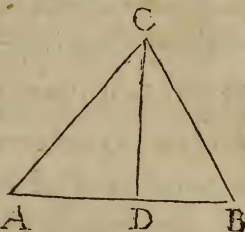
which (per *queft.*) is a minimum. But when $\dfrac{AC + BC}{\sqrt{DC}}$ is a minimum,

the $\sqrt{DC}$, and confequently the area of the triangle ABC, muft be a
maximum, (becaufe AB and AC+CB are given quantities) and $\therefore$
(per *Theor.* 5. p. 198. *Simpfon's* Geom. 2d Ed.) AC = BC, & AD =
BD; and the triangle ABC, an ifofceles one.

The fame anfwered by Mr. ADAM OLIVER.

By *mechanics*, the time in falling down the perpendicular CD is as
$\sqrt{CD}$; and the fum of the times in falling down CA, CB is as CB+CA
$\div \sqrt{CD}$ which will be a minimum as well as the real time. Now, as
CA+CB is a given quantity, it is evident that $\sqrt{CD}$ will be a maximum.
The points A and B being looked upon as the *foci* of an ellipfis; CD
will be greateft when it is the femiconjugate of that ellipfis; for by
the property of the ellipfis, the femiconjugate is greater than any ordi-
nate parallel to it. Therefore CA = CB; AD = DB.

10 Queft. 438. admits of neither *maximum* nor *minimum*. It not being properly
attended to before publication, &c. which *over-fight* the editor hopes h's kind *con-*
tributors will generoufly excufe, on account of his then bad ftate of health, &c.
And defires Mr. *Jofeph James* (in future) to be more careful in whatever he may
propofe to *public* confideration, &c.

11. QUEST. anſwered by ABDOLONIMUS.

LET E and W, be the eaſt and weſt points of the horizon; then, it is evident, becauſe the direction of the wind was due eaſt, that the kite was due eaſt from the boy. Therefore, let K the place of the kite, B that of the boy, KIB the ſtring; draw the ord. BK, which will repreſent the diſtance of the kite from the boy; alſo let C be the place where the ſhadow of the kite fell upon the ground; and let DC, BC, KC,
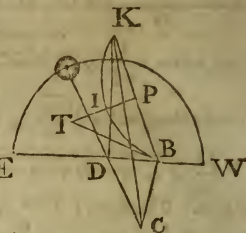
and BT be drawn; then as BT touches the ſtring at B, it will therefore be a tang. to it at that point. Draw the ſubtangent PT, and from K, let fall the ⊥ KD. Put BI = 100 = s; tangent BT = t = 137,3265146 yards; abſ. PI = x, its correſponding ſemiord. BP = y ſubtangent PT = v; and let a = the tenſion of the ſtring at I. Then (ſuppoſing the ſtring to form the catenarian curve) we ſhall have s^2 = $2ax + x^3$, and $\frac{sy}{a} = v$ ∴ $\frac{s^2 - x^2}{2x} = a = \frac{sy}{v}$ hence, $y = \frac{s^2 - x^2}{2sx} \times v$.

But (by 47. Eu. 1.) $y^2 = t^2 - v^2$ ∴ $v = \frac{2stx}{s^2 + x^2}$; which written for v, in the value of y found above, we get $y = \frac{s^2 - x^2}{s^2 + x^2} \times t$ = BP (by the prop. of the *catenary* $\frac{s^2}{2x} \frac{x^2}{} \times$ hyp. log. $\frac{s + x}{s - x}$; from whence x is found = 50, & then BK = 164,7918176 yards, the diſtance of the kite from the boy.

Again, the ſun's decl. at the given time was 1° 25′ 18″ found by proportioning the given hours from noon; conſequently, there are given the lat. decl. and hour, to find the ſun's alt. = 30° 3′ 8″ to which adding 17′ 32″ his ſemidiam. and refract. — 8″ his parallax (had from aſtronomical tables) gives 30° 20′ 24″ the apparent alt. of the ſun's upper limb; and his azimuth from the eaſt towards the ſouth = ∠ ⊙ DE = ∠ BDC, whoſe coſ. call b; BK = d, cotang ſun's alt. = c; and let x = ſine DBK. Then dx = DK, cdx = DC, $dx\sqrt{1 - c^2}$ = KC; and $d\sqrt{1 - x^2}$ = BD. Alſo by trig. $d\sqrt{1 - x^2 + c^2x^2 - 2bcx\sqrt{1 - x^2}}$ = BC, whence
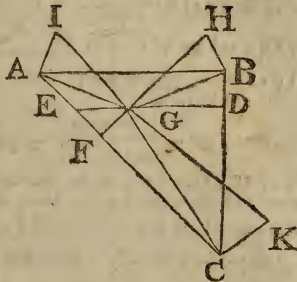
$$\frac{c^2dx - bcd\sqrt{1 - x^2}}{\sqrt{1 + c^2} \times d\sqrt{1 - x^2 + c^2x^2 - 2bcx\sqrt{1 - x^2}}} = \left(\frac{KC^2 + BC^2 - BK^2}{2BC \times CK}\right)$$

$$= \frac{c^2x - bc\sqrt{1 - x^2}}{\sqrt{1 + c^2} \times \sqrt{1 - x^2 + c^2x^2 - 2bcx\sqrt{1 - x^2}}} = \text{coſine of } 32° 57′ 48″$$

= ∠ KCB; from whence, by a quadratic equation, x is found = ,9185546; and the kites height; 151,3373²373 yards, W. W. R.

⁎ A2

₊ As Mr. *Beck* (the propofer of the *Prize Queftion*) fent no folution along with it; and having this *year* received no fatisfactory folutions to the fame; although feveral ingenious correfpondents have attempted to give folutions thereto: yet, fome, through miftaking the *data*; and others, apprehending fome ambiguity in the terms under which it is propofed, &c. fhall therefore (for the prefent) omit inferting any of them; but leave the further confideration thereof to them, to another year, &c. fhall therefore, in the next place, give fome emendations and corrections to fome folutions that have been publifhed in fome preceding *Diaries.*

To begin then with QUEST. 7. propofed 1775, and anfwered in 1776. Mr. W. T. defires the following folution a place this year.

LET ABC be the garden; AI, HB, and KC, the three pillars; draw GF perpendicular to AC, and thro' G, draw ED, parallel to AB; and put $AB = BC = a = 295,161$, $AC = b, = 417,4106$; and put $16\frac{1}{12} = c$. Then, by the laws of falling bodies, $\frac{9c}{4} = IA$; $c = HB$, and $4c = KC$; then put $x =$ the time of defcent down each plane (and p. 19, *Emerfon's* mechanics $1\frac{1}{2}'' : \frac{9c}{4} :: x'' :$

$\frac{3cx}{2} = IG$, and in like manner $cx = HG$; and $2cx = KG$; and (per 47. *Eu.* 1.) $\frac{3c}{2} \times \overline{x^2 - \frac{9}{4}}|^{\frac{1}{2}} = AG$; $c \times \overline{x^2 - 1}|^{\frac{1}{2}} = BG$; and $2c \times \overline{x^2 - 4}|^{\frac{1}{2}} = CG$. Then (cor. p. 23. B. 2. *Emerfon's* geom.) $CD = \frac{a}{2} - \frac{15c^2}{2a} + \frac{3c^2}{2a} \times x^2$: and $CF = \frac{b}{2} - \frac{175c^2}{32b} + \frac{7c^2}{8b} \times x^2$; for which, fubftitute $u + vx^2$, and $m + nx^2$. Now (by Sim. △ 1) CB : CA :: CD : $\frac{bu + bvx^2}{a} = CE$, and $CE - CF = EF = FG = \frac{bu}{a} - m + \frac{bv}{u} - n \times x^2 = p + sx$ by fubftitution. Then (p. 47. *Eu.* 1.) $CF^2 + FG^2 = CG^2$; that is, $\overline{m + nx^2}|^2 + \overline{p + sx^2}|^2 = 4c^2x^2 - 16c^2$. Reduced, $x^4 + \frac{2mn + 2ps - 4c^2}{n^2 + s^2} \times x^2 = - \frac{m^2 + p^2 + 16c^2}{n^2 + s^2}$. In numbers $x^4 + 408,385x^2 = - 22926,664$. folved, $x = 8,195$. Hence all the reft is eafily had.

N. B. I took the times of defcent, 1, $1\frac{1}{2}$, and 2 feconds, and not as printed: for, as the *queftion* is printed, it gives $x^4 - 228,1932x^2 = - 16314,4343$, which is impoffible.

The second Quest. 1776. answered also by Mr. W. T.

Let K, be the center of the wheel, and put $a = BF = DM =$ the height of the fall; $x =$ the radius of the wheel; and $z =$ the fine of the angle EKF $=$ GKF.

Then (scho. p. 2. B. 1. *Emerson*'s trig.) $2z \sqrt{1-z^2} =$ the fine of the angle EKG $=$ DFM; and by *trigonometry*

$$\sqrt{1-z^2} : x :: z : \frac{zx}{\sqrt{1-z^2}} = FE; \text{ and } 2z \sqrt{1-z^2} :$$

$$a :: 1 : \frac{a}{2z\sqrt{1-z^2}} = DF;$$

then $DF - EF = \frac{a-2z^2x}{2z\sqrt{1-z^2}} = DE$; (and by similar triangles) FD :

FB :: ED : EC $= a - 2z^2x$. But the force of the wheel will be as the velocity of the water on the floats at E, multiplied into the radius of the wheel, or as $x \times \overline{a-2z^2x}|^{\frac{1}{2}} = a \ maximum$. Which (supposing z given) gives $x = \frac{a}{3z^2}$. From this expression, it is evident that if z be variable, x and consequently the force of the wheel will be greatest, when z is indefinitely small. Therefore the case in hand admits of no *maximum* in the *undershot* wheel, but when the angle DFM is indefinitely small, and the radius of the wheel indefinitely great. But in the *overfall* wheel the angle DFM is $= 90°$, and $z =$ the fine of $45°$, and $x = \frac{2a}{3}$.

Remark. It appears, the *undershot* has greatly the advantage of the *overshot* wheel, when they act by impulse alone.

N. B. This solution is nearly the same as that published, Prob. 27. of Mr. *Emerson*'s miscellanies.

A *corrected* solution to Quest. 8. 1776. by Mr. W. T.

Put AB $= a$, the given object to be cut; DE $= n$; the force acting at E $= m$; and put $x =$ the fine of half the required angle, then $\sqrt{1-x^2} =$ the cosine; then by *trigonometry*, $x : \frac{a}{2} :: 1 : \frac{a}{2x} = BD$.

And, by the property of the *lever* $\frac{2mnx}{a} =$ the force at B, acting upon the perpendicular BC; but the force upon BA,
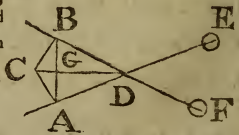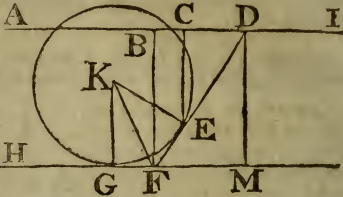
BA, is to the force upon BC, as the angle GED is to radius; that is as

$$\sqrt{1-x^2} : 1 :: \frac{2mnx}{a} : \frac{2mnx}{a\sqrt{1-x^2}}$$ the force to cut AB; a maximum or

$$\frac{x}{\sqrt{1-x^2}} = \text{a maximum.}$$ In fluxions, &c. $x = \sqrt{\frac{1}{2}} = $ the natural fine of $45°$. Hence the angle EDA $= 90°$, at which the fciffars will cut the beft.

NEW Mathematical QUESTIONS to be anfwered in the next year's DIARY.

(1) QUEST. 441. by ABDOLONIMUS.

Four equations I fend, in hopes that fome friend
   Will hafte for to give me relief;
By *quadratic* equations, and fair operations,
   From hence * fhow the caufe of my grief.

*Given
$$\begin{cases} \overline{x^{12}+y^{12}+z^{12}+w^{12}}\big|^{\frac{1}{3}} \times \overline{x^{12}+y^{12}+z^{12}}\big|^{\frac{1}{6}} = 50094,3470718 \\ \overline{x^4+y^4+w^4}\big|^{\frac{1}{3}} \times \overline{x^4+y^4+z^4+w^4}\big|^{\frac{1}{5}} = 842,56895473 \\ \overline{x^{12}+y^{12}+z^{12}+w^{12}}\big|^{\frac{1}{8}} + \overline{x^4+y^4+w^4}\big|^{\frac{1}{3}} = 170,6861442 \\ \overline{x^4+y^4+z^4+w^4}\big|^{\frac{1}{5}} + \overline{x^{12}+y^{12}+z^{12}}\big|^{\frac{1}{6}} = 497,3194942 \end{cases}$$

(2) QUEST. 442. by Mr. JOSEPH JAMES, of *Stoke-Bifhop.*

IT is required to find a fquare number; fuch, that being multiplied by 4, and that product leffened by 16. the remainder fhall be a fquare number?

(3) QUEST. 443. by Mr. PATRICK HALL, of *Denby*, Derbyfhire.

A gentleman having a garden in the form of a quadrant of an ellipfe, whofe femi-tranfverfe $= 15$, and femi-conjugate axe $= 10$ yards; which he is defirous to have divided into two trilineal fpaces, by a walk drawn from the right angle of the faid garden, and terminating in the curve; fo that the fpace lying next the greater femi-axe, may be to the other, in the ratio as 3 to 4. *Query*, the greateft rectangular fifh-pond that can be infcribed in the fpace bounded by the walk, the femi-tranfverfe, and the curvilineal part of the ellipfe.

(4.) QUEST.

(4.) QUEST. 444. by Mr. JOHN WILLES, mafter of the FREE-SCHOOL, at *Marfk* in *Cleveland*, by whom *youth* are taught the ENGLISH LANGUAGE, and the various branches of the MATHEMATICS.

To determine the length of the tangent (TM) drawn to touch an ellipfis (whofe diameters are 40 and 30 refpectively) in the point (M) fuch; that if the femi-ordinate (PM) and a right line (MC) from the point of contact to the center of the ellipfis be drawn; the difference of the areas of the two triangles (CPM) and (PMT) formed thereby, may be a minimum.
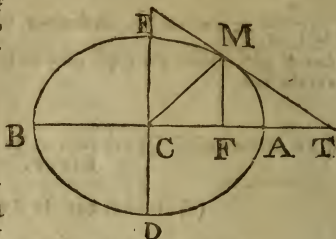
(5.) QUEST. 445. By Mr. ALEX. ROWE, of *Reginnis*, near *Penzance.*

ON the 21ft of *June*, 1777, at a certain place, the fun being due eaft; it was obferved, that the fine of the fun's diftance from fix o'clock, was to that of his altitude, as 2 to 3. required the latitude of the place.

(6.) QUEST. 446. By Mr. ISAAC ROWBOTTOM, of *Weft Hallam*, Derbyfhire.

IF the fub-tangent of a curve be expreffed by $\dfrac{\overline{bx-x}\,|^3}{\overline{b-x^1\times\sqrt{a^2+x^2}|+ab}\,|^3}$

$\times\dfrac{^ny^2y}{\dot{x}^2}$; Quere the femi-ordinate y; when $a=4$, $x=3$, and $b=1000$ yards refpectively.

(7.) QUEST. 447. By Mr. JOHN WILLES, of *Marfk*.

AN erect declining dial declines from the fouth 30 degrees; and the plane's difference of longitude exceeds the fubftyles diftance from the meridian, juft equal to the co-latitude of the place. To determine in what latitude this dial is fixed.

(8.) QUEST. 448. By Mr. THOMAS WALKER.

LET there be a right angled triangle, and a femiparabola joined together at the leaft angle of the triangle, and vertex of the parabola, fo,

that

that the bafe and abfcifs may make one right line; the legs of the triangle being 80 and 60; and abfcifs and greateft femiordinate of the parabola 80 and 50. Required the dimenfions of the greateft parabola that can be infcribed in the fpace contained by the fegment of the hypothenufe, tangent, and curve; when the tangent is drawn fo as to divide the area of the triangle in the ratio of 3 : 2.

(9.) Quest. 449. By Mr. William Winn, of *Thirſk*, Yorkſhire.

On a certain day in 1777, at 6 o'clock in the morning, as I was fitting in a room, the Sun ſhining in at the window, I obfe-ved the rays to fall on the cieling of the room from a reflecting body on the floor (which was an horizontal plane,) I obferved the fame, when the Sun was due eaft, and meafured the diftance of two rays upon the cieling, and found it 12,846064 feet. Moreover, I found the *ſum* of both the reflected rays from the cieling to the body, to be to their *difference,* as 12,846064 to 2,646224. Required the latitude; the time of the year; and the height of the room.

(10.) Quest. 450. By Mr. Ralph Thompson, of Witherley Bridge.

What are the dimenfions of the area, of the greateft femicubical parabola that can be infcribed in an annulus, with its vertex in the inner circle; the fum of whofe circumferences is 125,664; and difference of their diameters = 20. And alfo, the length of a chord of the outer circle perpendicular to its diameter, that will cut off one half of the faid parabola.

(11.) Quest. 451. By Mr. William Sherwin, of *Aſſon*, upon *Trent*.

A noted *ſurveyor* of land, in meafuring a nobleman's park, found a fiſh-pond; upon the brink of which grew a ftately oak, whofe neareft diftance from the park wall was 1,5 chains; and he obferved, that the angle (at any point of the brink of the pond,) fubtended by that perpendicular height of the wall which was in a right line with that point and the oak tree was $1°$ $1'$ $43''$; and the height of the wall was 4 yards. From whence he defires fome ingenious *diarian,* will in the next year's Diary, tell him the exact area of the pond.

(12.) Quest. 452. By Mr. Thomas Walker.

Given the time of evacuation of a paraboloid thro' a circular hole in the vertex of $1\frac{1}{2}$ inch diameter $19'$ $23''$ $12'''\frac{1}{2}$ the neareft diftance from the middle of the bafe to the curve furface 45,161175 inches; required the diameter and folid content?

(13.) Quest.

(13.) QUEST. 453. being the PRIZE QUEST. by Mr. ISAAC ROW-
BOTTOM.

A gentleman has a garden in the form of the trapezium ABCV, in
which are two canals a triangular one ABO, and another AVC,
bounded by a ſtraight walk AC, and two equal curved ones AV, VC,
uching each other in their vertices V, whoſe equation is $px = y^3$.

Now, on a certain day in the
ſpring, 1777, I being employed in
ſurveying his eſtate, obſerved that at

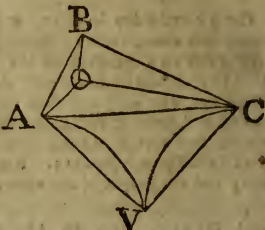$55\frac{7}{15}$ min. paſt 6 o'clock in the

morning the ſhadow of a ſtaff 6 feet
long erected at C, fell upon the walk
KC, and its length was 15,87872

feet; but $1\frac{17}{225}$ hours after, it fell

upon the walk CO, and its length

was then but 7,52444 feet: alſo at $1\frac{137}{450}$ hours paſt noon on the ſame

day, the ſhadow of a tree ſtanding perpendicular to the horizon at A,
fell upon AB; moreover, I found that if a right line was drawn from
C, and another from A, to the ſummit of a *fir* ſtanding perpendicular
to the horizon at O, the angles formed by theſe lines and the horizon
would be 5° 14′ 47″ and 17° 32′ 10″. Theſe are all the di-
menſions that can poſſibly be procured, only (from an old plan of this
garden,) we found, that when the walks AV, VC were made, they
took the leaſt quantity of materials poſſible; and the gentleman him-
ſelf, remembering that the angle ABC was right; and that the canal
AVC, exceeded ABC, by 2 a. 1 r. 36,31 p. It is requeſted, that
ſome of your ingenious correſpondents, will give the dimenſions of
each ſeparate part of this garden, ſo that the true area thereof may
be known.

F I N I S.