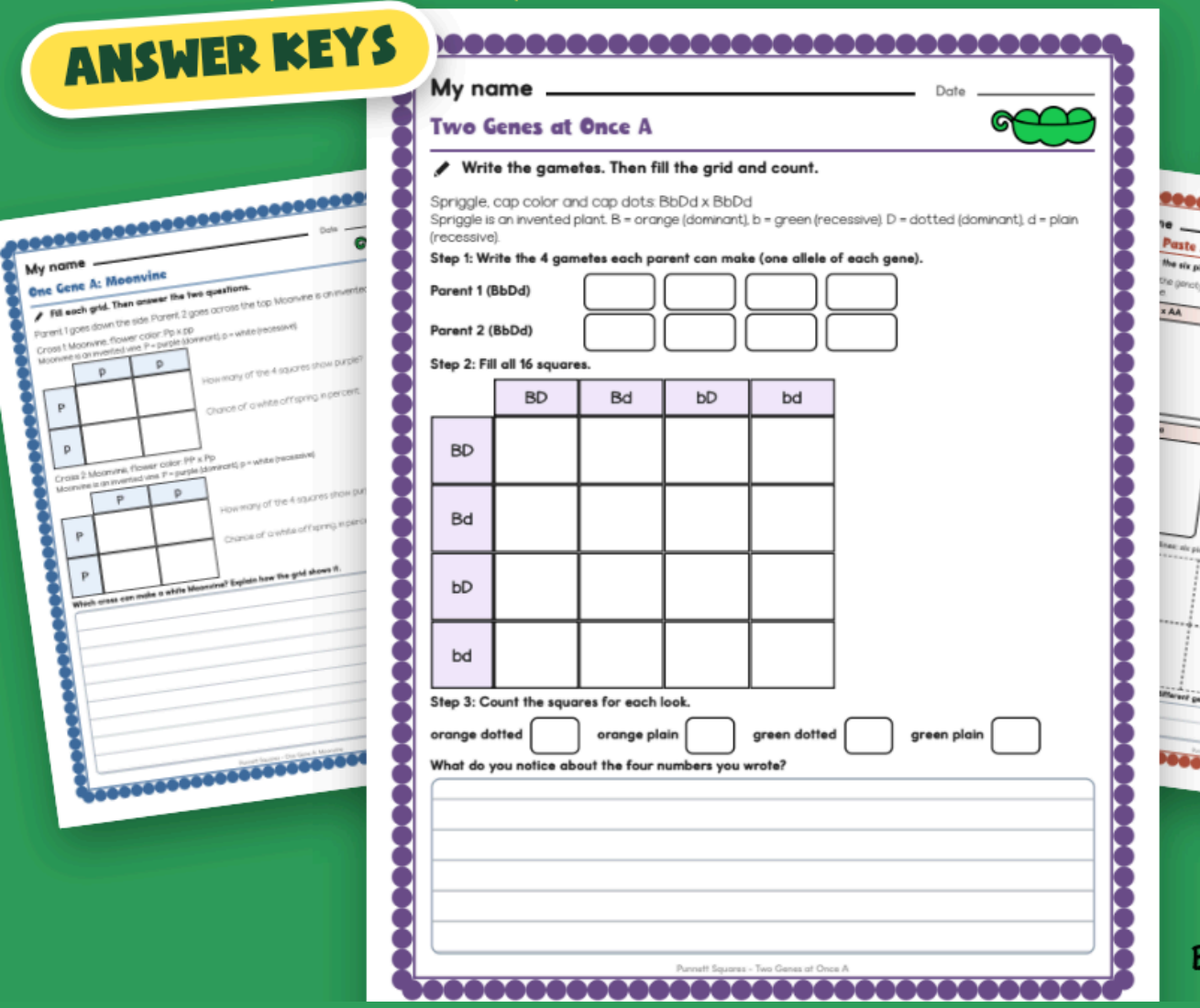
PUNNETT SQUARES

Monohybrid, Dihybrid, Cut and Paste - Grades 6-8

ANSWER KEYS

25 STUDENT PAGES



Bright Path Sped

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- Open it in a PDF reader (Adobe Acrobat Reader, Preview, or your browser), click into a line, a box or a square of a grid, type, and Save As.
- The name line, every answer box, every ruled work box, every check box and every empty square of every grid on the student pages are type-in fields, and so are the tracker, class grid, team note and family page. You can also print any page and write by hand.
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Print at 100 percent

Turn off fit to page and shrink to fit so the ruled lines stay 0.34 inch apart. Every student page is black and white inside a colored border, so it still reads when copied in black and white.

Student work

A filled-in tracker, class grid or team note carries a real student's name. Keep it in the data folder, and use a first name only on any page that leaves your hands.

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PREVIEW

How To Read a Page

The parts of a student page, then the page types in the order they come.

The parts of a page

- **The grid.** Parent 1 down the side, parent 2 across the top. Every empty square is a type-in field. The capital letter goes first.
- **The answer box.** A bordered box for a count, a percent, a letter or a word. Click it to type, or print and write in it.
- **The ruled work box.** Lines 0.34 inch apart. A short answer gets at least 4 lines; the other written boxes get at least 2 or 3. It types and prints.
- **The check box.** True or false, genotype or phenotype, yes or not yet: click or mark one.
- **The cut line.** Six pieces in a 3 by 2 grid, each 2.4 by 1.25 inches, edge to edge: two cuts across and two down.

Page type	What it looks like	What the student does
Words and code	3 sheets, 18 items	Match eight terms; turn a genotype into a look; try the four steps.
One-gene grids	4 sheets, 16 items	Fill two grids a page; count the looks; find a chance.
Ratios and chances	2 sheets, 14 items	Write genotype and look ratios; work expected-number questions.
Incomplete dominance, two genes	4 sheets, 20 items	Fill pink-in-the-middle grids; fill a 16-square and an 8-square grid.
Sorts, true or false	3 sheets, 30 items	Genotype or phenotype; homozygous or heterozygous; fix false sentences.
Quiz, cut and paste	12 items, 18 pieces	A quiz in two parts and three cut-and-paste mats.

Untimed, unscored on the page

No student page has a timer or a score on it. The keys and the tracker are for you. The answer keys are on pages 30 to 33, and every grid in them is computed from the parent genotypes.

Chances, not promises

A Punnett square shows the chance of each outcome. It does not say what any one offspring will be. Pages 13 and 20 say so in the students' own words.

Printing and the type-in fields

Every page prints clean in black and white. The name line, every answer box, every ruled box, every check box and every grid square are type-in fields in any PDF reader: click one, type, then save. This is a fillable PDF, not a slideshow or a word-processor file.

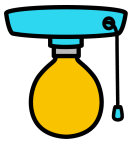
Open answers

Written boxes, short answers and the design page are open. The keys give a sample and what to look for. Accept any answer that is true to the grids and explains its reason.

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____



Genetics Words

Write the letter of each meaning.

1	genotype		A	the trait you can see or measure, such as purple flowers
2	homozygous		B	an allele that shows in the organism even when only one copy is present
3	allele		C	a chart that follows one trait through a family tree
4	recessive allele		D	a section of DNA that holds the instructions for one trait
5	gene		E	having two of the same allele for a trait, such as BB or bb
6	heterozygous		F	a change in the order of the DNA in a gene
7	phenotype		G	an allele that is hidden when a dominant allele is present
8	dominant allele		H	one of the different versions of a gene
			I	having two different alleles for a trait, such as Bb
			J	the pair of alleles an organism has for a trait, such as Bb

Two of the meanings are not used.

Use two of the words in one sentence about a plant or animal.

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

How to Fill a Punnett Square

Read the four steps. Then fill the practice grid.

1. **Write the alleles.** Put one parent's two alleles across the top and the other parent's two alleles down the side.
2. **Fill each square.** Copy the letter from the top and the letter from the side into the square. Write the capital letter first.
3. **Read the squares.** Each square is one possible offspring. The two letters are its genotype.
4. **Count.** Count each genotype and each look. Use the counts for a ratio and a chance.

Worked example: Moonvine, flower color: Pp x Pp

Moonvine is an invented vine. P = purple (dominant), p = white (recessive).

	P	p
P	PP	Pp
p	Pp	pp

Genotypes: 1 PP : 2 Pp : 1 pp

Looks: 3 purple : 1 white

Chance of white: 1 of 4, or 25 percent

Cross Your turn: Glimmerfin, fin color: Gg x gg

Glimmerfin is an invented fish. G = gold (dominant), g = silver (recessive).

	g	g
G		
g		

How many of the 4 squares show gold? ☐

Chance of a silver offspring, in percent: ☐

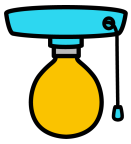
In step 2, why is it written Pp and not pP?

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

One Gene B: Tumblebug



Fill each grid. Then answer the two questions.

Parent 1 goes down the side. Parent 2 goes across the top. Tumblebug is an invented bug.

Cross 1: Tumblebug, back pattern: Ss x Ss
Tumblebug is an invented bug. S = spotted (dominant), s = plain (recessive).

	S	s
S		
s		

How many of the 4 squares show spotted? ☐

Chance of a plain offspring, in percent: ☐

Cross 2: Tumblebug, back pattern: SS x ss
Tumblebug is an invented bug. S = spotted (dominant), s = plain (recessive).

	s	s
S		
S		

How many of the 4 squares show spotted? ☐

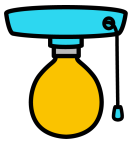
Chance of a plain offspring, in percent: ☐

In the second cross, why is every offspring spotted even though one parent is plain?

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____



One Gene D: Glimmerfin

Fill each grid. Then answer the two questions.

Parent 1 goes down the side. Parent 2 goes across the top. Glimmerfin is an invented fish.

Cross 1: Glimmerfin, fin color: gg x Gg
Glimmerfin is an invented fish. G = gold (dominant), g = silver (recessive).

	G	g
g		
g		

How many of the 4 squares show gold? ☐

Chance of a silver offspring, in percent: ☐

Cross 2: Glimmerfin, fin color: GG x gg
Glimmerfin is an invented fish. G = gold (dominant), g = silver (recessive).

	g	g
G		
G		

How many of the 4 squares show gold? ☐

Chance of a silver offspring, in percent: ☐

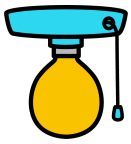
Compare the two grids. What is different about the parents in each cross?

PREVIEW

Preview - Bright Path Shed

My name _____ Date _____

What Are the Chances?



Use a Punnett square to help. Write each answer.

Draw a Punnett square on scrap paper if it helps. Expected means what the grid predicts.

1. Two purple Moonvines (Pp x Pp) are crossed. What fraction of the offspring is expected to be white?

   ____ fraction

2. The same cross. What percent of the offspring is expected to be purple?

   ____ percent

3. A Flurb cross Tt x tt makes 40 offspring. About how many are expected to have short tails?

   ____ number

4. A Tumblebug cross Ss x Ss makes 200 offspring. About how many are expected to be plain?

   ____ number

5. A Glimmerfin cross GG x gg. What is the chance, in percent, of a silver offspring?

   ____ percent

6. A Glimmerfin cross Gg x Gg makes a gold first offspring. What is the chance, in percent, that the next offspring is silver?

   ____ percent

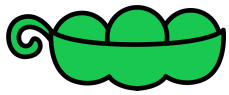
A grid predicts 1 white out of 4. Why might a real group of offspring not match exactly?

PREVIEW

Preview - Bright Ezee Shed

My name _____ Date _____

Incomplete Dominance B



Fill each grid. Then count the squares.

Same Pinkle bush. Fill each grid and count.

Cross 3: Pinkle bush, flower color: RR x Rr
Pinkle bush is an invented shrub. RR = red, Rr = pink, rr = white.

	R	r
R		
R		

How many of the 4 squares are pink? ☐

How many of the 4 squares are white? ☐

Cross 4: Pinkle bush, flower color: Rr x rr
Pinkle bush is an invented shrub. RR = red, Rr = pink, rr = white.

	r	r
R		
r		

How many of the 4 squares are pink? ☐

How many of the 4 squares are white? ☐

5 Can two pink Pinkle bushes (Rr x Rr) have a red offspring? Use a grid. ☐ **yes** ☐ **no**

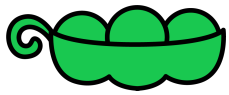
Explain your answer to question 5.

PREVIEW

Preview - Bright Path Seed

My name _____ Date _____

Two Genes at Once B



Fill the grid. Then count the looks.

Quibble, fur and wings: FFWw x FfWw
Quibble is an invented animal. F = fuzzy (dominant), f = smooth (recessive). W = winged (dominant), w = wingless (recessive).

Fill all 8 squares. Parent 1 can make only 2 different gametes, so the grid has 2 rows.

	FW	Fw	fW	fw
FW				
Fw				

Count the squares for each look.

fuzzy winged ☐ **fuzzy wingless** ☐ **smooth winged** ☐ **smooth wingless** ☐

How many different genotypes are in the grid? ☐

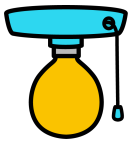
No offspring is smooth. Look at Parent 1. Why can this cross never make a smooth Quibble?

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Homozygous or Heterozygous?



Write the letter that names each genotype.

A homozygous dominant	B homozygous recessive	C heterozygous

Write the letter from the box for each genotype.

1 Tt		7 tt	
2 gg		8 ss	
3 SS		9 EE	
4 Ee		10 pp	
5 PP		11 GG	
6 Gg		12 Pp	

Why can a heterozygous organism hide a recessive allele?

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Cut and Paste 2

Cut out the six pieces. Paste each one in the right box.

Each piece is a genotype. Paste it in the box that names it.

Homozygous	Heterozygous

PREVIEW

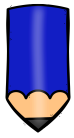
Cut on the dashed lines: six pieces, two straight cuts across and two down.

Pp	TT	Ss
gg	Gg	EE

Pick a piece from the right-hand box. How do you know it is heterozygous?

My name _____ Date _____

Think It Through A



Answer each question in full sentences.

Use what you learned from the grids to answer.

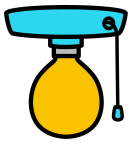
1. In your own words, what is the difference between a genotype and a phenotype? Use a Moonvine as your example.

2. Why does a Punnett square put one parent's alleles along the top and the other parent's down the side?

3. Two purple Moonvines (Pp x Pp) have a white offspring. Neither parent is white. How is that possible?

PREVIEW

My name _____ Date _____



Design Your Own Cross

Make up a trait. Fill the grid. Write your ratio.

Make up a plant or animal that does not exist. Pick one trait with two looks. No real animals or people.

My plant or animal (invented): _____

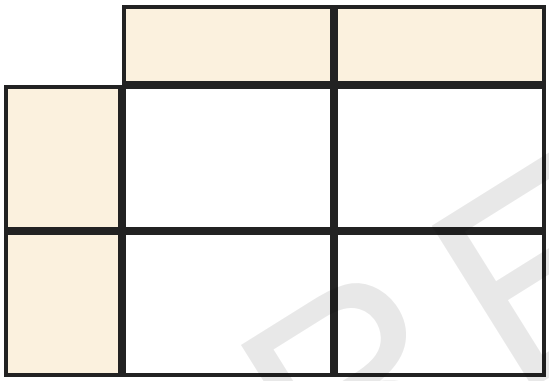
The trait: _____

Dominant allele and look: _____

Recessive allele and look: _____

Parent 1 genotype: ☐ **Parent 2 genotype:** ☐

Write each parent's alleles in the shaded boxes. Then fill the squares.



My genotype ratio: _____

My look ratio: _____

What is the chance an offspring shows the recessive look? Show how you know.

PREVIEW

My name _____ Date _____

Quiz, Part B

Read each one. Write the letter of the best answer.

Write the letter of the best answer in the box.

7 A Tumblebug has the genotype Ss. What is its phenotype?

A spotted
B plain
C half spotted and half plain

8 A Flurb cross Tt x tt. What percent of the offspring is expected to have long tails?

A 25 percent
B 50 percent
C 75 percent

9 A cross makes offspring in the genotype ratio 1 TT : 2 Tt : 1 tt. Which two parents were crossed?

A TT x tt
B Tt x tt
C Tt x Tt

10 Which genotype is homozygous recessive?

A gg
B Gg
C GG

11 A Zibbit cross Ee x Ee makes 80 offspring. About how many are expected to have floppy ears (ee)?

A 40
B 20
C 60

12 Which statement about a Punnett square is true?

A It shows exactly which offspring will be born
B It shows only the parents' phenotypes
C It shows the chances of each outcome

PREVIEW

Answer Key: Words and Sorts

Genetics Words, Read the Code, both sorts and True or False. Every look is computed from the genotype.

Genetics Words page 5 (unused meanings: C and F)

#	Word	Letter
1	genotype	J
2	homozygous	E
3	allele	H
4	recessive allele	G
5	gene	D
6	heterozygous	I
7	phenotype	A
8	dominant allele	B

Read the Code page 6

#	Genotype	Look
1	Pp	purple
2	tt	short
3	GG	gold
4	Ss	spotted
5	ee	floppy
6	RR	red
7	Rr	pink
8	pp	white

True or False? page 20; for the fix-it lines, accept any true rewrite

#	Starts with	Answer
1	A recessive allele shows in an …	True
2	A Punnett square tells you exactly …	False: It shows the chances of each outcome, not a promise about any one offspring.
3	An organism with the genotype Bb …	False: Bb has two different alleles, so it is heterozygous.
4	Each parent gives one allele for …	True
5	Dominant means the most common allele …	False: Dominant describes the allele that shows when two different alleles are present. It says nothing about how common the allele is.
6	Two heterozygous parents can have an …	True

Genotype or Phenotype? page 18

#	Item	Answer
1	Tt	genotype
2	long tail	phenotype
3	gold fins	phenotype
4	gg	genotype
5	spotted back	phenotype
6	SS	genotype
7	white flowers	phenotype
8	Ee	genotype
9	floppy ears	phenotype
10	pp	genotype
11	Gg	genotype
12	plain back	phenotype

Homozygous or Heterozygous? page 19

#	Genotype	Answer
1	Tt	C: heterozygous
2	gg	B: homozygous recessive
3	SS	A: homozygous dominant
4	Ee	C: heterozygous
5	PP	A: homozygous dominant
6	Gg	C: heterozygous
7	tt	B: homozygous recessive
8	ss	B: homozygous recessive
9	EE	A: homozygous dominant
10	pp	B: homozygous recessive
11	GG	A: homozygous dominant
12	Pp	C: heterozygous

PREVIEW

Answer Key: Ratios, Incomplete, Two Genes

Everything on this page is computed from the parent genotypes in code.

Ratios From the Grid page 12

#	Cross	Genotypes	Looks
1	Ee x Ee	1 EE : 2 Ee : 1 ee	3 upright : 1 floppy
2	EE x ee	all Ee	all upright
3	Ee x ee	1 Ee : 1 ee	1 upright : 1 floppy
4	EE x Ee	1 EE : 1 Ee	all upright

What Are the Chances? page 13

#	Starts with	Answer
1	Two purple Moonvines (Pp x Pp) …	1/4
2	The same cross. What percent of …	75 percent
3	A Flurb cross Tt x tt …	20 offspring
4	A Tumblebug cross Ss x Ss …	50 offspring
5	A Glimmerfin cross GG x gg …	0 percent
6	A Glimmerfin cross Gg x Gg …	25 percent

Page 16: BbDd x BbDd

	BD	Bd	bD	bd
BD	BBDD	BBDd	BbDD	BbDd
Bd	BBDd	BBdd	BbDd	Bbdd
bD	BbDD	BbDd	bbDD	bbDd
bd	BbDd	Bbdd	bbDd	bbdd

Gametes (either parent): BD, Bd, bD, bd. Looks: 9 orange dotted : 3 orange plain : 3 green dotted : 1 green plain; counts 9, 3, 3, 1.

	r	r
R	Rr	Rr
R	Rr	Rr

Page 14, cross 1: RR x rr
Genotypes: all Rr
Looks: all pink
Answers: 4 squares pink; 0 squares white

	R	r
R	RR	Rr
r	Rr	rr

Page 14, cross 2: Rr x Rr
Genotypes: 1 RR : 2 Rr : 1 rr
Looks: 1 red : 2 pink : 1 white
Answers: 2 squares pink; 1 square white

	R	r
R	RR	Rr
R	RR	Rr

Page 15, cross 3: RR x Rr
Genotypes: 1 RR : 1 Rr
Looks: 1 red : 1 pink
Answers: 2 squares pink; 0 squares white

	r	r
R	Rr	Rr
r	rr	rr

Page 15, cross 4: Rr x rr
Genotypes: 1 Rr : 1 rr
Looks: 1 pink : 1 white
Answers: 2 squares pink; 2 squares white

Page 15, question 5: yes. Rr x Rr makes 1 of 4 squares RR (red).

Page 17: FFWw x FfWw

	FW	Fw	fW	fw
FW	FFWW	FFWw	FfWW	FfWw
Fw	FFWw	FFww	FfWw	Ffww

Counts: fuzzy winged 6, fuzzy wingless 2, smooth winged 0, smooth wingless 0. Different genotypes: 6. Every offspring gets an F from the FF parent, so none can be smooth (ff).

PREVIEW

Punnett Squares Tracker

One student, every scored page. Filled example: page 38.

Student _____ Teacher _____ Month _____

Page	Page type and set	Items	Right	Date	Notes
5	Genetics Words	8			
6	Read the Code	8			
7	How to Fill a Punnett Square	2			
8	One Gene A: Moonvine	4			
9	One Gene B: Tumblebug	4			
10	One Gene C: Flurb	4			
11	One Gene D: Glimmerfin	4			
12	Ratios From the Grid	8			
13	What Are the Chances?	6			
14	Incomplete Dominance A	4			
15	Incomplete Dominance B	5			
16	Two Genes at Once A	6			
17	Two Genes at Once B	5			
18	Genotype or Phenotype?	12			
19	Homozygous or Heterozygous?	12			
20	True or False?	6			
21	Cut and Paste 1	6			
22	Cut and Paste 2	6			
23	Cut and Paste 3	6			
27	Quiz, Part A	6			
28	Quiz, Part B	6			

How to fill this in

Write how many items the student got right with no prompt, and the date. A blank means not tried yet, never wrong. There are 128 items on the 21 scored sheets. Answer keys: pages 30 to 33. Filled example: page 38.

This month we are working on (your own standard or wording)

PREVIEW

Team Note

Use this page between team meetings or when a student moves classes, to hand off what changed without writing a note from scratch. Everything below is observable, with a blank for the number or the wording your team already uses.

Student _____ Team member _____ Date _____

Page type	Covered since last note (Y/N)	Items right	Still blank
Words and code			
One-gene grids			
Ratios and chances			
Incomplete, two genes			
Sorts, true or false			
Quiz, cut and paste			

What I saw (observable, not a conclusion)

- Filled ___ of ___ grids with the right letters in the right squares without a prompt.
- Told a genotype from a phenotype on ___ of 12 items (page 18).
- Used a grid to answer a chance question (page 13): yes / no / with a reminder.
- Explained that a grid shows chances, not a promise: yes / no.

Next step

- Next page or set: ___, because ___ (what you saw).
- What to try in another class or at home: ___.
- What to keep doing because it is working: ___.
- Anything for the team meeting to decide: ___ (this page records what happened, never a label or a plan).

Summary, in one or two sentences, for whoever reads this next

A filled-in line, for reference

"Matched 6 of 8 words on Genetics Words with no prompt on 9/22. Next step: act out genotype and phenotype with an example from the grids." That is the level of detail this page is built for. It matches the filled example on page 38.

PREVIEW

Dana's Tracker (Invented Student)

Dana R. is invented; nothing on this page describes a real student. The blank tracker is on page 34.

Student	Teacher	Month
Dana R. (an invented student)	Ms. Hale (invented)	September to October

Page	Page type and set	Items	Right	Date	Notes
5	Genetics Words	8	6	9/22	Mixed up genotype and phenotype
6	Read the Code	8	7	9/23	Rr: wrote purple, not pink
7	How to Fill a Punnett Square	2	2	9/24	-
8	One Gene A: Moonvine	4	3	9/26	Missed the percent in cross 2
9	One Gene B: Tumblebug	4	4	9/29	-
10	One Gene C: Flurb	4	-	-	-
11	One Gene D: Glimmerfin	4	-	-	-
12	Ratios From the Grid	8	-	-	-
13	What Are the Chances?	6	-	-	-
14	Incomplete Dominance A	4	-	-	-
15	Incomplete Dominance B	5	-	-	-
16	Two Genes at Once A	6	-	-	-
17	Two Genes at Once B	5	-	-	-
18	Genotype or Phenotype?	12	10	10/1	Mixed up gold fins and Gg
19	Homozygous or Heterozygous?	12	-	-	-
20	True or False?	6	5	10/3	Marked dominant as most common
21	Cut and Paste 1	6	-	-	-
22	Cut and Paste 2	6	-	-	-
23	Cut and Paste 3	6	-	-	-
27	Quiz, Part A	6	-	-	-
28	Quiz, Part B	6	-	-	-

How to read it

Dana R. has done **7 of 21** scored sheets and got **37 of 44** items right with no prompt. **2** sheets were all right and **5** carry a note. Every number comes from the table.

What the table points to

The lowest page is Genetics Words (6 of 8) and One Gene A: Moonvine (3 of 4). That is where the next practice goes. The 14 pages left blank are not tried yet, never wrong.

PREVIEW